



Chesapeake Bay Phase II Watershed Implementation Plan

Supporting Data and Preferred Strategies

City of Chesapeake, Virginia

Prepared by:

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Attachment

Hampton Roads Chesapeake Bay Phase II Watershed Implementation Plan

Introduction/WIP Strategies Development Process

The City of Chesapeake has been actively engaged in all aspects of the Chesapeake Bay TMDL development as well as the Phase I and II WIP development. City staff has participated in numerous state and regional meetings with the Virginia Department of Conservation and Recreation (DCR), the Virginia Department of Environmental Quality (DEQ), the Virginia Secretary of Natural Resources, and the U. S. Environmental Protection Agency (EPA). Staff has also participated in numerous educational events hosted by the state and EPA including educational webinars and conferences such as Environment Virginia. As an active member of the Virginia Municipal Stormwater Association, Chesapeake has actively engaged in dialogue and planning efforts with other localities throughout Virginia. The Hampton Roads Planning District (HRPDC) has facilitated the region's planning efforts for the Phase II WIP, as well as hosting numerous educational events over the past three years. The HRPDC efforts are summarized in the attached document titled "Chesapeake Bay Phase II Watershed Implementation Plan – Hampton Roads Regional Planning Framework, Scenario, and Strategies". In conjunction with the regional planning process, the City assembled an internal team headed by the Public Works Director and comprised of engineering, environmental, planning, schools, and other representative staff from departments likely to be affected by the Bay TMDL implementation process.

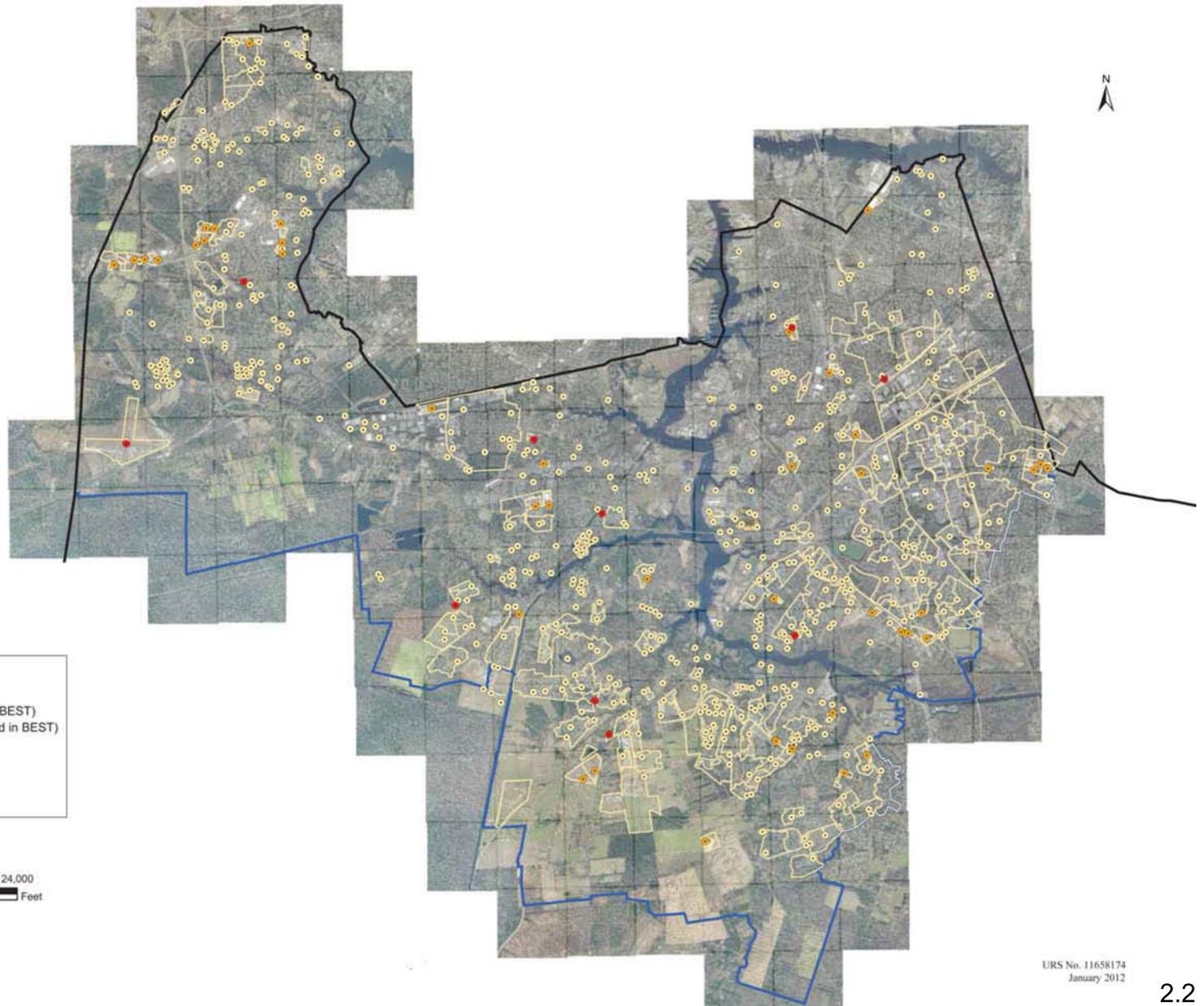
The City of Chesapeake retained the services of URS as part of a COE cost sharing agreement utilizing the Corps section 22 program, Water Resources Development Act of 1974 which has been provided by the U.S. Congress to assist the States in the preparation of comprehensive plans for the development, utilization, and conservation of water and related land resources. This planning assistance study includes the collection of corrected baseline data for submittal to DCR, including an updated BMP inventory, corrected land use data, corrected land cover data and the development of future scenarios /strategies for the City to meet required pollutant reduction goals established for the Chesapeake Bay clean up program.

BMP Inventory

The City of Chesapeake maintains a robust inventory of structural stormwater controls, commonly referred to as “best management practices” or BMPs. The inventory includes both publicly and privately owned BMPs. BMP Inspections are tracked by Public Works Stormwater technical staff utilizing a regional proprietary database known as “PARS”. Although detailed information on each documented BMP is not contained in this submittal, the City is willing to share this information with the Virginia DCR and/or EPA for use in the Chesapeake Bay Model and future versions of VAST.

Acres Treated by BMP Type

Wet Pond³	All (Total Acres)²	Acres	639.5
	Regulated Impervious Developed	Acres	348.4
	Regulated Pervious Developed	Acres	242.2
Dry Pond	All (Total Acres)	Acres	32.8
	Regulated Impervious Developed	Acres	15.3
	Regulated Pervious Developed	Acres	15.8
Extended Detention Pond⁵	All (Total Acres)	Acres	18.9
	Regulated Impervious Developed	Acres	17.3
	Regulated Pervious Developed	Acres	1.5
Urban Filtering Practices (Manufactured BMPs)	All (Total Acres)	Acres	19.1
	Regulated Impervious Developed	Acres	14.7
	Regulated Pervious Developed	Acres	4.3
Erosion And Sediment Control⁸	Regulated Construction	Acres	595.0
Erosion And Sediment Control⁸	Regulated Extractive	Acres	398.0
Street Sweeping⁹	Regulated Impervious Developed	Pounds	1,000,000
Adjustments (to correct data error in VAST)			
Agricultural Nutrient Management¹¹			
Landuse From	Landuse To		
Hightill With Manure	Nutrient Management Hightill With Manure	Acres	2146.0
Hightill Without Manure	Nutrient Management Hightill Without Manure	Acres	586.0
Lowtill With Manure	Nutrient Management Lowtill With Manure	Acres	1079.0
Degraded Riparian Pasture	Hay Without Nutrients	Acres	8.7
Animal Waste Management & Barnyard Runoff Control¹⁵		Acres	3.3
Wetland Restoration (ERP)¹⁷	All (Total Acres)	Acres	4.0
Rainwater Harvesting on City Property¹⁹	Regulated Impervious Developed	Acres	3.9
Nutrient Reductions from Bay Model vs. Corrected Land Use Acreages¹⁴			
	Regulated Construction 982.3 Acres (Bay Model) to 595 Acres from GIS data.	Acres	387.3
	Regulated Pervious to Forest	Acres	5136.0
Modeled # of Septic Systems	Actual # of Septic Systems	# of Systems	2338.0

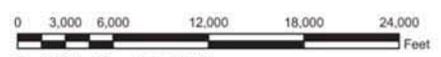


Existing BMP Points From PARS

- Existing BMP Points From PARS
- Existing BMP Installed After 2006 (Included in BEST)
- Existing BMP Installed After 2006 (Not Included in BEST)
- Existing BMP Service Area

Boundary

- City Boundary
- TMDL Boundary



See GIS for Complete Details

Existing BMPs

Chesapeake Bay TMDL Support
 City of Chesapeake, Virginia

URS No. 11658174
 January 2012

Land Use/Land Cover Corrections

Virginia DCR requested that Virginia localities evaluate and correct the land use and land cover data included the Bay Model for their respective localities. As part of its watershed planning efforts, Chesapeake has completed detailed watershed studies on over 160 square miles of the City using the EPA Storm Water Management Model (SWMM). The SWMM studies involved very detailed delineations of watershed and sub watershed boundaries throughout the City, including the complete watershed boundary of the Chesapeake Bay within the City of Chesapeake. The delineations were made using detailed GIS data, spot elevations, pipe connectivity, prior studies, development plans, surveying, field inspections, and reviews of each delineated boundary by City staff. This level of detail is substantially more involved than that used by the Chesapeake Bay Program Office (CBPO) to build the Chesapeake Bay Watershed Model. Not surprisingly, the detailed delineation differs considerably from that used by the CBPO. The incorrect boundary line is significant due to the resulting incorrect land uses (and associated pollutant loads) in the Bay model and VAST. This point will be addressed further in a later section of this report. For the purposes of this submission, Chesapeake's corrected watershed boundary has been used to provide more accurate land use and land cover information.

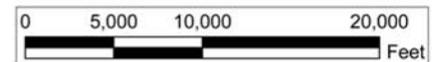
The city of Chesapeake does not currently have detailed imperviousness data in its GIS system, however, for the purpose of providing more accurate data to VA DCR, the City's consulting engineers reviewed watershed sub basin delineations from prior SWMM studies along with current, detailed aerial photography to estimate imperviousness within the sub watersheds draining to the Chesapeake Bay. In the future the City may undertake additional studies to refine this GIS data using other methodology, but the current process provides an accurate picture of Chesapeake's land cover. The land use information provided in the Bay Model and in VAST was grossly inaccurate, particularly for agricultural uses, regulated pervious developed, and forest land. The Bay Model also grossly overestimated the number of septic systems within the City of Chesapeake's Bay watershed boundary.

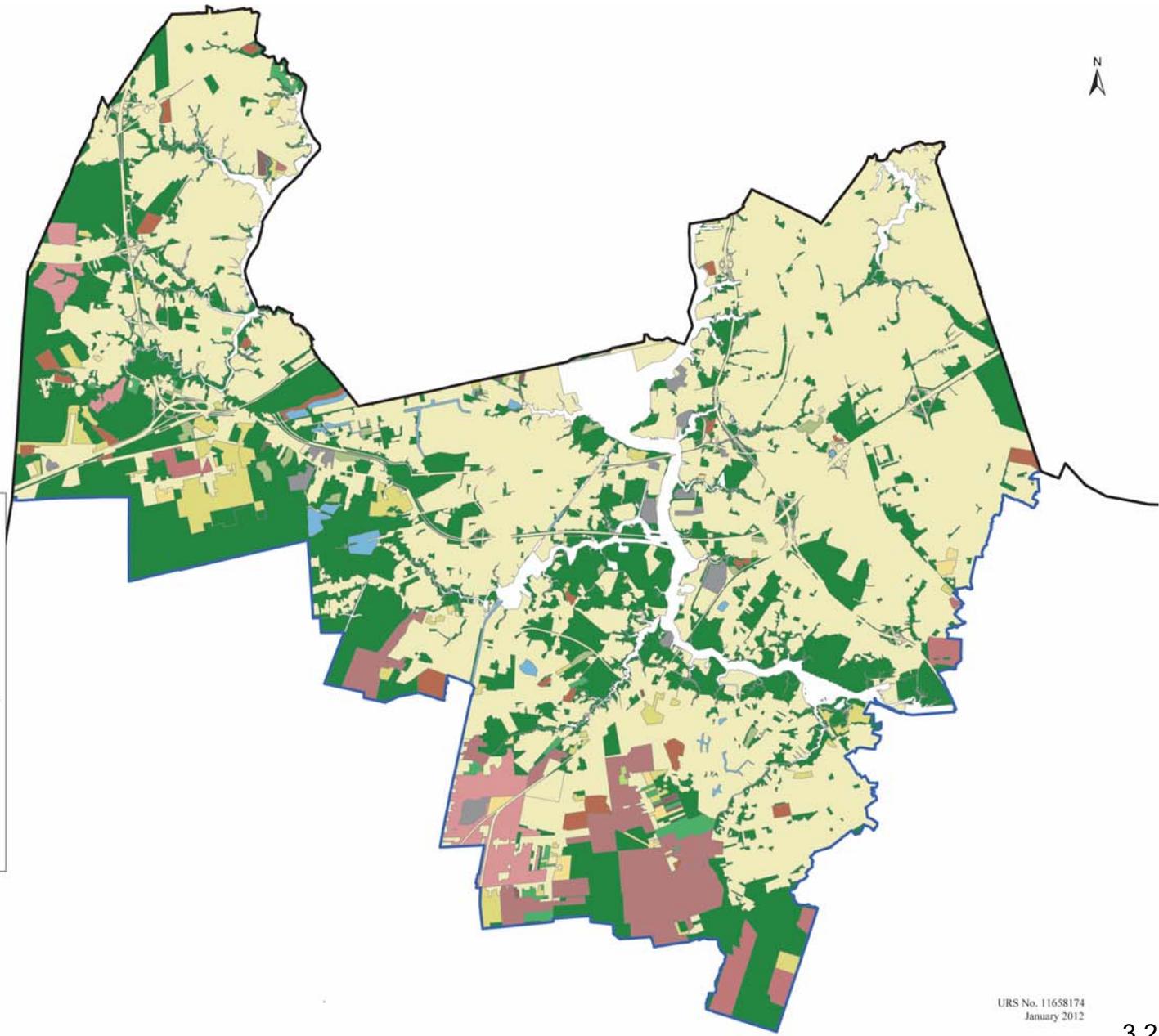
**CITY OF CHESAPEAKE, VIRGINIA
CHESAPEAKE BAY TMDL**



-  TMDL Boundary From SWMM Models
-  Chesapeake Bay Model Watershed

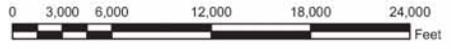
**Chesapeake Bay Watershed From EPA Bay Model
Vs. Chesapeake Bay Watershed From URS SWMM Models.**





Legend for the map:

- TMDL_Boundary (Blue line)
- LandUse**
- Forest (Dark Green)
- Harvested Forest (Light Green)
- Hay With Nutrients (Yellow)
- Hay Without Nutrients (Light Yellow)
- Hightill Without Manure (Dark Brown)
- Nutrient Management Hightill With Manure (Dark Red)
- Nutrient Management Hightill Without Manure (Red)
- Nutrient Management Lowtill (Light Red)
- Nursery (Light Green)
- Pasture (Green)
- Regulated (Yellow)
- Regulated Construction (Brown)
- Regulated Extractive (Grey)
- Water (Blue)



See GIS for Complete Details

Existing Land Use

Chesapeake Bay TMDL Support
City of Chesapeake, Virginia

URS No. 11658174
January 2012

2011 City of Chesapeake Land Use

Land Use Designation	Land Use Description	Acres
Agriculture		
hwm	hightill with manure	0
nhi	nutrient management hightill with manure	2,146
hom	hightill without manure	76
nho	nutrient management hightill without manure	586
lwm	lowtill with manure	0
nlo	nutrient management lowtill	1,079
hyw	hay with nutrients	230
nhy	nutrient management hay	0
alf	alfalfa	0
nal	nutrient management alfalfa	0
hyo	hay without nutrients	1,307
pas	pasture	320
npa	nutrient management pasture	0
trp	degraded riparian pasture	0
afo	nonregulated animal feeding operations	0
cafo	regulated animal feeding operations	0
urs	nursery	22
Urban		
rpd	regulated pervious developed	19,142
npd	nonregulated pervious developed	0
rid	regulated impervious developed	15,114
nid	nonregulated impervious developed	0
cpd	CSS (combined sewer system) on pervious developed	0
cid	CSS on impervious developed	0
ccn	CSS on construction	0
cex	CSS on extractive	0
rcn	regulated construction	595
rex	regulated extractive	398
nex	nonregulated extractive	0
Forest		
for	forest/woody	16,770
hvf	harvested forest	223
Water		
	water	358
Totals:		58,366

City of Chesapeake Livestock Populations within Chesapeake Bay Watershed

Animal Type	Animal #'s in Ches. Bay Watershed Model	Actual Animal #'s in Ches. Bay Watershed
Angora Goats	4	0
Dairy	98	0
Hogs for Slaughter	5583	100
Horses	1945	175
Layers	1032	90
Milk goats	30	5
Other Cattle	5008	250
Pullets	51	20
Sheep and Lambs	321	15
Turkeys	47	3
Total	14,119	658

Technical Challenges and Limitations

There are many known (and unknown) problems with the models, tools, and data used to produce the Chesapeake Bay TMDL. Doug Domenech, Virginia Secretary of Natural Resources, summarized DCR's opinions about the inadequacy of the Chesapeake Bay Watershed Model (CBWM) in his September 28, 2011 letter to Shawn Garvin, EPA Regional Administrator. In his letter, Secretary Domenech stated, "...when used on a local government level outrageous anomalies occur in the model that are inconsistent with current scientific knowledge." He continued, "It is clear that the model, as currently constructed, is not capable of producing meaningful, realistic loading targets for use at the local level...."

Just as there are problems inherent with the model, there are also problems with the data that was input for the Final Chesapeake Bay TMDL (published on December 29, 2010). Land uses are inconsistent, watershed areas are incorrect (which proves to be particularly problematic for communities like the City of Chesapeake), BMPs were estimated, and data that was prepared at the state level was diluted when input to the Watershed Model (presumably because there was not enough time to work out the details). For example, DCR reported Virginia's animal populations to EPA by Hydrologic Unit Code (HUC). HUC designations are watershed boundaries that subdivide localities into smaller, more detailed sub watersheds. In other words, the Commonwealth provided the populations and locations of these animals to EPA. However, EPA took the populations and assumed an equal distribution by locality—presumably to save processing time. In the City of Chesapeake, that assumption results in erroneous over-populations of livestock within the City and, in particular, areas draining to the Chesapeake Bay. In reality, the northern portion of the City is much more developed, and the existing animal populations are primarily located in the rural, southern portion of the City, which is not located in the Bay watershed. The result is that the Bay Model and VAST indicate that Chesapeake is required to remove nutrient loads from 13,461 animals that do not actually exist in the Bay watershed. This is just one example of erroneous information discovered during this data review and collection effort.

The Chesapeake Bay Watershed Model (CBWM) has been referred to as the "World's Largest Environmental Model." Only a very small number of individuals and institutions can actually run the model—fewer still can make sense of its inputs and outputs. To facilitate planning at the local level, DCR contracted with the Interstate Commission on the Potomac River Basin (ICPRB) to develop a simpler assessment tool that would, among other features, standardize the input from the 96 Virginia municipalities required to submit WIP II data by February 1, 2012. The first iteration of the Virginia Assessment Tool (VAST) was distributed on October 11, 2011. While problems with the CBWM are somewhat understood, by comparison VAST is an entirely new undertaking. One of the main problems with VAST is the inability to run new scenarios based upon corrected land use. This single limitation creates the need for work-arounds to offset the effects of erroneous data related to land use and watershed area. It is important to note that the Land Use data being solicited by DCR for the February 1, 2012

WIP II submittal does not count toward reducing the target loads of the Bay TMDL. It is believed that EPA intends to use this 'correct' data in future model runs, but EPA has not indicated when or if the model will be run again prior to 2017.

VAST has other significant limitations related to the inability to change land use and watershed area. For example, BMPs are hardcoded computationally to land use. If a certain land use is zero in the current version of VAST, the municipality cannot compute pollutant load reductions from BMPs associated with that specific land use. VAST also has been undergoing coding changes as this data review and collection effort was underway, creating a bit of a moving goal post issue. Chesapeake's consultant also noticed that when a simple change was made from an initial VAST scenario, then deleted and re-computed, VAST could not reproduce the original result. This appears to be a problem that has recently been fixed. Unfortunately, the WIP II schedule allowed little room for testing and debugging.

In an attempted workaround for the animal population discrepancies, an effort was made to use VAST to "transport the manure from these animals out of the Chesapeake Bay watershed. Instead of decreasing the nutrients associated with the non-existent animals, there was a slight increase in Phosphorus and Nitrogen loads from agricultural lands. This was due to CBWM and VAST containing a built in assumption that agricultural crops have a certain nutrient requirement and if manure is removed in excess of this requirement, fertilizer will then be applied to the land. It was discovered that many such assumptions are hard-coded into the program codes for these models. In this case, the effect of removing the non-existent animals with such a workaround would be to increase pollutant loads.

The above issues are mentioned because they need to be taken into consideration when creating Watershed Implementation Plans. The regulatory schedule mandated by Executive Order 13508 has not been modified to deal with these issues.

Local Strategies and Resource Needs

In keeping with DCR's request to Virginia localities, the City of Chesapeake has developed a list of preferred strategies for meeting its load reduction targets. The spreadsheet provided by DCR was used as a template for the purpose of this submittal. The strategies presented herein are focused on opportunities for source control, public education, policy changes and enhancements, incentives, and structural controls. Given today's challenging economic climate, the City will be seeking the most cost effective methods by which to achieve pollutant reductions. Strategies will be prioritized based on their overall effectiveness and value to the tax and rate payers of Chesapeake, or "bang for the buck". Additionally, it is fully anticipated that the Virginia DCR, DEQ, and the EPA will ensure that other sectors located within the Bay Watershed but which the City has no direct control or authority over, will be expected to make reductions commensurate with their pollutant contributions to the watershed.

A number of the local strategies identified are largely dependent on resources and authorities which may not presently be available, but are identified in the Strategies Spreadsheet. They are also dependent on collaboration with and voluntary participation from private citizens and businesses, the agricultural sector, environmental organizations, and the Forestry sector. Chesapeake will also be relying on upcoming regulatory programs including the revised Virginia Stormwater Management Program Regulations, Virginia Regulations for the Application of Fertilizer to Non-agricultural Lands, Onsite Sewage Regulations, Agricultural Resource Management Plan Regulations, and revised Virginia Confined Animal Feeding Operations Regulations to have a significant impact on reducing nutrients and sediment to the Bay, however, the impact has not yet been quantified.

Strategy and Resources Reporting Template

NOTE: The strategies listed below are considered to be possible approaches that the City of Chesapeake will use in order to achieve the corrected nutrient load reductions as required. These are only possible options, additional methods will be considered as we strive to meet our goal. We reserve the right to use any combination of approved BMP to achieve compliance.

TYPE	SOURCE	BMP	STRATEGY	RESOURCE NEEDS
Capacity Building	Agriculture	BarnRunoffCont (Systems)	Coordinate with state to explore opportunities for areas to recommend Animal waste management & Barnyard Runoff Control	State will lead this strategy
Capacity Building	Harvested Forest	ForHarvestBMP (Acres)	Coordinate with the Department of Forestry to explore opportunities to implement site appropriate BMP for Forest Harvesting practices	State will lead this strategy
Capacity Building	Multiple	Multiple	Continue to enforce and explore new opportunities to install outlet protect measurement. This will allow energy dissipation and provide acceptable velocities for the point discharge into receiving waters.	
Capacity Building	Multiple	Multiple	Investigate areas to increase BMP service areas to include offsite drainage where appropriate during new development and redevelopment.	
Capacity Building	Multiple	Other (Specify)	Explore opportunities to incorporate shoreline restoration, shoreline enhancement and shoreline protection projects.	
Capacity Building	Multiple	Tree Planting (Acres)	Review city-owned and School properties for reforestation and tree planting opportunities	Identify funding and obtain support from affected stakeholders
Capacity Building	Septic	Septic Pump outs (systems) (Annual)	Investigate opportunities to develop a program to expand septic system pump out requirements to areas beyond the CBPA	Enabling legislation from general assembly
Capacity Building	Urban	Multiple	Review existing ordinances for potential modification in order to incentivize BMP retrofits on private property	
Capacity Building	Urban	Multiple	The City of Chesapeake will review city-owned properties for shoreline restoration and buffer enhancement opportunities.	Contingent upon identification of funding for land acquisition and implementation of high-value opportunities
Capacity Building	Urban	Other (Specify)	Encourage LID techniques for new stormwater management facilities where ideal site conditions exist	
Implementation	Construction	EandS (Acres) (Annual)	Continue to enforce Erosion and Sediment control regulations on construction activity	
Implementation	Combined Sewer System	Other (Specify)	Continue to eliminate sanitary sewer overflows in compliance with existing EPA/DEQ consent order.	State and federal consideration of financial burden to meet other significant Clean Water Act requirements
Implementation	Multiple	Other (Specify)	Investigate opportunities to implement nutrient management plans on city-owned and School properties	State assistance for writing plans
Implementation	Multiple	Other (Specify)	Continue to support groups such as the Elizabeth River Project in efforts to implement activities and projects such as oyster reefs, wetland restoration, shoreline stabilization, and the River Star program.	
Implementation	Septic	Septic Connections (systems)	Continue to partner with neighborhoods to convert unserved sanitary sewer areas to city sewer.	Additional state funding such as grants or low interest loans
Implementation	Urban	Multiple	Implement DCRs revised Virginia Stormwater Management Regulations in 2014, and continue to enforce current water quality and quantity requirements for new development and redevelopment	Model ordinances, guidance, and funding from state
Implementation	Urban	Multiple	Locality will investigate opportunities to retrofit existing stormwater facilities built prior to 2006 to increase the water quality volume. Retrofits may include modifications such as adding a sediment forebay, baffles to increase hydraulic retention time, wetland bench, a series of high marsh, low marsh & pools, modifications to outlet structures, harvested wetlands or similar measures that would provide enhancement of water quality without having a negative flooding impact on the surrounding areas.	
Implementation	Urban	Other (Specify)	Continue with the illicit discharge detection and elimination program	
Implementation	Urban	StreetSweep (Acres) (Annual)	Continue the City street sweeping program	
Implementation	Urban	Urban Nutrient Management	Locality will encourage implementation of Urban Nutrient Management on private property.	State funding and support for private Urban Nutrient Management
BMP Implementation	Urban	Multiple	Continue the BMP inspection and maintenance program	
BMP Implementation	Urban	Multiple	The City of Chesapeake will continue to track sediment removal of maintenance activities (i.e. ditch cleaning, catch basin cleaning, pipe cleaning, yard waste pickup)	State and federal support to include this activity as a recognized BMP.
New BMP	Multiple	Multiple	The City of Chesapeake will evaluate the feasibility of designating "No Discharge Zones" within navigable Bay tributaries.	State support for this effort, local funding, and adequate pump out facilities must be available
New BMP	Nurseries	Other (Specify)	Encourage site appropriate water quality BMPs for recycle and reuse	
New BMP	Urban	Multiple	Conversion of garbage fleet to compressed natural gas. This will achieve a 30-50% reduction in NOx emissions over the current diesel powered fleet. 90% of the fleet will be converted by 2017 if current purchasing plan of 17 trucks in 2012 and 6 trucks per year thereafter is followed.	Continued city funding for fleet replacement and state guidance on how to estimate pollutant reductions and count this as a water quality BMP.
New BMP	Urban	Multiple	Explore areas to add new stormwater management facilities such as retention basins, detention basins, bioretention facilities, enhanced extended detention basins, constructed wetlands, dry swales, & green allies	Contingent upon identification of funding for land acquisition and implementation of high-value opportunities
New BMP	Urban	Other (Specify)	Continue rainwater harvesting practices on city properties	Encourage reconciliation of VDH requirements with state building codes for rainwater harvesting

Alternate BMPs

As a City located within the Chesapeake Bay Preservation Act (CBPA) area, and which is also a Phase I Municipal Separate Storm Sewer (MS4) locality, Chesapeake has had a fully implemented Storm Water Program in place for over 20 years. In this capacity the City controls storm water quality and quantity from public and private developed areas, enforces the Virginia Erosion and Sediment Control Program, maintains the storm water collection system, maintains roadways, controls illicit discharges to the storm sewer system, and undertakes other projects and activities which improve water quality. Virginia's Phase I WIP is largely focused on implementation of filtration, infiltration, and bioretention BMPs which are infeasible and ineffective in the Coastal Plain due to a naturally occurring high water table and poorly drained soils. A number of strategies and practices which can be very effective to reduce pollutant loads in Virginia's Coastal Plain are not included in the Chesapeake Bay Watershed Model or VAST. Chesapeake is requesting that the following "alternate" BMPs be accepted in Virginia; accounted for in future versions of the Bay Model and VAST; and that guidance on tracking and reporting these efforts be developed by Virginia and the Chesapeake Bay Program for use by Virginia localities:

1. Air Deposition – reduction in pollutant loads by elimination or closure of sources and implementation of cleaner technologies such as CNG, hybrid, or other alternative fuel technologies.
2. Sanitary Sewer Overflow Elimination and Reduction
3. Establishment of "No Discharge Zones" within navigable Bay tributaries
4. Oyster Reef Restoration and Construction
5. Submerged Aquatic Vegetation Restoration
6. Floating Wetlands – used to enhance treatment in existing wet ponds and retention basins
7. Wetland Restoration
8. Urban Tree Canopy – enhancement and preservation
9. Street Sweeping – the mass loading approach for reporting sediment removed should also account for the associated nitrogen and phosphorus also removed.
10. Catch Basin Cleaning and Storm Drain Vacuuming – similar to street sweeping, the nutrients associated with solid material removed from the MS4 should be credited.

11. Trash Removal, Yard Waste Collection, and Leaf Recycling
12. Pesticide Management
13. Public Education and Outreach Programs – examples include pet waste education campaigns and bag stations, rain barrel workshops, and fertilizer education
14. Shoreline Erosion Control, Outfall Stabilization and Improvements, and Off-shore Stabilization – these are viable opportunities to reduce pollutants
15. Structural BMP Retrofits
16. Structural BMP Enhancements and Restoration
17. BMP Conversions
18. Terminal Drinking Water Reservoirs – capture runoff and prevent sediment and nutrients from entering the Bay Watershed.

Further information and explanation of these alternate BMPs can be found in Section 4 of the HRPDC Regional WIP II Submittal, attached to this report.