BALTIMORE COUNTY

Phase II Watershed Implementation Plan

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CHAPTER 1

OVERVIEW OF THE BALTIMORE COUNTY PHASE II WIP PROCESS

The development of the Baltimore County Phase II WIP was initiated with a regional workshop on January 21, 2011 hosted by Maryland Department of the Environment. The initial Baltimore County Phase II WIP team was established at that time based on attendance at the Baltimore County breakout session. County staff representing a cross-section of county agencies had previously attended an NPDES Management Committee meeting on December 13, 2010. Members of this committee were also invited to be on the Baltimore County Phase II WIP team. There are currently 67 names on the Baltimore County team membership contact page. The team represents a cross-section of county agencies, local watershed associations, agricultural interests, engineering firms, developers, state agency representatives, federal representatives, and individual interested citizens.

A total of four team meetings were held prior to the submittal of the Baltimore County Phase II WIP on November 18, 2011. The primary topics are summarized in Table 1.

Table 1: Baltimore County Phase II WIP Team Meeting

Meeting Date	Topic(s)
March 24, 2011	WIP Development Process Tracking and Reporting
June 21, 2011	Edge of Stream/Delivery Ratios Accounting for Growth 2012 – 2013 Milestones
July 28, 2011	Demonstration of MAST Septic System Analysis
November 7, 2011	Draft Baltimore County Phase II WIP status

The agendas and copies of the presentations can be found at: http://www.mde.state.md.us/programs/Water/TMDL/TMDLImplementation/Pages/BaltimoreCountyTeam.aspx

The larger team membership has served as a sounding board for discussion of issues, development of ideas for inclusion in the WIP, and for review and comment on the documents produced for the Phase II WIP. It is anticipated that there will be additional Phase II WIP team meetings going forward on a quarterly basis as implementation of the

Baltimore County Phase II WIP continues, and to serve as a sounding board for the development of the local TMDL Implementation Plans.

The Baltimore County Department of Environmental Protection and Sustainability (EPS) had the overall lead in developing the Baltimore County Phase II WIP. In order to develop the strategies, numerous meetings were held internal to EPS and with sister agencies in the County. These typically were small meetings on specific topics that needed coordination between agencies to provide the information and commitments needed to produce the Phase II WIP.

1.1 General Approach to Meeting Reduction Targets

The overall approach to developing the Baltimore County Phase II WIP was to identify current restoration actions and the associated nitrogen and phosphorus reduction. The current rate of those actions was projected forward and the amount of reduction achieved was assessed relative to the nitrogen and phosphorus reduction targets for the septic system source sector and the urban stormwater source sector. This analysis provided the gap that needed to be filled by new or expanded programs.

To facilitate an understanding of the Maryland Assessment Scenario Tool (MAST), the information from MAST was contrasted with local Baltimore County information. This data included; the number and distribution of on-site disposal systems (OSDS), land use, stormwater management facility implementation, and restoration progress. The results of the analysis and the current restoration progress information were used to develop the overall restoration strategy for meeting the septic and urban stormwater sector reduction targets. The results of the OSDS analysis and strategy development are presented in Appendix A. Appendix B presents the results of the urban stormwater analysis and strategy development.

In developing the strategy, consideration was also given to the relative delivery ratios for Baltimore County's fourteen 8-digit watersheds and the land use loading rates for urban impervious and urban pervious. MAST has 4 categories for delivery ratios; zero, low, medium, and high. The Liberty Reservoir watershed has no delivery to the bay and therefore any actions that take place within the watershed receive no credit toward bay restoration. The Prettyboy Reservoir watershed and Loch Raven Reservoir watersheds have a low delivery ratio due to treatment factors in the reservoirs and drinking water withdrawals. Tidal water watersheds had high delivery ratios (100%) and the balance of the watersheds with streams that have a distance to flow were rated as medium. Baltimore County used the 8-digit watershed specific average delivery ratio for calculations of nutrient reduction effects for the first 2-year milestone actions.

The State of Maryland submitted a Baltimore County Phase II WIP strategy that comprises all of the urban lands, including, Maryland State Highway Administration, the State of Maryland lands, Federal lands, and State regulated Industrial sites. These lands were not included in the initial Baltimore County MAST submittal. In addition, the initial MAST submittal contained placeholders for actions that are currently not credited, or are credited at a lower efficiency than is likely in the future. The State of Maryland modification of the Baltimore County Phase II WIP resulted in backfilling of restoration actions to achieve the load reduction allocations for Baltimore County urban stormwater. Some of the backfilled options are not considered achievable. The County has modified

the MAST submittal to reflect what is considered achievable. Those actions that are not fully credited, or not currently credited, will in the future be used to meet some of backfilled actions in MAST.

Baltimore County also has other obligations regarding local TMDLs that preclude conducting all of our restoration efforts in the tidal water watersheds, which would be most effective in achieving the Chesapeake Bay TMDL reductions. Future decisions on where restoration activities will occur will have to be balanced by meeting multiple objectives, not just restoration of the Chesapeake Bay.

1.2 Past Successes

Baltimore County has been successful in the following areas:

- Restoration Progress: Achieving significant restoration progress over the last 20 years through the Waterway Improvement Program. These restoration efforts have been funded by bonds, supported by the administration and approved by Baltimore County citizens. The known success of this program has resulted in Baltimore County successfully competing for grant funding to augment the local funding restoration efforts.
- Watershed Planning: Development of detailed Small Watershed Action Plans that include watershed associations and citizens in the process; meet EPA criteria for funding consideration; provide the strategy for meeting local TMDLs (and now the Chesapeake Bay TMDL); identify responsible parties for implementation, and identify potential funding sources and cost estimates.
- Land Use Planning: Past planning and growth management policies resulted in 90% of the Baltimore County population living on 30% of the land area. This has maintained the remaining 70% of the land area in a rural character, with the result of protecting aquatic communities and providing for an abundance of brook and brown trout. *Master Plan 2020* furthers the goals of environmental protection and water quality restoration by directing future growth into redevelopment and community revitalization.
- Reporting and Tracking: Baltimore County has developed reporting and tracking mechanisms over the years for multiple factors. These tracking mechanisms are used to develop the Annual NPDES – MS4 Report. While additional tracking mechanisms are now needed, our experience should make the development of additional tracking mechanisms easier.

1.3 Future Challenges

The following future challenges are anticipated:

- Acquiring sufficient funding for the increased pace of restoration efforts needed. This applies to project funding, staff for project management and monitoring, and future maintenance and inspection. With the passage of the Maryland State law requiring all NPDES – MS4 Phase I jurisdictions to institute a stormwater utility fee by July 1, 2013, this challenge may be met. There are a number of unknowns,

particularly regarding the local TMDLs for bacteria and trash that make the ultimate cost difficult to estimate.

- Coordinating and reconciling local information with MAST and the Chesapeake Bay Watershed Model.
- Developing reliable restoration category efficiencies for use in load reduction analysis: This is particularly important in the areas of stream restoration and implementation of the Fertilizer Act of 2011, but also includes urban shoreline enhancement and various types of retrofits.
- Developing an optimization model for restoration efforts that will meet all the water quality goals for the least cost. Given the existing TMDLs and the local listing of impaired waterbodies, finding the suite of restoration efforts that will address nutrient and sediment reduction while at the same time address aquatic community impairment, bacteria, trash, and toxic contamination, developing an optimization model will be a challenge.

CHAPTER 2

BALTIMORE COUNTY PHASE II WIP STRATEGIES

The Baltimore County Phase II WIP strategies are designed to meet the state allocations to Baltimore County for nitrogen and phosphorus reduction by source sector. The point source strategy is being developed by the State and will be assured through the NPDES Permitting system. The agriculture source sector is being developed by the Maryland Department of Agriculture with input from the local Soil Conservation Districts and the local agriculture sector teams. The federal sector will also be preparing a separate strategy.

This chapter will focus on the septic and the stormwater sector allocations with a brief discussion of the point source strategy. The overall allocation by source sector is presented in Table 2-1 for nitrogen and Table 2-2 for phosphorus. The tables have been modified from the initial submittal to reflect the changes in the interim target load reduction and the extension of the final load reduction target date from 2020 to 2025. The table has also been updated to reflect the 2010 progress in pollutant load reductions based on the data within MAST. The state has not allocated reductions for sediment.

Table 2-1: Baltimore County Total Nitrogen Final Target Load by Source Sector

Total Nitrogen - By Sector					
Sector	**2010Progress**	**Interim Target Load 2017**	**% Reduction from 2010 Progress**	**Final Target Load 2025**	**% Reduction from 2010 Progress**
UrbanReg	848,000	729,000	14.0%	620,815	26.8%
Agriculture	363,000	310,000	8.3%	270,895	25.4%
Septic	167,000	156,000	6.6%	106,137	36.4%
Forest	151,000	155,000	NA	151,659	NA
WWTP & Industrial Discharge	2,910,000	1,553,000	46.6%	1,439,136	50.5%
Non-tidal Atmospheric	15,000	15,000	NA	15,000	NA
Total	**4,454,000**	**2,919,000**	**34.5%**	**2,604,000**	**41.5%**

Table 2-2: Baltimore County Total Phosphorus Final Target Load by Source Sector

Total Phosphorus By Sector					
Sector	**2010 Progress**	**Interim Target Load 2017**	**% Reduction from 2010 Progress**	**Final Target Load 2025**	**% Reduction from 2010 Progress**
UrbanReg	61,000	52,000	14.8%	35,953	41.1%
Agriculture	28,000	24,000	14.3%	23,940	14.5%
Forest	2,650	2,637	NA	2,631	NA
WWTP & Industrial Discharge	110,000	95,000	13.6%	98,618	NA
Non-tidal Atmospheric	1,000	1,000	NA	1,000	NA
Total	**203,000**	**175,000**	**13.8%**	**162,142**	**20.1%**

The allocations are based on the delivered load to the bay; the edge-of-stream loads are higher. The overall reduction is 41.5% for nitrogen and 20.1% for phosphorus by 2025. The objective is to meet the overall reduction to achieve water quality standards in the Chesapeake Bay. The allocations are broken out by source sector each having varying percent reductions based on both location of the land use and progress made through 2010. Most of the agriculture in Baltimore County is above the reservoirs and will have reduced delivery to the bay. Conversely, urban land use is mostly below the reservoirs and close to the bay; hence the larger reductions required for urban stormwater relative to the agriculture.

The following are discussed below: point source strategies, Baltimore County's share of the urban stormwater strategy, septic strategy, and a summary of load reductions based on the strategies. The section for the point source strategy will summarize the information relative to Baltimore County and provide discussion where appropriate. The point source strategy is the responsibility of the State through the issuing of permits. The section for urban stormwater will present both restoration implementation actions and programmatic actions. The implementation actions and associated nitrogen and phosphorus load reductions will be based on three time frames; the first 2-year milestone, progress to 2017 and progress to 2025. The septic strategy will be presented as the ultimate strategy to reach the 2025 reduction target. The relationship between the submittal of Maryland Assessment Scenario Tool (MAST) and the proposed Baltimore County MS4 urban stormwater reduction strategy is presented.

2.1 Point Source Strategy

The point source strategy is primarily the responsibility of the State of Maryland. This strategy will be attained by the re-issuance of NPDES Permits with more stringent permit requirements. The strategy focuses on four main categories of dischargers:

- Major Municipal Waste Water Treatment Plants,
- Minor Municipal Waste Water Treatment Plants,

- Major Industrial Dischargers, and
- Minor Industrial Dischargers.

2.1.1 Major Municipal Waste Water Treatment Plants

Baltimore County contributes sewage to two major municipal Waste Water Treatment Plants (WWTP), Back River WWTP and the Patapsco WWTP. Both WWTPs are scheduled to be up-graded to Enhanced Nutrient Removal (ENR) by 2015. The Patapsco WWTP is currently under construction to be upgraded first to Biological Nutrient Removal (BNR) and then to ENR. The scheduled date for completion is June 20, 2014. The Back River WWTP currently operates under BNR. That plant is scheduled to undergo design and construction to ENR, being fully operational under ENR by September 1, 2015. Back River WWTP has two outfalls; one to Back River and one to Severstal Steel (now RG Steel) where it is used as process water prior to discharge.

The nitrogen and phosphorus load reductions achieved through the upgrades to ENR technology will reduce nitrogen and phosphorus below the ultimate permit limits. This will allow for future population growth to be accommodated on the public sanitary sewer system. This reduction also presents an opportunity to help meet the 2017 and 2025 load reductions through the concept of Trading-In-Time. The excess reduction of nitrogen and phosphorus through the WWTP upgrades could be used as a contingency for achieving the urban stormwater load reduction allocation, if the restoration pace should fall behind that needed to achieve either the 2017 or 2025 reduction targets. The overall reduction target would still be achieved to meet Chesapeake Bay water quality standards. Any nitrogen or phosphorus reduction credits borrowed would need to be paid back over time, as future population growth places more demands on WWTP capacity.

Table 2-3 demonstrates the concept of Trading-In-Time with an analysis of nitrogen load changes as a result of the WWTP upgrades. The upgrade of both WWTPs by 2017 will result in greater than 3.6 million pounds of nitrogen reduction. The numbers for 2025 represent the ultimate discharge capacity and ultimate nitrogen load limits, not the actual discharge at that time. The gap between the nitrogen load in 2017 and 2025 represents the amount of nitrogen credit that can be borrowed to help meet the urban stormwater nitrogen reduction target. Based on agreements, and cost sharing to upgrade and operate the WWTPs, the estimated Baltimore County share of nitrogen for use in a Trading-In-Time program would be 50% of the Back River WWTP (150,841 pounds nitrogen) and 38% of the Patapsco WWTP (21,246 pounds nitrogen).

Table 2-3: Trading-In-Time Calculations for Nitrogen

	Projected		Difference Between Time Periods	
Back River WWTP	**Discharge (MGD)**	**Nitrogen #s**	**Discharge (MGD)**	**Nitrogen #s**
2010	146	2,900,737		
2017	155	1,891,121	9	-1,009,616
Cap	180	2,192,803	25	301,682
Patapsco WWTP				
2010	63	3,439,761		
2017	68	833,394	6	-2,606,367
Cap	73	889,304	5	55,909

The Trading-In-Time concept could also be applied if the WWTPs achieve greater reduction performance. The current nitrogen load limits are set by achieving a 4.0 mg/L

nitrogen discharge concentration. If plant performance achieves a greater reduction with discharges below 4.0 mg/L, then additional nitrogen reductions could be used to offset load reduction requirements in other sectors.

The Trading-In-Time concept requires additional analysis and coordination among the local jurisdictions that are served by the two WWTPs and formal agreements on borrowing the extra reduction credits with condition of paying back the credits over time.

Programmatic Strategies

- Work with MDE, Baltimore City, Anne Arundel County, and Howard County to define each jurisdiction's share of the remaining capacity of the WWTPs.
- Work with MDE, Baltimore City, Anne Arundel County, and Howard County to refine the concept of Trading-In-Time and develop formal agreements, if it is determined that the contingency is needed to meet the overall nutrient reductions.

2.1.2 Minor Municipal Treatment Plants (0.1-0.5 MGD)

According to MAST, Baltimore County has six minor municipal WWTPs. Five are privately owned and operated, with one operated by Baltimore County. The facility operated by Baltimore County is Richlyn Manor in the Lower Gunpowder Falls. It is the intention of Baltimore County to ultimately connect the Richlyn Manor to the public sanitary system. The timing of when that will occur is not currently set. According to MAST data Richlyn Manor currently has a delivered nitrogen load of 1,760 pounds and a delivered phosphorus load of 246 pounds. The reduction of nitrogen and phosphorus that would be attained by connection to the sanitary sewer that flows to the Back River WWTP providing ENR treatment, could assist in meeting the urban stormwater nutrient load reduction allocations, or be used to help pay back reduction credits if a Trading-In-Time contingency is used to help meet the urban stormwater reduction allocations. It will depend on the timing of the connection to the sanitary sewer.

There are no current plans to upgrade the remaining five minor WWTPs.

Programmatic Strategy

- Coordinate with Baltimore County Department of Public Works to set a timeframe for connecting Richlyn Manor package treatment plant to the public sanitary sewer.

2.1.3 Major Industrial Dischargers

MAST lists six major industrial discharges in Baltimore County. Maryland will present the strategy for addressing the nutrient reduction allocations from major industrial discharges in a separate document. Table 2-4 presents the MAST data for the anticipated nutrient reductions through implementation of the major industrial discharger strategy.

Table 2-4: Major Industrial Dischargers – Reduction Allocations

Year	Nitrogen Delivered		Phosphorus Delivered	
	Load (#)	Reduction (#s)	Load (#)	Reduction (#s)
2010	675,440		9,872	
2017	335,975	-339,975	29,894	20,022
2025	131,420	-204,555	25,400	-4,494

There appears to be a discrepancy with the phosphorus load calculations for major dischargers. The county will work with MDE to get clarification and rectification, if necessary.

2.1.4 Minor Industrial Dischargers

Mast lists 104 minor industrial dischargers in Baltimore County. Many of these are swimming pools with small nitrogen and phosphorus loads. Maryland will present the strategy for addressing the nutrient reduction allocations from minor industrial discharges in a separate document. Table 2-5 presents the MAST data for the anticipated nutrient reductions through implementation of the minor industrial discharger strategy.

Table 2-5: Minor Industrial Dischargers – Reduction Allocations

Year	Nitrogen Delivered		Phosphorus Delivered	
	Load (#)	Reduction (#s)	Load (#)	Reduction (#s)
2010	70,476		2,010	
2017	53,935	-16,541	1,568	-442
2025	6,262	-47,673	932	-636

2.2 Urban Stormwater Loads

Baltimore County anticipates that the restoration requirements for urban stormwater will be increased with the re-issuance of the County NPDES – MS4 permit. It is expected that the county will be required to retrofit 20% of the impervious acres that do not currently have adequate stormwater management. This is in addition to the previously required retrofits in the current permit and the previous permits. Various types of retrofits, or retrofit equivalents will be used to achieve this goal over the five-year term of the permit.

The Maryland Phase I WIP strategy for Phase I – MS4 jurisdictions requires reductions in nutrients and sediments equivalent to retrofitting 30% of the pre-1985 impervious cover for Maryland's ten largest counties and the State Highways Administration (SHA). The load reduction associated with this strategy is estimated on the basis of an average reduction efficiency of 25% for total nitrogen. Baltimore County recognizes that meeting the renewed NPDES – MS4 Permit requirements may not be sufficient to meet the nutrient reduction allocations for 2017. The urban sector presented in Tables 2-1 and 2-2 for nitrogen and phosphorus, respectively is further subdivided by source of input; either County MS4, non-regulated, construction, extractive, State Highway Administration Phase I MS4, regulated industry, state lands, and federal lands. The breakout by source sector is displayed in Table 2-6. Baltimore County is only responsible for the County MS4, the non-regulated, and the construction source areas. Table 2-7 presents the information on the Baltimore County share of the urban stormwater sector reduction allocations for nitrogen and phosphorus based on the county addressing the Phase I MS4 component and the non-regulated component, with construction considered separately. The balance of the categories is, either the responsibility of the state of Maryland through ownership or regulation, or the federal government. The county share of the urban stormwater load is 90% for nitrogen and 88% for phosphorus.

Table 2-7 also presents the reduction targets for nitrogen and phosphorus, the percent reduction needed and the target 2-year milestone load reductions assuming a linear reduction strategy. These tables have been modified from the initial submittal to reflect

the target reduction for 2017 from 70% to 60% and the change for the final reductions from 2020 to 2025. The construction component has been removed from Table 2-7, since 100% of the construction will have sediment controls regardless on the acreage of disturbance per year.

Table 2-6: Urban Stormwater Reduction Allocations for Baltimore County - All

	County MS4	Non-regulated	Construction	Extractive	State Phase II MS4	SHA Phase I MS4	Regulated Industrial Facilities	Federal Developed	Total
#s Nitrogen									
2010 Progress	710,077	31,908	16,763	4,114	18,314	50,545	15,157	3,547	**850,425**
2017 Target	591,158	27,218	17,812	3,701	14,829	42,486	12,522	2,933	**721,506**
2025 Target	511,879	24,092	18,512	3,425	12,505	37,114	10,765	2,524	**620,816**
#s Phosphorus									
2009 Progress	49,466	1,144	2,861	927	1,076	4,005	1,574	199	**61,253**
2017 Target	34,345	867	3,950	769	782	2,977	1,166	147	**47,003**
2025 Target	27,358	658	3,399	664	577	2,291	896	110	**35,953**

Table 2-7: Urban Stormwater Reduction Allocations for Baltimore County – County Share

	County MS4	Non-regulated	Total	#s Reduction	% Reduction	#/2-year Milestone Period
#s Nitrogen						
2010 Progress	710,077	31,908	741,985			
2017 Target	591,158	27,812	618,377	-123,608	**-16.7%**	-35,318
2025 Target	511,879	24,092	535,971	-82,406	**-11.1%**	-21,764
Total Reduction				-217,643	**27.8%**	
#s Phosphorus						
2010 Progress	49,466	1,144	50,610			
2017 Target	36,201	852	37,054	-13,556	**26.8%**	-3,873
2025 Target	27,358	658	28,016	-9,038	**-17.9%**	-2,259
Total Reduction				-22,990	**-44.6%**	

Based on the information in Table 2-7 the Baltimore County urban stormwater reduction target for the first 2-year milestone and those that follow is 35,318 pounds of nitrogen and 3,873 pounds of phosphorus through 2017. Thereafter the 2-year milestone targets are 21,764 pounds of nitrogen and 2,259 pounds of phosphorous through 2025. Any

reduction that is less than these targets would have to be made up in the following 2-year milestones to meet the 2017 target and 2025 target.

2.2.1 Urban Stormwater Implementation Actions

The urban stormwater implementation actions are based on existing programs and the combination of similar types of actions and will include the following elements:

- Capital projects: stream restoration, shoreline erosion control, SWM retrofits/conversions
- Operational programs: Street sweeping and storm drain cleaning
- Nutrient management: Urban nutrient management – 1998 and Fertilizer Act of 2011
- Reforestation: Upland reforestation, urban riparian buffer reforestation, and urban canopy tree planting
- Watershed Association projects,
- Sanitary sewer overflow elimination (SSO), and
- Redevelopment and community revitalization.

(If Appendix B is not finished, this will be removed and any other reference to Appendix B)

2.2.1.1 Capital Projects

The County currently has a Waterway Improvement Program that routinely conducts a variety of restoration projects. This program is housed in the Baltimore County Department of Environmental Protection and Sustainability (EPS) and is overseen by the Capital Program and Operations Section (CPO). The county capital budget is on a two-year cycle that coincides with the two-year milestone period. In order to address the expected increase in the restoration requirement associated with the renewal of the County NPDES – MS4 permit, 2 full-time employees (FTEs) were moved from the Stormwater Engineering Section in the spring of 2011. These two FTEs are in training in capital project management, prior to being at full capacity. The bulk of the stormwater restoration implementation will fall to this program. The CPO section typically conducts stream restoration, shoreline erosion control, and SWM retrofit/conversion projects to achieve multiple objectives; one of which is pollutant load reduction. Credit for these activities are cumulative over time as additional projects are completed.

The current pace of the program was analyzed to determine the progress that could be made by 2025. The current pace was estimated by multiplying the anticipated projects that will be completed in the first 2-year milestone period by 3.5 to determine the amount of a particular action that will be completed by the end of 2017. To calculate the amount of a particular action that will be achieved by the end of the year 2025, the 2-year milestone was multiplied by 7.5. It was determined that the capital projects along with other types of nutrient load reduction would not be sufficient to meet the 2017 or the 2025 reduction targets for nitrogen. Additional potential actions were then identified that would cumulatively result in meeting the targets. Table 2-8 presents both the current

capital restoration action rates extended to 2025 and additional actions that may be incorporated to meet the reduction targets. The actions in bold italics are additional actions that may be taken to assist in meeting the targets. The first part of the table indicates the amount of action in acres or linear feet, while the following two parts indicate the amount of reduction to be achieved for nitrogen and phosphorus through implementation.

While most of the actions are self explanatory, one action that accounts for the majority of the credit is additional credits for stream restoration. The basis for this increase can be found in Schueler (August 2011). In this document Schueler recommends using an interim load reduction of 0.20 pounds/linear foot for nitrogen and 0.068 pounds/linear foot for phosphorus. With the May 29, 2012 update to MAST, a stream restoration interim credit BMP was provided. Using MAST, the reductions for stream restoration interim credit were used to assess the pounds nitrogen and phosphorus reduced during each time period. There is an existing expert panel working under the Chesapeake Bay Program – Urban Stormwater Workgroup that will be considering revisions to the stream restoration credits. Currently additional data is being gathered and summarized. That panel is scheduled to have a final determination by mid-summer 2012. It then needs to be approved by the Chesapeake Bay Program.

Table 2-8: Urban Stormwater Strategy – Capital Restoration Actions to Meet Chesapeake Bay TMDL by 2025

Strategy	Acres/Linear Feet July 1, 2011 – June 30, 2013	Acres/Linear Feet 2017	Acres/Linear Feet 2025
Stream Restoration	63,174 feet	221,109 feet	442,000 feet
Shoreline Erosion Control	5,190 feet	18,165 feet	26,168 feet
SWM Retrofit/Conversions	669 acres	2,342 acres	4,683acres
5X Retrofits/Conversions	***0***	***7,025 acres***	***25,206 acres***
Nitrogen Reductions #s			
Stream Restoration (Interim Credit)	7,165	25,077	50,129
Shoreline Erosion Control	830	2,905	4,150
SWM Retrofit/Conversions	1,268	4,441	8,879
5X Retrofits/Conversions	***0***	***13,320***	***47,891***
Total Reductions	**9,263**	**45,743**	**111,049**
Phosphorus Reductions #s			
Stream Restoration (Interim Credit)	4,225	14,788	29,562
Shoreline Erosion Control	571	1,999	2,855
SWM Retrofit/Conversions	165	579	1,157
5X Retrofits/Conversions	***0***	***1,736***	***6,302***
Total Reductions	**4,961**	**19,102**	**39,876**

2.2.1.2 Operational Programs

The county has a street sweeping program that is operated by the Baltimore County Department of Public Works – Bureau of Highways. The total amount of solids removed is reported annually to EPS for inclusion in the annual NPDES – MS4 Report to MDE. Credit for this program is based on annual removal rates, with credit increasing or decreasing depending on the amount of material removed. Credit for this activity is based on annual performance. For each of the two years in this milestone period the county is proposing to remove:

- 2,362,000 pounds of material - street sweeping

The county has a storm drain cleaning program that is operated by the Baltimore County Department of Public Works – Bureau of Utilities. The total amount of solids removed is calculated based on work orders. This information is included in the annual NPDES – MS4 Report submitted to MDE. Credit for this program is based on annual removal rates, with credit increasing or decreasing depending on the amount of material removed. For each of the two years in this milestone period the county is proposing to remove:

- 191,847 pounds of material - storm drain cleaning

The removal of nitrogen and phosphorus associated with these two programs is presented in Table 2-9. It may be possible to achieve greater removal rates with existing personnel and equipment by targeting the street sweeping and inlet cleaning to areas with greater accumulation of materials. This is, to a certain extent, already incorporated in the operating procedures of the programs. Baltimore County Department of Environmental Protection and Sustainability (EPS) is in the process of preparing Small Watershed Action Plans for the urban areas of the county. Part of this process is to perform Neighborhood Source Assessments, one component of which is to identify neighborhoods in need of additional street sweeping and/or inlet cleaning. By coordinating the SWAP process with the two programs, additional pollutant removal may be achieved. This is represented in Table 2-9 as targeted street sweeping and targeted storm drain cleaning. The nitrogen and phosphorus reduction due to the Street Sweeping Program and the Inlet Cleaning Program are currently not credited by the Chesapeake Bay Program unless strict criteria in terms of frequency of sweeping are met. The Chesapeake Bay Program – Urban Stormwater Workgroup will be reconvening an expert panel to assess the potential to provide nitrogen and phosphorus reduction credit based on bulk removal. The nutrient reduction information provided in Table 2-9 is based on the expectation that credits for bulk removal sediment and organic matter due to street sweeping operations and storm drain cleaning operations will be credited in the future

Table 2-9: Urban Stormwater Strategy – Operation Program Actions to Meet Chesapeake Bay TMDL by 2020

Strategy	Acres/Linear Feet July 1, 2011 – June 30, 2013	Acres/Linear Feet 2017	Acres/Linear Feet 2025
Street Sweeping	Current Rate		
Storm Drain Cleaning	Current Rate		
Targeted Street Sweeping	***0***	***2X removal rate by targeting***	
Targeted Storm Drain Cleaning	***0***	***2X removal rate by targeting***	
Nitrogen Reductions #s			
Street Sweeping	4,238	4,238	4,238
Storm Drain Cleaning	734	734	734
Targeted Street Sweeping	***0***	***4,238***	***4,238***
Targeted Storm Drain Cleaning	***0***	***734***	***734***
Total Reductions	**4,972**	**9,944**	**9,944**
Phosphorus Reductions #s			
Street Sweeping	1,620	1,620	1,620
Storm Drain Cleaning	284	284	284
Targeted Street Sweeping	***0***	***1,620***	***1,620***
Targeted Storm Drain Cleaning	***0***	***284***	***284***
Total Reductions	**1,904**	**3,808**	**3,808**

2.2.1.3 Urban Nutrient Management

Urban nutrient management is typically described as public education and awareness programs to reduce fertilizer application to lawns and other pervious urban areas. While most jurisdictions, including Baltimore County, have extensive education programs as required in our MS4 permits, we have been unable to formulate a mechanism for tracking, reporting, and validating nutrient reduction credits. For purposes of this strategy, two components included in the Maryland Phase I WIP will also be included here. One component relates to the existing urban nutrient management law and the second to the Fertilizer Use Reduction Act of 2011, which will become effective October 1, 2013.

Existing Urban Nutrient Management Law

Since 1998, MDA has regulated approximately 700 applicators that apply fertilizer to 10 or more acres of non-agricultural land, including private lawns, golf courses, public parks, airports, athletic fields and state owned land such as restoration areas and highway right-of-ways. Applicators are required to take soil tests, follow University of Maryland Extension guidelines when applying nutrients, and maintain certain records of fertilizer applications. Baltimore County obtained the list of operators within the county jurisdiction. Since it is unknown where landscaping firms and lawn care companies conduct their operations, the analysis was limited to large institutional, recreational, and county operated sites that were listed. Based on this listing, 6,125 acres were estimated to fall under this regulation. The reduction rates applied are 17% for nitrogen and 22% for phosphorus, based on the Maryland Phase I WIP.

Fertilizer Use Reduction Act of 2011

This new legislation was passed during the 2011 Maryland legislative session. It enacts requirements for point of sale regulation of slow release nitrogen products and formulation requirements would further reduce phosphorus in lawn fertilizers used by homeowners to zero, except when establishing or renovating a lawn. All fertilizer products will be banned for use as deicers. The results of this regulation will be applied to the remaining pervious urban acres in Baltimore County. The initial analysis of the nutrient reduction effect of this regulation by the Chesapeake Bay Program and others was a 1% reduction factor for nitrogen and a 15% reduction factor for phosphorus. A Chesapeake Bay Program expert panel has been tasked with determining the reduction rates to be applied through the program in the future based on a more detailed analysis. Those results will be available in the summer of 2012.

Conceptually, having a lower rate of reduction for nitrogen and phosphorus than what is used for the existing urban nutrient management law does not make sense. They both rely on the recommendations of the University of Maryland Extension guidelines, while the Fertilizer Use Reduction Act of 2011 goes further and requires the use of fertilizer with a greater portion of slow release nitrogen and bans phosphorus altogether, except for establishing new lawns and based on soil test results. To account for this discrepancy additional credit is provisionally included. The results for urban nutrient management are displayed in Table 2-10. The Chesapeake Bay Program – Agriculture Workgroup has convened an expert panel to determine the pollutant removal efficiency due to the implementation of fertilizer control legislation enacted by various states in the Bay watershed, including the Maryland Fertilizer Use Reduction Act of 2011. The findings of

this expert panel are anticipated to be released during the summer of 2012. New load reductions due to the enactment of the Fertilizer Use Reduction Act of 2011 will be calculated once the new efficiencies are approved. MAST is using higher efficiencies for this BMP, therefore, the MAST generated load reductions were used in our strategy for 2017 and 2025 timeframes.

Table 2-10: Urban Stormwater Strategy – Urban Nutrient Management to Meet Chesapeake Bay TMDL by 2020

Strategy	Acres/Linear Feet July 1, 2011 – June 30, 2013	Acres/Linear Feet 2017	Acres/Linear Feet 2025
Nutrient Management 1998	6,125 acres	6,125 acres	6,125 acres
Fertilizer Use Reduction Act of 2011 – Current Credit	***0***	***90,319 acres***	***90,319 acres***
Total Acres		***96,444***	***96,444***
MAST Nitrogen Reduction	**4,565**	**83,322**	**83,322**
MAST Phosphorus Reduction	**204**	**3,681**	**3,681**

2.2.1.4 Reforestation

Reforestation contains three components; upland reforestation, riparian buffer reforestation, and urban tree canopy planting. Baltimore County has a Community Reforestation Program that is supported by Forest Conservation fee-in-lieu funds and grants. The reforestation activities that take place using the Forest Conservation fee-in-lieu funds cannot be counted toward restoration efforts for the Chesapeake Bay, however those reforestation activities supported by grants or other funding may be counted.

Upland Reforestation

Rural residential tree planting addresses properties of low housing density that include lawns and fields but are not used for agricultural purposes. These rural areas often include single family homes located on five or more acre lots where there is the opportunity to reforest larger low-density parcels. This action would reduce nutrient and sediment runoff by converting landuse from turf grass or open fields to forest. EPA watershed model land use loading factors for turf grass versus forest will provide the nutrient and sediment benefits. This program was pioneered by Baltimore County through grant support. Without grant support, the county has been unable to continue the program. However, funds from other sources have allowed limited reforestation. In order to expand this program and other upland reforestation opportunities, a source of funding must be secured that covers planting materials, supplies, equipment, and additional staff for implementation. The estimated progress for this component is 20 acres per year.

Riparian Buffer Reforestation

Urban riparian buffer planting provides additional nitrogen and phosphorus reduction credits beyond the land use conversion, due to the treatment of groundwater and stormwater. This component is part of many stream restoration projects, but can also be part of the Community Reforestation Program. The urban riparian buffer plantings will occur on both public land and private lands. The private land urban riparian buffer

planting is anticipated to be conducted by Watershed Associations and is included the Watershed Association projects discussed below. Much of riparian buffer reforestation activity will be associated with stream restoration projects with the balance conducted by the Community Reforestation Program.

Urban Tree Canopy Planting

Urban tree canopy is defined as at least 100 trees to an acre in the Maryland Phase I WIP. The county has pioneered the Growing Home Campaign, which provides discount coupons for homeowners trees or shrubs that are purchased at participating nurseries and outlets. Because of the disappointing selection of plant material and a lower citizen response in recent years the county is abandoning this program. However, the county has a Department of Energy – Sustainability grant that is providing funding for the planting of trees for shade as a means to reduce energy consumption. Seven hundred trees will be planted through this program. The county has a growing out center for trees to be used in its planting operations. Twice a year a "Big Tree" sale is held, where native high-value trees are sold to Baltimore County citizens. The county anticipates that 700 trees per year will be planted through this process.

Reforestation Summary

Reforestation can be a cost effective strategy for achieving nitrogen and phosphorus load reductions. Based on the analysis of urban stormwater nutrient reductions, it was determined that additional reforestation efforts could assist in meeting the load reduction targets. The upland reforestation and urban riparian buffer-planting rate was increased by 5 times the current level to achieve additional load reductions. In order for this to occur additional funding to support the increased rate must be secured. The summary of the proposed reforestation efforts is presented in Table 2-11. The reduction calculations are based on MAST delivered per acre reductions for nitrogen and phosphorus based on riparian buffer reforestation and urban tree canopy planting BMPs. There currently is not reforestation BMP available in MAST, so those acres were considered equivalent to the urban tree canopy BMP.

Table 2-11: Urban Stormwater Strategy – Reforestation Actions to Meet Chesapeake Bay TMDL by 2025

Strategy	Acres/Linear Feet July 1, 2011 – June 30, 2013	Acres/Linear Feet 2017	Acres/Linear Feet 2025
Upland Reforestation	20 acres	70 acres	150 acres
Riparian Buffer Reforestation	10 acres	35 acres	50 acres
Urban Tree Canopy Planting	1,400 trees	4,900 trees	10,500 trees
5X Urban Riparian Buffer Planting	***0***	***105 acres***	***150 acres***
5X Urban Reforestation	***0***	***595 acres***	***1,275acres***
Nitrogen Reductions #s			
Upland Reforestation	85	297	636
Riparian Buffer Reforestation	57	201	287
Urban Tree Canopy Planting	59	208	445
5X Urban Riparian Buffer Planting	***0***	***603***	***861***
5X Urban Reforestation	***0***	***2,524***	***5,408***
Total Reductions	**201**	**3,230**	**7,637**
Phosphorus Reductions #s			
Upland Reforestation	3	10	21
Riparian Buffer Reforestation	4	12	18

Urban Tree Canopy Planting	2	7	15
5X Urban Riparian Buffer Planting	***0***	***37***	***53***
5X Urban Reforestation	***0***	***82***	***176***
Total Reductions	**9**	**148**	**283**

2.2.1.5 Watershed Association Projects, SSO Elimination, and Redevelopment

Baltimore County provides grant funding to local watershed associations to facilitate their education and outreach activities, to implement restoration projects, and to participate in watershed planning activities. The County often works with the local watershed associations for their inclusion in grant applications for State and Federal restoration implementation grants. The local watersheds, in turn, report their restoration activities to the county for inclusion in our annual NPDES – MS4 permit. We anticipate that this collaboration will continue. For watershed association activities, we have included their current pace of restoration implementation in our urban stormwater strategy. Many of these watershed associations are poised to increase the pace of their restoration activities. The anticipated load reductions at the current pace are presented in Table 2-12 below.

2.2.1.6 Sanitary Sewer Overflow (SSO) Elimination

Baltimore County is under a Consent Decree to address SSOs that occur due to wet weather inflow and infiltration, equipment failure, sanitary sewer line breaks, and sanitary sewer line blockages. The Consent Decree requires all work to be completed by 2020. This should mean that all overflows would cease by that date. In order to account for the nitrogen and phosphorus load reduction due to the repairs to the sanitary sewer system, the average annual overflow volume and associated nitrogen and phosphorus loads were calculated for the previous eleven years. The assumption is that a 20% reduction in overflows will occur during each of the first five 2-year milestone periods. The measure for this restoration factor is to track the number and volume of overflows each year to determine if the reductions are being achieved. The anticipated load reductions are presented in Table 2-12 below.

2.2.1.7 Redevelopment Pollutant Load Reduction

Redevelopment and community revitalization provide water quality improvements over the existing condition by implementing required stormwater management on-site. The County Water Resources Element Analysis provides the documentation of the improvements through the type of activity. Redevelopment is defined by the Stormwater Management regulations as development on a site that has greater than 40% impervious cover. Such development projects are required to remove 50% of the existing impervious area or provide equivalent treatment. There are many sites that are developed, but do not have 40% impervious cover and require full treatment as though they were green-field developments. *Master Plan 2020* encourages redevelopment and community revitalization. Baltimore County intends to develop a tracking and reporting mechanism to be able to receive credits for these types of activities. The anticipated number of acres to be redeveloped or revitalized, for each of the three time periods, is presented in Table 2-12, along with the anticipated nitrogen and phosphorus load reductions.

Table 2-12: Urban Stormwater Strategy - Restoration Actions to Meet Chesapeake Bay TMDL by 2020

Strategy	Acres/Linear Feet July 1, 2011 – June 30, 2013	Acres/Linear Feet 2017	Acres/Linear Feet 2025
SSO Elimination	20% reduction	70% reduction	100% reduction
Redevelopment	200 acres	500 acres	750 acres
Watershed Association Projects	Current Rate		
Nitrogen Reductions #s			
SSO Elimination	230	806	1,151
Redevelopment	915	2,288	3,431
Watershed Association Projects	155	541	1,163
Total Reductions	**1,300**	**3,635**	**5,747**
Phosphorus Reductions #s			
SSO Elimination	76	267	382
Redevelopment	106	264	398
Watershed Association Projects	15	53	113
Total Reductions	**197**	**584**	**893**

2.2.1.8 Summary Urban Stormwater Load Reductions

To assess the overall progress in meeting the urban stormwater load reductions the various tables above are consolidated into Table 2-13 – Restoration Actions; Table 2-14 – Delivered Nitrogen Load Reduction; and Table 2-15 Delivered Phosphorus Load Reduction. As can be seen from these tables, the proposed strategy will meet the urban stormwater nitrogen and phosphorus load reductions. However, much of the achievement is due to the re-evaluation of stream restoration efficiencies and higher credits for the Fertilizer Act of 2011. The bold, italic entries in the following tables indicated restoration actions items that are not currently approved for pollutant removal credits or are not currently funded.

Table 2-13: Urban Stormwater Strategy - Restoration Actions to Meet Chesapeake Bay TMDL by 2020

Strategy	Type*	Acres/Linear Feet July 1, 2011 – June 30, 2013	Acres/Linear Feet 2017	Acres/Linear Feet 2025
Stream Restoration	C	63,174 feet	221,109 feet	347,000 feet
Shoreline Erosion Control	C	5,190 feet	18,165 feet	27,000 feet
SWM Retrofit/Conversions	C	669 acres	2,342 acres	4,700 acres
Street Sweeping	A	Current Rate		
Storm Drain Cleaning	A	Current Rate		
Nutrient Management 1998	A	6,125 acres	6,125 acres	6,125 acres
SSO Elimination	C	20% reduction	70% reduction	100% reduction
Upland Reforestation	C	20 acres	70 acres	150 acres
Riparian Buffer Reforestation	C	10 acres	35 acres	50 acres
Urban Tree Canopy Planting	C	1,400 trees	4,900 trees	10,500 trees
Redevelopment	C	200 acres	500 acres	750 acres
Watershed Association Projects	C	Current Rate		
9X Retrofits/Conversions	***C***	***0***	***7,025 acres***	***41,800 acres***
Fertilizer Act of 2011 – Current Credit	***A***	***0***	***91,200 acres***	***91,200 acres***
Targeted Street Sweeping	***A***	***0***	***2X removal rate by targeting***	
Targeted Storm Drain Cleaning	***A***	***0***	***2X removal rate by targeting***	
5X Urban Riparian Buffer Planting	***C***	***0***	***105 acres***	***150acres***
5X Urban Reforestation	***C***	***0***	***595 acres***	***1,275 acres***

* C = Cumulative A = Annual

Table 2-14: Urban Stormwater Strategy – Delivered Nitrogen Reduction (Target 217,643 #s Nitrogen)

Strategy	Nitrogen Reduction July 1, 2011 – June 30, 2013	Nitrogen Reduction 2017	Nitrogen Reduction 2020
Credits			
Stream Restoration	7,165	25,077	50,129
Shoreline Erosion Control	830	2,905	4,150
SWM Retrofit/Conversions	1,268	4,441	8,879
Street Sweeping	4,238	4,238	4,238
Storm Drain Cleaning	734	734	734
SSO Elimination	230	806	1,151
Upland Reforestation	85	287	636
Riparian Buffer Reforestation	57	201	287
Urban Tree Canopy Planting	59	208	445
Redevelopment	915	2,286	3,431
Watershed Association Projects	155	541	1,163
5X Retrofits/Conversions	***0***	***13,320***	***47,891***
Fertilizer Act of 2011 – MAST Credit	***4,565***	***83,322***	***83,322***
Targeted Street Sweeping	***0***	***4,238***	***4,238***
Targeted Storm Drain Cleaning	***0***	***734***	***734***
5X Urban Riparian Buffer Planting	***0***	***603***	***861***
5X Urban Reforestation	***0***	***2,524***	***5,408***
Total Reductions	**20,301**	**146,465**	**217,697**
Reduction Target	**35,318**	**123,608**	**217,643**
Remaining Reduction Needed	**15,017**	**-22,857**	**-54**

Table 2-15: Urban Stormwater Strategy – Delivered Phosphorus Reduction (Target 22,990 #s Phosphorus)

Strategy	Phosphorus Reduction July 1, 2011 – June 30, 2013	Phosphorus Reduction 2017	Phosphorus Reduction 2020
Credits			
Stream Restoration	4,225	14,788	29,562
Shoreline Erosion Control	571	1,999	2,855
SWM Retrofit/Conversions	165	579	1,157
Street Sweeping	1,620	1,620	1,620
Storm Drain Cleaning	284	284	284
SSO Elimination	76	267	382
Upland Reforestation	3	10	21
Riparian Buffer Reforestation	4	12	18
Urban Tree Canopy Planting	2	7	15
Redevelopment	106	264	398
Watershed Association Projects	15	53	113
5X Retrofits/Conversions	***0***	***1,736***	***6,602***
Fertilizer Act of 2011 –MAST Credit	***204***	***3,681***	***3,681***
Targeted Street Sweeping	***0***	***1,620***	***1,620***
Targeted Storm Drain Cleaning	***0***	***284***	***284***
5X Urban Riparian Buffer Planting	***0***	***37***	***53***

5X Urban Reforestation	***0***	***82***	***176***
Total Reductions	**7,275**	**27,323**	**48,841**
Reduction Target	**3,873**	**13,616**	**22,990**
Remaining Reduction Needed	**-3,402**	**-13,707**	**-25,851**

2.2.1.9 Relationship Between the MAST Submittal and the Proposed Urban Stormwater Strategy

In the initial MAST submittal in November 2011, Baltimore County indicated certain restoration actions as placeholders for actions currently not credited or where credits were lower than what was anticipated to be the credit in the future. Maryland Department of the Environment made no modifications to the 2017 actions proposed by Baltimore County, but to ensure that the final target load reductions would be met, the 2025 reductions actions were modified. A MAST analysis was performed to determine the acreage for each action that would fall under the State of Maryland or Federal responsibility. The portion remaining after subtracting the State and Federal responsibilities would be the responsibility of Baltimore County unless the County proposed an alternative strategy. Table 2-16 provides the results of this analysis.

Table 2-16: Division of Responsibilities if the MDE 2025 Urban Stormwater Strategy is Accepted.

BMP Name	Unit	MDE 2025 Final Strategy	State, Federal Strategy	Baltimore County MS4 Strategy – If MDE Strategy is Accepted
Bioretention/Raingardens	Acres	523	11	512
Bioswale	Acres	1,546	151	1,395
Dry Detention Ponds and Hydrodynamic Structures	Acres	7,534	607	6,927
Dry Extended Detention Ponds	Acres	1,642	276	1,366
Impervious Surface Reduction	Acres	5,622	1,068	4,554
MS4 Permit – Stormwater Retrofits	Acres	24,042	884	23,158
Stormwater Management Generic BMP (1985 to 2002)	Acres	2,400	930	1,470
Stormwater Management Generic BMP (2002 to 2010)	Acres	5,183	636	4,547
Urban Filtering Practices	Acres	42,341	5,111	37,230
Urban Forest Buffers	Acres	3,877	444	3,433
Urban Infiltration Practices	Acres	434	200	234
Urban Tree Planting/ Urban Tree Canopy	Acres	1,798	690	1,108
Vegetated Open Channel – Urban	Acres	832	832	0
Wet Ponds and Wetlands	Acres	1,798	575	1,223
Erosion and Sediment Control on Construction	Acres	1,747	0	1,747
Erosion and Sediment Control on Extractive	Acres	461	325	136

Forest Conservation	Acres	11,632	709	10,923
Urban Nutrient Management	Acres	100,685	5,777	94,908
Street Sweeping Pounds	Lbs/Year	13,250,857	7,073,080	6,177,777
Urban Stream Restoration (interim)	Linear Feet	0	0	0
Urban Stream Restoration/Shoreline Erosion Control	Linear Feet	1,224,722	0	1,224,722

After assessing the ability to achieve certain actions Baltimore County decided to propose an alternate strategy that would meet the nitrogen and phosphorus reduction requirements. The alternate strategy includes the original MDE strategy for State and Federal responsibilities. The alternate Baltimore County 2025 MS4 Strategy, along with differences with the MDE 2025 urban stormwater strategy is displayed in Table 2-17.

Table 2-17: Baltimore County 2025 MS4 Strategy Compared to the MDE 2025 Strategy

BMP Name	Unit	MDE 2025 Final Strategy	State, Federal Strategy	Baltimore County MS4 Strategy	Baltimore County Total 2025 Strategy	Difference Between MDE and Baltimore County 2025 Strategy
Bioretention/Raingardens	Acres	523	11	500	511	-12
Bioswale	Acres	1,546	151	500	651	-895
Dry Detention Ponds and Hydrodynamic Structures	Acres	7,534	607	11,842	12,449	4,915
Dry Extended Detention Ponds	Acres	1,642	276	8,357	8,633	6,991
Impervious Surface Reduction	Acres	5,622	1,068	0	1,068	-4,554
MS4 Permit – Stormwater Retrofits	Acres	24,042	884	25,000	25,884	1,842
Stormwater Management Generic BMP (1985 to 2002)	Acres	2,400	930	0	930	-1,470
Stormwater Management Generic BMP (2002 to 2010)	Acres	5,183	636	0	636	-4,547
Urban Filtering Practices	Acres	42,341	5,111	20,500	25,611	-16,730
Urban Forest Buffers	Acres	3,877	444	200	644	-3,233
Urban Infiltration Practices	Acres	434	200	1,187	1,387	953
Urban Tree Planting/ Urban Tree Canopy	Acres	1,798	690	1,500	2,190	392
Vegetated Open Channel – Urban	Acres	832	832	0	0	0
Wet Ponds and Wetlands	Acres	1,798	575	4,107	4,682	2,884
Erosion and Sediment Control on Construction	Acres	1,747	0	1,747	1,747	0
Erosion and Sediment Control on Extractive	Acres	461	325	136	461	0
Forest Conservation	Acres	11,632	709	0	709	-10,923
Urban Nutrient Management	Acres	100,685	5,777	96,444	102,221	1,536

Street Sweeping Pounds	Lbs/Year	13,250,857	7,073,080	2,554,000	9,627,080	-3,623,777
Urban Stream Restoration (interim)	Linear Feet	0	0	442,000	442,000	442,000
Urban Stream Restoration/Shoreline Erosion Control	Linear Feet	1,224,722	0	48,000	48,000	-1,176,722

The revised Baltimore County urban stormwater scenario will meet the reduction targets by 2025 as required by MDE, as shown in Table 2-18. However, Baltimore County intends to pursue the additional actions that are currently not credited or are under credited. Those actions not credited include; sanitary sewer overflow reductions, redevelopment, street sweeping for nutrients, storm drain cleaning for nutrients, and illicit and Illicit Discharge Detection and Elimination Program efforts. Those actions currently under credited include: shoreline erosion control projects and urban nutrient management. The interim efficiency for stream restoration was available in MAST and was used, but the actual efficiency will depend on the findings of the expert panel that is currently analyzing the available information. Changes in the nutrient reduction credits will result in reductions in other practices. As an example, credit for nitrogen removal from street sweeping based on Baltimore County calculations would result in the reduction of 4,238 pounds of nitrogen. This is equivalent to installing filtering practices on 2,230 acres of urban land. Tables 2-12, 2-13, and 2-14 display the Baltimore County MS4 strategy that contains actions that are not credited or are under credited. While the strategy is different from the one submitted through MAST, it will also meet the reduction requirements. If any of the actions are not credited or new higher credits are not generated, then additional actions as detailed in the MAST submittal will be taken.

Table 2-18: Baltimore County Urban Stormwater Strategy – Nitrogen and Phosphorus Reductions

BMP	Nitrogen Reduction	Remaining Delivered Nitrogen	Phosphorus Reduction	Remaining Delivered Phosphorus
Initial Load		916,079		67,804
All State and Federal BMPs	-36,713	879,366	-3,649	64,155
Erosion and Sediment Control	-5,588	873,778	-1,907	62,248
Urban Nutrient Management	-83,322	790,456	-3,681	58,567
Urban Forest Buffers	-959	789,497	-59	58,508
Urban Tree Canopy	-6,362	783,136	-207	58,302
Existing SWM	-15,532	767,604	-1,764	56,538
Stream Restoration – Interim Rate	-50,129	717,475	-18,050	38,488
Shoreline Erosion Control	-960	716,615	-110	38,378
MS4 Retrofits	-21,245	695,270	-2,714	35,663
Urban Filtration Projects	-48,561	646,709	-6,330	29,333
Bioretention/Raingarden	-2,276	644,433	-174	29,159
Bioswale	-2,276	642,157	-174	28,985
Street Sweeping	0	642,157	0	28,985
MS4 Retrofits – 11,000 more acres	-37,819	621,237	-20,920	25,376

Erosion and Sediment Control on unregulated Extractive	-548	621,019	-51	25,324
Urban Filtration on 500 more acres	-2,425	619,625	-259	25,065
Target Reductions		**620,815**		**35,953**
Difference		**-1,190**		**-10,888**

2.2.2 Urban Stormwater Programmatic Actions

There are a number of programmatic actions necessary to enable the county to meet the urban stormwater load reduction allocations. These can be broken down as:

- Work with the State of Maryland to develop adequate mechanisms to fund the increased restoration pace and the staff needed to meet the urban stormwater reduction allocations by 2025.
- Develop tracking and reporting mechanisms for redevelopment and revitalization to assess load reductions.
- Develop tracking and report mechanisms for green field development to assess load increases.
- Work with MDE, Baltimore City, Anne Arundel County, and Howard County to define each jurisdiction's share of the remaining capacity of the WWTPs.
- Work with MDE, Baltimore City, Anne Arundel County, and Howard County to refine the concept of Trading-In-Time and develop formal agreements, if it is determined that the contingency is needed to meet the overall nutrient reductions.
- Coordinate with Baltimore County Department of Public Works to set a timeframe for connecting Richlyn Manor package treatment plant to the public sanitary sewer.
- Continue working with the Chesapeake Bay Program – Urban Stormwater Workgroup expert panel to determine new stream restoration pollutant load reduction credits.
- Develop a reforestation program funded through capital funds.
- Coordinate between the Departments of Public Works and Environmental Protection and Sustainability to target street sweeping and storm drain cleaning in neighborhoods identified through the Neighborhood Source Assessment in the Small Watershed Action Plans.
- Continue to work with the Farm Trust to determine if thereare pollutant load reduction credits associated with Preservation Programs.
- Continue to explore the possibility of pollutant load reduction credits as a result of Baltimore County's land use planning through the implementation of the *Master Plan 2020*.

- Explore the development of an Environmental Land Management Plans with the Departments of Recreation and Parks and Education.
- Continue to work with the State and the Chesapeake Bay Program to find solutions to the Watershed Model technical and data deficiencies identified in Chapter 6 below.

2.2.4 Urban Stormwater Contingencies

There are a number of anticipated reduction factors, such as, higher reduction credits for stream restoration or higher credits for implementation of the Fertilizer Act of 2011 that may not granted. In order to address this, several contingencies are contemplated, including:

- Implementing a Trading-In-Time agreement to take advantage of the WWTP upgrades that would extend the time frame to meet the urban stormwater reduction allocations.
- Develop a nutrient reduction crediting system for the existing Baltimore County Illicit Connection Program.
- Increase the number of restoration activities beyond what is currently proposed.

2.3 On-Site Disposal System (OSDS) Strategy

The OSDS restoration action strategy is based on the analysis detail in Appendix A. The target nitrogen reductions from OSDS are:

- 2017 – reduce 42,103 pounds of nitrogen
- 2025 – reduce an additional 18,045 pounds of nitrogen

This represents a 25.3% reduction by 2017 and a 36.2% reduction by 2025.

2.3.1 OSDS Restoration Actions Strategy

The Baltimore OSDS strategy is to adjust the number of sanitary sewer connections in MAST to account for mis-identification of the number of existing OSDS. This credit will be applied to those areas in the Chesapeake Bay Critical Area (CBCA) outside the Urban-Rural Demarcation Line (URDL) where historic sanitary sewer extension has occurred and inside the URDL in the watersheds with our designated growth areas where there is an over estimate of the number of OSDS. In addition, the county will continue to analyze and evaluate the OSDS data to provide a better determination of the actual number of OSDS in Baltimore County. One analysis will be a parcel-by-parcel analysis of the Tetra Tech OSDS data in relation to the Baltimore County OSDS data. At the same time Baltimore County will continue to evaluate its Bay Restoration Fund database in terms of accuracy of assignment to being served by OSDS and being connected to sanitary sewer. We believe that even the Baltimore County data over estimates the number of OSDS.

The county for the next two-year milestone period will continue at the current pace of installation of de-nitrifying systems, sanitary sewer connections, and OSDS pump-outs. Based on the two analyses described above, Baltimore County will determine the pace of OSDS restoration for the remaining two-year milestones.

Table 2-19 indicates the reduction of nitrogen based on the restoration strategies detailed below. As can be seen from this table the proposed strategy will almost meet the reduction target for OSDS. As we continue to analyze the data and track our progress, we will be able to refine our reduction estimates and determine if additional restoration actions for OSDS are necessary.

Table 2-19: OSDS Strategy – Delivered Nitrogen Reduction (Target 106,137 #s Nitrogen)

Strategy	# of Systems	Nitrogen Reduction	Remaining Nitrogen Load	Remaining to Meet Target
2009 Progress from MAST			166,285	60,148
Health Projects	1,537	-24,201	142,084	35,947
Growth Area Adjustments	7,805	-33,649	108,435	2,298
De-nitrifying Systems	220	-897	107,538	1,401
Future Health Projects	200	*	*	*
OSDS Pump-outs	7,800/yr	-464	106,469	332

*Not broken out separately

Restoration Strategies

1. Take credit for the sanitary sewer extensions beyond the URDL in the tidal neck areas. 1,537 sanitary sewer connections in CBCA – high delivery areas
2. Take credit for the misidentification of OSDS within the designated growth areas. 4,255 (Gwynns Falls) + 3,550 (Bird River, Lower Gunpowder Falls) = 7,805 sanitary sewer connections – evenly split between upland and <1,000 from streams in medium delivery areas.
3. Continue pace of installation of on-site sewage disposal de-nitrifying systems at 20 systems per year targeted in the CBCA.
4. Continue pace of sanitary sewer connections of existing OSDS at an average of 14 per year.
5. Continue OSDS pump-outs at the rate of 7,800 per year (21.5%)

2.3.2 OSDS Programmatic Strategy

1. Investigate households within the CBCA that are indicated as being on OSDS to determine the correctness of the designation.
2. Investigate households within the URDL that are indicated as being on OSDS to determine the correctness of the designation.
3. Investigate the legal mechanisms for requiring households on OSDS within the URDL to connect to the sanitary sewer system.
4. Develop outreach and education programs on the value of OSDS pump-outs with the intention of increasing the pump-out rate from 21.5% to 33.3% or once every three years on average. To be implemented in FY 2014
5. Investigate solutions for OSDS problem areas identified in the report entitled *Problem Areas for OSDS in Baltimore County* (DEPRM 1998). Begin implementation of the solutions in FY 2014.
6. Improve tracking of OSDS connections to the sanitary sewer and OSDS pump-outs.

7. Conduct detailed parcel analysis between data used in MDE Report and Baltimore County data.

CHAPTER 3

BALTIMORE COUNTY JULY 1, 2011 – JUNE 30, 2013 MILESTONES

3.1 Introduction

In order to ensure progress is being made in meeting the reduction requirements to restore the Chesapeake Bay, a 2-year milestone process has been instituted. This will provide not only the mechanism to gage progress, but to also identify where programmatic development is needed to fill the gaps in achieving the goals. The first two-year milestone is from July 1, 2011 through June 30, 2013. For the Baltimore County Phase II WIP, only those milestones for the County NPDES – MS4 stormwater coverage, non-regulated urban, and construction, and for septic systems will be presented. Two-year milestones for agricultural strategies, point sources, state property, and regulated urban are being developed separately. The federal strategies are also being developed separately.

The Baltimore County approach to developing the current two-year milestones is based on the current capital budget, which spans the two years under consideration. Also included are existing operating programs, such as, street sweeping, storm drain cleaning, and Erosion and Sediment Control. The analysis of the number of septic systems present in the county and those attributed to the county both in the CBP Watershed Model and in the MDE analysis indicates that the number is far over estimated. The septic loading will be adjusted based on the OSDS analysis (Appendix A).

3.2 Urban Stormwater Strategies

The allocations for urban stormwater are divided into nine categories. One category, Municipal Phase II MS4, does not apply in Baltimore County since there are no incorporated municipalities within the county's borders. Table 3-1 presents the allocations by urban stormwater source sector for nitrogen and phosphorus; no reduction allocations have been received for sediment. Table 3-2 presents the stormwater allocations for which Baltimore County is responsible and the percent reduction needed

to meet the target. Table 3-2 also presents the reductions needed for each two-year milestone period based on a steady reduction strategy.

Table 3-1: Urban Stormwater Reduction Allocations for Baltimore County - All

	County MS4	Non-regulated	Construction	Extractive	State Phase II MS4	SHA Phase I MS4	Regulated Industrial Facilities	Federal Developed	Total
#s Nitrogen									
2010 Progress	710,077	31,908	16,763	4,114	18,314	50,545	15,157	3,547	**850,425**
2017 Target	591,158	27,218	17,812	3,701	14,829	42,486	12,522	2,933	**721,506**
2025 Target	511,879	24,092	18,512	3,425	12,505	37,114	10,765	2,524	**620,816**
#s Phosphorus									
2009 Progress	49,466	1,144	2,861	927	1,076	4,005	1,574	199	**61,253**
2017 Target	34,345	867	3,950	769	782	2,977	1,166	147	**47,003**
2025 Target	27,358	658	3,399	664	577	2,291	896	110	**35,953**

Table 3-2: Urban Stormwater Reduction Allocations for Baltimore County – County Share

	County MS4	Non-regulated	Total	#s Reduction	% Reduction	#/2-year Milestone Period
#s Nitrogen						
2010 Progress	710,077	31,908	741,985			
2017 Target	591,158	27,812	618,377	-123,608	**-16.7%**	-35,318
2025 Target	511,879	24,092	535,971	-82,406	**-11.1%**	-21,764
Total Reduction				-217,643	**27.8%**	
#s Phosphorus						
2010 Progress	49,466	1,144	50,610			
2017 Target	36,201	852	37,054	-13,556	**26.8%**	-3,873
2025 Target	27,358	658	28,016	-9,038	**-17.9%**	-2,259
Total Reduction				-22,990	**-44.6%**	

The initial targets for 2017 are based on achieving a 60% reduction over three and a half 2-year milestone periods, while the 2025 final targets are based on achieving the final 40% reduction over four 2-year milestone periods. The Baltimore County urban stormwater reduction target for the first 2-year milestone and those that follow is 35,318 pounds of nitrogen and 3,873 pounds of phosphorus through 2017. Thereafter the 2-year milestone targets are 21,764 pounds of nitrogen and 2,259 pounds of phosphorous

through 2025. Any reduction that is less than these targets would have to be made up in the following 2-year milestones to meet the 2017 target and 2025 target.

In addition, any increase in pollutant loads due to development to accommodate future population growth will have to be offset in some fashion.

3.2.1 Stormwater Implementation Actions

3.2.1.1 Capital Projects

The County currently has a Waterway Improvement Capital Program that routinely conducts a variety of restoration projects. This program is housed in the Baltimore County Department of Environmental Protection and Sustainability (EPS) and is overseen by the Capital Program and Operations Section. The county capital budget is on a two-year cycle that coincides with the two-year milestone period. In order to address the expected increase in the restoration requirement associated with the renewal of the County NPDES – MS4 permit, 2 FTEs were moved from the Stormwater Engineering Section in the spring of 2011. These two FTEs are in training in capital project management, prior to being at full capacity. Based on the projects that are currently under design, in construction, or for which it is anticipated that design and construction can be completed prior to June 30, 2013; the following restoration actions will be completed through the Capital Program and Operations Section.

- 63,174 linear feet stream restoration
- 5,190 linear feet shoreline erosion control
- 669 acres of stormwater retrofit/conversion
- 1,400 Urban tree canopy plantings

3.2.1.2 Operational Programs

The county has a street sweeping program that is operated by the Baltimore County Department of Public Works – Bureau of Highways. The total amount of solids removed is reported annually to EPS for inclusion in the annual NPDES – MS4 Report to MDE. Credit for this program is based on annual removal rates, with credit increasing or decreasing depending on the amount of material removed. For each of the two years in this milestone period the county is proposing to remove:

- 2,362,000 pounds of material - street sweeping

The county has a storm drain cleaning program that is operated by the Baltimore County Department of Public Works – Bureau of Utilities. The total amount of solids removed is calculated based on work orders. This information is included in the annual NPDES – MS4 Report submitted to MDE. Credit for this program is based on annual removal rates, with credit increasing or decreasing depending on the amount of material removed. For each of the two years in this milestone period the county is proposing to remove:

- 191,847 pounds of material - storm drain cleaning

3.2.1.3 Urban Nutrient Management

Since 1998, MDA has regulated approximately 700 applicators that apply fertilizer to 10 or more acres of non-agricultural land, including private lawns, golf courses, public parks, airports, athletic fields and state owned land such as restoration areas and highway right-of-ways. Applicators are required to take soil tests, follow University of Maryland Extension guidelines when applying nutrients, and maintain certain records of fertilizer applications. Baltimore County obtained the list of operators within the county jurisdiction. Since it is unknown, where landscaping firms and lawn care companies conduct their operations, the analysis was limited to large institutional, recreational, and county operated sites that were listed. Based on this listing, 6,125 acres were estimated to fall under this regulation. The reduction rates applied are 17% for nitrogen and 22% for phosphorus, based on the Maryland Phase I WIP.

- 6,125 acres of nutrient management

3.2.1.4 Reforestation

The reforestation component takes the form of three separate actions; upland reforestation, urban riparian buffer reforestation, and urban tree canopy planting. The anticipated numbers of acres or trees to be planted in the 2-year milestone period are:

- 20 acres upland reforestation,
- 10 acres urban riparian buffer reforestation, and
- 1,400 urban trees planted for an increase in the urban tree canopy.

3.2.1.5 Watershed Association Restoration Projects

Baltimore County provides grant funding to local watershed association to facilitate their education and outreach activities, to implement restoration projects, and to participate in watershed planning activities. The County often works with the local watershed associations for their inclusion in grant applications for State and Federal restoration implementation grants. The local watersheds, in turn, report their restoration activities to the county for inclusion in our annual NPDES – MS4 permit. We anticipate that this collaboration will continue. For watershed association activities, we have included their current pace of restoration implementation in our urban stormwater strategy. While many of these watershed associations are poised to increase the pace of their restoration activities, the County is proposing to credit these actions at the current pace. Any additional restoration action over the current pace will be tracked and credited on an annual basis in the Baltimore County NPDES – MS4 Report.

3.2.1.6 Redevelopment

Redevelopment and community revitalization provide water quality improvements over the existing condition by implementing required stormwater management on-site. The County Water Resources Analysis provides the documentation of the improvements through the type of activity. Redevelopment is defined by the Stormwater Management regulations as development on a site that has greater than 40% impervious cover. Such development projects are required to remove 50% of the existing impervious area or provide equivalent treatment. There are many sites that are developed, but do not have 40% impervious cover and require full treatment as though they were green-field developments. *Master Plan 2020* encourages redevelopment and community

revitalization. Baltimore County intends to develop a tracking and reporting mechanism to be able to receive credits for these types of activities. The anticipated acres of redevelopment/revitalization for the 2-year milestone period are:

- 200 acres of redevelopment/revitalization

3.2.1.7 Sanitary Sewer Overflow (SSO) Elimination

Baltimore County is under a Consent Decree to address SSOs that occur due to wet weather inflow and infiltration, equipment failure, sanitary sewer line breaks, and sanitary sewer line blockages. The Consent Decree requires all work to be completed by 2020. This should mean that all overflows would cease by that date. In order to account for the nitrogen and phosphorus load reduction due to the repairs to the sanitary sewer system, the average annual overflow volume and associated nitrogen and phosphorus loads were calculated for the previous eleven years. The assumption is that a 20% reduction in overflows will occur during each of the five 2-year milestone periods. The measure for this restoration factor is to track the number and volume of overflows each year to determine if the reductions are being achieved. For this 2-year milestone period the County anticipates that there will be a 20% reduction in the volume of SSO compared to the previous eleven years.

3.2.1.5 2-Year Milestone Calculated Stormwater Nutrient Reductions

The nitrogen and phosphorus reductions for each of the restoration actions were calculated and are presented in Table 3-3. Note the higher credit for stream restoration does not have any additional restoration action associated with it, but is dependant on the re-evaluation of the stream restoration credits allotted to stream restoration (See Chapter 2 for further discussion). The interim rate for stream restoration made available in MAST in May 2012 was used to calculate the nitrogen and phosphorus reductions due to stream restoration. As can be seen, Baltimore County will be short of the target for nitrogen reduction but will make the target for phosphorus reduction. If additional credit for stream restoration is not approved, then the gap will be greater.

Table 3-3: 2-Year Milestone Restoration Targets and Associated Nitrogen and Phosphorus Reductions

Strategy	Type*	Acres/Linear Feet July 1, 2011 – June 30, 2013	Nitrogen Reduction	Phosphorus Reduction
Stream Restoration (Interim Rate)	C	63,174 feet	7,165	4,225
Shoreline Erosion Control	C	5,190 feet	830	571
SWM Retrofit/Conversions	C	669 acres	1,268	165
Street Sweeping	A	Current Rate	4,238	1,620
Storm Drain Cleaning	A	Current Rate	734	284
Nutrient Management 1998	A	6,125 acres	4,565	204
SSO Elimination	C	20% reduction	230	76
Upland Reforestation	C	20 acres	85	3
Riparian Buffer Reforestation	C	10 acres	57	4
Urban Tree Canopy Planting	C	1,400 trees	59	2
Redevelopment	C	200 acres	915	106
Watershed Association Projects	C	Current Rate	155	15

Total Reductions			***20,301***	***7,275***
Reduction Target			***35,318***	***3,873***
Remaining Reduction Needed			***15,335***	***-3,402***

3.2.1.3 Erosion and Sediment Control

Baltimore County has been given the authority to enforce sediment control regulations by the state of Maryland. This program is operated by the EPS – Inspection and Enforcement Section. Sediment control plans are required for any activity disturbing an area greater than 5,000 square feet. The number of grading permits and acres of disturbance is tracked and reported to MDE in the annual NPDES – MS4 Permit. The measurement of this program is based on enforcing sediment control regulations on 100% of the acres disturbed regardless of how many acres are disturbed each year. For each of the two years in this milestone period the county is proposing to enforce:

- 100% of the acres disturbed through - erosion control enforcement

The construction portion of the load reduction is based on an average 1,721 acres of disturbance per year. Erosion and sediment control structures are applied this acreage. If fewer acres are disturbed each year, then the actual pollutant load to the bay from this source will be less. Based on MAST the before BMP delivered load from construction activities is 12.80 pounds nitrogen/acre/year and 2.73 pounds phosphorus/acre/year. With 100% erosion and sediment control BMPs the delivered load rates are 3.25 pounds nitrogen/acre/year and 1.11 pounds phosphorus/acre/year.

3.2.2 Stormwater Programmatic Actions

There are a number of programmatic actions necessary to enable the county to meet the urban stormwater load reduction allocations. The Programmatic actions 2-year timeframe is from January 1, 2012 through December 31, 2013. These can be broken down as;

- Work with the State of Maryland to develop adequate mechanisms to fund the increased restoration pace and the staff needed to meet the urban stormwater reduction allocations by 2025.
- Develop tracking and reporting mechanisms for redevelopment and revitalization to assess load reductions
- Develop tracking and report mechanisms for green field development to assess load increases
- Work with MDE, Baltimore City, Anne Arundel County, and Howard County to define each jurisdiction's share of the remaining capacity of the WWTPs.
- Work with MDE, Baltimore City, Anne Arundel County, and Howard County to refine the concept of Trading-In-Time and develop formal agreements, if it is determined that the contingency is needed to meet the overall nutrient reductions.
- Continue working with the Chesapeake Bay Program – Urban Stormwater Workgroup expert panel to determine new stream restoration pollutant load reduction credits

- Develop a reforestation program funded through capital funds
- Coordinate between the Departments of Public Works and Environmental Protection and Sustainability to target street sweeping and storm drain cleaning in neighborhoods identified through the Neighborhood Source Assessment in the Small Watershed Action Plans
- Continue to work with the Farm Trust to determine if there are pollutant load reduction credits associated with Preservation Programs.
- Continue to explore the possibility of pollutant load reduction credits as a result of Baltimore County's land use planning through the implementation of the 2020 Master Plan.
- Continue to work with the State and the Chesapeake Bay Program to find solutions to the Watershed Model technical and data deficiencies identified in Chapter 6 below.

3.3 On-site Sewage Disposal Systems (OSDS) Strategies

The OSDS restoration action strategy is based on the analysis detail in Appendix A. The target nitrogen reductions from OSDS are:

- 2017 – reduce 42,103 pounds of nitrogen
- 2020 – reduce an additional 18,045 pounds of nitrogen

This represents a 25.3% reduction by 2017 and a 36.2% reduction by 2025.

3.3.1 OSDS Restoration Actions Strategy

The Baltimore OSDS strategy is to adjust the number of sanitary sewer connections in Maryland Assessment Scenario Tool (MAST) to account for miss-identification of the number of existing OSDS. This credit will be applied to those areas in the Chesapeake Bay Critical Area (CBCA) outside the Urban-Rural Demarcation Line (URDL) where historic sanitary sewer extension has occurred and inside the URDL in the watersheds with our designated growth areas where there is an over estimate of the number of OSDS. In addition, the county will continue to analyze and evaluate the OSDS data to provide a better determination of the actual number of OSDS in Baltimore County. One analysis will be a parcel-by-parcel analysis of the Tetra Tech OSDS data in relation to the Baltimore County OSDS data. At the same time Baltimore County will continue to evaluate its' Bay Restoration Fund database in terms of accuracy of assignment to being served by OSDS and being connected to sanitary sewer. We believe that even the Baltimore County data over estimates the number of OSDS.

The county for the next two-year milestone period will continue at the current pace of installation of de-nitrifying systems, sanitary sewer connections, and OSDS pump-outs. Based on the two analyses described above, Baltimore County will determine the pace of OSDS restoration for the remaining two-year milestones.

Table 3-4 indicates the reduction of nitrogen based on the restoration strategies detailed below. As can be seen from this table the proposed strategy will almost meet the reduction target for OSDS. As we continue to analyze the data and track our progress,

we will be able to refine our reduction estimates and determine if additional restoration actions for OSDS are necessary.

Table 3-4: OSDS Strategy – Delivered Nitrogen Reduction (Target 106,137 #s Nitrogen)

Strategy	# of Systems	Nitrogen Reduction	Remaining Nitrogen Load	Remaining to Meet Target
2009 Progress from MAST			166,285	60,148
Health Projects	1,537	-24,201	142,084	35,947
Growth Area Adjustments	7,805	-33,649	108,435	2,298
De-nitrifying Systems	220	-897	107,538	1,401
Future Health Projects	200	*	*	*
OSDS Pump-outs	7,800/yr	-464	106,469	332

*Not broken out separately

Restoration Strategies

1. Take credit for the sanitary sewer extensions beyond the URDL in the tidal neck areas. 1,537 sanitary sewer connections in CBCA – high delivery areas
2. Take credit for the misidentification of OSDS within the designated growth areas. 4,255 (Gwynns Falls) + 3,550 (Bird River, Lower Gunpowder Falls) = 7,805 sanitary sewer connections – evenly split between upland and <1,000 feet from streams in medium delivery areas.
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5. Continue OSDS pump-outs at the rate of 7,800 per year (21.5%)

3.3.2 OSDS Programmatic Strategy

1. Investigate households within the CBCA that are indicated as being on OSDS to determine the correctness of the designation.
2. Investigate households within the URDL that are indicated as being on OSDS to determine the correctness of the designation.
3. Investigate the legal mechanisms for requiring households on OSDS within the URDL to connect to the sanitary sewer system.
4. Develop outreach and education programs on the value of OSDS pump-outs with the intention of increasing the pump-out rate from 21.5% to 33.3% or once every three years on average. To be implemented in FY 2014
5. Investigate solutions for OSDS problem areas identified in the report entitled *Problem Areas for OSDS in Baltimore County* (DEPRM 1998). Begin implementation of the solutions in FY 2014.
6. Improve tracking of OSDS connections to the sanitary sewer and OSDS pump-outs.
7. Conduct detailed parcel analysis between data used in MDE Report and Baltimore County data.

CHAPTER 4

BALTIMORE COUNTY IMPLEMENTATION TRACKING AND REPORTING METHODS

4.1 Introduction

This section addresses tracking and reporting protocols and provides an overview of how Baltimore County accounts for the implementation of restoration actions associated with the urban stormwater sector and the on-site disposal system (OSDS) sector

The tracking and reporting of stormwater management practices, erosion and sediment control, restoration actions, and progress toward meeting TMDL reduction requirements have been coordinated through Baltimore County Department of Environmental Protection and Sustainability (EPS) – Watershed Management and Monitoring Section (WMM). WMM consolidates information reported through various sections within EPS and other County agencies to produce the annual Baltimore County NPDES – MS4 Permit Report. The latest report can be found on the web at: http://www.baltimorecountymd.gov/Agencies/environment/npdes/

The Chesapeake Bay Program will be instituting verification procedures to assure proper crediting of restoration actions. These verification procedures are in the process of development for all sectors with the expectation that they will be instituted in the spring of 2013. Baltimore County will continue to be involved with the development of the verification procedures for the urban stormwater sector and will incorporate those procedures into our tracking mechanisms when they are fully developed.

4.2 Urban Stormwater

The Department of Environmental Protection and Sustainability (EPS) – Watershed Management and Monitoring Section (WMM) has primary responsibility for tracking actions that are required as permit conditions in the NPDES – MS4 Permit. WMM has developed tracking mechanisms over the years for a variety of restoration actions, inspection and enforcement activities, and actions related to land development. All tracking is geo-referenced if possible. The tracking is done at the 8-digit watershed level to facilitate the analysis of TMDL pollutant load reduction progress.

Table 4-1 provides a summary of the tracking functions that have been identified as necessary to track progress in meeting the Chesapeake Bay urban stormwater nitrogen and phosphorus reduction allocations. The table includes the originating agency/section and the status of the tracking mechanisms. As can be seen from the table a number of

tracking mechanisms will need to be developed. These will be developed by the end of the first two-year milestone.

The current tracking methodologies collect data on an annual calendar year basis. That will change with the next annual NPDES – MS4 Report where the data will be summarized on a State fiscal year basis. This will bring the reporting into conformance with the 2-year milestone time periods and allow for a direct measure of progress made in meeting the 2-year milestones.

A brief overview of the requirements for each tracking factor is presented below.

Table 4-1: Tracking Status

Tracking Factor	Submitting Agency/Section	Status
Stormwater Management Facility Data	EPS – Stormwater Engineering Section EPS – Capital Program and Operations	Complete
Erosion and Sediment Control Actions	EPS – Inspection and Enforcement Section	Complete
Restoration Capital Projects	EPS – Capital Program and Operation Section	Complete
Street Sweeping	DPW – Bureau of Highways	Needs Improvement
Storm Drain Cleaning	DPW – Bureau of Utilities	Complete
Reforestation Projects	EPS – Sustainability Section (Community Reforestation Program) EPS – Capital Program and Operation Section	Complete Complete
Watershed Association Projects	7 Local Watershed Associations	Complete
Redevelopment/Revitalization	Office of Planning (maybe)	Needs to be Developed
Sanitary Sewer Overflow Elimination	DPW	Needs to be Developed
Urban Nutrient Management	Maryland Department of Agriculture	Needs to be Developed

4.2.1 Stormwater Management

Maryland law mandates implementation of a stormwater management program at the local government level for private and local government projects. State and Federal projects are regulated and inspected by Maryland Department of the Environment (MDE). EPS – Stormwater Engineering Section oversees the stormwater management programs, which review and approve new and redevelopment projects, and require the inspection and ensure maintenance of all stormwater management practices (e.g., inspected once every three years and maintain). The EPS - Capital Program and Operations Sections (CPO) provides inspection and maintenance of public facilities. The data on number, type, and location of stormwater management facilities, along with inspection information are collected annually based on the calendar year. (Section 1 in the annual NPDES – MS4 Report)

4.2.2 Erosion and Sediment Control

The Erosion and Sediment Control Program is implemented by Permits, Approvals, and Inspections (PAI) Department – Code Inspection and Enforcement. This program is periodically reviewed by the Maryland Department of the Environment (MDE) and has consistently met the review requirements. The main function of the Erosion and

Sediment Control Program is to reduce pollutant loads from new development and redevelopment during the construction phase. This goal is achieved using sediment control best management practices (BMPs) as specified in the sediment and erosion control plan for each development site. The Inspection and Enforcement Section reviews and tracks grading and building permits and reports quarterly information regarding earth disturbances exceeding one acre or more. There is also an annual summary of number of permits and acres of disturbance that includes all permits, not just those above one acre. The number of inspections of various types and enforcement actions are also reported. MDE has responsibility for inspection and enforcement of erosion and sediment control for State and Federal projects. (Section 2 in the annual NPDES – MS4 Report)

4.2.3 Capital Project Restoration

The EPS – CPO and WMM sections work together to update the pollution reduction tracking database, which currently tracks reductions from capital construction BMP projects, such as, stream restoration and shoreline enhancement. Existing stormwater management facility conversions and retrofits are also tracked. EPS reports the pollutant load reductions from these programs in the annual NPDES report. (Section 7 in the annual NPDES – MS4 Report)

4.2.4 Street Sweeping/Storm Drain Cleaning

The Street Sweeping Program is managed by the DPW - Bureau of Highways. WMM receives an annual report on the amount of material removed countywide, through this program. WMM then calculates the amount of nitrogen and phosphorus removed and partitions the amount of removal between the 8-digit watersheds based on the number of miles of street sweeping routes in each watershed. This tracking could be improved by more site-specific tracking of where the material is swept from and better coordination between the Street Sweeping Program and WMM.

The Storm Drain Cleaning Program is managed by the DPW - Bureau of Utilities. Each time a crew cleans an inlet, street or pipe, the amount of debris removed is recorded on a data sheet that typically contains all cleaning records for that particular location. Completed data sheets are sent to EPS, where the data is entered into a database that calculates the volume of material removed. The amount of nitrogen and phosphorus removed is then calculated in accordance with approved Chesapeake Bay Program procedures. (Section 3 in the annual NPDES – MS4 Report)

4.2.5 Reforestation

EPS currently tracks pollutant reductions from tree planting programs such as the Community Reforestation Program and the Growing Home Campaign. The removal efficiencies were developed following guidance from the Chesapeake Bay Program's removal efficiency numbers. EPS calculates planting projects using the land cover conversion rate from urban pervious to forest cover. An additional reduction is applied for trees planted within riparian buffers. (Section 7 in the annual NPDES – MS4 Report)

4.2.6 Watershed Association Restoration Projects

To expand the County's overall restoration strategy, EPS developed the *Watershed Association Restoration Planning and Implementation Grant* Program. This grant

program was developed to address staffing needs of local Watershed Associations. The intent of the grant is to provide part-time funding for staff of volunteer groups. These groups assist the county with participation in County restoration planning, identification of restoration projects, implementation of restoration projects, identification of Stream Watch participants, and offer educational activities, they can use the grant to leverage additional funding. (Section 7 in the annual NPDES – MS4 Report)

4.2.6 Redevelopment and Revitalization

Currently Baltimore County does not have a program to track development and/or redevelopment of land to achieve reduction in stormwater pollutant levels. EPS and Baltimore County Office of Planning (OP) are presently exploring the development of a tracking and reporting mechanism for the Watershed Implementation Plan. The tracking mechanism will be developed by the summer of 2013 with the results included in the annual NPDES – MS4 Report.

4.4.7 Sanitary Sewer Overflow (SSO) Elimination

Baltimore County is currently developing a program to eliminate sewer overflows as required by a Consent Decree issued in 2005. EPS and DPW are working together utilizing the Baltimore County Sanitary Sewer Consent Decree requirements to determine the best methodology to track progress on sanitary sewer system repairs and SSO elimination. While the reported overflows are available on a geo-referenced basis, the completed and scheduled repairs are not. We will work to complete a tracking system by the end of 2012. In the mean time the overflows will be tracked and the volume will be compared to the historic average to determine if the 20% 2-year milestone reduction targets are being met.

4.2.8 Urban Nutrient Management

Under the current Urban Nutrient Management Law, Maryland Department of Agriculture regulates fertilizer applications on commercially managed lawns (i.e. golf courses, and athletic fields). Several agencies track their fertilizer application activities and annually submit the data to EPS. (Section 3 in the annual NPDES – MS4 Report)

The tracking of this management measure will be assessed to determine the best way to track and verify the actions.

4.3 On-site Sewage Disposal Systems (OSDS)

Table 4-2 presents the tracking factors for OSDS restoration implementation. There are three factors that need to be tracked to determine progress in meeting the 2-year milestones; installation of de-nitrifying systems, sanitary sewer connections of existing OSDS, and OSDS pump-outs.

Table 4-2: OSDS Implementation Tracking

Tracking Factor	Submitting Agency/Section	Status
De-nitrifying System Installation	EPS – Groundwater Management Section	Complete
Sanitary Sewer Connection	DPW	Needs to be Developed
OSDS pump-outs	DPW – Bureau of Utilities	Needs to be Developed

4.3.1 De-nitrifying Systems

The installation of denitrifying systems is funded through the Bay Restoration Fund. Baltimore County has applied for and received a grant to provide funding assistance to 20 households per year for installation of the denitrifying systems. At the current rate of installation, an additional 120 denitrifying systems will be installed by June 2017 and a total of 200 by December 2020. EPS – Groundwater Management Section is responsible for implementation of this program. A spreadsheet of install systems and a geo-referenced data layer is kept current. This factor will be included in the next annual NPDES – MS4 Report.

4.3.2 Sanitary Sewer Connections

Baltimore County does not have a consistent tracking methodology in place for this restoration action. EPS is currently working with DPW to develop a methodology that will capture existing OSDS connections to the sanitary sewer. An attempt will be made to have the data captured in a geo-referenced fashion. If the tracking methodology is complete by the next annual NPDES – MS4 Report, the data will be included with the report.

4.3.3 OSDS Pump-outs

The Baltimore County Department of Public Works (DPW) provides access to the public sewer system for discharge of septic waste collected by septic haulers. The septic haulers are required to submit a monthly report on the address of the pump-out location and how many loads were discharged to the sanitary sewer for billing purposes. The monthly summary sheets were used to determine the number of pump-outs for 2010. This provides the information necessary to track the number of pump-outs per year. However, we are working a tracking methodology that will provide geo-referenced data on the location of each pump-out to allow a more complete analysis of this factor and to be able to assess the data on an 8-digit watershed scale. None of the data is currently electronic, which provides a barrier to developing geo-referenced data. If geo-referenced data is available by the next annual NPDES – MS4 Report it will be reported on the 8-digit watershed scale, otherwise it will be reported as a countywide aggregate.

4.4 Reporting

Baltimore County will include the reporting on Chesapeake Bay TMDL nitrogen and phosphorus reductions in its annual NPDES – MS4 Report. The web access to the latest report is listed above. With the renewal of the Baltimore County – MS4 Permit, we are anticipating changing the report structure to reflect the new permit conditions. We will also be changing the timeframe of the report from calendar year to State fiscal year to enable us measure progress against the 2-year milestones. Typically, the report is due on the anniversary of the issuance of the permit. Baltimore County intends to attempt to complete the report by September 30th each year with data current to the end of the previous fiscal year. This will enable the county, the State, and the Chesapeake Bay Program to assess the progress made against the established 2-year milestones.

CHAPTER 5

RELATIONSHIP OF BALTIMORE COUNTY WATERSHED PLANNING FRAMEWORK TO THE PHASE II WIP

5.1 Introduction

Watershed planning has been and continues to be an integral part of Baltimore County's Waterway Improvement Program. The Department of Environmental Protection and Sustainability (EPS) recognizes the benefits of a strategy to guide the restoration process to assure waterway improvement success. Baltimore County is engaged in watershed planning through the NPDES Municipal Stormwater Permit, the Reservoir Protection Program, the Baltimore Watershed Agreement, and through its *Master Plan 2020*, which contains the Water Resources Element. The County has demonstrated its ongoing commitment to water quality improvement and environmental restoration through the Capital Budget process, which is supported primarily through bond referendums.

The Baltimore County Phase II Watershed Implementation Plan (WIP) provides an overall strategy to meet the Chesapeake Bay TMDL reduction allocations for four sectors; agriculture, urban stormwater, septic systems, and point source discharges (note: agriculture, point sources, federal property, and state property strategies are under a separate cover). The other watershed planning activities within the county may have a different focus, but elements of each planning activity will have be related to the Phase II WIP, particularly those focused on pollutant load reduction. These planning activities include:

- NPDES MS4 Permit Watershed Planning requirements
  - Water Quality Management Plans
  - Small Watershed Action Plans
- Reservoir Agreement and Action Strategy
- Baltimore Watershed Agreement
- *Master Plan 2020*
  - Water Resources Element

Each of these watershed-planning activities will be briefly discussed below.

5.2 NPDES MS4 Stormwater permit

The National Pollutant Discharge Elimination Program – Municipal Separate Storm Sewer System (NPDES – MS4) permit has required watershed planning as a permit requirement since the first Baltimore County permit was issued in 1994. The county is currently on the third re-issuance of the NPDES – MS4 permit and is expecting the next five-year permit to be issued in the near future. The next permit is expected to continue the requirement for watershed planning activities and to require the development of TMDL Implementation Plans for each local TMDL that has been developed for Baltimore County watersheds. These TMDL Implementation Plans will be in addition to the watershed planning already underway. The permit conditions will require the TMDL Implementation Plans be submitted to Maryland Department of the Environment within one-year of the permit issuance date, and they will be required to have a public input component.

5.2.1 Water Quality Management Plans

The initial Baltimore County efforts in conducting watershed planning pre-dated the issuance of the first NPDES – MS4 permit. The original Water Quality Management Plans helped to focus the department's capital restoration program. Projects were identified and then prioritized in the watershed plan. County staff worked with consulting firms to design stormwater retrofits and stream stabilization projects. Additional collaboration was conducted with State and Federal permitting authorities to develop an understanding of project outcomes along with land and water impacts. These trade offs were evaluated for each individual project with the goal to improve the water quality, habitat and ecosystem services for the receiving water body.

Water quality management plans have been completed for ten of the fourteen major watersheds in Baltimore County. The four remaining watersheds have limited urban development and therefore are not required by the NPDES – Municipal Stormwater Discharge Permit to have water quality management plans. However, recognizing the benefits of a watershed management plan, Baltimore County has completed the development of a Prettyboy Watershed Plan under the State's Watershed Restoration Action Strategy (WRAS) process. Harford County in conjunction with stakeholders has also completed the WRAS process to develop a watershed plan for Deer Creek watershed. Table 5-1 presents the watersheds and the year of completion of the water quality management plan. The Gwynns Falls Watershed Management Plan, completed in December 2004, was a cooperative effort between Baltimore County and Baltimore City.

Table 5-1: Status of Watershed Management Plans

Watershed	Watershed Plan Status	Completion Date
Upper Western Shore		
Deer Creek	WRAS	6/30/07
Prettyboy Reservoir	WRAS	1/4/08
Loch Raven	Complete	9/30/96
Lower Gunpowder Falls	Complete	9/30/98
Little Gunpowder River	Complete	3/31/02
Bird River	Complete	3/29/96
Gunpowder River	Not Required	
Middle River	Complete	3/30/01
Patapsco/Back River		
Liberty Reservoir	Not Required	

Patapsco	Complete	9/30/98
Gwynns Falls	Complete	12/1/04
Jones Falls	Complete	9/30/96
Back River	Complete	9/30/96
Baltimore Harbor	Complete	3/30/01

Baltimore County enlisted the services of consultants for the preparation of the Watershed Management Plans. While the details of each plan vary, a common framework is incorporated into each plan. This framework includes:

1. watershed modeling using US EPA Stormwater Management Model (SWMM);
2. stream stability assessment using Rosgen classification methodology Levels I,II,III;
3. identification and ranking of water quality problems;
4. development of non-point source control management strategies;
5. prioritization of programs and projects; and
6. preparation of the final document, integrating the above tasks and preparing maps and tables to relate results.

Two of the water quality management plans (Middle River and Baltimore Harbor) did not include a stream stability assessment due to the limited mileage of open stream channels. These two plans did, however, include tidal estuarine water quality models, which were not a component in any of the other plans. The Water Quality Management Plans and/or their Executive Summaries have been posted under their individual watershed page on Baltimore County's website at:
http://www.baltimorecountymd.gov/agencies/environment/watersheds/

The Water Quality Management Plans are related to the Baltimore County Phase II WIP through the identification of specific potential restoration projects that could be implemented to help meet the Chesapeake Bay TMDL nutrient and sediment reductions necessary to restore the bay.

5.2.2 Small Watershed Action Plans (SWAP)

The majority of the Water Quality Management Plans were developed prior to the development of TMDLs. With the re-issuance of the Baltimore County NPDES – MS4 Permit in 2005, the county reassessed its watershed planning activities. A new paradigm for watershed planning was developed that was more inclusive of citizen stakeholders in the planning area and identified sufficient actions to meet local TMDLs that were in place at the time of development. EPA's criteria for watershed planning (commonly referred to as *a-i*) were developed in 2005 (EPA 2005) and federal restoration grant funding was increasingly being tied to watershed plans that meet the criteria. Thus the new process was designed to meet those criteria. The original plans were developed at the 8-digit watershed scale. This boundary did not readily match with urban vs. rural land uses, or communities with similar interests. The new watershed planning process results in the development of Small Watershed Action Plans (SWAPs). The first plan to test out the new process was funded under the former Water Restoration Action Strategy grant program funded through Maryland Department of Natural Resources.

The SWAPs set out to engage citizens and other stakeholders and develop a plan to meet these additional components and TMDL requirements. The steps for the SWAPs are outlined below:

- Identify and meet with stakeholders
- Set goals
- Identify pollution sources
- Identify opportunities
- Identify projects
- Evaluate costs
- Prioritize projects
- Track progress

Local community and environmental representatives are invited to join the SWAP steering committee. These members are integral to identifying restoration opportunities and pollution sources and to establishing goals. The committee also engages other stakeholders in larger public meetings to prioritize the final strategy. The plan identifies specific on-the-ground projects, timeline and the responsible parties for project completion. After completion of the plan the steering committee is encouraged to stay involved and become the implementation committee. This group meets semi-annually to update progress and discuss any changes to the strategy. In this way an adaptive management approach is used to keep actions moving forward to implement the plan. The Figure 5-1 below shows the county's current progress with preparation of SWAPs.

Stakeholders are invited to participate in the development of each SWAP. A series of two to three meetings are held over the course of the development of each SWAP. The first introduces the stakeholders to the process and solicits their input on the characterization of the planning area and goals. The second meeting presents the final characterization document and solicits input on preferred restoration options. The third meeting presents the SWAP, which includes not only County actions and projects, but also citizen-based and business-based restoration activities and options. Planning areas are selected on similarity of impacts within each area, allowing focus on specific issues related to the stakeholders who live and work within each planning area. Twenty-three planning areas have been delineated.

The Tidal Back River SWAP was completed in February 2010 in conjunction with the Back River Restoration Committee (BRRC). The Lower Jones Falls and Upper Back River SWAPs were completed in the fall of 2008 with funding from a U.S. Environmental Protection Agency – Region III Water Quality Cooperative Assistance grant. This funding permitted the hiring of contractual staff and the Center for Watershed Protection to assist in the development of the Action Plans. These two SWAPs were a collaborative effort with Baltimore City, Herring Run Watershed Association, and Jones Falls Watershed Association. (These two watershed associations have since merged with 3 other local groups to form Blue Water Baltimore.) A Watershed Restoration Action Strategy (WRAS) was developed in January 2008 for the Prettyboy watershed. This was in partnership with DNR, MDE, Carroll County, York County PA, the Soil Conservation Districts, and the Prettyboy Watershed Alliance. These same organizations are continuing with semi-annual meetings to follow-up on implementation of the plan. Figure 5-2 shows the planning areas and schedule. The completed SWAPs can be viewed on the Baltimore County website at:
http://www.baltimorecountymd.gov/Agencies/environment/watersheds/swap.html

The SWAPs are related to the Baltimore County Phase II WIP in that they identify both capital restoration projects and citizen actions that are needed to meet the local TMDL reduction requirements. Those SWAPs that are already developed will have an addendum added that addresses the actions needed to meet the Chesapeake Bay TMDL reduction allocations, while those in development and future SWAPs will explicitly include the Chesapeake Bay TMDL and the reductions needed. The SWAP process provides the opportunity for citizens to see the connection with restoration actions in their area of concern and the relationship to the Chesapeake Bay TMDL progress needed. The SWAPs will be strengthened through policies and actions of *Master Plan 2020*.

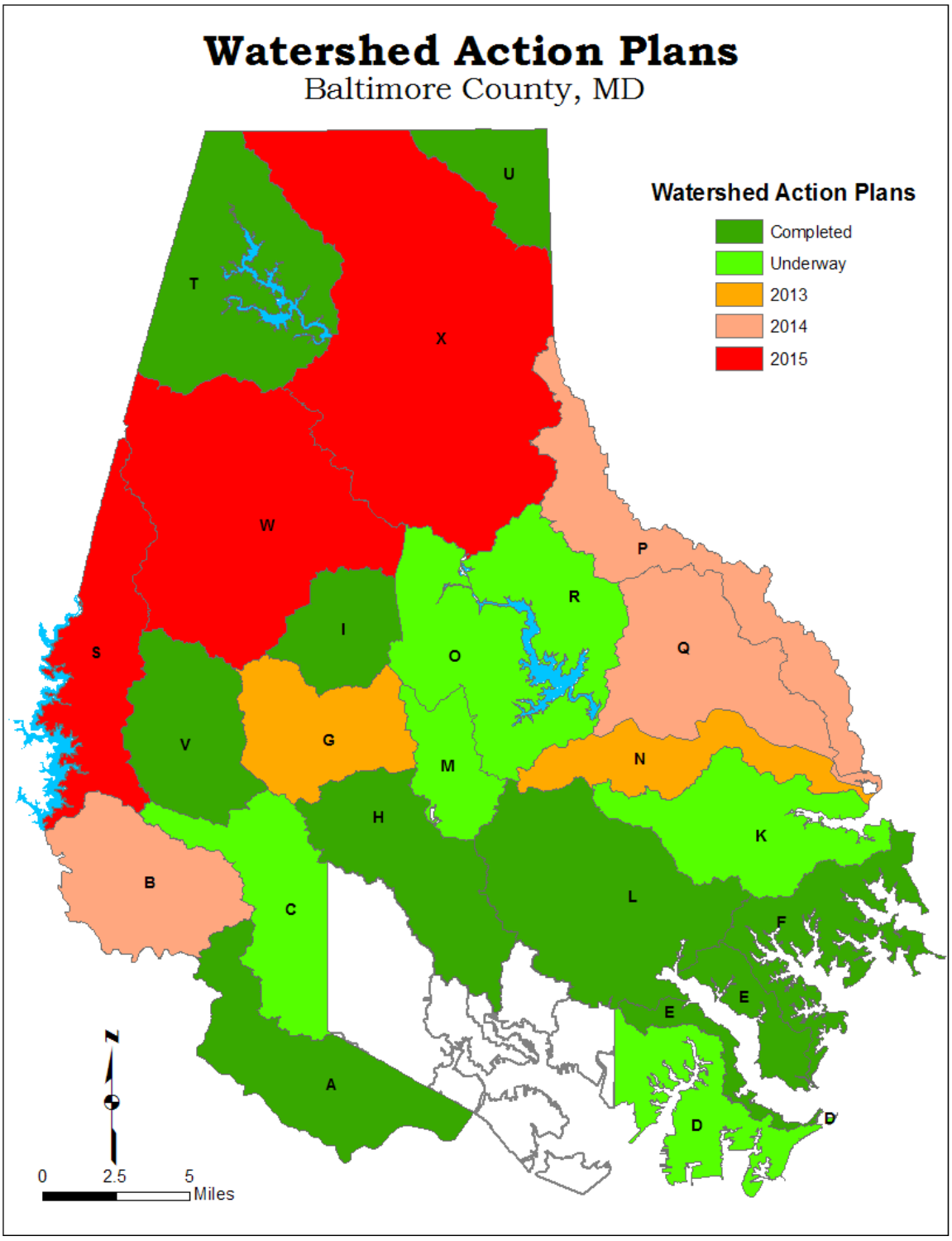

Figure 5-1 Baltimore County SWAPs as of January 2012.

Table 5-2 SWAP Schedule

Watershed	SWAP Area	Acres	Completed By:	Anticipated Completion
Patapsco	A	17,569	Consultant	Complete
Patapsco	B	15,761	Consultant	2014
Gwynns Falls	C	14,884	Consultant	In – Progress 2013
Balt Harbor	D	11,484	Consultant	In – Progress 2012
Back River	E	7,858	Consultant	Complete
Gunpowder/Middle R.	F	6,520	Consultant	Complete
Jones Falls	G	13,187	Consultant	2013
Jones Falls	H	5,777	EPS/Consultant	Complete
Loch Raven	I	8,350	Consultant	Complete
Bird River	K	22,528	Consultant	In – Progress 2013
Back River	L	15,385	EPS	Complete
Jones Falls	M	6,957	EPS	Complete
Lower Gunpowder	N	10,553	Consultant	2013
Loch Raven	O	17,523	EPS	In – Progress 2012
Little Gunpowder	P	17,217	Consultant	2014
Lower Gunpowder	Q	18,931	Consultant	2013
Loch Raven	R	11,466	Consultant	In – Progress 2013
Liberty Reservoir	S	16,449	Consultant	2015
Prettyboy Reservoir	T	24,027	EPS	Complete
Deer Creek	U	7,132	Harford County	Complete
Gwynns Falls	V	13,618	Consultant	Complete
Loch Raven	W	38,515	Consultant	2015
Loch Raven	X	61,436	Consultant	2015

5.3 Reservoir Agreement 2005 and Action Strategy

5.3.1 Reservoir Agreement 2005

The Loch Raven, Prettyboy and Liberty Reservoirs together provide high-quality drinking water for approximately 1.8 million people in Baltimore City and the five surrounding counties. In addition, more than half the homes and several communities in the 467-square-mile reservoir watershed area depend on wells that draw from the watersheds' groundwater. The majority of the reservoir watershed area (290 square miles) is in Baltimore County. Another 165 square miles are in Carroll County. Very small portions are in Harford County and southern Pennsylvania. Only six percent of the watershed is owned by Baltimore City, which owns the three reservoirs and operates the central regional water system.

The 2005 Reservoir Agreement has the fundamental goal of ensuring that the three reservoirs and their respective watersheds will continue to serve as sources of high-quality raw water for the Baltimore metropolitan water-supply system. Other goals address future loadings to the reservoirs of phosphorus, sediment, bacteria, sodium and chlorides; reducing the risk of contamination by hazardous materials; and promoting beneficial patterns of land use in the three watersheds.

5.3.2 Reservoir Action Strategy

The Action Strategy is a set of implementation actions (policies, studies, and new efforts) by the participating organizations that support the goals of the Reservoir Agreement. Included are policies or actions in the following areas: water quality monitoring and analysis; point source management (i.e. wastewater and industrial discharges); nonpoint source management (i.e., agricultural practices; stormwater and sewerage systems; septic systems); planning, zoning & development; resource protection and restoration; management of city-owned watersheds; toxics, spills, pathogens, and disinfectant by-products; reservoir watershed program coordination; and public awareness. The committee released a progress report on the implementation of the Action Strategy commitments since 2005 in October 2009. For additional information see the Baltimore Metropolitan Council web pages:

- Reservoir Watershed Management Agreement of 2005: http://www.baltometro.org/RWP/ReservoirAgreement2005.pdf
- 2005 Action Strategy: http://www.baltometro.org/RWP/RWPActionStrategy2005.pdf
- Progress Report: http://www.baltometro.org/RWP/RWPProgressReport2006-2007.pdf

5.4 Baltimore Watershed Agreement

In 2002, leaders from Baltimore County and Baltimore City signed the first Baltimore Watershed Agreement. Since then the two jurisdictions have shared stream-monitoring information, worked together on restoration projects, collaborated on issues regarding environmental regulations, and provided support to local watershed organizations. Several State of Our Watersheds reports have been prepared for the citizens of the region, and shared in several conferences.

The Agreement was updated and renewed in 2006. The updated agreement delved into more specific issues that affect the shared water resources of the two entities and provided a road map for joint initiatives. It created a “Committee of Principals” composed of agency heads and citizen leaders, and set timetables for the development of joint goals and action strategies. It identified five specific topic areas which include: stormwater; greening; redevelopment and development; public health; and trash. It established a process whereby the City and County bureaucracies and the citizen leaders could hold themselves accountable for addressing water quality management issues effectively.

The formulation of goals and a Phase I Action Plan was completed in 2007. The plan focuses on addressing water quality issues within the four watersheds shared by Baltimore County and Baltimore City. The Plan is organized by common categories: Implementation; Policy & Regulation; Planning & Collaboration; Education; and Outreach & Awareness, which cross with the five topic areas. Two important areas of concern, sustainable communities and environmental justice, are woven into the Plan

actions. A Progress Report on the actions was presented at the 2010 conference and describes the primary actions with their changes since the previous year.

5.5 *Master Plan 2020*

The Baltimore County Charter requires a master plan be updated at least every ten years. This plan outlines comprehensive objectives, policies, and actions, guiding the county's future development. The recently adopted *Master Plan 2020*, written on a framework of sustainability, carries forward the successes of past master plans. It also strives to help protect and restore our natural resources and improve water quality through many innovative policies and actions influenced primarily by the plan's Water Resources Element (WRE).

Baltimore County's *Master Plan 2020* continues a strong growth management framework that includes the long-established urban/rural demarcation line (URDL). The URDL divides the County into urban and rural land management areas. This division allows infrastructure investments and most land development to be focused in the urban area (closest to Baltimore City), while natural and agricultural resources in the rural area are preserved. Drinking water and wastewater disposal within the URDL are provided almost entirely through the Baltimore Metropolitan Water Supply and public wastewater treatment systems. Moreover, this urban area coincides with the state's designation as a "priority funding area" (PFA). Development in the PFA is encouraged and facilitated through infrastructure improvements and state funding.

Outside the PFA, all rural development is served by more restrictive private well supply and onsite sewage disposal systems. These systems lead to less dense development due to the larger land areas required for installation and maintenance. Furthermore, Resource Conservation (RC) zones adopted by the county help to restrict the number, configuration, size and location of new building lots to preserve agriculture and protect natural resources, while permitting limited growth. As a result of these land management policies, almost ninety percent of the county's population resides in about one third of the total land area.

Master Plan 2020 includes the county's Water Resources Element (WRE). This analysis demonstrates there is, and will be safe, adequate supplies of drinking water, and sufficient facilities for wastewater disposal for existing and projected populations. It also provides for protection of high quality natural resources, and a reduction and cap of pollutant loadings from point and non-point sources. The WRE will help to achieve improvements to water quality by directing policies and actions in *Master Plan 2020* to be implemented over the next decade and beyond.

The WRE examined existing conditions of land uses and determined current pollutant loadings. Based on projected population figures, six land use scenarios were evaluated. The pattern of land use that demonstrated the lowest pollution loadings was a combination of high density mixed use, including the revitalization of older neighborhoods with single-family homes and townhouses, and converting some existing development to open parkland. Policies and actions to enable implementation of this land use pattern are written throughout *Master Plan 2020*.

The results of the WRE analysis helped shift the focus of land development within the PFA. More than 50 sites were investigated for potential redevelopment as higher-density, mixed-use walkable communities. The term "Community Enhancement Areas" (CEAs) is used to label these locations, and several sites are preliminarily identified in the plan. However, there are other properties that may be considered as suitable for CEAs. Underutilized commercial properties and neighborhoods in need of revitalization will be targeted for redevelopment as CEAs, with possible transit-oriented developments (TODs) having the highest priority. These well-designed neighborhoods will be developed as sustainable communities, having a strong emphasis on water quality improvements.

A core group of the Master Plan Implementation Committee (MPIC) has been meeting to develop the foundation for future implementation efforts. The larger MPIC will include a broad spectrum of knowledgeable people from several county agencies who will apply their expertise towards attaining the policies and actions contained in *Master Plan 2020*. Investigations of land use ordinances and regulations that can accomplish the goals and visions will be initiated throughout the ten-year life of the plan. In compliance with state regulations, annual reports that summarize the achievements of *Master Plan* 2020 will be submitted to the Maryland Department of Planning.

CHAPTER 6

BALTIMORE COUNTY – IDENTIFICATION OF DATA DISCREPANCIES AND TECHNICAL ISSUES

6.1 Introduction

Maryland Department of the Environment (MDE) has requested that local jurisdictions provide a description of any technical discrepancies or issues discovered during the preparation of their Phase II Watershed Implementation Plans (WIPs). This chapter will provide a description of any data discrepancies or technical issues discovered during Baltimore County's analysis of the information supplied by the Maryland Assessment Scenario Tool (MAST) and/or information associated with the Chesapeake Bay Program Watershed Model (CBP-WM) 5.2.3 – July 2011 run. Solutions to the issues will also be provided, if such solutions are identified.

6.2 Data Discrepancies

Data discrepancies are those problems that arose based on the basic data provided by MAST. MAST reflects the data generated by the CBP-WM, therefore it is assumed that the errors found in MAST reflect errors in the CBP-WM.

6.2.1 Mapping Errors

The CBP-WM is based on the development of land/river segments that provide pollutant loads to downstream segments and ultimately to the Chesapeake Bay. These land/river segments represent natural drainage areas and local jurisdiction boundaries. This permits the assignment of nitrogen, phosphorus, and sediment loads to a local jurisdiction. Each land/river segment will have acreages of the various land uses, number of septic systems, the location and discharge characteristics of point sources, and the acreages of the various types of Best Management Practices (BMPs) installed up to a certain date.

The expectation is that the land/river segments will conform to the Maryland 8-digit watersheds either singly or in aggregate, with some land/river segments split to represent local jurisdictional boundaries. By overlaying the GIS land/river segments data layer (obtained from the Chesapeake Bay Program) with the GIS Maryland 8-digit watersheds data layer, it is possible to note any discrepancies. For the most part, the data layers align correctly, but a correction is needed between two land/river segments. Maidens Choice

Run, which is located in the Gwynns Falls watershed, has been included in the land/river segment WM3_4060_0001, locating it in the Lower North Branch Patapsco River watershed. The proper designation for this subshed is inclusion in the land/river segment WM1_3660-3910 (Figure 6-1).

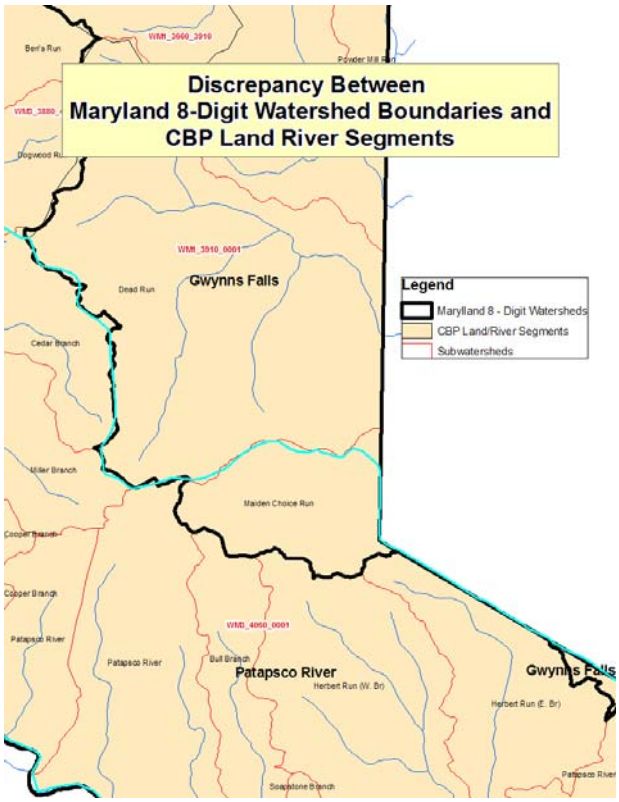

Figure 6-1: Discrepancy Between Maryland 8-digit Watersheds and the CBP Land/river Segments.

6.2.2 On-site Disposal System (OSDS)

The number of OSDS is severely overestimated by MAST and in the report on OSDS prepared for MDE (Tetra Tech, 2011). This discrepancy is detailed in Appendix A and will not be further elaborated here.

Solution: Conduct a parcel-by-parcel comparison between the MDE OSDS data as presented in the GIS data layer with the Baltimore County – Bay Restoration Fund data layer. Use the results to inform MDE and perhaps provide a mechanism of analysis of OSDS with other local jurisdiction data. Work with MDE and the CBP to incorporate a more accurate depiction of the number and distribution of OSDS in the 2017 run of the Watershed Model.

6.2.3 Best Management Practice (BMP) Progress

MAST provided estimates of the progress made in reducing pollutants through the installation of stormwater management facilities, forest conservation, urban riparian buffers, and restoration efforts. The progress estimate was made through only 2009 due to problems associated with the progress run for 2010.

For all types of BMPs MAST uses a percentage of urban impervious and urban pervious land served by the particular types of BMPs (eg. detention ponds, wet ponds, etc.) and the

associated pollutant reduction efficiency. There is no attempt to distinguish between which land/river segments or which agency installed the BMPs; they are expressed as a percentage countywide. These practices are reported to MDE on an annual basis with geographically oriented coordinates. These are in-turn aggregated by MDE and reported to the Chesapeake Bay Program for inclusion in the Watershed Model. Downloads from the Chesapeake Bay Program website shows the number of BMPs by land/river segment.

By distributing the practices countywide instead of by land/river segment MAST will underestimate the load reductions due to the differential delivery rates to the bay. Baltimore County has most of its development, particularly newer development with BMPs, in land/river segments with higher delivery ratios to the bay. The MAST acreages of BMPs are ~10,000 acres less than that reported by Baltimore County. Likewise the acreages that are in Forest Conservation or Forest Buffer easements/reservations are ~1,600 acres less than Baltimore County data. For Forest Conservation/Forest Buffers this is likely a conservative estimate of the discrepancy, as the county has not yet input all of the easements/reservations into GIS. This results in an underestimate in the progress made in reduction nitrogen, phosphorus, and sediment.

Solution: Continue to input and quality-assure our GIS data layers for stormwater BMPs and Forest Conservation/Forest Buffer easements/reservations. Work with MDE to redistribute the locations of stormwater BMPs and the easements/reservations within MAST to reflect their actual distribution. Work with the State Highway Administration to exchange the locations and drainage areas of stormwater management BMPs to correctly account for the acreage installed under the State and through Baltimore County regulatory authority.

6.2.4 Restoration Progress

The progress made in restoration is accounted for in MAST by a single practice called "MS4 Permit-Required Stormwater Retrofit". This practice has a nitrogen reduction efficiency of 25% and a phosphorus reduction efficiency of 35%. This single practice does not account for all the types of restoration and pollutant reduction operations that Baltimore County conducts. As with the stormwater BMPs, the crediting is spread evenly to urban land throughout the county. The actual practice should be credited within MAST along with the actual location, so that the delivered loads to the Chesapeake Bay can be more accurately estimated.

Solution: The restoration information by practice type and location, along with estimated load reductions are reported to MDE on an annual basis. Revise the annual NPDES – MS4 Report to reflect the anticipated permit requirements in the soon to be re-issued permit. Within the report and the associated GIS data layers and databases, more clearly report not only the 8-digit watershed, but also the Chesapeake Bay Program Watershed Model land/river segment in which the restoration project or operational program was installed.

6.3 Technical Issues

Technical issues differ from data discrepancies in that they must be resolved on a Statewide or Chesapeake Bay wide basis. These issues included:

- Pollutant loadings from high-density urban land use versus low-density urban land use.
- Watershed Model calibration,
- Pollutant load reduction credits for certain restoration practices, and
- MAST calculations.

6.3.1 Pollutant Loadings for Low Density Urban Versus High Density Urban Land Uses

Currently the CBP-WM uses six basic urban land use types:

- Urban high density pervious,
- Urban high density impervious,
- Urban low density pervious,
- Urban low density impervious,
- Extractive, and
- Construction.

This is an improvement of Watershed Model 4.3 which used four categories by lumping high and low density pervious, and high and low density impervious. Yet the value of breaking out the difference between high and low density urban is lost since the per acre loading rates differ by only a small amount between low and high density urban.

Low density urban, particularly lot sizes 2 acres or greater, differ greatly from the higher density urban. The soils in high-density urban situations are often compacted resulting in high runoff volumes, and the impervious cover is more often directly connected to storm drainage systems, also resulting in higher volumes of runoff. Low-density urban conversely exhibits lower compaction of soils, due to a number of reasons, including less compaction during construction (construction equipment is often limited impacts immediately surrounding the house and drive), and less compaction over time from human use (the use is spread over a wider area). In addition, large residential lots have characteristics that Environmental Site Design (ESD) is trying to achieve (dispersed flow, sheet flow to buffers, rooftop disconnects, sheet flow from driveways, etc.). Large lots often have a large percentage of the turf area not under active management, with little or no fertilizer applied and limited seasonal mowing. The larger the lot the more likely all of these factors will apply. The reduced and attenuated runoff will more mimic natural runoff conditions and result in less stream erosion, one of the primary sources of nutrient and sediment pollutants in high-density urban settings. Based on all of these factors, the per acre pollutant loadings for low-density urban should be lower than high-density urban.

Solution: Continue to work with MDE, the CBP Urban Stormwater Workgroup, and the CBP Modeling Workgroup to derive scientifically based pollutant loadings for low-density urban impervious and pervious land uses. Derive urban loading rates prior to the 2017 re-run of the CBP-WM.

6.3.2 Watershed Model Calibration

The CBP-WM calibration run was based on 2005 input data, using hydrologic and water quality monitoring data from sites throughout the bay watershed to provide the calibration. The number of calibration sites throughout the bay is greater than has been

used in the past and thus provides a better calibration, but the number is still low given the extent of the watershed. In Baltimore County, there is only one long-term calibration station with limited water quality data. A second station with a shorter record has also been identified, but has limited data. The station with the long-term record is located on the Gunpowder River between Prettyboy Reservoir and Loch Raven Reservoir. Because this long-term site is on a regulated river (one that has controlled releases from an up-stream dam), its ability to serve as a calibration site is limited both from a hydrologic perspective and from a water quality perspective. The short-term site is located on Gwynns Falls and drains an urban watershed that is unregulated. This is an ideal site for assessing urban stormwater and baseflow nutrient and sediment contributions, but is lacking a sufficient length of record, at this time.

The second issue with the use of the calibration is to infer that the pollutant load numbers that are derived from the model are exact. As with all models, the calibration is not perfect. This should be acknowledged and a range of pollutant loads based on the uncertainty of the calibration should be provided. As the pollutant loads are currently interpreted, the loads are assumed to be absolutely correct, and therefore any BMPs installed prior to the calibration year that are not currently counted can not be counted in the future since they are included in the calibration. In fact the additional nutrient and sediment reduction from these BMPs may be well within the level of accuracy of the model.

While it was claimed that additional BMPs prior to the 2005 calibration year could not be counted, when the CBP-WM was re-run in July 2011 additional pounds of nitrogen and phosphorus were generated using the same calibration year. Given the magnitude of the increase in the loads, not all could be accounted for by actual load changes that resulted from new urban development. However, this load increase could also be well within the level of accuracy of the model.

One other aspect not accounted for in the calibration and the issues regarding crediting prior BMPs or new loads in the recent model run, is the time lag between BMP implementation and the effect of that implementation. Some BMP implementation, such as, WWTP upgrades have relatively quick effects (less than one year for full efficiency); while others, such as, riparian buffer reforestation, are increasingly effective over time. This increase in efficiency can be due to changes in the BMP over time; trees grow and increase nutrient uptake, while at the same time increased organic matter under the planted riparian trees result in increased denitrification; or could be the result of the residence time of groundwater, that in some physiographic provinces can be on the order of a decade or more.

Solution: Work with MDE and the CBP to encourage a broader explanation of the calibration and develop a range of pollutant loads based on sensitivity analysis. This should provide a better acceptance of the model results and provide a more realistic depiction of what the CBP-WM output means.

6.3.3 Restoration Practice Pollutant Load Reduction

A number of pollutant load reductions credits for certain practices need to be reviewed and revised, and certain practices currently not credited need to be reviewed to develop the proper credits.

Stream Restoration. The credits for stream restoration are currently based on a single study in Baltimore County (Spring Branch), additional data collection in Spring Branch and a subsequent analysis indicates a higher load reduction. There is currently an expert panel from the Urban Stormwater Workgroup reviewing stream restoration pollutant load reduction credits with a report out in mid-2012.

Shoreline Erosion Control. Shoreline enhancement (erosion control) projects are currently only credited as an agricultural practice by the Chesapeake Bay Program, although MAST now provides a credit. The credit provided in MAST is the same as stream restoration, which is considerably less than the credit given for doing the same project in an agricultural setting. The credit for urban shoreline enhancement projects needs to be upgraded to the credit given for agricultural shoreline enhancement projects, at least on an interim basis until an expert panel can determine if there are differences between the two.

Maryland Fertilizer Use Reduction Act of 2011. The Maryland Fertilizer Use Reduction Act of 2011 currently has an interim pollution reduction credit of 15% for phosphorus and 1% for nitrogen. The Maryland Nutrient Management (1998) regulations are given a credit of 22% for phosphorus reduction and 17% for nitrogen reduction. The Maryland Fertilizer Act of 2011 bans phosphorus from fertilizer for turf management and requires at least 30% slow release nitrogen in the formulation, and requires extensive labeling regarding the Maryland Extension Service recommendations for fertilizer application. The Maryland Nutrient Management regulations require that all managers of 10 or more acres of turf follow the fertilizer application recommendations of the Maryland Extension Service and conduct soil phosphorus tests to determine how much phosphorus to apply. Clearly the Maryland Fertilizer Use Reduction Act of 2011 is more stringent than the Maryland Nutrient Management regulations, yet less pollutant load reduction credit is given for the Maryland Fertilizer Use Reduction Act of 2011. It is critical that scientifically supported reduction credits be developed for the Maryland Fertilizer Use Reduction Act of 2011. These regulations will be fully effective in October 2013 and can potentially account for a large reduction in nitrogen and phosphorus from urban stormwater. Currently an expert panel from the Chesapeake Bay Program Agriculture Workgroup is review efficiencies of fertilizer restrictions in place in various states in the Bay watershed. The results of the review are due out in the summer of 2012. This should provide scientifically supported reduction efficiencies for the Maryland Fertilizer Use Reduction Act of 2011.

Urban Tree Canopy. Urban tree canopy planting is currently credited as one acre of forest for every 100 trees planted. This restoration practice needs to be better evaluated based on its stormwater effect through interception, evapotranspiration, and nutrient uptake, as well as, filtering of the air in interception of dry fall. While the current credit methodology provides an acceptable interim crediting procedures, it needs to be better based on science.

Solution: Continue to work the MDE, the Urban Stormwater Workgroup, and expert panels to determine scientifically defensible pollution reduction credits for the above items. This should be completed prior to the end of the first two-year milestone period, as future number and type of restoration activities is dependant on having the correct pollution reduction credits.

6.3.4 MAST Calculations

MAST is still unable to provide calculations for street sweeping and storm drain cleaning programs when the input is in pounds of material removed. This needs to be corrected so that these operational programs can be properly credited.

APPENDIX A

BALTIMORE COUNTY PHASE II WATERSHED IMPLEMENTATION PLAN (WIP)

ON-SITE SEWAGE DISPOSAL SYSTEM ANALYSIS AND STRATEGY

A.1 Introduction

In order to devise at strategy to meet the allocated reductions for on-site sewage disposal systems (OSDS) an analysis of the location of the OSDS within Baltimore County and comparison with the Chesapeake Bay Watershed Model 5.3 (July 2011) was conducted. The landscape position of the OSDS affects the amount of nitrogen that is delivered to streams. The distance of streams from tidal waters and the presence of reservoirs, in turn, affect the delivery of nitrogen to the Bay. It is also necessary to analyze the current rate of progress being made in addressing nitrogen reductions from OSDS through three Best Management Practices recognized by the Chesapeake Bay Program; on-site sewage disposal connections to the sanitary sewer system, installation of de-nitrifying systems, and pump-outs of OSDS.

Based on the analysis, a strategy for addressing the OSDS reduction allocations is presented, along with an estimated need for a change in the pace of addressing OSDS nitrogen reductions.

A.2 Analysis

The analysis conducted for the OSDS sector of the Baltimore County Phase II WIP consisted of the following components:

- Analysis of the distribution of existing OSDS in relation to:
  - Watershed
  - Inside or outside the Urban – Rural Demarcation Line (URDL)
  - Landscape position
    - In the Chesapeake Bay Critical Area
    - Within a 1,000 feet of a perennial stream
    - Greater than 1,000 feet of a perennial stream
- Comparison of the distribution and nitrogen loading of OSDS between Baltimore County derived data and Maryland Assessment Scenario Tool (MAST)
- Comparison of the distribution of OSDS between Baltimore County derived data and the MDE commissioned report on Maryland OSDS.

- Analysis of current rate of progress
  - Denitrifying OSDS
  - OSDS connections to sanitary sewer
  - OSDS pump-outs
- Recommended scenario to meet the Baltimore County OSDS nitrogen reduction allocation.

A.2.1 Distribution of OSDS Based on Baltimore County Data

The distribution of OSDS was analyzed on the basis the following five location factors:

- 8-digit watershed,
- Inside or outside the Urban/Rural Demarcation Line (URDL)
- In the Chesapeake Bay Critical Area (CBCA)
- Within 1,000 feet of a perennial stream
- Greater than 1,000 feet of a perennial stream

The Bay Restoration Fund data layer was developed in order to assess property owners that are connected to the sewer system or that are served by a OSDS a fee to provide funding for upgrades to Waste Water Treatment Plants (WWTPs) to Enhanced Nutrient Removal (ENR), upgrades of OSDS to de-nitrifying systems, and the planting of cover crops. Each assessment is designated as being either connected to the sanitary sewer or served by OSDS. Based on the parcel address each connection or OSDS was geographically located with GIS. The Bay Restoration Fund database is maintained on the mainframe. The data is periodically downloaded and imported into the GIS. The database year used in this analysis is 2009. This corresponds to the 2009 Progress data used by the Chesapeake Bay Program in the latest run of the Watershed Model (5.3.2).

The rational for using the 8-digit watershed as a location feature is based on several considerations. First the 8-digit watershed is the level at which the State of Maryland lists impaired waters, and therefore has considerations in the development of Total Maximum Daily Load Implementation Plans. Second, each 8-digit watershed has a different delivery factor to the Bay. These delivered load factors will be used later in the analysis.

Location of the OSDS, inside or outside the URDL, determines whether sanitary sewer is available for potential sanitary sewer connection. Sanitary sewer extensions beyond the URDL are usually conducted as health projects. Those OSDS within the URDL can be considered for connecting to the sanitary sewer, while those OSDS outside the URDL can be considered for installation of de-nitrifying technologies. Those OSDS outside the URDL may also be considered for sewer extension, typically through health projects, as has been done in the past.

The other factors are related to the attenuation of the on-site sewage disposal nitrogen based on distance from water bodies. Those systems within the CBCA have the lowest attenuation of nitrogen from OSDS due to the presence of high water tables, and proximity to tidal waters. Those OSDS within 1,000 feet of perennial streams have an intermediate attenuation of nitrogen, while those systems greater than 1,000 feet from a perennial stream have the greatest amount of attenuation of nitrogen. The existing CBCA area was used to determine the number of OSDS present. For perennial streams,

the USGS 100km stream layer was used to be consistent with the Chesapeake Bay Program Watershed Model.

The Bay Restoration Fund data was derived from a 2009 download from the mainframe database where the information is stored. Table A-1 presents the results of the location analysis. This analysis indicates that there are 36,211 OSDS in Baltimore County. Of those systems, 29,031 (80.2%) are outside the URDL and 7,180 (19.8%) are inside the URDL. There are a total of 858 (2.4%) OSDS in the CBCA, there are 11,797 (32.6%) OSDS within 1,000 feet of a perennial stream, and 23,556 (65.1%) OSDS located greater than 1,000 feet of a perennial stream.

Table A-1: Distribution of Baltimore County OSDS Based Location Factors

Watershed	Outside URDL				Inside URDL				Total Watershed OSDS
	Critical Area	<1,000 feet of Stream	>1,000 feet of Stream	Total	Critical Area	<1,000 feet of Stream	>1,000 feet of Stream	Total	
Deer Creek	0	196	380	576	0	0	0	0	576
Prettyboy	0	449	1,196	1,645	0	0	0	0	1,645
Loch Raven	0	4,355	8,991	13,346	0	465	1,020	1,485	14,831
Lower Gunpowder	4	1,126	1,824	2,954	0	111	588	699	3,653
Little Gunpowder	4	926	1,757	2,687	0	0	0	0	2,687
Bird River	131	34	61	226	8	264	439	711	937
Gunpowder River	77	0	1	78	31	46	28	105	183
Middle River	63	0	0	63	115	2	55	172	235
Total UWS	**279**	**7,086**	**14,210**	**21,575**	**154**	**888**	**2,130**	**3,172**	**24,747**
Liberty	0	1,426	487	1,913	0	52	67	119	2,032
Patapsco	0	1,449	733	2,182	2	223	370	595	2,777
Gwynns Falls	0	285	225	510	0	483	839	1,322	1,832
Jones Falls	0	1,803	1,031	2,834	0	487	787	1,274	4,108
Back River	12	0	0	12	194	100	166	460	472
Baltimore Harbor	5	0	0	5	212	2	24	238	243
P/B Total	**17**	**2,476**	**4,963**	**7,456**	**408**	**1,347**	**2,253**	**4,008**	**11,464**
Total OSDS	***296***	***9,562***	***19,173***	***29,031***	***562***	***2,235***	***4,383***	***7,180***	***36,211***

A.2.2 Comparison of Baltimore County Data and CBP Watershed Model Data – July 2011 Model Run

The Chesapeake Bay Program Watershed Model was re-run in July 2011. The model was re-run to account for an under-estimation of urban acres, particularly in rural areas, changes in accounting for the effect of agriculture nutrient management plans and changing the OSDS loads calculation methodology. The model provides the number of OSDS by land/river segment divided into the three categories listed above.

The document *Estimates of County-Level Nitrogen and Phosphorus Data for Use in Modeling Pollutant Reduction* (EPA, December 2010) states:

"To calculate the amount of nitrogen generated from OSDSs, we used the number of people on septic systems in Chesapeake Bay Watershed. This question was asked on the 1990 Census, but was removed in subsequent censuses. To estimate this number, we calculate the ratio of the number of people in a county on on-site sewage disposal to the

total number of people in the county in 1990. That ratio is multiplied by the total population in the total population in the county, interpolated from the U.S Census.

The calculation is on a county scale each year:

> (No. of people on on-site sewage disposal in 1990/ no. of people in 1990) * total population of the year being calculated"

The recent run of the Watershed Model (version 5.3.2, July 2011) used 2.6 people per system (Paul Emmart, MDE, personal communication) and the following attenuation rates:

- Chesapeake Bay Critical Area: 80% delivery, 20% attenuation,
- <1,000 feet from a perennial stream: 50% delivery, 50% attenuation, and
- >1,000 feet from a perennial stream: 30% delivery, 70% attenuation.

Using the Maryland Assessment Scenario Tool (MAST) the number OSDS in each of the three attenuation categories and the edge-of-stream pounds of nitrogen for each system was derived with the following results:

- Chesapeake Bay Critical Area: 16.45 pounds nitrogen per system/year
- <1,000 feet from a perennial stream: 10.28 pounds nitrogen per system/year
- >1,000 feet from a perennial stream: 6.17 pounds nitrogen per system/year

MAST also provides the OSDS data by land/river segment. The number of systems by 8-digit watershed was determined using the correspondence between the 8-digit watershed and the land/segment (see Figure A-1). For the most part there is a direct correspondence between the land/river segments and the 8-digit watersheds. The results of this analysis are displayed in Table A-2. For comparison, the Baltimore County derived number of OSDS is displayed by watershed and landscape position in Table A-3, and the differences between MAST data and Baltimore County data in Table A-4. It is not possible using the MAST data to determine the position of the OSDS relative to the URDL. The assumption is that all OSDS in MAST and the Chesapeake Bay Program Watershed Model are outside URDL.

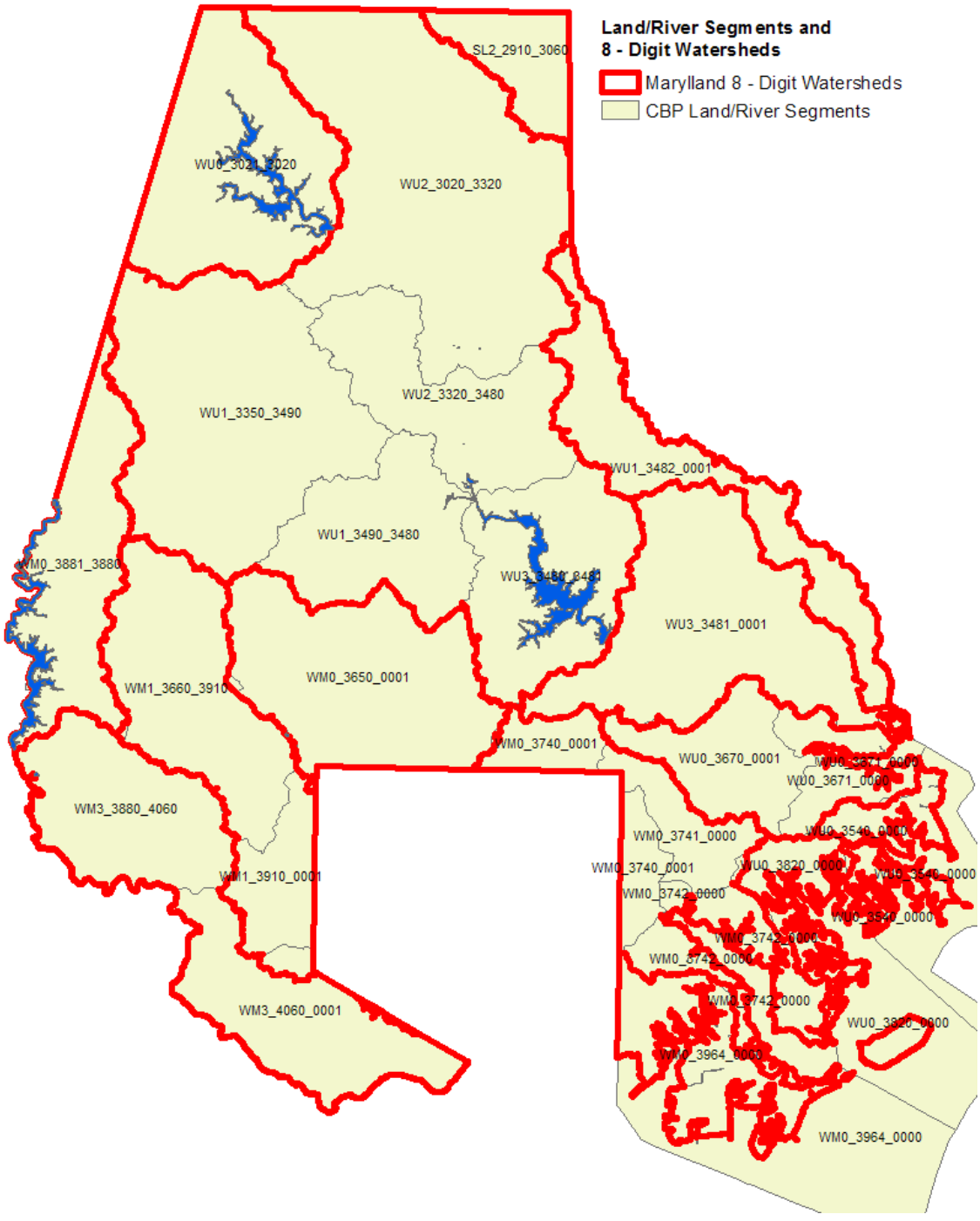

Figure A-1: Chesapeake Bay Watershed Model Land/River Segments in Relation to Maryland 8-Digit Watersheds

Table A-2: MAST- Number of OSDS by Watershed and Landscape Position

Watershed	MAST Data			
	Critical Area	<1,000 feet of Stream	>1,000 feet of Stream	Total
Deer Creek	0	147	316	463
Prettyboy	0	391	1,179	1,570
Loch Raven	0	4,963	10,126	15,089
Lower Gunpowder	26	1,686	4,033	5,745
Little Gunpowder	4	825	1,601	2,430
Bird River	352	759	1,631	2,742
Gunpowder River	556	19	288	863
Middle River	859	2	57	918
Total UWS	**1,797**	**8,792**	**19,231**	**29,820**
Liberty	0	506	1,400	1,906
Patapsco	1	1,350	2,052	3,403
Gwynns Falls	0	3,217	2,870	6,087
Jones Falls	0	1,459	2,929	4,388
Back River	406	6	29	441
Baltimore Harbor	1	0	0	1
P/B Total	**408**	**6,538**	**9,280**	**16,226**
Total OSDSs	***2,205***	***15,330***	***28,511***	***46,046***

Table A-3: Baltimore County - Number of OSDS by Watershed and Landscape Position

Watershed	Baltimore County Data			
	Critical Area	<1,000 feet of Stream	>1,000 feet of Stream	Total
Deer Creek	0	196	380	576
Prettyboy	0	449	1,196	1,645
Loch Raven	0	4,820	10,011	14,831
Lower Gunpowder	4	1,237	2,412	3,653
Little Gunpowder	4	926	1,757	2,687
Bird River	139	298	500	937
Gunpowder River	108	46	29	183
Middle River	178	2	55	235
Total UWS	**433**	**7,974**	**16,340**	**24,747**
Liberty	0	539	1,493	2,032
Patapsco	2	956	1,819	2,777
Gwynns Falls	0	708	1,124	1,832
Jones Falls	0	1,518	2,590	4,108
Back River	206	100	166	472
Baltimore Harbor	217	2	24	243
P/B Total	**425**	**3,823**	**7,216**	**11,464**
Total OSDS	***858***	***11,797***	***23,556***	***36,211***

Table A-4: Difference between MAST Data and Baltimore County Date – Number of OSDS by Watershed and Landscape Position

Watershed	Difference Between Baltimore County Data and MAST Data			
	Critical Area	<1,000 feet of Stream	>1,000 feet of Stream	Total
Deer Creek	0	-49	-64	-113
Prettyboy	0	-58	-17	-75
Loch Raven	0	143	115	258
Lower Gunpowder	22	449	1,621	2,092
Little Gunpowder	0	-101	-156	-257
Bird River	213	461	1,131	1,805
Gunpowder River	448	-27	259	680
Middle River	681	0	2	683
Total UWS	**1,364**	**818**	**2,891**	**5,073**
Liberty	0	.33	.93	-126
Patapsco	-1	394	233	626
Gwynns Falls	0	2,509	1,746	4,255
Jones Falls	0	.59	339	280
Back River	200	-94	-137	-31
Baltimore Harbor	-216	-2	-24	-242
P/B Total	**-17**	**2,715**	**2,064**	**4,762**
***Total** OSDS*	***1,347***	***3,533***	***4,955***	***9,835***

As can be seen from Table A-4, the MAST data indicates that there are 9,835 more OSDS in Baltimore County than would be indicated by Baltimore County data. It is particularly noticeable that the MAST data has ~2.5 times the number of OSDS in the Chesapeake Bay Critical Area and than the Baltimore County data. Three watersheds (Gwynns Falls, Lower Gunpowder Falls, and Bird River) account for 83% of the over-estimate of OSDS by MAST compared to Baltimore County data. These three watersheds contain the two designated growth areas (Owings Mills and White Marsh/Perryhall) of the County. The rest of the watersheds have minor variations in the number of OSDS identified by the two methodologies, although Gunpowder River and Middle River have a significant over-estimate of OSDS in the CBCA.

There are two potential causes of this mismatch in the data. First, there are areas served by sanitary sewer systems that are not accounted for in the MAST data set, and second that the methodology of estimating the number of people on OSDS provides a bias.

A.2.2.1 Sewer Extensions Beyond the URDL

Baltimore County has extended sanitary sewer outside the Urban/Rural Demarcation Line for human health reasons. The historic development of Baltimore County resulted in a number of small lots situated adjacent to the tidal shoreline. These residences were initially used as summer residences in the early to mid 1900's. Over time these seasonal residences were converted to year round residences. The small size of the lots precluded the installation of OSDS to meet modern day standards. With a number of the systems failing both to surface water and ground water, Baltimore County opted to extend sanitary sewer to these areas as a health project, in the late 1990's and early 2000's. The design of the sanitary sewer extension outside the URDL was such that it had the

capacity to address the existing OSDS, but had limited capacity for growth. This was done to limit the development within the Chesapeake Bay Critical Area and to address the concerns of the citizens living in the area.

The Baltimore County Bay Restoration Fund billing data layer was analyzed to determine the number of households outside the URDL that were assessed based on being connected to the sanitary sewer. A total of 1,690 households assessed as being connected to the sanitary sewer. There are three areas of concentration with 1,537 sanitary sewer hook-ups that correspond to the three health projects:

- Back River Neck – 655 OSDS hook-ups to sanitary sewer
- Bowleys Quarters – 519 OSDS hook-ups to sanitary sewer
- Bird River Area – 363 OSDS hook-ups to sanitary sewer.

These health project areas are displayed in Figures A-2 through A-4. The balance (153) of the sanitary sewer hook-ups are, for the most part, scattered around the periphery of the URDL.

The sewer extensions primarily affected four watersheds, Middle River, Gunpowder River, Bird River, and Back River, with a few in Lower Gunpowder Falls. Most of the OSDS that were connected to the sewer system were in the Chesapeake Bay Critical Area. Table A-5 summarizes the distribution of households that were connected to the sanitary sewer system. Table A-6 displays the expenditures for the sanitary sewer extensions to the tidal neck areas in Baltimore County and the number of connections of OSDS to sanitary sewer. This table does not include sanitary sewer connections in the Bird River area. Note that based on the expenditure and connection information additional sanitary sewer connections may be unaccounted for in the Bay Restoration Fund database. This would indicate that the Baltimore County data also over estimates the number of OSDS in the county.

Table A-5: Tidal Neck Health Projects – Distribution of Households Connected to Sanitary Sewer

Watershed	Back River Neck		Bowleys Quarters		Bird River Area		Total	
	CBCA	Other	CBCA	Other	CBCA	Other	CBCA	Other
Back River	187	0	0	0	0	0	187	0
Middle River	467	1	186	0	0	0	653	1
Gunpowder River	0	0	333	0	16	0	349	0
Bird River	0	0	0	0	200	129	200	129
Lower Gunpowder Falls	0	0	0	0	18	0	18	0
Total	**654**	**1**	**519**	**0**	**234**	**129**	**1407**	**130**

Table A-6: Baltimore County Expenditures on Sanitary Sewer Extensions for Health Projects

Bowleys Quarters Sewer Projects		
Project	**Construction Cost**	**Connections**
Middle River Neck Interceptor	1,323,179.00	8
Armstrong Glenwood Collection System	1,112,329.00	67
Clarks Point-Revolea Beach Collection System	3,726,686.00	94
Long Beach Collection System	1,739,725.00	220
Galloway Burke Collection System	1,468,859.00	119
Chestnut-Goose Harbor Collection System	2,112,682.00	135
Miami Beach Collection System	2,235,000.00	205
Nollmeyer Seneca Park Collection System	2,937,575.00	130
Bowleys Quarters Pumping Station	995,928.00	
Seneca Park Pumping Station	1,547,800.00	
Total:	$19,199,763.00	978
Back River Neck Sewer Projects		
Project	**Construction Cost**	**Connections**
Cedar Beach Collection System	1,653,144.00	189
Holly Neck Collection System	1,970,334.00	134
Riverside Collection System	2,626,800.00	146
Barrison-Rocky Point Collection System	2,153,325.00	104
Wildwood-Evergreen Collection System	1,893,785.00	112
Golupski Sewer Extension	644,741.00	30
Back River Neck Pumping Station & Force Main	815,228.00	
Cedar Beach Pumping Station & Force Main	1,531,519.00	
Holly Neck Pumping Station	381,616.00	
Rocky Point Pumping Station	558,120.00	
Total:	$14,228,612.00	715
Middle-Back River Neck Sewer Projects		
Project	**Construction Cost**	**Connections**
Middle Back River Neck Area Sewers	3,425,523.00	235
Middle Back River Neck Force Main	343,596.50	
Middle Back River Neck PS & Rosalie Avenue PS	1,345,710.00	
Total:	$5,114,829.50	235
Grand Total	***$38,543,204***	***1,938***

In the Fall of 2010, the Groundwater Management Section (GWM) of EPS initiated an evaluation of all properties that were served by OSDS in the CBCA. To do this, GWM obtained the BRF property designations from the database maintained by DPW (2009), Metro Finance and Petitions. BRF designations that identified properties as being served by as septic system, or as "unknown" were evaluated using GIS to determine:

1.) If the property was inside the CBCA;
2.) If there was an actual structure on the property;
3) What year the property was built on; and
4) If the property had access to public sewerage.

Status of Project:

As of March 1, 2011, the areas of Dundalk, Essex, Middle River, Back River Neck, Bowleys Quarters, and Chase have been completed. The findings are as follows:

- Total Number of Properties Identified: 975
- Total Number of Properties in CBCA: 756 (77% of total)

Based on available info, it is estimated that:

- Roughly 30% (300 properties) will be found to be already connected, 235 of which are located in the CBCA. Corrections made will allow appropriate billing of BRF fees and sewer service fees
- Roughly 20% (190 properties) are inside the CBCA with access to sewer but are still using septic systems. To get these connected may require legislation.
- Roughly 1% (10 properties) are outside the CBCA with access to sewer but still using septic systems. May need to wait until system fails, and then require connection.
- Roughly 3 % (35 properties) are on septic in the CBCA and scheduled to connect as part of a Health Project sewer extension in the next 1-2 years.
- Roughly 5% (50 properties) are on septic systems in the CBCA but do not have access to public sewer and would require DEPS to initiate a Sanitary Survey to extend sewer.
- Roughly 5% (50 properties) are on septic systems outside the CBCA but do not have access to public sewer and would require DEPS to initiate a Sanitary Survey to extend sewer.
- Roughly 18% (175 properties) are on septic systems within the CBCA but in areas where sewer extension would not be justified due to cost—these areas could be targeted for BRF septic system upgrades.

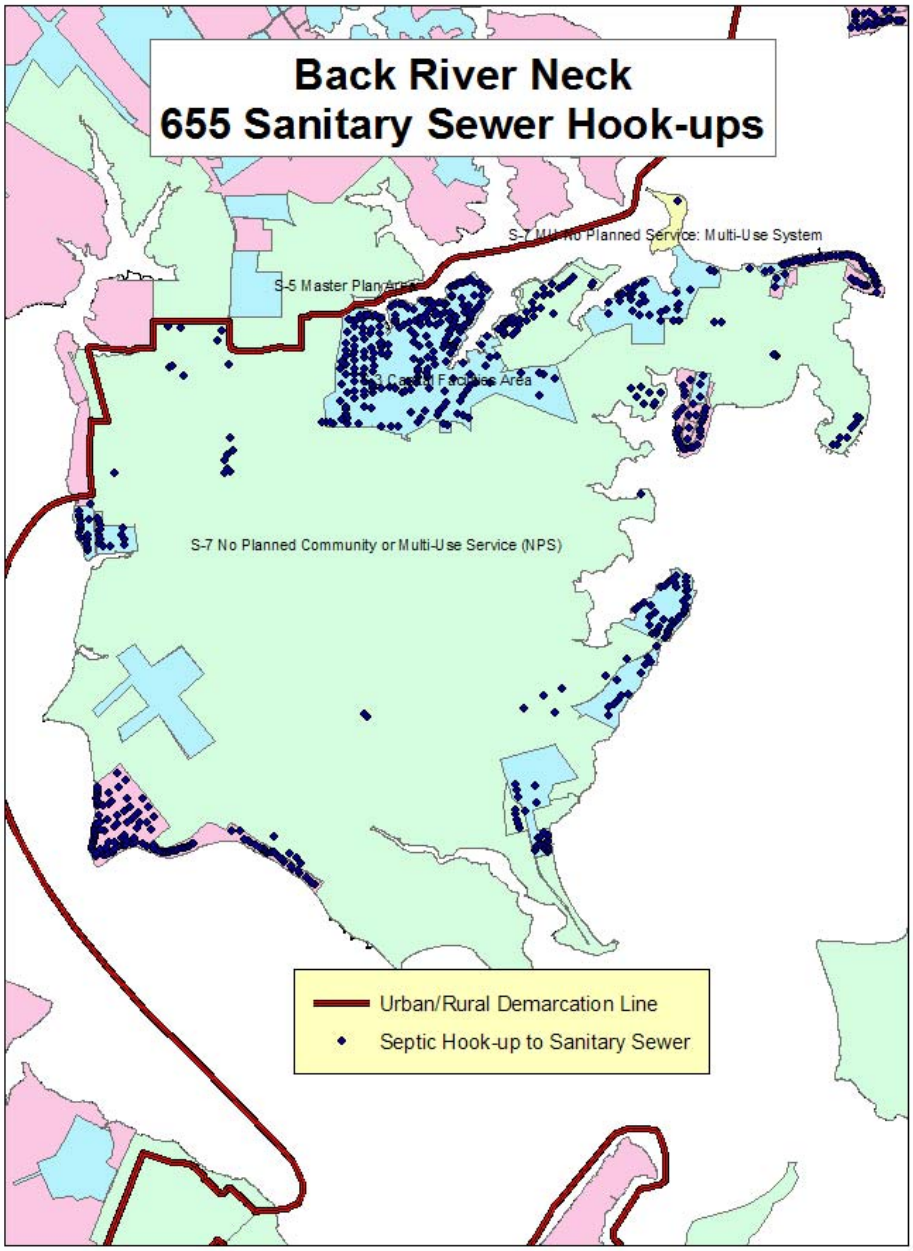

Figure A-2: Back River Neck Health Project – 655 Sanitary Sewer Connections

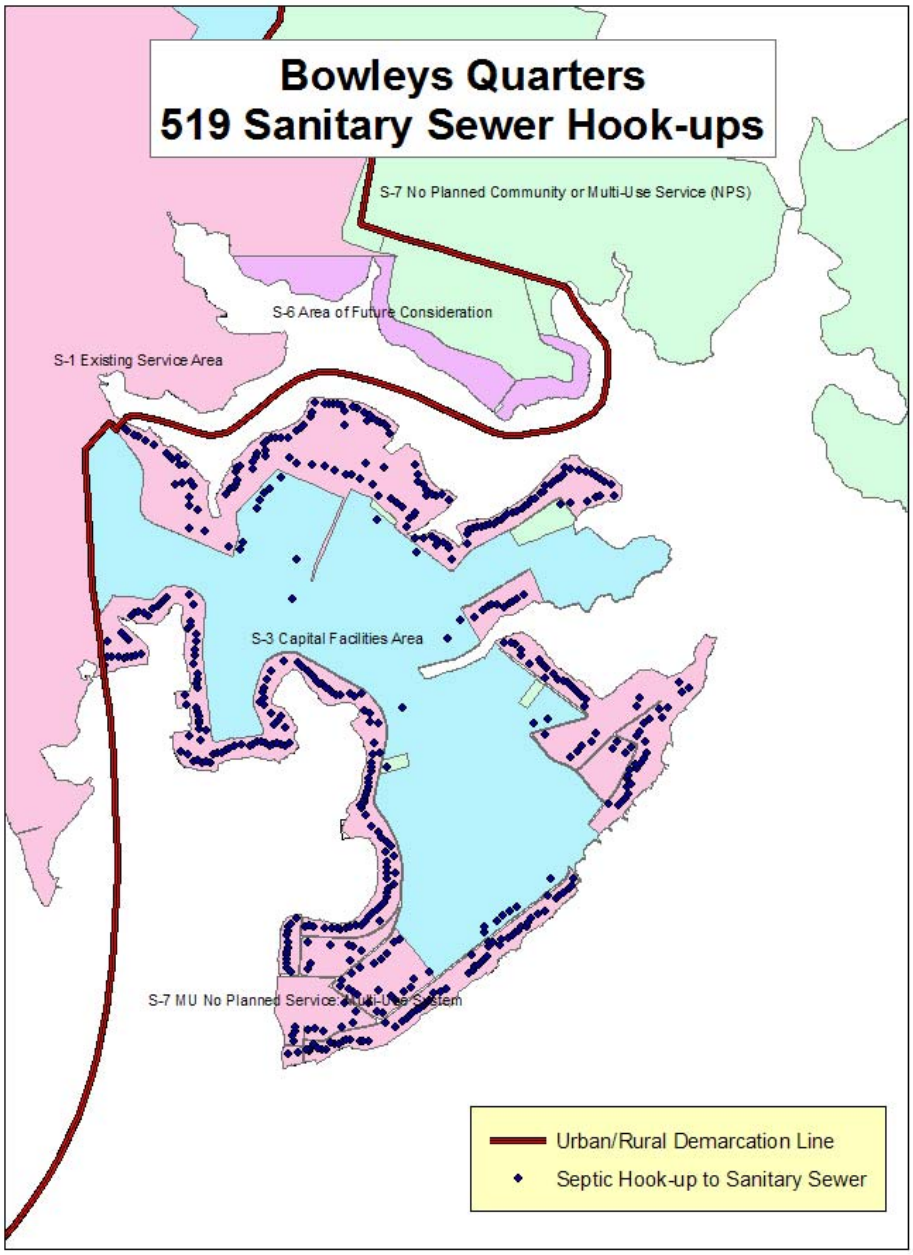

Figure A-3: Bowleys Quarters Health Project – 519 Sanitary Sewer Connections

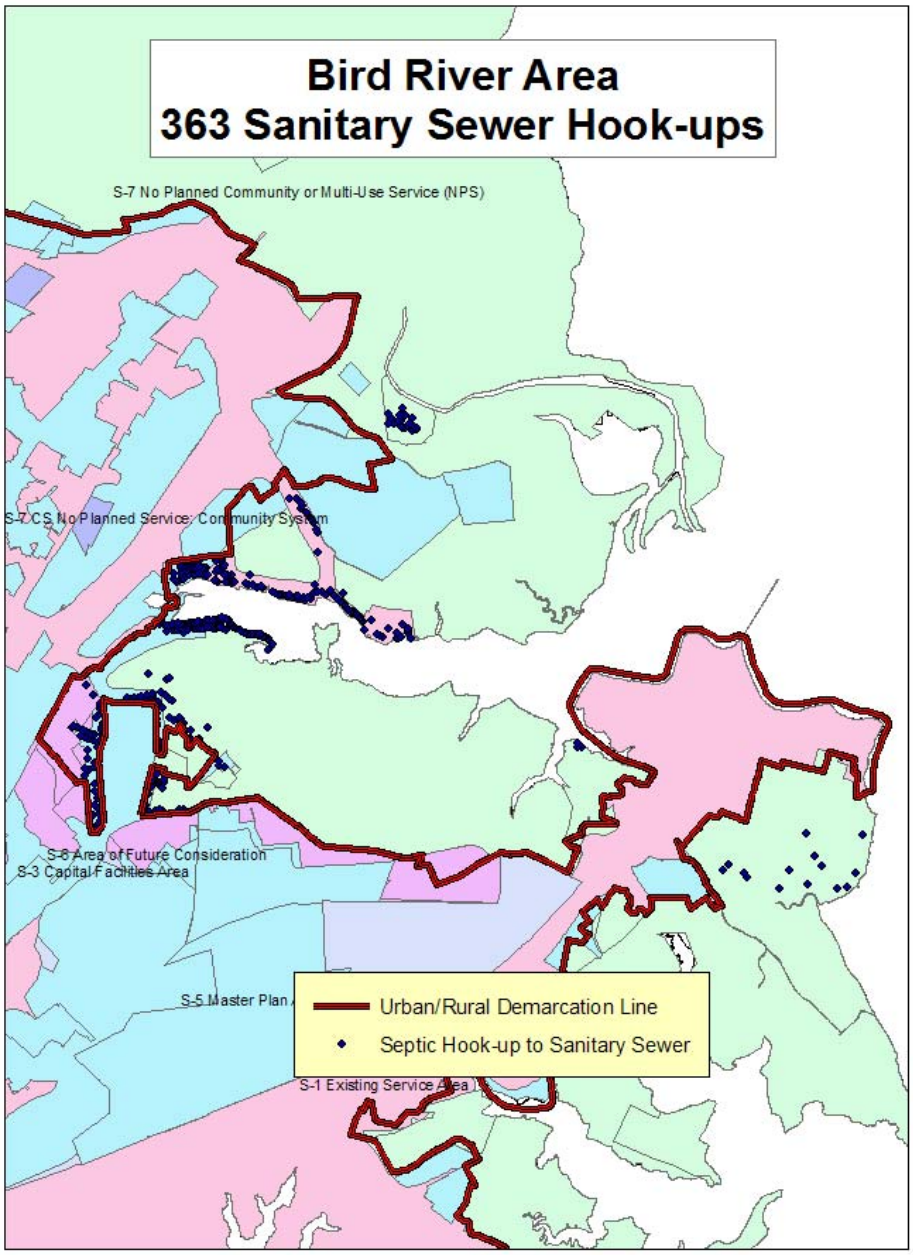

Figure A-4: Bird River Area Health Project – 363 Sanitary Sewer Connections

A.2.2.2 Designated Growth Areas

There are two designated growth areas in the County, Owings Mills and White Marsh/Perry Hall. Owings Mills is located in the Gwynns Falls watershed (Figure A-5), while White Marsh/Perry Hall is split between the Bird River and Lower Gunpowder Falls watersheds (Figure A-6). These designated growth areas were provided with infrastructure to accommodate the expected growth in each area. The infrastructure included new and upgrades sanitary sewer systems to handle the expected increase in sanitary sewer flows. As indicated in Table A-4, Gwynns Falls has an excess of 4,255 OSDS, while Bird River and Lower Gunpowder Falls have a combined excess of 3,897 OSDS when comparing the MAST data to Baltimore County data. This combined excess OSDS represents 83% of the differential between MAST estimated OSDS and Baltimore County estimated OSDS. There is clearly a relationship between the designated growth areas, and the over estimate of the number of OSDS by MAST. The use of the 1990 U.S. Census data, may have resulted in an over estimate of the proportion of the population on OSDS due to future population growth. While it was indicated that the estimate was conducted at the County level, the data from the land/river segments would indicate that the estimate was also conducted at that level and perhaps by census blocks.

Gwynns Falls: The Owings Mills was designated growth area in 1979, but the bulk of the development in the area occurred after 1990. Owings Mills is located primarily in the Gwynns Falls watershed with a small portion in the Liberty Reservoir watershed. Only 1,861 acres of Gwynns Falls is outside the URDL. The MAST data indicate that there are 6,087 OSDS in Gwynns Falls, all outside the URDL, while the Baltimore County data indicates 510 OSDS. MAST data would result in one OSDS for each 0.3 acres outside the URDL. The current minimum requirements for OSDS are 1-acre lot size. As can be seen from Figure A-5, the Baltimore County data shows a clear cluster of OSDS immediately adjacent to the upper western side of the Owings Mills designated growth area and outside the URDL. Soldiers Delight covers most the area immediately to the south of this cluster. Based on this analysis, it would appear that MAST has over estimated the number of OSDS by ~5,500. However, MAST does not take into account the OSDS that may be inside the URDL, so the differential of 4,255 is probably closer to the correct number for the over estimate.

White Marsh/Perry Hall: This growth area was also designated in 1979. The area is centered on the Bird River watershed, but extends to both the Lower Gunpowder Falls and Back River watersheds. Most of the growth occurred in the Bird River and Lower Gunpowder Falls watersheds, beginning in the 1980's. Only a small portion of the growth area is outside the URDL (Figure A-6), and no development has occurred there. As with the Owings Mills designated growth area, infrastructure

The combined total excess from MAST is 3,897 OSDS (2,092 Lower Gunpowder Falls and 1,805 Bird River). However, a portion of the excess is account for through the sanitary sewer health project extensions discussed above. Excluding the 347 OSDS sanitary sewer connections made through the health project a total of 3,550 excess OSDS can be attributed to miss-assignment to being served by OSDS when actually connected to the sanitary sewer system.

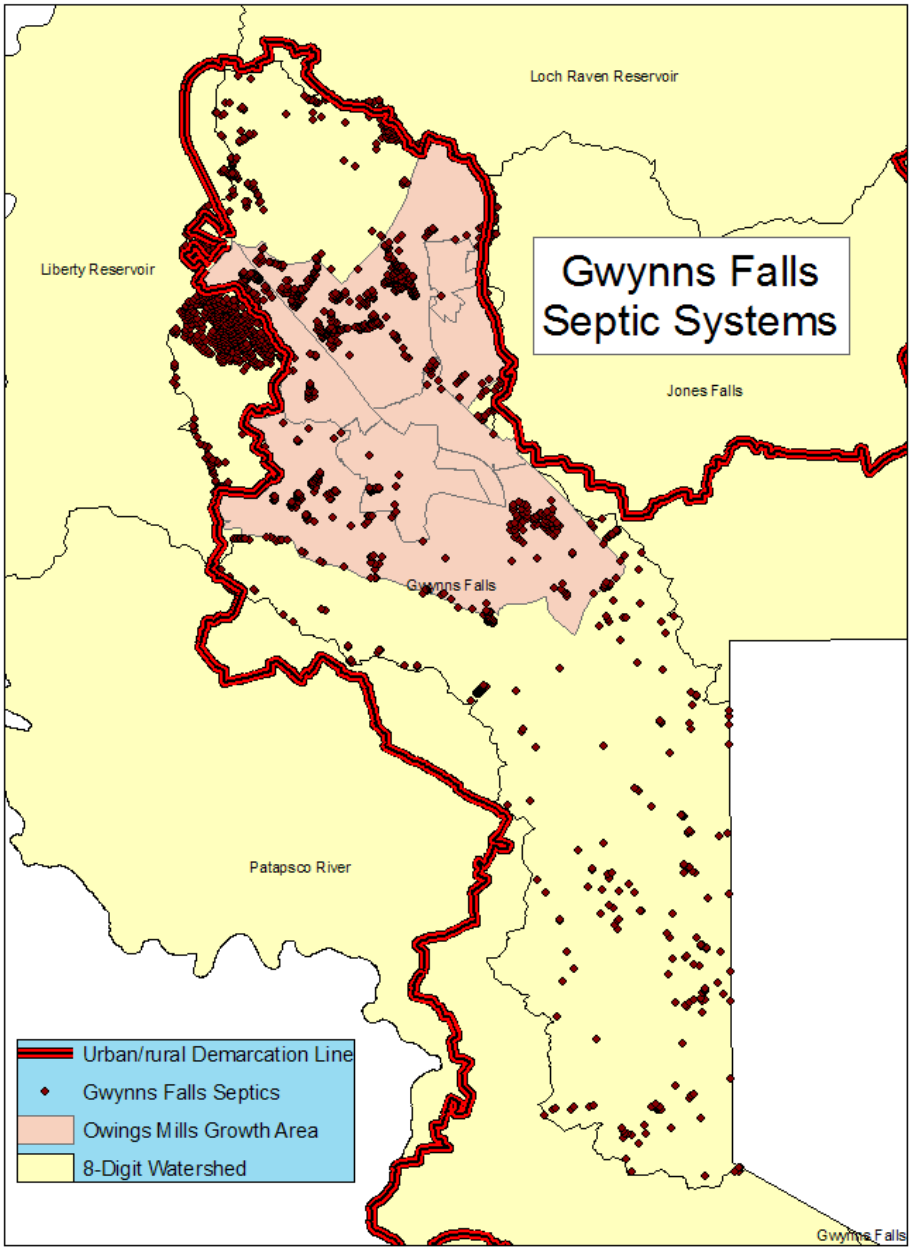

Figure A-5: Owings Mills Designated Growth Area in Gwynns Falls – OSDS Locations

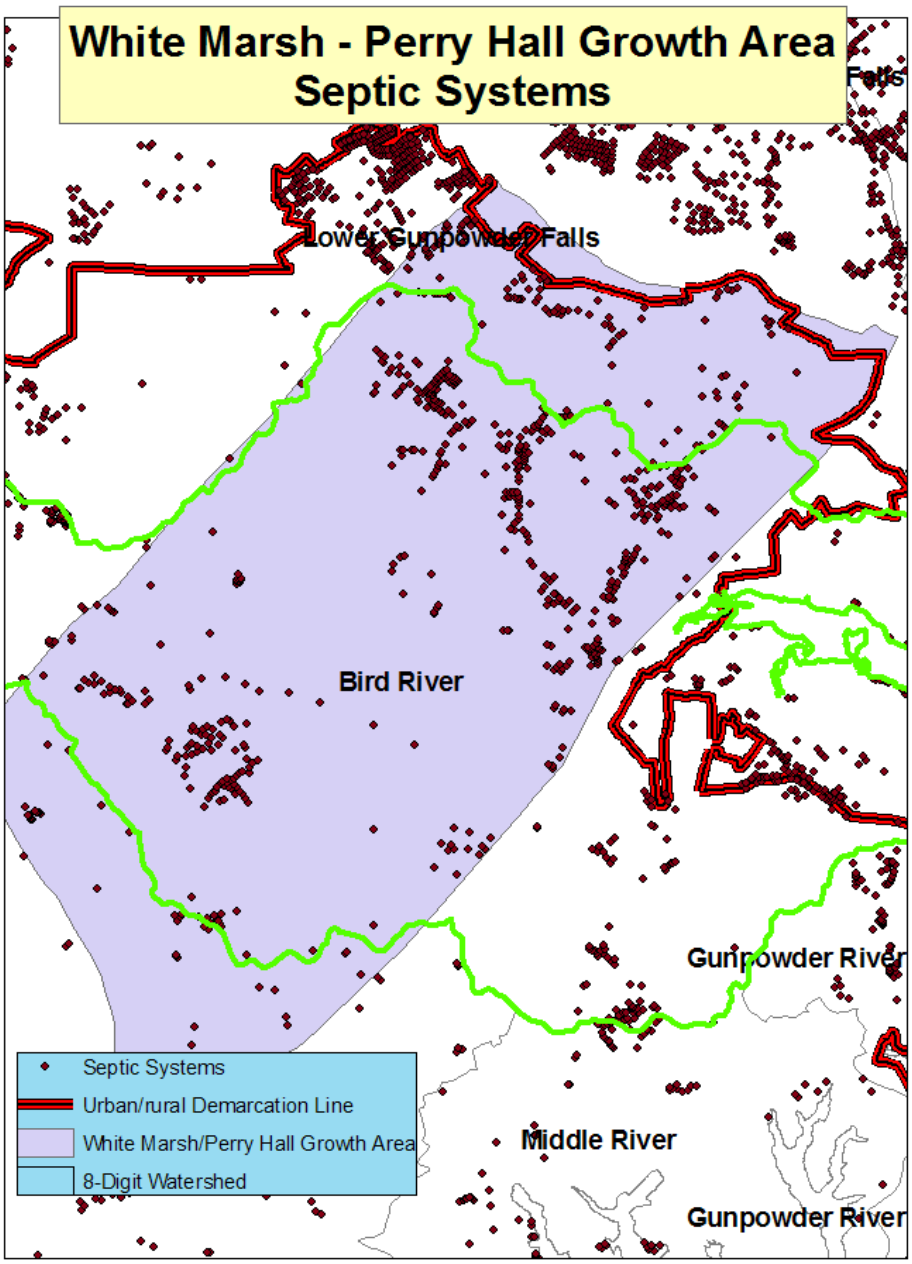

Figure A- 6: Perry Hall Designated Growth Area in Bird River and Lower Gunpowder Falls – OSDS Locations

A.2.2.3 Population Analysis and OSDS

The Baltimore County Water Resources Element analysis was conducted on the basis of population distribution between the rural and urban sectors of Baltimore County. The population outside the URDL was 78,458 in 2005 and was project to be 85,011 in 2020. Interpolating between these two numbers the rural population in 2010 would be projected to be 80,642. Using the 2.6 people per household factor there would be an estimated 31,016 OSDS in the rural area of the County. Subtracting the 1,537 OSDS that were connected to the sanitary sewer system discussed above, there would be an estimated 29,479 OSDS in the rural portion of the county outside the URDL. This compares favorably to the 29,031 based on the Baltimore County BRF data and is far below the 46,046 OSDS estimated by the Chesapeake Bay Program Watershed Model.

A.2.3 Comparison of Baltimore County Data and MDE Analysis

Maryland Department of the Environment commissioned Tetra Tech, Inc. to provide analysis of the number and location of OSDS in Maryland, along with a nutrient reduction recommendations and guidance (Tetra Tech, March, 2011). This analysis was based on parcel data. The GIS data relevant to Baltimore County was acquired from MDE to facilitate the analysis of OSDS distribution and status in preparation of the Baltimore County Phase II WIP.

The data set acquired from MDE, like the information from the Chesapeake Bay Watershed Model indicates a greater number of OSDS in Baltimore County than the locally derived data. A total of 44,146 systems are included in the GIS data. Unlike the MAST data, the MDE data set could be analyzed based on position relative to the URDL. Table A-7 presents the results of this distribution analysis. Table A-8 presents the differential between the MDE OSDS data set and the Baltimore County OSDS data set.

Table A-7: Distributions of OSDS Based on the MDE Data Set for Baltimore County

Watershed	Outside URDL				Inside URDL				Total Watershed OSDS
	Critical Area	<1,000 feet of Stream	>1,000 feet of Stream	Total	Critical Area	<1,000 feet of Stream	>1,000 feet of Stream	Total	
Deer Creek	0	117	328	445	0	0	0	0	445
Prettyboy	0	330	1,092	1,422	0	0	0	0	1,422
Loch Raven	0	3,964	7,968	11,932	0	800	1,760	2,560	14,492
Lower Gunpowder	17	1,029	1,590	2,636	7	542	2,158	2,707	5,343
Little Gunpowder	4	835	1,624	2,463	0	0	0	0	2,463
Bird River	312	63	115	490	30	675	1,488	2,193	2,643
Gunpowder River	340	0	1	341	242	18	271	531	872
Middle River	415	0	0	415	445	3	61	509	924
Total UWS	**1,088**	**6,338**	**12,718**	**20,114**	**724**	**2,038**	**5,738**	**8,500**	**28,604**
Liberty	0	430	1,286	1,716	0	44	36	80	1,796
Patapsco	1	606	1,378	1,985	0	685	578	1,263	3,278
Gwynns Falls	0	223	284	507	0	2,809	2,424	5,233	5,740
Jones Falls	0	973	1,646	2,619	0	440	1,189	1,629	4,248
Back River	159	0	0	159	232	5	42	279	438
Baltimore Harbor	4	0	0	4	0	0	0	0	4
P/B Total	**164**	**2,232**	**4,594**	**6,990**	**232**	**3,983**	**4,269**	**8,484**	**15,504**
Total OSDS	***1,252***	***8,570***	***17,312***	***27,134***	***956***	***6,021***	***10,007***	***16,984***	***44,108***

Table A-8: Difference Between MDE Data Set and Baltimore County Data Set for OSDS

Watershed	Outside URDL				Inside URDL				Total Watershed OSDS
	Critical Area	<1,000 feet of Stream	>1,000 feet of Stream	Total	Critical Area	<1,000 feet of Stream	>1,000 feet of Stream	Total	
Deer Creek	0	-79	-52	-131	0	0	0	0	-131
Prettyboy	0	-179	-104	-223	0	0	0	0	-223
Loch Raven	0	-391	-1,023	-1,414	0	335	740	1,075	-339
Lower Gunpowder	13	-97	-234	-318	7	431	1,570	2,008	1,690
Little Gunpowder	0	-91	-133	-224	0	0	0	0	-224
Bird River	181	29	54	264	22	411	1,049	1,482	1,706
Gunpowder River	263	0	0	263	211	-28	243	426	689
Middle River	352	0	0	352	330	1	6	337	689
Total UWS	**809**	**-748**	**-1,492**	**-1,431**	**570**	**1,150**	**3,608**	**5,328**	**3,857**
Liberty	0	-996	799	-197	0	-8	-31	-39	-236
Patapsco	1	-843	645	-197	-2	462	208	668	501
Gwynns Falls	0	-62	59	-3	0	2,326	1,585	3,911	3,908
Jones Falls	0	-830	615	-215	0	-47	402	355	140
Back River	147	0	0	147	38	-95	-124	-181	-34
Baltimore Harbor	-1	0	0	-1	-212	-2	-24	-238	-239
P/B Total	**147**	**-244**	**-369**	**-466**	**-176**	**2,636**	**2,016**	**4,476**	**4,040**
Total OSDS	***956***	***-992***	***-1,861***	***-1,897***	***394***	***3,786***	***5,624***	***9,804***	***7,897***

The MDE data set indicates 7,897 OSDS than the Baltimore County. Most of the differential is due to OSDS inside the URDL. For rural OSDS, the MDE data set would indicate fewer OSDS than the Baltimore County data for systems located outside URDL with the exception of the CBCA. The Critical Area OSDS is higher than the Baltimore

County data both inside and outside the URDL. Similar to the MAST data set, the watersheds with the highest discrepancies (Gwynns Falls, Lower Gunpowder Falls, and Bird River) are located in our designated growth areas. The issues with the MDE data set are the same as with the MAST data set. Figure A-7 displays an area within the White Marsh/Perry Hall designated growth area, along with the Tetra Tech recommendations for OSDS and the location of sanitary sewer lines. As can be seen from this figure, most of the parcels being indicated as being served by OSDS are actually connected to sanitary sewer. A visual examine indicates that many of the parcels within the URDL that are designated as being served by OSDS are actually connected to the sanitary sewer.

Figure A-8 shows the same information for a portion of the Middle River neck area outside the URDL where the health project sanitary sewer extension took place. The Tetra Tech report in this instance recommended the installation of a cluster system. However, many of the indicated OSDS are already connected to sanitary sewer.

The parcel based OSDS analysis conducted by Tetra Tech for MDE allows a direct comparison on a parcel-by-parcel basis with the Baltimore County Bay Restoration Fund parcel data. That analysis will be conducted within the initial 2011-2013 milestone timeframe.

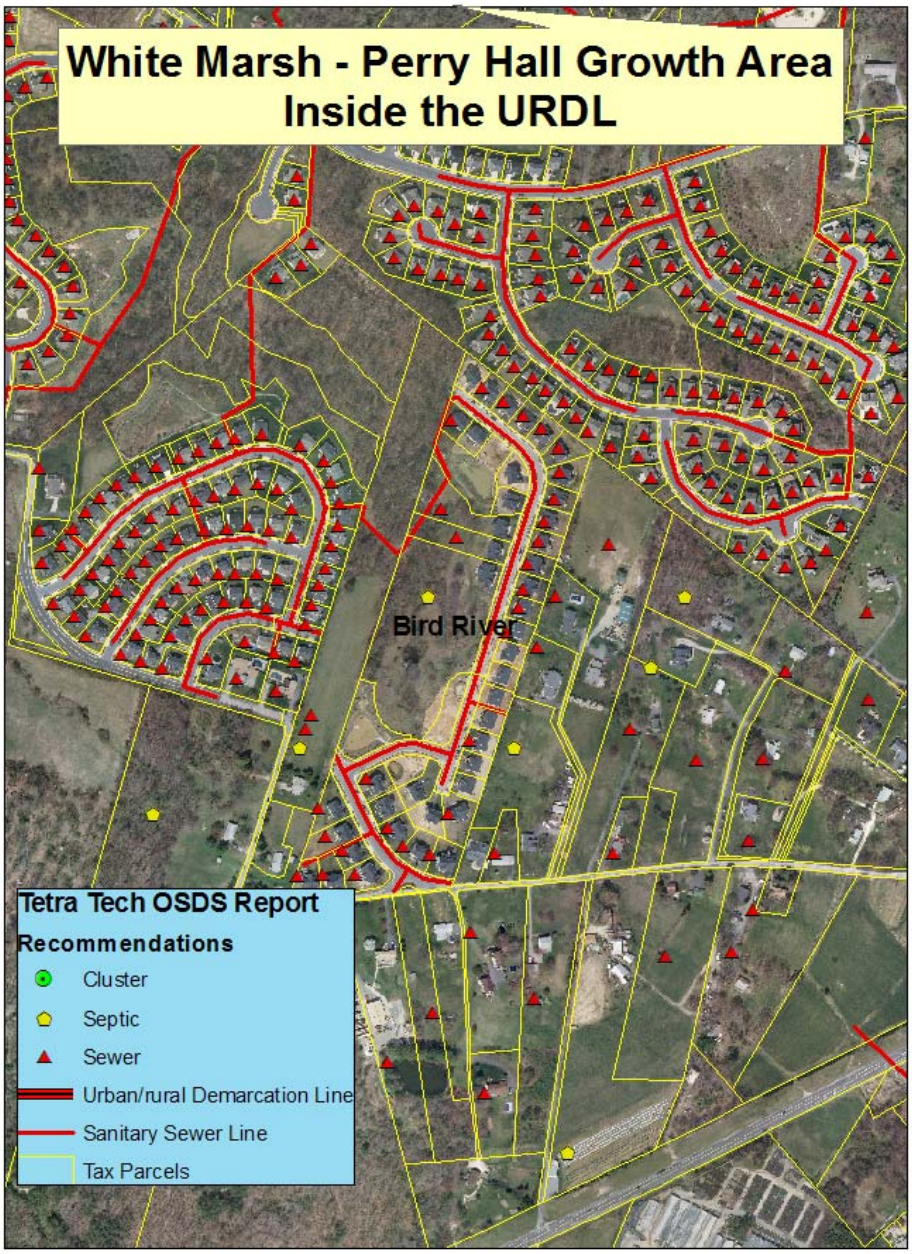

Figure A- 7: White Marsh/Perry Hall Designated Growth Area Indicating Locations of Sanitary Sewer Lines and the Tetra Tech OSDS Designations

Figure A- 8: Middle River Neck Sewer Line Extension Project Area Indicating Locations of Sanitary Sewer Lines and the Tetra Tech OSDS Designations

A.2.4 Current Pace of OSDS Restoration Activities

There are three OSDS restoration activities that are currently acceptable by the Chesapeake Bay Program; sanitary sewer hook-ups, installation of OSDS denitrifying systems, and on-site sewage disposal pump-outs. The current pace of implementation of each of these practices was determined based on Baltimore County data.

A.2.4.1 Sanitary Sewer Connections

Sanitary sewer connections are typically required through health projects to address multiple OSDS failures within an area. These are identified as part of the Water and Sewer Plan update triennially. Much of the discussion above has centered on past sanitary sewer line extensions in the CBCA outside the URDL and on sanitary sewer connections within the designated growth areas. A review of recent sanitary sewer health projects detailed in the Water and Sewer Plan indicates a current average annual rate of 14 sanitary sewer connections of existing OSDS facilities. This is the base rate that will be projected for future connections.

A.2.4.2 Denitrifying Systems

Approximately 98 denitrifying systems have been installed to date. The installation of denitrifying systems is funded through the Bay Restoration Fund. Baltimore County has applied for and received a grant to provide funding assistance to 20 households per year for installation of the denitrifying systems. At the current rate of installation, an additional 120 denitrifying systems will be installed by June 2017 and a total of 200 by December 2020.

A.2.4.3 On-site sewage disposal Pump-outs

The Baltimore County Department of Public Works provides access to the public sewer system for discharge of on-site sewage disposal waste collected by on-site sewage disposal haulers. The on-site sewage disposal haulers are required to submit a monthly report on the address of the pump-out location and how many loads were discharged to the sanitary sewer for billing purposes. The monthly summary sheets were used to determine the number of pump-outs for 2010. This analysis indicated that there were ~7,800 pump-outs for the calendar year 2010. This represents 21.5% of the 36,000 OSDS in Baltimore County, indicating an average pump-out rate of once every five years.

A.3 OSDS Strategy

The Baltimore OSDS strategy is to adjust the number of sanitary sewer connections in MAST to account for miss-identification of the number of existing OSDS. This credit will be applied to those areas in the CBCA outside the URDL where historic sanitary sewer extension has occurred and inside the URDL in the watersheds with our designated growth areas where there is an over estimate of the number of OSDS. In addition, the county will continue to analyze and evaluate the OSDS data to provide a better determination of the actual number of OSDS in Baltimore County. One analysis will be a parcel-by-parcel analysis of the Tetra Tech OSDS data in relation to the Baltimore County OSDS data. At the same time Baltimore County will continue to evaluate its' Bay Restoration Fund database in terms of accuracy of assignment to being served by

OSDS and being connected to sanitary sewer. We believe that even the Baltimore County data over estimates the number of OSDS.

The county for the next two-year milestone period will continue at the current pace of installation of de-nitrifying systems, sanitary sewer connections, and OSDS pump-outs. Based on the two analyses described above, Baltimore County will determine the pace of OSDS restoration for the remaining two-year milestones.

Table A-9 indicates the reduction of nitrogen based on the restoration strategies detailed below. As can be seen from this table the proposed strategy will almost meet the reduction target for OSDS. As we continue to analyze the data and track our progress, we will be able to refine our reduction estimates and determine if additional restoration actions for OSDS are necessary.

Table A-9: OSDS Strategy – Delivered Nitrogen Reduction (Target 106,137 #s Nitrogen)

Strategy	# of Systems	Nitrogen Reduction	Remaining Nitrogen Load	Remaining to Meet Target
2009 Progress from MAST			166,285	60,148
Health Projects	1,537	-24,201	142,084	35,947
Growth Area Adjustments	7,805	-33,649	108,435	2,298
De-nitrifying Systems	220	-897	107,538	1,401
Future Health Projects	200	*	*	*
OSDS Pump-outs	7,800/yr	-464	106,469	332

*Not broken out separately

Restoration Strategies

1. Take credit for the sanitary sewer extensions beyond the URDL in the tidal neck areas. 1,537 sanitary sewer connections in CBCA – high delivery areas
2. Take credit for the misidentification of OSDS within the designated growth areas. 4,255 (Gwynns Falls) + 3,550 (Bird River, Lower Gunpowder Falls) = 7,805 sanitary sewer connections – evenly split between upland and <1,000 from streams in medium delivery areas.
3. Continue pace of installation of on-site sewage disposal de-nitrifying systems at 20 systems per year targeted in the CBCA.
4. Continue pace of sanitary sewer connections of existing OSDS at an average of 14 per year.
5. Continue OSDS pump-outs at the rate of 7,800 per year (21.5%)

Programmatic Strategies

1. Investigate households within the CBCA that are indicated as being on OSDS to determine the correctness of the designation.
2. Investigate households within the URDL that are indicated as being on OSDS to determine the correctness of the designation.
3. Investigate the legal mechanisms for requiring households on OSDS within the URDL to connect to the sanitary sewer system.

4. Develop outreach and education programs on the value of OSDS pump-outs with the intention of increasing the pump-out rate from 21.5% to 33.3% or once every three years on average. To be implemented in FY 2014
5. Investigate solutions for OSDS problem areas identified in the report entitled *Problem Areas for OSDS in Baltimore County* (DEPRM 1998). Begin implementation of the solutions in FY 2014.
6. Improve tracking of OSDS connections to the sanitary sewer and OSDS pump-outs.
7. Conduct detailed parcel analysis between data used in MDE Report and Baltimore County data.

References:

Devereux, O.H. and Rigelman, J.R. August 2011. *Maryland Assessment and Scenario Tool: General Features and User's Guide.* pp. 57

EPA, December 2010. *Estimates of County-Level Nitrogen and Phosphorus Data for Use in Modeling Pollutant Reduction: Documentation for Scenario Builder Version 2.2.* pp. 41

Tetra Tech, March 2011. *Chesapeake Bay TMDL Phase I Watershed Implementation Plan: Decentralized Wastewater Management Gap Closer Research and Analysis.*