EXECUTIVE SUMMARY

Since 1972, Section 303(d) of the federal Clean Water Act has required states to identify waters that do not meet water quality standards and publicly report them on a list published every two years. For each of the listed waters, states are to determine the maximum amount of pollution that the waters can withstand and still meet standards. This maximum amount of pollution is called a Total Maximum Daily Load (TMDL).

In 1996, the U.S. Environmental Protection Agency (EPA) listed certain sections of the Virginia portion of the Chesapeake Bay as "impaired." That is, water quality, most notably dissolved oxygen, was insufficient to fully support aquatic life. Recognizing the low dissolved oxygen in portions of the Upper Bay, Maryland listed all of the upper Chesapeake Bay tidal water segments as not meeting standards for phosphorus, nitrogen (nutrients) and sediments.

In 2000, the Bay watershed partners signed the Chesapeake 2000 Agreement to clearly identify the actions needed to achieve water quality standards. With this Agreement came the understanding that if the voluntary actions taken were not successful in reaching the water quality goals, EPA would complete a TMDL by the end of 2010. Although much progress has been accomplished, it has not been enough to reach the pollution reduction goals. For the past several years, EPA has led a process to develop TMDLs for the Chesapeake Bay.

A multi-jurisdictional TMDL on the scale of the Chesapeake Bay watershed has never been completed before. There will actually be 294 TMDLs, one for each of the three pollutants (nitrogen, phosphorus and sediment) for 98 impaired Bay segments (Maryland drains to 58 of the segments and will be subject to 174 TMDLs).

In recognition of the complexity and scope of this set of TMDLs, EPA determined that the part of the TMDL known as "reasonable assurance of implementation" needed to be significantly enhanced. "Reasonable assurance" is a demonstration that achieving the load reductions required by the TMDL can reasonably be met, that is, current or anticipated resources and commitments are expected to be sufficient.

This Watershed Implementation Plan (Plan), to be referenced by EPA's TMDL for Chesapeake Bay, supports the reasonable assurance of implementation for Maryland's part of the TMDL.

It contains, consistent with EPA guidance, the following elements:

1. Interim and Final Nutrient and Sediment Target Loads
2. Current Baseline Loading and Program Capacity
3. Account for Growth in Loads
4. Gap Analysis
5. Commitment & Strategy to Fill Gaps
6. Tracking and Reporting Protocols
7. Contingencies for Slow or Incomplete Implementation
8. Detailed Tables of Interim and Final Nutrient and Sediment Target Loads

The Final Plan submitted to EPA has been developed and finalized based on consideration of the public's comments and recommendations. Through a transparent and broad series of public meetings and outreach efforts, comments were solicited, carefully reviewed and evaluated. Final recommendations for strategy selection were further evaluated and selected through the Governor's BayStat process, which brings together all of the State agencies that are involved with the Bay TMDL. Maryland's Plan incorporates the strategies to restore and maintain the Bay.

Given significant time constraints and limitations of current data and models, it is almost certain that the TMDL allocations associated with this Phase I Plan will change during Phase II. This Plan serves as a starting point for finer scale planning during the Phase II process and identifies the implementation strategies needed to achieve a healthy Bay for our families and for future generations.

This Executive Summary provides the context for the Phase I Watershed Implementation Plan (Plan), several "Key Highlights" and brief synopses of the seven elements that make up the Plan.

Purpose of Phase I Watershed Implementation Plan

In general, TMDLs set pollutant limits for all sources by dividing, or "allocating," the maximum allowable pollutant loads among those sources.

As a means of gathering allocation information from states for the Bay TMDLs, EPA has requested that states develop Watershed Implementation Plans (Plans). A key function of the Plan is to identify final target loads to be achieved by various pollution source sectors and in different geographic areas. The final target loads will be used by EPA in setting TMDL allocations.

As noted above, the states' Plans also help to provide "reasonable assurance" that sources of pollution will be cleaned up, which is a basic requirement of all TMDLs. In addition, the Plans are part of a new "accountability framework" that EPA is establishing to ensure the TMDL goals are reached in a reasonable timeframe.

A Three-Phased Planning Process

EPA has laid out a three-phased planning process designed to ensure the involvement of interested parties and offer multiple opportunities to refine the Plan over time.

EPA's primary guidance to the states came in the form of two letters to the Chair of the Chesapeake Bay Principal's Staff Committee, comprised of the state agencies responsible for Bay related restoration programs. The first, "Expectations Letter," signed November 4, 2009, laid out EPA's expectations for the three-phased planning process, including the eight elements of the Phase I Plan. The second, "Consequences Letter," signed December 29, 2009, laid out the key actions and deadlines for the states to meet and the regulatory and other consequences that could be triggered if they are not met.

The Phase I Plan is to be developed at the same time as the Bay TMDLs, which are to be completed by December 31, 2010. In addition to setting final target loads that provide EPA the necessary information to establish TMDL allocations, the Plan also sets "interim target loads." EPA has set the year 2017 to achieve 60% of the needed implementation and 2025 as the deadline for achieving final target loads. Maryland committed to achieve the final target loads by 2020. Consistent with this accelerated implementation date, Maryland's Plan is designed to achieve 70% of the Final Target by 2017, which is reflected in this Phase I Plan. It is recognized that the pollutant reductions and full benefits to the Bay from many of those controls, such as tree plantings, will likely not occur until some time after 2017.

A Phase II Plan, to be developed in 2011, will refine the details of the Phase I Plan by providing more geographic specificity regarding target loads. The Phase II Plan will also include greater detail about pollution controls that the State and partners will implement by the end of 2017. The time allotted for the Phase II planning process will allow significantly more interaction between the State and interested partners to refine the Phase I Plan. As part of the Phase II planning process, EPA will allow states to revise the TMDL allocations established in the Phase I Plan, subject to public review.

A Phase III Plan will be developed in 2017 and will address reductions needed from 2018 to 2020 in Maryland. The TMDL allocations may again be revised to reflect better data, a greater understanding of the natural systems and to make use of enhanced analytical tools, such as updated watershed and water quality models.

Key Components

Maryland's Phase I Plan builds on its precedent setting programs to date. Maryland has been the leader in the Bay restoration. Since 1985 we have reduced nitrogen pollution by 33% and phosphorous pollution by 38%. These reductions were realized, even as a 29% increase in population (1.28 million) occurred in the State between 1985 and 2009. Maryland continues to be a leader – the first State to require nutrient management plans on all farms, the first to commit to implement state-of-the-art technology on all of the State's 69 largest wastewater treatment plants, accounting for 95% of our wastewater flow, and the first State to place stringent air pollution controls on power plants required by Maryland's nationally groundbreaking Healthy Air Act, reducing nitrogen emissions by over 75% from coal fired power plants by 2013.

Over the past four years, Maryland has continued its leadership. We have committed to accomplish Maryland's nutrient reduction goals by 2020 and initiated the switch to measuring progress on the Bay in two year increments instead of once a decade. To ensure that progress is transparent, we have established BayStat to measure this progress in real time – allowing all Marylanders to monitor the restoration of the Chesapeake Bay. We were the first state in the watershed to receive federal approval for our Concentrated Animal Feeding Operation program that meets the new EPA regulations and requires comprehensive nutrient management on poultry farms for the first time. Maryland is also the first State in the watershed to require nutrient removal technology for new and failing septic systems in its Critical Area – the land within 1000 feet of the Bay. Maryland created the Chesapeake Bay 2010 Trust Fund to fund cost-effective projects to reduce non-point source pollution with required monitoring that tracks

implementation and progress. Together with Virginia, we restricted the female crab harvest yielding a tremendous increase in recent catches. We have instituted a Marylanders Grow Oysters Program. We recently achieved a record setting commitment by farmers to plant cover crops – one of the most cost effective nutrient reduction practices available. We were the first state in the Watershed to require environmental site design to reduce stormwater runoff on all new development approved after May of 2010 and implemented one of the most progressive set of stormwater requirements for a stormwater (MS4) permit in the Bay Watershed. The hallmark of Maryland's proposed Plan is that it continues and accelerates implementation of these state-of-the-art practices and programs to achieve the needed pollution reductions.

- **Loading and Capacity Gaps:** Loading gaps are estimated for the Interim and Final target loads. Maryland's Interim Target goal is 70% of the Final Target by 2017. These loading gaps reflect resource capacity gaps to meet the load reductions. Although they have significant uncertainty, they reflect the scale of challenge:

  - **Interim Target by 2017:**
    - Nitrogen: Current actions are expected to achieve about 53% of the 70% Interim Target.
    - Phosphorus: Current actions are expected to achieve 80% of the 70% Interim Target.
    - Completing upgrades of the major municipal treatment plants will substantially close these gaps.
    - The Plan details a set of strategies that will meet the 70% reduction goal for nitrogen, phosphorus and sediments; this estimate will need to be confirmed by planned model runs.

  - **Final Target:**
    - There is greater uncertainty regarding this Target, due to the longer timeframe and associated anticipated changes in technology and programs beyond 2017.
    - Because reductions from point sources will be credited between now and 2017, achieving the remaining 30% reduction will largely be accomplished in the non-point source sectors.
    - Using the current pace of reductions for nitrogen as a measure of "capacity," the Plan estimates at least a 3 fold increase in capacity is needed by 2020.

- **Nutrient Offsets:** The Plan commits to adopting nutrient offset policies and programs for septic system and land development loads. Although the approach is not fixed, the Plan proposes a framework that would create incentives for smart growth and a schedule for development and implementation beginning in 2013.

Trading Programs: To enable offsets, a policy framework and technical and administrative implementation systems are needed to ensure nutrient reductions are achieved. The State's point source to point source trading policy was published in April 2008 (http://www.mde.maryland.gov/programs/Water/Pages/water/nutrientcap.aspx). Complementary programs to administer trading and offsets between point sources and agricultural nonpoint sources, that serve as a foundation for development of an appropriate framework for other point

to nonpoint trades, were initiated in September 2010. In addition, the State proposes integrating that framework with broader trading of "ecological services."

- **Public Comment:** The final selection of strategies and contingencies was based on the public comments on the Draft Phase I Plan. Maryland's Draft Phase I Plan presented a list of strategy options for consideration and discussion during the public comment period which closed on November 8th 2010. A large number of organizations and individuals representing sectors ranging from the Building Association to elementary school children submitted 113 sets of comments. Additionally, over 100 e-mails sent from multiple sources, and 100 letters from students and parents were delivered. Two Petitions with over 1,000 citizen signatures were also submitted. Each of the comments has been reviewed and catalogued. The comments focused generally on cost, the need for additional detail regarding implementation, whether the strategies demonstrated reasonable assurance, the challenges associated with Bay restoration and support for the Chesapeake Bay restoration. The comments were enormously instructive and informative regarding the changes needed to the Draft Plan submitted in September. The comments have informed each of the changes made in this Final Plan. Responses to the comments will be compiled in a formal document which will be published prior to December 31, 2010.

- **Strategy for Achieving the 2017 Interim Target:** The Plan lists strategies that will achieve a 70% reduction of the final target load by 2017. These strategies encompass extensions of current 2-year Milestone commitments and additional proposed strategies. Based on public comments, a subset of strategies that were proposed in the Draft Phase I Plan has been selected to meet the Interim Target and are now reflected in the final Phase I Plan.

- **Strategy for Achieving the Final Target**: Three approaches are proposed for achieving the final target by 2020:

    - Develop new technology and approaches prior to 2017. Examples of innovations might include development of seeds and crops that require less fertilizer and processes to reduce ammonia released from poultry manure.
    - Increase the scope of implementation of existing strategies. Examples include upgrading additional small WWTPs, increasing acres retrofitted with stormwater controls; and more efficient urban runoff controls.
    - Improve regulatory requirements to increase reductions achieved.

- **Sediments:** The Chesapeake Bay TMDL requires both nutrient and sediment reductions. Maryland developed its gap closing strategies with the expectation that reduction practices designed to meet the phosphorus target would also likely meet the sediment target. Phosphorous from nonpoint source runoff binds strongly to sediments and, therefore a percentage reduction in one correlates strongly with the other. EPA validated this approach through its determination that Maryland's draft strategy met both the 2017 Interim Target and the 2020 Final Target for sediment.

The remainder of this Executive Summary presents highlights of the seven key sections of the Plan.

Element 1: Interim and Final Target Loads

Based on analyses conducted by the EPA Chesapeake Bay Program, in consultation with the states and other interested parties, nutrient and sediment load limits have been set that are intended to meet water quality standards. These loads have been divided among the Bay states with the understanding that the states will, in turn, allocate them geographically and among source sectors, such as waste water treatment plants, agricultural sources, septic systems and storm water from developed land.

Maryland has used a similar process to divide the loads among regions and source sectors. Briefly, the allocation process first set waste water treatment plant load allocations at levels equal to Maryland's Enhanced Nutrient Removal Strategy for major wastewater treatment plants (and five of the largest minor plants), and caps set in the 2004 Tributary Strategies for minor facilities. Then, nonpoint sources were reduced by equal percentages between "no action" loads and maximum-feasible-reduction loads. In addition, sources closest to the Bay must achieve greater reductions than sources further away This is more cost effective, because the control of sources closer to the Bay has a greater beneficial impact on Bay water quality.

The allocations described above are referred to as "initial" allocations because the models used by EPA are undergoing significant revision this year, which is likely to influence the distribution of loads among source sectors.

The following tables summarize the statewide interim and final target loads for nitrogen, phosphorus, and sediment by major source sector. Interim target loads were developed subsequent to Bay model verification that the reduction strategies selected by Maryland following the public comment process meet the 2017 goal. The Interim Targets presented will meet the 70% goal.

Total Nitrogen Interim and Final Target Loads by Source Sector

Total Nitrogen - By Sector (Million lbs/yr)					
Sector	**2009 Progress**	**Final Target Load**	**% Reduction from 2009 Progress**	**Interim Target Load**	**% Reduction from 2009 Progress**
UrbanReg	5.098	4.184	18%	4.650	9%
UrbanNonReg	0.551	0.444	19%	0.591	-7%
Agriculture	17.713	13.653	23%	16.606	6%
CAFO	0.080	0.070	12%	0.064	20%
Septic	4.007	2.454	39%	2.975	26%
Forest	7.133	7.133	0%	7.149	0%
Air	0.691	0.686	1%	0.698	-1%
WWTP & CSO	14.148	10.462	26%	8.587	39%
Total	**49.421**	**39.086**	**21%**	**41.319**	**16%**

Total Phosphorus Interim and Final Target Loads by Source Sector

Total Phosphorus By Sector (Million lbs/yr)					
Sector	**2009 Progress**	**Final Target Load**	**% Reduction from 2009 Progress**	**Interim Target Load**	**% Reduction from 2009 Progress**
UrbanReg	0.581	0.383	34%	0.513	12%
UrbanNonReg	0.091	0.056	39%	0.095	-4%
Agriculture	1.364	1.196	12%	1.320	3%
CAFO	0.007	0.004	31%	0.005	28%
Forest	0.349	0.349	0%	0.348	0%
Air	0.041	0.040	2%	0.042	-1%
WWTP & CSO	0.871	0.686	21%	0.571	34%
Total	**3.304**	**2.715**	**18%**	**2.892**	**12%**

Total Sediment Interim and Final Target Loads by Source Sector

Total Suspended Solids By Sector (Million lbs/yr)					
Sector	**2009 Progress**	**Final Target Load**	**% Reduction from 2009 Progress**	**Interim Target Load**	**% Reduction from 2009 Progress**
UrbanReg	382	240	37%	307	20%
UrbanNonReg	18	9	49%	20	-11%
Agriculture	787	700	11%	670	15%
CAFO	0.11	0.04	66%	0.10	8%
Forest	191	191	0%	187	2%
WWTP & CSO	8	78	-889%	62	-677%
Total	**1,387**	**1,218**	**12%**	**1,246**	**10%**

Perhaps the most important element of the Phase I Plan is the set of control strategies and associated Interim Target Loads. The control strategies are estimated to be sufficient to achieve the 2017 Interim Target, i.e., 70% of the Final Target load. The strategies to meet the interim target loads are summarized in Element 5 of this Executive Summary.

Element 2: Current Baseline Loading and Program Capacity

The Phase I Plan is required to identify the current baseline loads, the current capacity to reduce pollution and, while accounting for future growth in loads, determine the "gap" in capacity needed to attain the interim and final target loads.

The following table summarizes the most recent baseline loads relative to Maryland's target loads for nitrogen and phosphorus. Reductions of atmospheric deposition from implementation of the federal Clean Air Act were "taken off the top" before states were given their allocations by EPA. Maryland will separately take credit for the Healthy Air Act and adoption of the California low emission vehicle standards.

Maryland's Estimated 2009 Baseline Compared to Target Loads
(Millions of pounds per year)

Nitrogen			Phosphorus		
2009 Progress	Draft Allocation	% Reduction	2009 Progress	Draft Allocation	% Reduction
49.42	39.09	20.9%	3.30	2.72	17.8%

The Plan describes current legal, regulatory, programmatic, financial, staffing and technical capacity for each of the major source sectors accounted for in the Bay TMDL. These sectors are itemized below:

- Wastewater (including federal facilities):
  - Major Municipal Treatment Plants (design flow equal to or greater than 500,000 gallons/day flow)
  - Minor Municipal Treatment Plants (design flow less than 500,000 gallons/day flow)
  - Major Industrial Plants (load equal to a major municipal plant)
  - Minor Industrial Plants
- On Site Sewage Disposal Systems (Septic Systems)
- Regulated Stormwater
- Sediment and Erosion Control
- Concentrated Animal Feeding Operations (CAFOs)
- Agriculture
- Atmospheric Sources
- Other Sources

The capacity analysis for the Phase I Plan is limited to State resources. For programs administered by local governments, and federal agencies (i.e. USDA NRCS) substantial additional analyses will be necessary as part of the Phase II Plan. However, a broad quantitative sense of the current capacity, relative to the reduction goals, can be gained from the loading gap analysis described below.

Element 3: Accounting for Growth in Loads

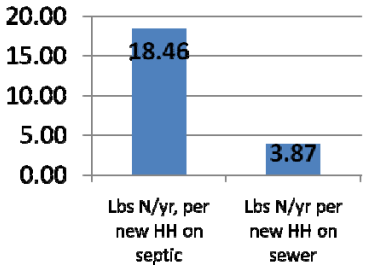
In determining the pollutant load reductions to meet the interim and final target loads, it is necessary to account for future growth. Broadly speaking this can be done in two ways. First, future loads can be estimated and included in quantitative load reduction analyses. Second, policies and programs can be adopted to ensure all future load increases are offset by commensurate load reductions on an as-needed basis.

This Plan uses both approaches. The Plan uses future projections of loads in the calculations used to set strategies for achieving the interim target loads by 2017. This is described further in the next section on the gap analysis.

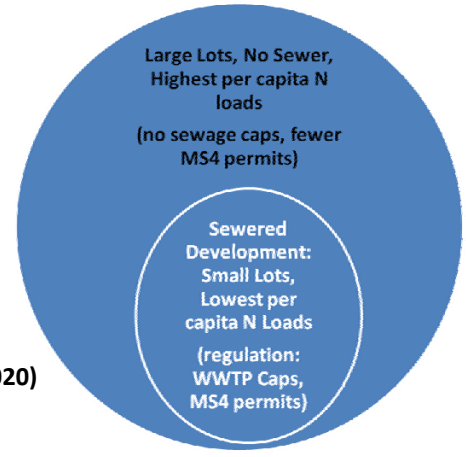
The Plan also offers a schedule for adopting nutrient offset programs for septic system and land development loads. This will build on existing nutrient trading policies and programs. Current trading programs include point-to-point trading and point-to-nonpoint (primarily agricultural sector). The Plan also includes pursuing multi-ecosystem services trading. These approaches would strengthen the market for a more robust trading program for nutrient and sediment management for the Bay.

The proposed approach for offsetting future loads would use different degrees of offsets in three different types of places. Areas with high loads per capita would need to offset loads to a higher degree than areas with low loads per capita. A third category would fall in between. Areas with sewer service and higher density of homes and jobs, served by state of the art sewage treatment, will tend to have lower per capita loads. Areas with low density development on well and septic systems would tend to have higher per capita loads.

In addition to the federal requirement to offset loads, a quantitative analysis of the potential implications of not offsetting future loads in the following example provided by the Maryland Department of Planning, shows that offsetting is needed to accomplish the necessary loading reductions. The example shows that, per household, the load from new development on well and septic is almost 5 times higher than new loads from sewered areas.



263,225 Additional Households Forecasted in Maryland (2010 -2020)
29% served by septic tanks
71% served by ENR WWTP



Element 4: Gap Analysis

The gap analysis addresses several issues. It estimates the loading gap in achieving 70% of the target load by 2017, and the loading gap in achieving the final target load, both of which account for future projected growth in loads. It also provides a broad estimate of the gap in resources, or "capacity," to achieve these target loads.

It is important to understand that these estimates are general and subject to potentially significant changes due to anticipated changes in EPA's watershed model and the underlying data. In addition, the "gaps" depend on the pollution control strategies selected, because the strategies influence the source sector allocations. The gaps reported in this Plan are based on the initial allocation described above.

The Bay TMDL calls for reductions of 20.9% in nitrogen and 17.8% in phosphorus from the 2009 baseline load.

The gap analysis for the 2017 interim goal is summarized in Table A for nitrogen. The edge-of-stream (EOS) loads reflect local loading, whereas, the "delivered" loads account for transport losses as nutrients work their way to the Bay.

Table A
Nitrogen
Key Statewide Gap Analysis Results

Summary Values (million lbs/yr)	Delivered	EOS
Statewide Target	39.09	53.99
2009 Baseline Load	49.42	68.20
2017 70% Goal	42.19	58.22
2017 Reduction Needed	7.22	9.98
2017 Current Capacity Reduction	3.85	5.31
2017 Remaining Reduction Gap	3.39	4.68

The broad implication is that an 88 percent increase in capacity is needed to meet the Interim Target for nitrogen. That is, we have the capacity to reduce about 3.85 million pounds of the 7.22 million pound 2017 reduction goal, leaving a 3.39 million pound reduction gap for which additional capacity is needed (3.39/3.85 = 0.88). Most of this capacity need would be filled by upgrading the major WWTPs.

Table B provides the key statewide findings for phosphorus.

Table B
Phosphorus
Key Statewide Gap Analysis Results

Summary Values (million lbs/yr)	Delivered	EOS
Statewide Target	2.72	3.43
2009 Baseline Load	3.30	4.16
2017 70% Goal	2.89	3.64
2017 Reduction Needed	0.412	0.519
2017 Current Capacity Reduction	0.328	0.413
2017 Remaining Reduction Gap	0.084	0.106

The broad implication is that a 26 percent increase in capacity is needed to meet the Interim Target for phosphorus. That is, we have the capacity to reduce about 0.328 million pounds of the 0.412 million pound 2017 reduction goal, leaving a 0.084 million pound reduction gap for which additional capacity is needed (0.084/0.328 = 0.26). As with nitrogen, most of this capacity need would be filled by upgrading the major WWTPs.

These findings mask the implications for nonpoint source sectors which need greater capacity enhancements than indicated above. Because the point source sector is on track to achieve most of the reduction needed by 2017, the remainder of the gap to achieve the final 2020 Target must be addressed by nonpoint sources. The dominant role of the point source sector in achieving the 2017 goal is depicted in Figure A. Even without accounting for additional reductions in 2016 that could be achieved with full funding of upgrades of the remaining major WWTPs with ENR, the point source reductions are by far the most significant. The agricultural strategies are providing the most significant decrease in the nonpoint source sector.

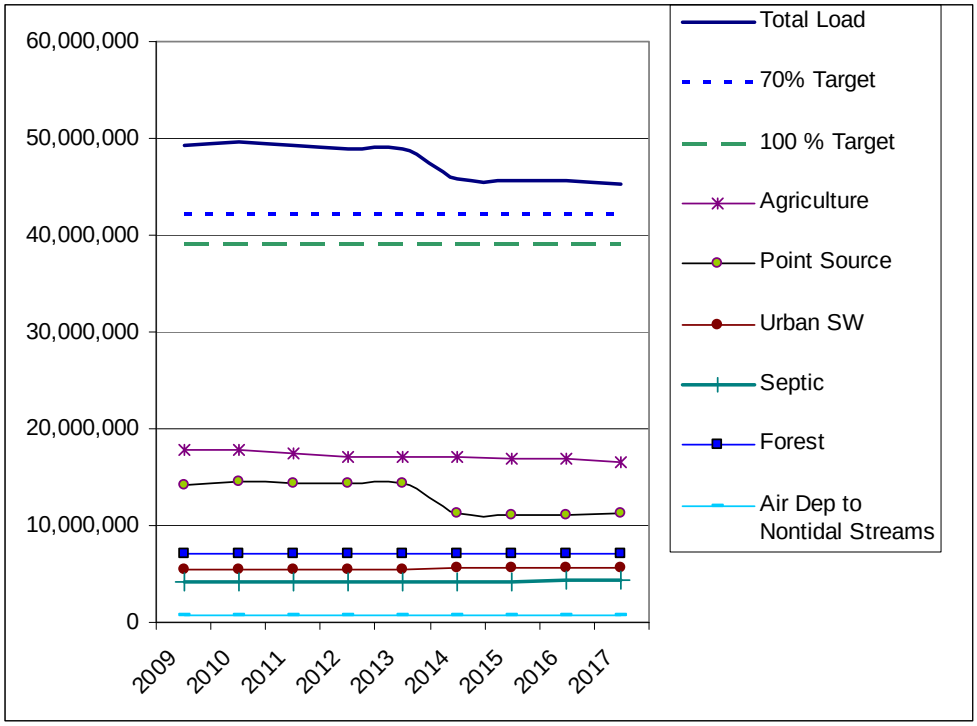


Figure A: Statewide Nitrogen Gap Analysis Projected Reductions (Delivered Loads)

Beyond achieving the 2017 Interim Targets, gaps for nitrogen and phosphorus remain between 2017 and 2020. This additional gap is 3.07 million lbs for nitrogen and 0.166 million lbs phosphorus. As noted above, the nonpoint source sectors will need to close this gap, because most of the point source strategies to reduce loads will be implemented by 2017.

The notion of "Bay Restoration" implies two key factors. First, excessive pollutants must be reduced. Second, load caps must be maintained. Additional resource capacity will be needed for both. The following estimate addresses the resource implications for reductions and notes qualitative implications for maintaining load caps.

Table C
Capacity Increase Needed to Meet Nitrogen Final Target

Source Sector	Number of Years to Meet Final Target with Current Capacity	Multiple of Current Capacity Needed to Meet the Final Target Goal by 2020
Agriculture[1]	25	2 - 4
Urban Stormwater[2]	40	3 - 4.0
Septic Systems[3]	46	4.6

1 This assumes a reduction in delivered load from 17.7 million to 13.8 million at 100,000 lbs EOS reduced per year.
2 This assumes a reduction in delivered load from 5.6 million to 4.5 million at about 16,000 lbs EOS per year.

3 This assumes a 15% reduction goal for septic systems thus reducing the delivered load from 4 to 3.4 million.

Although these are coarse estimates, they give a sense of the scale of effort needed to achieve the nitrogen loading goals in the given time-frame. These investments will significantly improve the Bay and the many rivers draining to the Bay. Investments of this scale will likely generate efficiencies that lower some costs, septic system upgrades being one example. Last, the scale of this endeavor must be viewed at a larger economic context – the economic value of a restored Bay and the job generation associated with the work to restore it.

Element 5: Commitment & Strategies Selected to Fill Gaps

This section of the Plan identifies a broad range of reduction strategies to achieve the 2017 Interim Target (70% of the Final Target Load). The 70% Interim Target for nitrogen is a 7.22 million pound reduction. The 70% Interim Target for phosphorus is a 0.41 million pound reduction. According to the results from the Chesapeake Bay Program the estimated reductions associated with those strategies is approximately 8.05 million pounds for nitrogen, 0.41 million pounds for phosphorus and 146 million pound reduction for total suspended solids.

Implementation of the MD strategies is projected to reduce more nitrogen than is needed to meet the 70% Interim Target for nitrogen and just meet the goal for phosphorus. The nitrogen goal is exceeded because most of the reduction strategies remove both nitrogen and phosphorus and the high level of implementation needed to achieve the phosphorus goal automatically results in more nitrogen reduction than is necessary. This gives the plan an even higher degree of reasonable assurance that MD will meet the 70% Interim Target for nitrogen.

The Plan describes enforceable and otherwise binding means to ensure controls are implemented, the primary resource needs both for implementation and compliance verification. This is described further in the Tracking and Reporting section (Element 6).

For the Final Target loads, a wide range of pollution reduction controls are included in this Plan, beyond the strategies selected to meet the 2017 load reduction targets. Many of these strategies for the Final Targets are considered contingencies and are listed under Element 7. These are not quantified and would require additional research to determine their viability.

The strategies are presented in the following table.

Maryland Watershed Implementation Plan: Summary Table of Strategies

Strategy	Description	Units	2010-2011	2012-2017	Total	Estimated Cost
Point Sources						
Major WWTPs (Not including Blue Plains)	Upgrade 68 Wastewater Treatment Plants to Maryland's Enhanced Nutrient Removal (ENR) standards. At the current rate of implementation, 24 plants will be operational by June 30, 2011, accounting for an estimated 740,000 lbs/year reduction in nitrogen. Full funding is available for implementation of the 2011 Milestone. The State projects it will be able to provide funding to maintain the construction schedule for upgrade projects through FY 2012. In 2011, determine all options to close the Bay Restoration deficit including consumption and income based strategies. In 2012, pursue statutory change to amend Bay Restoration Fund fee to provide funding needed to complete the upgrades for FY2013.	plants	24	44 (Of which, funding has been committed to 8 plants)	68 (66 majors not including Blue Plains + 2 private)	All major WWTPs not including Blue Plains $2.461 B 36 Facilities $1.186 B (Not upgraded yet and need funding commitments)
Blue Plains Waste Water Treatment Plant Upgrades	Complete BNR facilities at the Blue Plains Wastewater Treatment Plant to achieve a nitrogen reduction of 190,000 lbs/yr. Facility is on schedule for ENR upgrade by 2015 and will result in a total nitrogen reduction of approximately 875,000 lb/yr expected by 2017	plants	1	1	1	$402 M
Major Industrial	Continue Retrofits and Optimization at Major Industrial Treatment Plants to meet the Tributary Strategy load cap.	plants		11	11 (9 major facilities + 2 Dredged Material Containment Facilities)	
Minor Industrial	Identify loading targets and issue schedules in permits by 2017 for reductions of approximately 23.5%, representing approximately 143,000 lbs/yr reduction, for minor industrial sources	plants		477	477	

Strategy	Description	Units	2010-2011	2012-2017	Total	Estimated Cost
Federal facilities - major	Continue ENR Retrofits at Major Federal WWTPs in accordance with July 2006 MOU with DOD. Originally 7 facilities, 3 of which were privatized (1 of the 3 is included in Major Municipal List: APG Main); remaining 2 private plants are included in this count, for a total of 6.	plants		6 Total: 4 federal 2 privatized	6	
Upgrade Large Minor Municipal WWTPs (0.1-0.5 MGD)	Evaluate feasibility of the largest minor municipal WWTPs for potential upgrade based on flow, load, capacity needs, community interest, technical feasibility and cost-effectiveness. Select 5 plants, with approximately 1.0 million gallons per day discharge flow for upgrade by 2017, with estimated nitrogen load reduction of about 45,000 lbs/yr. Cost of upgrade to ENR roughly $58 M.	plants		5	5	$58 M
Eliminate Sewer Overflows	Older combined sewer systems designed to collect and transport sewage to treatment plants during dry weather also serve as stormwater drains during rain events. Once combined sewers are full,, the blended effluent is discharged to waterways resulting in Combined Sewer Overflows. Sanitary sewer overflows occur when pipes or pumping stations fail and let sewage spill into waterways. Eliminate overflows through consent orders requiring system repair and upgrades and penalties assessed when failures occur. Long-term control plans are in place. Costs are the MD portion of the EPA's 2008 Clean Watershed Needs Survey	Systems		4	4	CSO: $0.463 B SSO: $1.374 B

Strategy	Description	Units	2010-2011	2012-2017	Total	Estimated Cost
Urban Stormwater						
MS4 Phase I Permitted Counties	Renew permits to require Nutrient and Sediment reductions equivalent to stormwater treatment on 30% of the impervious surface that does not have adequate stormwater controls for MD's largest counties subject to Phase I Municipal Separate Storm Sewer System (MS4) Permits. In 2011, convene workgroup to determine funding options, schedules, and most cost effective practices with local government. In 2012, if local utilities or other systems of charges are not being implemented, seek legislation requiring local stormwater utilities. Alternative cost effective practices include forest buffer planting, stream restoration, wetland restoration, pavement removal and operational practices. Selection of practices and timing of implementation will be based on cost-effectiveness, pollutant removal efficiency and maximizing available funding.	Nutrient and Sediment Reductions Equivalent to treatment of 30% pre-1985 impervious surface acres	10%	20%	30%	$2.614 B
SHA MS4 Phase I and II	Renew permit to require Nutrient and Sediment reductions equivalent to stormwater treatment on 30% of the impervious surface that does not have adequate stormwater controls Develop work plan to meet nutrient and sediment reduction goals through system retrofitting and equivalent alternative practices and trading in 2011. Alternative practices include forest buffer planting, stream restoration, wetland restoration, pavement removal and operational practices. Selection of practices and timing of implementation will be based on cost-effectiveness, pollutant removal efficiency and maximizing available funding.	Load reduction equal to 30% per-1985 impervious surface acres .	0% MS4 Phase I 0% MS4 Phase II	30% in MS4 Phase I areas 20% in MS4 Phase II areas	30% in MS4 Phase I areas 20% in MS4 Phase II areas	$1.0 B

Strategy	Description	Units	2010-2011	2012-2017	Total	Estimated Cost
MS4 Phase II (CE and WA Counties, larger municipalities, and federal facilities)	Require Nutrient and Sediment reductions equivalent to stormwater treatment on 20% of the impervious surface that does not have adequate stormwater controls in smaller jurisdictions (less populated counties and municipalities) through required Phase II MS4 permits.	Nutrient and Sediment Reductions Equivalent to treatment of 20% pre-1985 impervious surface acres		20%	20%	$365 M
Existing Urban Nutrient Management Law	Regulate fertilizer applications on 220,000 acres of commercially managed lawns (for example, golf courses and athletic fields) through Maryland's Nutrient Management Law.	acres (annual)	220,000	220,000	220,000	$0.69 M
Enhanced Urban Nutrient Management	Require modification of lawn fertilizer formulation to eliminate phosphorus to the extent practicable and to require the use of slow release nitrogen fertilizers on lawns and managed turf. Additional options to receive reductions are addressed.	acres (annual)		220,000	220,000	
Regenerative Stormwater Conveyance	Implement stream restoration and connection to the flood plain to mimic natural stream conditions and provide a nutrient and sediment reduction	linear miles		12	12	Included in MS4 costs
Rural Residential Tree Planting	Increase rural resident tree planting and homeowner association property including conversion of turf grass to tree covers. May also consider mandatory stream and waterway buffers.	acres		600	600	$5.25 M (Included in MS4 costs)

Strategy	Description	Units	2010-2011	2012-2017	Total	Estimated Cost
Urban Tree Canopy	State is implementing urban tree canopy goals based on reasonable expectations in gains by accounting for available lands and hydrologic flow paths in urban areas. The intent of the urban tree canopy was to target half of the older developed areas, particularly those developed prior to stormwater management, where urban trees may be particularly valuable for water and air quality. Urban tree canopy is defined as at least 100 trees to an acre	acres		1,200	1,200	$36 M (Included in MS4 costs)
Septics						
Continue Upgrade of new and failing Septic Systems in the Critical Area	Retrofit 5,700 septic systems by 2017 with current program using best available technology	systems	2,100	3,600	5,700	80.5 M
Septic hookups to ENR plants	Connect failing septic systems to Wastewater Treatment Plants with advanced nutrient removal technologies.	systems	704	226	930	35.7 M
Require upgrade all systems in Critical Area	In 2011, assess options to phase in requirement to retrofit all septic systems in the Critical Area using best available technology (the land within 1000 feet of tidal waters) beginning in 2012. Assessment to include viability of tax credits, income based criteria for grant eligibility and other means to facilitate upgrades. (BAT upgrade of additional 27,552 systems in Critical Area for a total of 32,379) Initiate phase-in in 2012.	systems		27,552	27,552	358.2 M

Strategy	Description	Units	2010-2011	2012-2017	Total	Estimated Cost
	Managing the Land to Improve Water Quality					
Cover Crops	Plant 180,000 acres of commodity and 175,000 acres of traditional cover crops. Cover crops are small grains such as wheat or rye that are planted in the fall after the harvest of corn, soybeans and other summer crops to absorb unused fertilizers that may remain in the soil. Cover crops also provide a ground cover to prevent soil erosion in the winter. The Maryland Agricultural Water Quality Cost Share Program implements this program with funding from the Chesapeake Bay Restoration Funds, 2010 Trust Fund and targeted Federal grants.	acres (annual)	325,000	355,000	355,000	$107.4 M
Soil Conservation & Water Quality Plans	Develop Soil Conservation and Water Quality Plans on an additional 257,049 acres. Develop a comprehensive plan for a farm that addresses natural resource management on agricultural lands and recommends best management practices (BMPs) that control erosion and sediment loss and manage nutrient runoff. 764,630 acres of Maryland farm land will be managed under a current SCWQP. Farmers may receive technical and financial assistance to install BMPs.	acres (annual)	764,630	764,630	764,630	$11.7 M
Conservation Tillage	Conservation Tillage involves planting and growing crops with minimal disturbance of the surface soil. No-till farming, a form of conservation tillage, is used to seed the crop directly into vegetative cover or crop residue with no disturbance of the soil surface. Minimum tillage farming involves some disturbance of the soil, but uses tillage equipment that leaves much of the vegetative cover or crop residue on the surface. The potential is 764,630 acres.	acres (annual)	764,630	764,630	764,630	
Continuous No-Till Conservation	Of the 764,630 acres in conservation tillage maintain 150,000 acres of continuous no-till farming, a form of conservation tillage in which seed is applied into the vegetative cover or crop residue with no disturbance of the surface soil. Conservation Tillage involves planting and growing crops with minimal disturbance of the surface soil. No-till farming, a form of conservation tillage, is used to seed the crop directly into vegetative cover or crop residue with no disturbance of the soil surface. Minimum tillage farming involves some disturbance of the soil, but uses tillage equipment that leaves much of the vegetative cover or crop residue on the surface.	acres (annual)	150,000	150,000	150,000	$3 M

Strategy	Description	Units	2010-2011	2012-2017	Total	Estimated Cost
Water Control Structures	Construct Water Control Structures on 7,250 acres. These structures are used in constructed drainage systems to control water depth and flow rates. They also increase water retention and decrease the quantity and quality of pollutants downstream. Cost-Share funds are available for the installation of these structures through the Maryland Agricultural Water Quality Cost-Share (MACS) program and USDA's Environmental Quality Incentives Program (EQIP).	acres	2,050	5,200	7,250	$0.98 M
Stream Protection with Fencing	Protect 3,800 acres of Pastureland Using Fencing. Pasture fencing keeps farm animals out of streams and prevents streambank erosion. Cost-Share funds are available for the installation of these systems through the Maryland Agricultural Water Quality Cost-Share (MACS) program and USDA's Environmental Quality Incentives Program (EQIP).	acres	3,000	800	3,800	$0.35 M
Stream Protection without Fencing	Utilize Stream Protection without Fencing on 3,000 acres. Watering troughs provide a safe, reliable source of water for livestock that is away from streams. The troughs help protects stream banks from erosion that may be caused by farm animals. Cost-Share funds are available for the installation of these systems through the Maryland Agricultural Water Quality Cost-Share (MACS) program and USDA's Environmental Quality Incentives Program (EQIP).	acres	1,800	1,200	3,000	$0.37 M
Streamside Grass Buffers	Plant 7,000 acres of Streamside Grass Buffers on Private Lands. Grasses planted next to waterways filter and take up nutrients coming off the land, stabilize the soil and provide wildlife habitat. Cost-Share funds are available for the implementation of grassed buffers on agricultural land through the Maryland Agricultural Water Quality Cost-Share (MACS) program, 2010 Chesapeake Bay Trust Fund and USDA's Conservation Reserve Enhancement Program (CREP).	acres	1,600	5,400	7,000	$1.27,M

Strategy	Description	Units	2010-2011	2012-2017	Total	Estimated Cost
Streamside Forest Buffers	Plant 3,000 acres of Streamside Forest Buffers on Private Lands. Trees planted next to waterways filter and take up nutrients coming off the land, stabilize the soil and provide wildlife habitat. Cost-Share funds are available for the implementation of riparian forest buffers on agricultural land through the Maryland Agricultural Water Quality Cost-Share (MACS) program, 2010 Trust Fund and USDA's Conservation Reserve Enhancement Program (CREP).	acres	500	2,500	3,000	$4.9 M
Wetland Restoration	Construct 1,000 acres of Wetland Restoration on Private Lands. A wetland is an area of land where the soil is wet or covered with water. Wetlands are often called swamps, marshes, or bogs. Cost-Share funds are available for the implementation of wetlands on eligible agricultural land through the Maryland Agricultural Water Quality Cost-Share (MACS) program, 2010 Chesapeake Bay Trust Fund and USDA's Conservation Reserve Enhancement Program (CREP). Funding for wetlands creation, restoration, and enhancement is also available from various federal sources, State and local governments and nonprofit organizations.	acres	550	450	1,000	$3.375 M
Retire Highly Erodible Land	Retire 2,300 acres of Highly Erodible Land on Private Lands. Land that is especially vulnerable to erosion is removed from crop or hay production and is planted in either grass or forest. This land usually is not disturbed for at least 10 years. Cost-Share funds are available for the retirement of highly erodible agricultural land through the Maryland Agricultural Water Quality Cost-Share (MACS) program, 2010 Chesapeake Bay Trust Fund and USDA's Conservation Reserve Enhancement Program (CREP).	acres	1,800	500	2,300	$3 M
Cropland Irrigation Management	Crop irrigation is used to decrease climatic variability and maximize crop yields. This results in a decrease in runoff and an increase in the crop's ability to uptake nutrients therefore less available for nutrient runoff. Yields are 20% to 25% higher than in un-irrigated fields. Nutrient uptake of irrigated acres are greater, resulting in less residual nutrients remaining in the soil for runoff.	acres (annual)		40,616	40,616	$1.2 M

Strategy	Description	Units	2010-2011	2012-2017	Total	Estimated Cost
Vegetative Environmental Buffers	A vegetative environmental buffer, or VEB, is the strategic planting of combinations of trees and shrubs around poultry houses to address environmental, production, and public relations issues by providing a vegetative filter to lower emissions of ammonia, dust, odor, feathers, and noise on a potential of 75 acres. In addition to offering a practical, efficient, and cost-effective means of capturing emissions, a properly designed VEB program can help to conserve energy and reduce air-borne pathogens by offering shade and slowing wind speeds, as well as create a more attractive landscape and screen routine operations from view.	operations	50	250	300	$0.75 M
Vegetated Open Channels	A suite of innovative alternative practices designed to enhance the removal of nutrients once they leave the field. These include increasing vegetative buffers that protect ditches from sediment and nutrient runoff. This may include reengineering of drainage channels to reestablish floodplains or redirect storm flows to wetland areas.	acres		1,212	1,212	$1.8 M
Stream Restoration Non-Coastal Plain	Restoration of drainage channels and streams utilizing stream recreation techniques. Options include in stream and riparian wetlands, designing channels to reestablish natural flow paths, and establishing habitat.	miles		2	2	$0.9 M

Strategy	Description	Units	2010-2011	2012-2017	Total	Estimated Cost
Agriculture-	**Managing Animal Wastes and Phosphorus**					
Addressing the Phosphorus Imbalance- Alternative uses of manure and revision of the P Site Index for nutrient management	Addressing the phosphorus balance requires a systematic approach to provide tools and technology that will work synergistically for the farmer and the environment. Maryland's goal is to provide sufficient soil phosphorus availability for agronomic optimum crop production while simultaneously minimizing the potential for off-site phosphorus losses from agricultural production fields to natural water bodies. The State of Maryland will support development of a revised P Site Index that incorporates the best available science in an effort to more appropriately identify the risk for phosphorus loss from agricultural lands. The expected revisions of the current P Site Index will more accurately assess P transport and delivery pathways across different landscapes, will incorporate site-specific soil P saturation information, and emphasize the importance of immediate manure and biosolids incorporation following land application. Initial preliminary review of probable revisions to the P Site Index indicates significant reductions in cropland eligible to receive additional phosphorus, particularly in areas of historically high concentrations of animal agriculture. These outcomes require management solutions that must also include economically viable alternative uses of animal manures, biosolids and other organic wastes. Development of market-based solutions that include value-added or energy-related technologies is essential.					
Manure Transport	Transport an additional 10,000 tons of manure out of the watershed for 2010-2011 and an additional 25,000 tons for 2012-2017. Excess manure is transported away from farms with high soil phosphorus levels to other farms or locations that can use the manure safely. 50% of the funding for this program is available through the Maryland Agricultural Water Quality Cost Share Program (MACS). The remaining 50% of the funds is provided by Special Funds (Poultry Companies match). Cost-share is also provided for transporting excess manure from Dairy operations.	tons (annual)	60,000	85,000	85,000	$6.75 M

Strategy	Description	Units	2010-2011	2012-2017	Total	Estimated Cost
Dairy Manure Incorporation Technology	Implement Dairy Manure Incorporation Technology on 2,500 acres for 2010-2011 and an additional 2,500 acres for 2012-2017. Dairy manure is incorporated into the soil at the time of application utilizing low disturbance technology. Ammonia loss from incorporation will be reduced up to 95% compared to surface application. Initial cost-share funding is through a demonstration grant supported by the Chesapeake Bay Trust (CBT). Evaluation by MDA and NRCS technical workgroups for cost-share funding will be done to determine eligibility for cost-share funding through the Maryland Agricultural Water Quality Cost-Share (MACS) program and USDA's Environmental Quality Incentives Program (EQIP).	Acres (annual)	2,500	5,000	5,000	$0.78 M
Poultry Litter Incorporation Technology	Use Poultry Litter Incorporation Technology on 2,500 acres. Poultry litter is incorporated into the soil at the time of application utilizing minimum disturbance technology which significantly reduces ammonia loss. Initial 2 years of funding through USDA Conservation Innovative Grants (CIG) and National Fish and Wildlife Foundation (NFWF) grant sources.	acres (annual)		2,500	2,500	$0.35 M
Poultry Waste Structures	Construct 53 Poultry Waste Structures. These structures protect poultry waste from rain so that it can be used as a crop fertilizer when conditions are right or transported to another location. Cost-Share funds are available for the installation of these structures through the Maryland Agricultural Water Quality Cost-Share (MACS) program and USDA's Environmental Quality Incentives Program (EQIP).	structures	50	3	53	$0.48 M
Livestock Waste Structures	Construct 145 Livestock Waste Structures. Animal waste is stored in structures to protect it from the weather until it can be used as a crop fertilizer when conditions are right or transported to another location. Cost-Share funds are available for the installation of these costly systems through the Maryland Agricultural Water Quality Cost-Share (MACS) program and USDA's Environmental Quality Incentives Program (EQIP).	structures	80	65	145	$5.5 M

Strategy	Description	Units	2010-2011	2012-2017	Total	Estimated Cost
Runoff Control Systems	Construct 180 Runoff Control Systems. Runoff control systems use a variety of techniques to direct rainwater to places where it won't cause nutrient runoff or soil erosion. Gutters and downspouts on barns and grading of the land are examples of ways to direct runoff from rainfall. Cost-Share funds are available for the installation of these systems through the Maryland Agricultural Water Quality Cost-Share (MACS) program and USDA's Environmental Quality Incentives Program (EQIP).	systems	75	105	180	$0.22 M
Phytase	With the advent of phytase addition to the diet and feed for all poultry in Maryland we have seen a steady reduction in the phosphorus levels in the manure. In early 2004 the Bay Program documented a 16% reduction in P. More recent results show a 24% reduction. The research shows up to a 33% reduction is easily achievable. 16% is the current reduction efficiency in the model. This efficiency will be increased to a 24% reduction efficiency adjustment immediately, followed by a 32% proposed reduction efficiency as supported by field demonstrations.	Percent reduction (annual)	24%	32%	32%	
P-sorbing Materials	"Phosphorus-sorbing" materials soak up dissolved phosphorus, keeping it from flowing downstream on a potential of 1,000 acres. Engineered systems in which drainage water passes through phosphorus-sorbing materials, such as gypsum, drinking water treatment residuals , or acid mine drainage residuals, can potentially remove large percentages of phosphorus as well as sediment, heavy metals, and other pollutants.	acres (annual)		1,000	1,000	$0.75 M
Poultry Litter Treatment	A surface application of an acidifier is added to poultry litter to acidify poultry litter and maintain ammonia in the non-volatile ionized form (ammonium) in the poultry house. Proposed treatment of 96,000 tons. Consider use of the Chesapeake and Coastal Bays Trust Fund for support. Limited funding through Farm Bill programs.	tons (annual)		96,000	96,000	$3.3 M
Mortality Composters	Requires dead bird composters at all poultry operations for bird mortality,	composters	20	125	145	$1.01 M

Strategy	Description	Units	2010-2011	2012-2017	Total	Estimated Cost
Agriculture-						
Nutrient Management Compliance	Maryland law requires farmers to implement Nutrient Management Plans that require they efficiently use manure or fertilizer needed to grow a healthy crop and ensure that excess nutrients are not lost to the environment. 1,325,004 acres are subject to the requirement to have and implement a nutrient management plan. MDA implementation inspections average a compliance rate of 75%.	acres (annual)	993,753	993,753	993,753	$29.1 M
Decision / Precision Agriculture	Use Precision Agriculture on 100,000 acres of farmland from 2010-2011 and 220,000 acres from 2012-2017.. Precision agriculture seeks to maximize the efficiency of nutrient application to cropland, thereby minimizing waste and nutrient runoff to the Bay.	acres (annual)	100,000	220,000	220,000	$13.71 M
100-ft CAFO setbacks	100 foot or 35 foot required setbacks for CAFO manure application on a potential of 2,500 acres. Based upon EPA regulations for CAFOs the infield spreading of manure is restricted.	acres (annual)		2,500	2,500	
10-ft riparian setbacks for application of crop nutrients	Require 10 ft application setbacks for the application of crop nutrients, bringing consistency to several programs regulating nutrients on a potential of 5,280 acres.	acres (annual)		5,280	5,280	

Strategy	Description	Units	2010-2011	2012-2017	Total	Estimated Cost
Natural Filters on Public Land						
Tree Planting - Forest Brigade	Plant one million trees on public lands by 2011 through the Department of Public Safety and Corrections Forest Brigade.	acres	1,550		1,550	
Wetland Restoration	Implement 555 acres of Wetland Restoration on public land. A wetland is an area of land where the soil wet or covered with water. Wetlands are often called swamps, marshes, or bogs. Dedicated funding is available through Maryland's Tributary and Wetland Restoration fund. Other potential funding sources include Maryland's Ecosystem Enhancement Program, Program Open Space, Chesapeake and Atlantic Coastal Bays 2010 Trust Fund, as well as competitive funding programs such as the Transportation Enhancement Program and Corporate Wetlands Restoration Partnership.	acres	555	600	1,155	$9.186 M
Streamside Forest Buffers	Plant 345 acres of Streamside Forest Buffers on public land. Trees planted next to waterways filter and take up nutrients coming off the land, stabilize the soil and provide wildlife habitat. Dedicated funding is available through Maryland's Tributary and Wetland Restoration fund. Other potential funding sources include Maryland's Ecosystem Enhancement Program, Program Open Space, Chesapeake and Atlantic Coastal Bays 2010 Trust Fund, as well as competitive funding programs such as the Transportation Enhancement Program and Corporate Wetlands Restoration Partnership.	acres	345	300	645	$2.213 M
Tree Planting - Other	Plant 450 acres of trees on public lands. Trees planted next to waterways filter and take up nutrients coming off the land, stabilize the soil and provide wildlife habitat. Potential funding sources include Maryland's Ecosystem Enhancement Program, Program Open Space, Chesapeake and Atlantic Coastal Bays 2010 Trust Fund, as well as competitive funding programs such as the Transportation Enhancement Program and Corporate Wetlands Restoration Partnership.	acres	450	3,000	3,450	$4.539 M

Strategy	Description	Units	2010-2011	2012-2017	Total	Estimated Cost
Streamside Grass Buffers	Plant 69 acres of Streamside Grass Buffers on public land. Grasses planted next to waterways filter and take up nutrients coming off the land, stabilize the soil and provide wildlife habitat. Dedicated funding is available through Maryland's Tributary and Wetland Restoration fund. Other potential funding sources include Maryland's Ecosystem Enhancement Program, Program Open Space, Chesapeake and Atlantic Coastal Bays 2010 Trust Fund, as well as competitive funding programs such as the Transportation Enhancement Program and Corporate Wetlands Restoration Partnership.	acres	69		69	
Grassland	Restore 45 acres of Grassland on public land. Grass planted next to waterways filter and take up nutrients coming off the land, stabilize the soil and provide wildlife habitat. Potential funding sources include Maryland's Ecosystem Enhancement Program, Program Open Space, Chesapeake and Atlantic Coastal Bays 2010 Trust Fund, as well as competitive funding programs such as the Transportation Enhancement Program and Corporate Wetlands Restoration Partnership.	acres	45		45	
Natural filters on Other Public Lands	Maryland will increase partnerships with local governments, non-profits, universities, other state agencies to implement natural filters.	Acres		600	600	$8.725 M
Air						
Maryland Healthy Air Act	Implement Maryland's Healthy Air Act (effective January 1, 2009). The emission controls on power plants will reduce nitrogen entering the Bay by over 300,000 pounds each year.	Pounds per year	Approximately 300,000 (the first phase of the HAA was implemented in 2009)	305,882 (the second phase of the HAA will be implemented on 1/1/2012	305,882 lbs per year	1.8 to 3.0 billion dollars to implement by 2013
Expand Diesel Engine Retrofit Program	Currently the Port of Baltimore partnered with the Environmental Finance Center to use stimulus money to retrofit dirty diesel truck engines to 'clean diesel' technologies for the Clean Air Act. It is estimated the project will reduce NOx emissions by 7 tons per year.	Pounds per year	approximately 43 lbs per year	approximately 43 lbs per year	approximately 43 lbs per year	Approximately $800,000 in 2010/11

Strategy	Description	Units	2010-2011	2012-2017	Total	Estimated Cost
Low Emission Vehicle Requirement	In 2007, Maryland passed Clean Cars Legislation, which requires by 2011 that all new cars meet the strictest emissions standards allowed under federal law.	Pounds per year	This program starts with the 2011 Model Year	approximately 2,000 lbs per year	approximately 2,000 lbs per year	Approximately $1,000 per new car purchased (it is estimated that about 200,000 new cars are sold in MD annually)

Reasonable Assurance

Maryland has strengthened the reasonable assurance in the Plan by expanding the Phase I Watershed Implementation Plan to include additional detail, timelines and schedules as appropriate. Key additions include:

- Outlining a strategy to address the Bay Restoration Fund shortfall in funding to complete the necessary upgrades for wastewater treatment plants. In addition to ensuring the necessary cash flow is available for 2012 and outlining steps to close the funding gap, a commitment to incorporate ENR discharge limits into NPDES permit renewals and a contingency to reduce funding from full to partial grant is included to ensure reasonable assurance.

- Outlining a stategy to ensure available funding for stormwater controls. In 2011, Maryland commits to convening formal discussion with stakeholders to determine funding options, schedules, and most cost effective practices with local government. In 2012, if the creation of local utilities or other systems of charges to support stormwater programs such as those that currently exist in 5 Maryland jurisdictions, is not underway, Maryland will seek legislation requiring development of local stormwater utilities. Alternative cost effective practices include forest buffer planting, stream restoration, wetland restoration, pavement removal and operational practices. Selection of practices and timing of implementation will be based on cost-effectiveness, pollutant removal efficiency and maximizing available funding. The State Highway Administration which also complies with this requirement has determined that based on rough cost estimates, the use of cost effective practices which achieve the same reduction in pounds of pollutants, may reduce costs by as much as two-thirds. The State also commits to pursue federal funding for stormwater projects on three tracks: a federal funding authorization, a formal agreement for retrofits at federal facilities and a commitment from the U.S. Army Corps of Engineers.

- To ensure appropriate contingencies are in place for agricultural practices, if the goals for best management practices are not met, Maryland has added a commitment to put in place a regulatory requirement for the use of cover crops in 2014 on agricultural acres for which manure or bio-solids (sewage sludge) are applied,

- Schedules are provided for:
    - Upgrades of certain major industrial discharges;
    - Evaluation of minor industrial discharges;
    - Retrofits at major federal WWTPs;
    - Evaluation of potential upgrades a minor municipal discharges; and
    - Enhancing permit requirements for MS-4 Phase I jurisdictions
    - Enhancing permit requirements for MS-4 Phase II jurisdictions
    - Phasing in the upgrade of additional septic systems

The schedules rely heavily on work to be conducted in collaboration with all stakeholders in 2011 to develop the most cost effective options for implementation.

Accounting for Progress in Reductions: Maryland identifies implementation targets in the Watershed Implementation Plan. Accounting, Tracking and Reporting are an important part of the Plan strategy and progress will be closely monitored for the two year milestones by tracking both implementation and water quality. However, it is important to note that the Plan incorporates the concept of adaptive management. Adaptive management requires that projections be made as to how to meet a goal and recognizes that in complex projects such as this, changes will be necessary. Implementation targets are surrogates for actual pound reductions and, as needed, Maryland may determine that targets for one practice may be reduced and increased for another to meet goals. The critical commitment is the nutrient reduction represented by an implementation practice. As long as the required reductions are met, Maryland will meet its milestones.

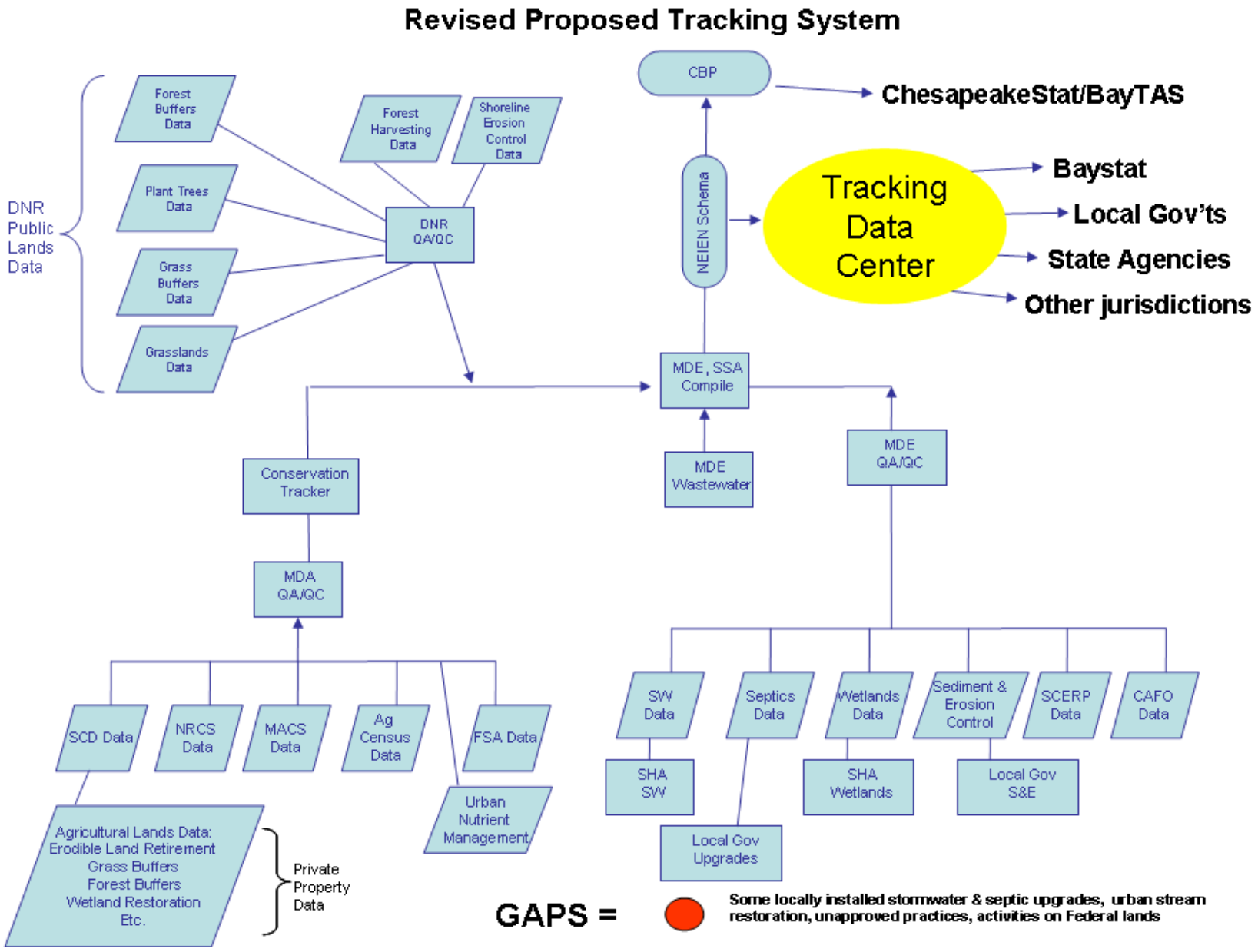
Element 6: Tracking and Reporting Protocols

This section of the Plan is organized in three main categories, point sources regulated under NPDES permits, non-point sources including regulated stormwater and agricultural BMP tracking and reporting. It describes the current implementation tracking and reporting procedures for each of the source sectors. It also describes procedures for verifying the practices are actually installed. The information being tracked supports the Bay Program annual evaluations of implementation (model inputs), Maryland's BayStat, and other information needs. An overview of the key elements of the system, with proposed enhancements, is reflected in the chart on the next page.

A key need is improved acquisition of information from the source. In many cases the source of data are locally administered programs that face resource limitations in performing primary functions and view tracking and reporting as a secondary priority. The Bay TMDL limits and new nutrient offset requirements will create strong incentives to track and report control practices; however, staffing levels and funding are challenges.

The Chesapeake Bay Regulatory and Accountability Program (CBRAP) grant is providing resources to enhance the State's programs. A portion of the CBRAP funding is being directed toward the tracking and reporting function, notably for urban stormwater management, Concentrated Animal Feeding Operations (CAFOs) and nutrient management planning.

A third priority is enhancement of tracking data management after the work is done and the results are reported to the State. The Plan considers the establishment of a tracking data process, which is identified in the chart below. These functions are still being evaluated among the State agencies in coordination with similar federal systems under development that might serve some of the needs envisioned by the tracking data proposal.


Revised Proposed Tracking System
CBP
ChesapeakeStat/BayTAS
Forest Buffers Data
Forest Harvesting Data
Shoreline Erosion Control Data
Plant Trees Data
DNR Public Lands Data
DNR QA/QC
Grass Buffers Data
Grasslands Data
NEIEN Schema
Tracking Data Center
Baystat
Local Gov's
State Agencies
Other jurisdictions
MDE, SSA Compile
MDE Wastewater
MDE QA/QC
Conservation Tracker
MDA QA/QC
SCD Data
NRCS Data
MACS Data
Ag Census Data
FSA Data
Urban Nutrient Management
Agricultural Lands Data:
Erodible Land Retirement
Grass Buffers
Forest Buffers
Wetland Restoration
Etc.
Private Property Data
SW Data
Septics Data
Wetlands Data
Sediment & Erosion Control
SCERP Data
CAFO Data
SHA SW
SHA Wetlands
Local Gov S&E
Local Gov Upgrades
GAPS =
Some locally installed stormwater & septic upgrades, urban stream restoration, unapproved practices, activities on Federal lands

Element 7: Contingencies for Slow or Incomplete Implementation

The strategy options were refined and strategies for achieving the 2017 Interim Target are selected and outlined in this Plan. Each strategy is required to be accompanied by commitments that demonstrate reasonable assurance that the strategy will be implemented as outlined. As discussed briefly in Element 5, implementation commitments have been added to the Plan where necessary. In many cases, such as those related to strategies for which there are funding gaps, contingency actions have been outlined to ensure that if the implementation strategy is not ultimately achieved, an alternative implementation mechanism is identified.

Conclusion

By building this Plan on strategies that accelerate Maryland's proven programs; by proposing a set of strategies that exceeded the reductions required; and then by soliciting public comment on those strategies to inform the selection of final strategies and contingencies in the Final Plan, Maryland's Plan maximized the opportunity for meaningful public input and provides the necessary assurance that these critical reductions can be achieved by 2020.

This opportunity, combined with the realization that a restored Chesapeake Bay is finally within our sights, will guide our decision making over the next several years as we work hand in hand with all Marylanders including local governments, stakeholder organizations, farmers, scientists, and all who are interested in developing the most practical, cost effective means if implementation. We are confident of this process and the results it will produce based on the significant participation and positive results to date, as well as the commitment to devising solutions embodied in the comments on the draft Plan.

It is important to note the calculations made to estimate loadings, reductions, and percentage of progress will change based on changes to EPA's Bay model in early 2011. The model is currently being refined and the model data output is subject to change. For these reasons, this Plan has been finalized based on the best available scientific data currently available, with the understanding that the strategies will be refined during the Phase II process.

This Phase I Plan addresses challenging issues such as, reducing further pollution from point source and non-point source sectors, offsetting new pollution loads, and seeks to create incentives for best management practices and restoration. It is not possible to meet Maryland's pollution reduction requirements without each of these elements in the Plan.

This Phase I Watershed Implementation Plan outlines the basis for the strategy necessary to reduce Maryland's pollution loads by the amount required to restore water quality and will provide the foundation for a more detailed Phase 2 Plan in 2011 and the Phase 3 Plan in 2017.