

**Progress Report for 2016 and 2017  
on the Implementation of the  
2005 Reservoir Watershed Action Strategy**

June 1, 2018

## **Introduction**

The Reservoir Watershed Management Agreement of 2005 was accompanied by a *2005 Action Strategy for the Reservoir Watersheds*, which included a long list of policy commitments and program commitments reflecting many different aspects of watershed protection, restoration and management. This report notes the status of all of the commitments included in the 2005 Action Strategy.

## **Status of Action Strategy Commitments**

**Note:** The numbers refer to the numbering system used in the 2005 Action Strategy, and (in most respects) the text next to each number comes directly from the Action Strategy.

### **1.1 Monitoring**

1.1.1 Baltimore City will continue to conduct comprehensive water quality monitoring in the three reservoirs and in selected major tributaries. Concentrations of key pollutants of concern will be measured, and estimated annual loadings of sediment and total phosphorus will be calculated.

- The City performs fixed-interval monitoring at 16 tributary stations. This switched from dry weather monitoring as a result of recommendations in a 2011 USGS report. The City also performs monitoring at 12 in-lake stations. Because the City labs are short-staffed, it is not possible to do all the storm-event sampling/analysis that is needed. Yet the majority of annual phosphorus and sediment loadings to the lakes occur during and after storms. The limited storm-related monitoring data reduces the accuracy of annual loading estimates and makes difficult the detection of loading trends over time.
- A cursory analysis of the City's data reveals that chlorides continue to increase in the watersheds and in the reservoirs. While this trend has occurred ever since 1982 (and probably before), the rate of increase has not been as high ever since the occurrence of the historic drought of 2002 - 2003.
- Low streamflow rates during dry periods can increase the concentration of solutes such as chloride. There also were other trends noted which corresponded to the 2002-2003 period of drought--most notably a rise in nitrate concentrations and a fall in dissolved solids, as indicated by changes in specific conductance. Although nitrates are generally believed not to affect algal populations in the reservoirs, this trend should be followed closely, because nitrates and phosphorus (which is known to affect algae in the lakes) are often associated with each other.
- The factors most critical to water treatment processes and to water quality concerns in the reservoirs are phosphorus concentrations, algae levels (indicated by chlorophyll) and

dissolved oxygen. All of these parameters have continued to display tremendous ambient variability in the three reservoirs, not increasing or decreasing consistently over the period of record.

1.1.2 Baltimore County will continue to conduct chemical and biological sampling in the tributaries in its portions of the three reservoir watersheds, including its Randomized Biological Monitoring Program to assess general water quality in the three watersheds and its Baseflow Chemical Monitoring Program to assess dry-weather-flow water quality in the three watersheds. Results will be reported annually in Baltimore County's NPDES/MS4 report, submitted to MDE.

- **Chemical Monitoring:** Baltimore County continued chemical stream monitoring in the reservoir watersheds. As a result of the 2011 USGS report, baseflow monitoring was replaced with trend monitoring. The Trend Program is a fixed-site, fixed-interval chemical monitoring program that will better serve the needs of assessing watershed improvement (or degradation) and provide data for any future modeling. This monitoring program results in 12 samples, annually, from each monitoring station regardless of weather conditions. A total of 17 fixed sites are located in the three reservoir watersheds (Liberty – 3 sites, Prettyboy – 3 sites, and Loch Raven – 11 sites. In addition, chemical synoptic surveys were conducted in support of the Prettyboy Watershed Restoration Action Strategy, and two Loch Raven Reservoir Small Watershed Action Plans (Beaver Dam and Loch Raven East). Results are summarized in the Characterization Report – Chapter 3 for the respective SWAP area. See webpage: [www.baltimorecountymd.gov/Agencies/environment/watersheds/swap.html](http://www.baltimorecountymd.gov/Agencies/environment/watersheds/swap.html)
- **Bacteria Monitoring:** A bacteria monitoring program was initiated in June of 2010 in response to the development of bacteria Total Maximum Daily Load (TMDL) in 6 of Baltimore County watersheds. This program is conducted in cooperation with Baltimore City and Carroll County. The Carroll County samples, collected in the Carroll County portion of the Liberty Reservoir watershed are delivered to Baltimore County EPS for analysis of *E. coli*. Sites are selected based on the original sites monitored by MDE used for the development of the bacteria TMDLs. Four Liberty Reservoir sites were sampled ten times during 2016, and a fifth site was sampled only 9 times. Three of 5 sites in the Liberty Reservoir watershed exceeded the 126 geometric mean standard of 126 Most Probable Number (MPN) (average of nine or ten samples). However, comparing the results to the single sample “infrequently used full body contact recreation” standard of 576 MPN during low flows in the seasonal period, only three of the 18 samples collected exceeded the standard. For the Prettyboy Reservoir watershed, all of the 3 sites sampled exceeded the 126 MPN geometric mean standard (average of 17 samples). Four samples out of a total of 21 total samples during seasonal low flows exceeded the 576 MPN standard. In calendar year 2016, six of 7 sample locations in the Loch Raven Reservoir watershed exceeded the 126 MPN standard (mean of 17 samples at each site). 16 samples from a total of 52 samples during seasonal low flow periods exceeded the 576 MPN standard. Baltimore County also completed, in 2016, a two-year Subwatershed Prioritization Program. This program was intended to systematically sample and identify sources of fecal bacteria upstream of trend points. A total of 14 sites in the Liberty watershed, 16 in the Prettyboy Watershed, and 45 in the Loch Raven watershed were

sampled under this program. Detailed results are available in Baltimore County's 2016 NPDES report.

- **Biological Monitoring:** The Probabilistic Biological Monitoring Program has been in effect since 2003. This program randomly selects points in streams for macro invertebrate sample collection. It operates on an alternate year basis with the Patapsco/Back River Basin sampled in odd years, and the Gunpowder Basin sampled in even years. This program allows assessment of current stream conditions, as well as trends over time. The data is supplemented with a Reference Site Biological Monitoring Program to serve as controls, and a Sentinel Site Biological Monitoring Program to serve as a fixed site control over time. The results for the Gunpowder Basin in 2016 (most recent year of results) indicated 64% of the 50 sites sampled were considered to have fair – good biological water quality and only 16% were considered very poor, most of which were in the Bird River watershed. The corresponding data for the Liberty Reservoir watershed was collected in 2015 and found 60% of the sites sampled (5 sites) were classified as being fair – good.
- **Trash Monitoring:** In response to a trash impairment listing of the Northwest Branch and Middle Harbor, a Trash Monitoring Program was initiated in October 2010. While there are currently no monitoring sites in any of the reservoir watersheds, the data is related to land use and extrapolated to trash loads for watersheds not currently monitored. The calculated annual trash loads in the reservoir watersheds are 38,761 lbs., 266,591 lbs., and 27,366 lbs, for Prettyboy, Loch Raven, and Liberty reservoir watersheds, respectively.

1.1.3 The Reservoir Technical Group will evaluate the existing reservoir/watershed monitoring programs and will determine the resources needed to develop and maintain a monitoring program which will meet certain long-term informational/management objectives. Objectives from the 2005 Action Strategy are listed below.

- a) The evaluation of annual and long-term water-quality trends in the reservoirs and in their contributing watersheds, with emphasis on those parameters related to the use of the reservoirs as sources of potable water and to their ability to support desirable types of living resources (including the need to sample for sodium and for “disinfection byproduct” precursors);
  - b) The evaluation of both monitoring efforts and available predictive tools (such as computer models) for their effectiveness in helping to manage reservoir water quality;
  - c) The investigation and evaluation of new technologies (including “best management practices”) that might improve the effectiveness of ongoing reservoir watershed management efforts;
  - d) The evaluation of various types of pollutant sources in relation to current land use and land cover in the watersheds; and
  - e) The evaluation of the areal extent and adequacy of the existing monitoring networks, including the need to sample additional areas in Carroll County or in selected watersheds.
- USGS Study

- Report Reference: Koterba, M.T., Waldron, M.C., and Kraus, T.E.C., 2011, The water-quality monitoring program for the Baltimore reservoir system, 1981–2007—Description, review and evaluation, and framework integration for enhanced monitoring: U.S. Geological Survey Scientific Investigations Report 2011–5101, 133 p.
- In 2006, an agreement was reached between the RTG and the USGS on a detailed “scope of work” for a study to evaluate the current in-lake and tributary monitoring datasets and to recommend possible improvements in the future monitoring efforts.
- The \$126,000 study was completed in 2011, with the USGS submitting the water quality monitoring assessment report to the RTG. (Access the report at <https://pubs.usgs.gov/sir/2011/5101/>)
- The City has committed to a comprehensive quality assurance plan for its ongoing monitoring program, in response to the report’s findings.
- As a result of this study, both Baltimore City and Baltimore County switched from a dry-weather monitoring program, to a fixed-interval monitoring program.
- Center for Watershed Protection Study/ BMC/ EA Engineering, Science and Technology, Inc.
  - Report Reference: Center for Watershed Protection and EA Engineering, Science, and Technology, Inc. 2016, Final Draft: Baltimore metropolitan water supply system: watershed and reservoir monitoring plan and quality assurance project plan (QAPP): Prepared for the Baltimore Metropolitan Council, 96 p.
  - In 2015, BMC contracted with the Center for Watershed Protection to conduct a follow-up study to the 2011 USGS study. The member jurisdictions invested \$60,000 in this study (\$25,000 from Baltimore County, \$26,000 from Baltimore City, \$1,000 from Carroll County, and \$8,184 from Howard County).
  - Implementation of recommendations and associated funding arrangements are pending.

## 1.2 Reservoir Modeling and Predictive Analysis

1.2.1 MDE and its contractors, working in consultation with the RTG, will develop in-lake models of Prettyboy and Loch Raven Reservoirs. These models will be in support of MDE’s efforts to develop TMDLs (total maximum daily loads) for nutrients and sediments entering Loch Raven and for nutrients entering Prettyboy. (The TMDL program is required of the State (MDE) under the federal Clean Water Act.)

- Strategy complete. The EPA has approved the following TMDLs for the Prettyboy and Loch Raven reservoirs.
  - Fecal bacteria in tributaries only (2009)
    - [Loch Raven](#)<sup>1</sup>

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[http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/tmdl\\_final\\_loch\\_raven\\_reservoir\\_bacteria.aspx](http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/tmdl_final_loch_raven_reservoir_bacteria.aspx)

- [Prettyboy](#)<sup>2</sup>
- Methylmercury in fish tissue (2004)
  - [Loch Raven](#)<sup>3</sup>
  - [Prettyboy](#)<sup>4</sup>
- [Phosphorus and sediment \(2007\)](#)<sup>5</sup>
- The EPA has approved the following water quality analysis (WQAs) for heavy metals (2003).
  - [Loch Raven](#)<sup>6</sup>
  - [Prettyboy](#)<sup>7</sup>
- TMDL restoration plans are implemented through MS4 permits.

1.2.2 MDE, working with the RTG, will develop pollutant loading targets for Liberty Reservoir (expressed in maximum pounds per year), using the TMDL process or a suitable alternative method. MDE will consider funding this work through the Chesapeake Bay Restoration Fund.

- Strategy complete. The EPA has approved the following TMDLs and water quality analyses for the Liberty Reservoir.
  - [Fecal bacteria \(2009\)](#)<sup>8</sup> (in tributaries)
  - WQA: [Methylmercury in fish tissue \(2014\)](#)<sup>9</sup>
  - [Phosphorus and sediment \(2014\)](#)<sup>10</sup>
- [The EPA has approved WQAs for chromium and lead \(2003\)](#).<sup>11</sup>
- TMDL restoration plans are implemented through MS4 permits.

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[http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/tmdl\\_final\\_prettyboy\\_bacteria.aspx](http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/tmdl_final_prettyboy_bacteria.aspx)

<sup>3</sup> [http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/tmdl\\_final\\_lochraven\\_hg.aspx](http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/tmdl_final_lochraven_hg.aspx)

<sup>4</sup> [http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/tmdl\\_final\\_prettyboy\\_hg.aspx](http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/tmdl_final_prettyboy_hg.aspx)

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[http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/tmdl\\_final\\_gunpowder\\_p\\_sed.aspx#TMDL\\_Prettyboy\\_Reservoir\\_Nut](http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/tmdl_final_gunpowder_p_sed.aspx#TMDL_Prettyboy_Reservoir_Nut)

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[http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/wqa\\_lochraven\\_final\\_metals.aspx](http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/wqa_lochraven_final_metals.aspx)

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[http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/wqa\\_prettyboy\\_final\\_metals.aspx](http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/wqa_prettyboy_final_metals.aspx)

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[http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/tmdl\\_final\\_liberty%20reservoir\\_bacteria.aspx](http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/tmdl_final_liberty%20reservoir_bacteria.aspx)

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[http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/wqa\\_final\\_liberty\\_reservoir\\_mercury.aspx](http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/wqa_final_liberty_reservoir_mercury.aspx)

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[http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/TMDL\\_Final\\_Liberty\\_Reservoir\\_nutrient\\_sediment.aspx](http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/TMDL_Final_Liberty_Reservoir_nutrient_sediment.aspx)

<sup>11</sup> [http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/wqa\\_liberty\\_final\\_cr\\_pb.aspx](http://www.mde.state.md.us/programs/Water/TMDL/ApprovedFinalTMDLs/Pages/wqa_liberty_final_cr_pb.aspx)

## 1.3 Watershed Studies and Modeling

1.3.1 MDE will link its hydrologic and water quality model of the Prettyboy and Loch Raven watersheds with the in-lake models described in Section 1.2, in order to develop TMDLs for the two reservoirs and to allocate load-reduction goals among the various land uses in the respective watersheds.

- Strategy complete. The two watershed models have been updated by MDE, and the final Gunpowder TMDL report (Appendix D, dated June 2007) allocates load-reduction goals among the major source categories in each watershed (Loch Raven and Prettyboy).
- The watershed models used for the TMDL indicate that most of the phosphorus and sediment loads entering the two reservoirs wash off the landscape. (Point sources make up a very small percentage of the total annual loads.) To demonstrate compliance with the loading goals set forth in the TMDL, participants in the Reservoir Program (including MDA, MDE, Baltimore County, and Carroll County) have been asked to summarize changes in the watersheds since the baseline period (1992-97) that relate to nutrient and sediment loads to the Gunpowder reservoirs.
- The Maryland Department of Agriculture (MDA) has developed a statewide system for tracking agricultural BMPs built (for structural practices) or applied (for agronomic practices) in individual watersheds and during specified time periods. This was done in part to support Maryland's Tributary Strategies Program. The MDA system estimates the total pounds of nitrogen loadings reduced per (average) year and the total pounds of phosphorus loadings reduced per (average) year by BMPs applied in a specified watershed. Analysis can be done for any sequence of years selected. Members of the Reservoir Technical Group (RTG) have agreed to use this system to track changes in N and P annual loadings from agriculture in each of the three reservoir watersheds.
- Baltimore County calculates the reductions and reports them in its annual MS4 report, current and past reports available at:  
<https://www.baltimorecountymd.gov/Agencies/environment/npdes/index.html>

1.3.2 MDE will give high priority to the reservoir watersheds on the new statewide Priority List for Watershed Water Availability Studies. These studies will determine the availability of ground water and surface water sources to meet future water demands.

- Since the time of adoption of this action strategy, a State law was enacted which requires, among other features, that a Water Resources Element (WRE) be developed and adopted by counties and municipalities as a component of the local Comprehensive Plan. The WREs include a "water supply availability analysis" that compares current and future demands for public water in each area with the known and planned sources of water (wells, stream withdrawals, reservoirs, etc.). All counties have developed their WREs. Baltimore and Carroll Counties completed their WREs in 2010.

1.3.3 Baltimore and Carroll Counties will work with the RTG to conduct GIS-based landscape assessments of the reservoir watersheds and will develop appropriate "landscape indicators" for use in summarizing watershed conditions and tracking progress over time.

- Landscape assessments are used regularly in watershed planning as required, but are not specifically coordinated through the RTG and this action strategy.
- Action strategy no longer necessary as stand-alone strategy.

## 2.0 Point Source Management

2.0.1 Hampstead WWTP will continue to meet the requirements of its NPDES discharge permit (issued by MDE in 1997), which requires an effluent phosphorus concentration below 0.3 mg/l. Since its latest upgrade, the WWTP has consistently met this requirement.

- In 2004, MDE placed a temperature limitation of 68°F (20°C) on the Hampstead WWTP effluent.
- Hampstead WWTP has been allocated with 822 lbs/yr annual waste load allocation for TP from the Loch Raven Reservoir Phosphorus and Sediment TMDL (2007). The annual allocation for TP was based on a monthly average maximum of 0.30 mg/l effluent concentration and a design capacity of 0.90 MGD.
- Hampstead WWTP is currently being upgraded to an ENR WWTP. Effective October 2017, the County was issued dual (split) discharge permits: one to Piney Run and the other to Deep Run watersheds, with a total permitted discharge of 1.15 MGD. The Piney Run discharge permit (State #16DP0594, NPDES #MD0022446) includes an alternate effluent limit (AEL). This permit can be viewed on MDE's website at <http://mes-mde.mde.state.md.us/WastewaterPermitPortal/>. This project was initially discussed with Baltimore City on December 14, 2014, and subsequently reviewed by and concurred on by the RTG on January 14, 2015. This action was made possible by the completion of the Liberty Reservoir Phosphorus and Sediment TMDL for Baltimore and Carroll Counties, Maryland<sup>12</sup>.

2.0.2 Policy for **new** municipal discharges in the watersheds: The Department of the Environment (MDE), through its NPDES permit program, will discourage new discharges exceeding 1,000 gpd, except as needed to correct failing septic systems. In those cases, MDE will encourage land treatment of the plant effluent.

- Policy continues unchanged; MDE reports that there have not been any applications made for new municipal discharges in the watersheds for at least the last 10 years.

2.0.3 MDE, through its NPDES permit program, will discourage discharges from package sewage treatment plants intended to serve new residential communities and proposed to discharge in the reservoir watersheds.

- Policy continues unchanged; MDE reports that there have not been any applications made for new package treatment plant discharges in the watersheds for at least the last 10 years.

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<sup>12</sup> Maryland Department of the Environment. Total Maximum Daily Loads of Phosphorus and Sediments for Liberty Reservoir, Baltimore and Carroll Counties, Maryland. Submitted September 28, 2012. Approved May 7, 2014. Reference accessed at <http://mde.maryland.gov/programs/Water/TMDL/DataCenter/Pages/index.aspx>

2.0.4 Policy for **existing** industrial discharges in the watersheds: MDE, through its NPDES permit program, will set a phosphorus limit of 0.3 mg/l effluent concentration when each permit comes up for renewal, if phosphorus is present at any significant level in the waste stream.

- This policy continues unchanged.
- As of January 2009, the NPDES discharge permit in effect for the Congoleum WWTP (Liberty watershed) contained a total phosphorus (TP) limit of 2.0 mg/l effluent concentration. The NPDES discharge permit was reissued in February 2010 with phosphorus limits of 160 lbs/yr annual maximum, 0.30 mg/L monthly average, and 2.0 mg/L daily maximum.
- As of January 2009, the existing NPDES permit for the Weston WWTP (also in the Liberty watershed) contains no effluent limit for total phosphorus. MDE is reviewing the permit, and an average effluent concentration of 0.3 mg/l TP is under consideration for a new, revised permit.
- Effective October 2017, MDE issued a split discharge for the BTR Hampstead wastewater discharge (State #16DP0022, NPDES #MD0001881) and the Hampstead WWTP (State #16DP0594, NPDES #MD0022446). The effluent from BTR is currently being sent to the Hampstead WWTP for treatment, resulting in a net reduction in load to the Liberty Reservoir watershed. These permits can be viewed on MDE's website at <http://mes-mde.mde.state.md.us/WastewaterPermitPortal/>.
- Baltimore City periodically samples the effluent discharges of the Congoleum WWTP and the Weston WWTP.
- For the Congoleum WWTP (City data), a total of 58 samples were gathered between 2003 and 2008. Of these, the TP concentration in 50 samples was *below* 0.3 mg/l, and 8 samples had TP *above* 0.3 mg/l.
- For the Weston WWTP (City data), a total of 62 samples were gathered between 2003 and 2008. Of these, the TP concentration in 60 samples was *below* 0.3 mg/l, and just 2 samples had TP *above* 0.3 mg/l.

2.0.5 Policy for **new** industrial discharges in the watersheds: MDE, through its NPDES permit program, will discourage significant phosphorus discharges to the reservoir watersheds.

- Policy continues; MDE reports that there have been no new industrial discharges proposed in the watersheds in recent years.

2.0.6 When a phosphorus loading goal has been established through the TMDL process (see commitment item 1.2.1) for each reservoir, MDE, through its NPDES permit program, will not permit an increase in the total phosphorus loads delivered to the reservoirs.

- Strategy completed. EPA approved phosphorus and sediment TMDLs for Liberty reservoir in 2014.<sup>13</sup> Annualized individual loading allocations for TP were set for significant municipal and industrial dischargers. An aggregated allocation was set for insignificant industrial facilities and industrial stormwater dischargers.

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<sup>13</sup> Ibid (Page 7).



### **3.0 Nonpoint Source Management, Land Use and Resource Protection**

#### **3.1 Agricultural Practices**

3.1.1 The Baltimore County Soil Conservation District (SCD) and the Carroll SCD will continue to encourage farm owners/operators in the three reservoir watersheds to utilize their various technical and financial assistance programs for soil conservation practices and other measures to protect local water quality. This includes both the federal programs (from NRCS and FSA) and the state assistance programs that are delivered in cooperation with the two SCDs (see items below).

- These efforts are ongoing.

3.1.2 The Baltimore County SCD and the Carroll SCD (also referred to as “the two SCDs”) will give targeted attention to farms operated in the reservoir watersheds, and will adopt the long-term goal of preparing a “soil conservation and water quality plan” (SCWQ plan) for every farm in the reservoir watersheds.

- The two SCDs continue to work with farms in these areas to update or develop SCWQ plans.
- During 2008-2017, the Baltimore County SCD prepared 313 SCWQ plans (covering 21,556 acres) in the Loch Raven watershed, 93 plans (covering 5,372 acres) in the Prettyboy watershed, and 24 SCWQ plans (covering 1,075 acres) in the Liberty watershed.
- During 2008-2017 the Carroll SCD prepared 147 new SCWQ plans (covering 16,110 acres) in the Liberty watershed, 101 new SCWQ plans (covering 5,332 acres) in the Prettyboy watershed, and 15 new SCWQ plans (covering 831 acres) in the Loch Raven watershed.

3.1.3 The two SCDs will continue their efforts to follow up on the implementation by farmers in the watersheds of their existing SCWQ plans (i.e., plan maintenance) and to update all SCWQ plans that are 10 or more years old.

- During 2008-2017, the Baltimore County SCD helped farmers plan for and install/apply 716 BMPs in the Loch Raven watershed, 239 BMPs in the Prettyboy watershed, and 72 BMPs in the Liberty watershed. The BMPs included agronomic practices (such as cover crops, residue management, rotations) and more permanent structural measures (such as fencing, watering troughs, and grassed waterways).
- During 2008-2017, the Carroll SCD helped farmers plan for and install/apply 552 BMPs in the Liberty watershed, 140 BMPs in the Prettyboy watershed and 14 BMPs in the Loch Raven watershed. The BMPs included both agronomic practices and more permanent structural measures.

3.1.4 The two SCDs will continue to assist farmers in meeting the requirements of federal (USDA) laws and regulations, which require up-to-date SCWQ plans for all farms that apply for benefits under a variety of federal USDA programs.

- Efforts are ongoing.

3.1.5 The two SCDs will continue to assist farmers in meeting the requirements of Maryland laws and regulations, including:

- a) Maryland Agricultural Land Preservation Program requirements that participants develop and implement a SCWQ plan. The same plan requirements apply for the local land preservation programs and for Rural Legacy designation;
  - b) Maryland water-quality and sediment-control requirements, which utilize SCWQ plans to address pollution concerns;
  - c) Maryland state discharge permits for confined animal feeding operations, which require SCWQ plan components as part of a Comprehensive Nutrient Management Plan for such operations; and
  - d) The Maryland Water Quality Improvement Act, which requires farmers to implement animal waste management measures as part of a complete nutrient management plan.
- These efforts by the SCDs are ongoing.

3.1.6 The two SCDs will encourage farm owners and operators in the reservoir watersheds to use the Maryland Agricultural Cost-Share program (MACS) to help offset the costs of best management practice (BMP) implementation.

- These efforts continue.

3.1.7 The two SCDs will provide information and assistance to farm owners and operators in the watersheds to help them utilize the Low-Interest Loan Agricultural Conservation Program to cover the cost of implementing conservation measures.

- These efforts continue.

3.1.8 The two SCDs will promote and support farmer participation in various federal conservation programs, including EQIP (Environmental Quality Incentive Program), CRP (Conservation Reserve Program), CREP (Conservation Reserve Enhancement Program), WHIP (Wildlife Habitat Incentives Program), AMA (Agricultural Management Assistance) and other new programs as they become available. These programs typically provide funding or other incentives for the application of eligible BMPs on farms or for the removal of highly erodible areas from crop production.

- The two SCDs continue to encourage farms to use these programs.

3.1.9 The two SCDs will encourage and assist agricultural producers to comply with the requirements of their “nutrient management plans”, including the implementation of those soil-conservation, water-quality, and animal-waste-management BMPs which support the appropriate management of nutrient inputs to croplands.

- Efforts continue.
- The Maryland Water Quality Improvement Act of 1998 requires all farms that make \$2500 or more annually (or have 8 or more animal units) to have and implement a nutrient management plan. Beginning July 2005, all such plans were required to address

nitrogen and phosphorus as limiting nutrients, in accordance with the regulatory guidelines.

3.1.10 In support of the Maryland Water Quality Improvement Act of 1998, as well as the Reservoir Watershed Management Program, the Maryland Department of Agriculture (MDA) will:

- a) provide comprehensive educational programs developed for nutrient consultants, as well as operation-specific training and certification for farmers, nutrient applicators, and fertilizer users in urban/suburban areas;
  - b) offer related assistance to farmers through the MACS cost-share program;
  - c) support technical assistance provided through the SCDs and county Extension offices;
  - d) enforce the Act and its regulations, including taking action against noncompliant farms;
  - e) compile information and generate reports at the county and state levels on operator/farmer compliance with nutrient management plan requirements; and
  - f) with the development of an advanced database system, may generate nutrient plan implementation reports at both the county and watershed levels.
- MDA continues to carry out these functions and policies.

3.1.11 The signatories will work to evaluate the pollution potential from horse operations located in the reservoir watersheds. The two SCDs will expand outreach and assistance to those operations.

- During 2006, staff members reviewed literature on the water-quality impacts of sizeable horse operations. In general, the adverse effects of horse wastes and horse farms have not been studied as extensively as have the effects of cow, steer and swine operations.
- MDA has compiled data on the horse populations in each reservoir watershed, drawing solely upon MDA's "nutrient management plan" database. In comparison with other data (the 2002 Maryland Equine Census), the MDA numbers seem to be missing significant numbers of horses. This needs to be pursued further.
- At the end of 2007, the Baltimore County SCD and Carroll SCD was working with horse operations in the Loch Raven, Prettyboy and Liberty watersheds; projects included stream fencing, tree buffers and pasture management. The Small Equine project ended in approximately 2014. The project provided cost share for small equine operations, which are too small to qualify for the regular cost-share program.

3.1.12 Baltimore County DEPRM and the Baltimore County SCD will continue to provide technical review of proposed farm ponds in the county.

- Policy continues.

3.1.13 MDA and the two SCDs will target assistance to farmers with on-site problems having the potential to cause water pollution. Where polluting conditions are suspected to exist on a farm, the particular SCD will work with MDA and with the Maryland Department of the Environment (MDE) to follow the enforcement protocol developed pursuant to a Memorandum of Understanding among MDA, MDE, and the State Soil Conservation Committee.

- Policy continues.

3.1.14 MDE will continue to inspect each site (often a farm) proposed for sewage biosolids application, and may issue a permit which specifies the allowed application rate, taking the sludge nutrient content into consideration. An MDE inspector also visits the site/farm at the time the biosolids are being applied, to verify that permit conditions are being met.

- This regulatory program continues.

3.1.15 Baltimore City, the Carroll SCD and MDA will continue their cooperative agreement, under which the City partially funds an MDA position at the SCD to work with farmers in the reservoir watersheds, to help them implement agricultural BMPs. As a result of this and other funding, the Carroll SCD currently has three full-time staff who work in the reservoir watersheds.

- As of mid-2008, the Carroll SCD had one conservation planner and one technician working full-time with landowners in the reservoir watersheds. These positions are currently funded by Carroll County and the Chesapeake Bay Trust. Baltimore City no longer contributes funding to the position(s).

3.1.16 The signatories agree to investigate the possibility of increased staffing support for the Baltimore County SCD, so that more outreach and assistance effort can be focused on farms in the reservoir watersheds in the county.

- During 2006, the Baltimore Co SCD received a new, contractual position, supported with EQIP funds from USDA. The new employee focused on developing grazing plans for farmers (with an eye to minimizing erosion), as well as developing new overall farm plans. In 2007, his efforts were focused on farms in the Prettyboy watershed.
- During 2006, the Baltimore Co SCD also shared a technician with the Harford SCD. This was a temporary position supported with EQIP funds; it was terminated in March 2007.

3.1.17 The two SCDs, working with MDA staff and with the Reservoir Technical Group (RTG), will develop “indicators” of agricultural-pollution-reduction program effectiveness in the watersheds. These indicators should include measures of BMPs actually applied, which can be related directly to the need to reduce phosphorus and sediment inputs to the reservoirs. This is another effort which relates directly to documenting compliance with the Gunpowder TMDL (refer to the bullets for item 1.3.1).

- A background paper was developed by the RTG in October 2006 which summarized the types of BMP-progress-reporting the two SCDs already were required to do, and how that data might be related to estimates of cumulative nutrient load reductions achieved by farms in the reservoir watersheds.
- In response to a number of different ongoing watershed planning and tracking efforts, MDA has developed a system for recognizing certain farming BMPs (when installed in defined watersheds) and for estimating the annual pounds of N and P (runoff) loads reduced by each BMP applied. (The calculated “savings” are a function of the practice type and the acreage being treated.) Actions that are recognized by the MDA tracking system include different MACS-cost-shared BMPs (including both agronomic and

structural practices), the adoption of a farm-specific Nutrient Management Plan (based on the acres covered), the existence of a Soil Conservation and Water Quality Plan (acres) and the application of a winter cover crop (acres).

- The Reservoir Technical Group believes the MDA system to be sufficient, and a reasonable approach to “tracking” estimated changes in nutrient loads from agriculture in the watersheds, as called for in Reservoir Action Strategy item.

### **3.2 Sediment Control and Stormwater Infrastructure**

3.2.1 Baltimore and Carroll Counties will continue to implement State-mandated stormwater management regulations for all new development (including residential, commercial and institutional.) The current county regulations, amended to adhere to MDE’s year 2000 regulations and supporting Design Manual, provide for enhanced water quality protection and onsite groundwater recharge, as compared to the older local regulations. (The counties and the State Highway Administration are also subject to the state law, in connection with all new or reconstructed road projects.)

- Baltimore and Carroll Counties continue to maintain delegation with their stormwater and sediment control programs, as required by the NPDES MS4 permits.

3.2.2 Baltimore and Carroll Counties will continue to operate their respective programs for the periodic inspection of all existing stormwater management facilities in their jurisdictions. The two counties’ programs meet state/federal requirements for stormwater facility approval, inspection and enforcement, as set forth in their federal/state NPDES/MS4 (municipal stormwater) permits, which are issued in Maryland by MDE.

- Baltimore County and Carroll Counties continue to implement their stormwater programs per the requirements of their NPDES MS4 permit conditions.

3.2.3 In accordance with the conditions of their respective NPDES/MS4 permits, Baltimore and Carroll Counties will continue to carry out long-term studies of a few specified stormwater BMPs. Each county will estimate the annual nutrient load reductions (on a watershed basis) resulting from all completed capital projects (stormwater retrofits and conversions; stream restorations.) For projects located in the reservoir watersheds, the estimated nutrient reductions will be counted against the established nutrient-load-reduction goals.

- Between 1997 and 2017, Baltimore County completed 19 different water quality capital improvement projects in the Loch Raven drainage area. Through 2008, most of these were stream-restoration projects. Since 2015, there have been several stormwater management pond conversions. The County has calculated the average annual load reduction of total phosphorus, total nitrogen, and total suspended solids resulting from each project. (The numbers are presented in Table 10-5 in the County’s 2017 NPDES/MS4 report.)
- Baltimore County recently has calculated the annual pollutant-load-reductions (for total suspended solids, total phosphorus and total nitrogen) resulting from ongoing urban sanitation practices and from completed capital projects to improve/treat urban storm runoff from developed county areas draining to each reservoir. For each watershed, load

reductions are estimated for completed stormwater management BMPs and for stream restoration projects, for the routine cleaning of street inlets, and for routine street-sweeping. The County estimated in 2017 that Prettyboy and Loch Raven are on track to meet the phosphorus target; Liberty is behind schedule. Both Liberty and Loch Raven are missing their sediment targets, but Loch Raven is very near. (See Baltimore County's 2017 NPDES/MS4 report, Table 10-70 at <https://www.baltimorecountymd.gov/Agencies/environment/npdes/index.html>.)

- Carroll County continues to work toward compliance with its NPDES MS4 requirement for impervious and stream restoration, long-term studies on specific stormwater BMPs, as well as tracking and reporting progress on nutrient load reductions.

3.2.4 Baltimore and Carroll Counties will continue their respective maintenance programs for all publicly-owned stormwater management facilities.

- Baltimore and Carroll Counties continue their respective maintenance programs.

3.2.5 Baltimore and Carroll Counties will review and revise, as necessary, their respective design standards for roads and parking areas, in order to reduce the extent of impervious surfaces.

- The Baltimore County DPW revised its Design Manual in 2010, which includes the road standards for rural, urban and suburban roadways. The County's Office of Planning is responsible for reviewing and revising the parking lot standards (re: minimum sizing) for institutions and for commercial properties.
- Carroll County adopted new regulations in 2004 to incorporate the new State requirements. The County continues to mitigate impervious surface countywide, not just specific to roads and parking lots.

3.2.6 The RTG will investigate the feasibility of having local and state agencies adopt an alternative de-icing policy in the reservoir watersheds.

- Baltimore County continues to explore options for salt reduction. The county is monitoring effectiveness of a different type of salt spreader.
- Carroll continues to implement a policy to reduce deicing materials in compliance with its NDPEs MS4 permit requirements. BMPs are implemented countywide. Co-permittees reduce the use of winter weather deicing materials through research, continual testing and improvement of materials, equipment calibration, and/or employee training. Carroll County employs SOPs that include BMPs for salt management that cover all aspects and phases of salt usage. Salt storage facilities are managed through good housekeeping BMPs. In the County, the increased use of salt brine is utilized whenever feasible for pre-wetting of road surfaces. Snow plowing and salt application procedures are designed to prevent overlapping and over usage of deicer materials.

3.2.7 Baltimore and Carroll Counties, working in cooperation with their respective SCDs, will continue to operate sediment and erosion control programs county-wide, in order to limit sediment runoff from all new private construction and redevelopment sites. (The Baltimore County SCD and the county agency cooperate on sediment-control plan review and approval,

while the county agency does inspection and enforcement. The Carroll SCD is responsible for sediment-control plan review and approval in Carroll County.) At the present time, Carroll County enforces the sediment and erosion control regulations in the towns of Hampstead, Manchester and Westminster.

- Baltimore County programs continue.
- Carroll County continues to maintain delegation countywide its erosion and sediment control program per State and federal requirements, as required by the NPDES MS4 permits and State law.

3.2.8 The state (MDE) will continue to enforce sediment and erosion control on state agency construction projects; the State Highway Administration provides sediment control inspection on its own construction projects; and the two counties will continue to enforce sediment and erosion control on local government projects, using the same standards as those applied to private construction projects.

- Programs continue.

3.2.9 The state (MDE) will continue to carry out triennial reviews of the respective local sediment/erosion control programs and stormwater management programs.

- Policy continues.

### **3.3 Sewerage System Infrastructure**

3.3.1 Baltimore and Carroll Counties will continue to operate sewage pumping stations located in the Liberty and Loch Raven watersheds in compliance with current state standards for backup systems, including secondary power sources and/or reserve storage capacity, in addition to backup pumps. This greatly reduces the chances of sewage overflows from the public collection systems which are adjacent to the two reservoirs.

- Operations continue in compliance with the standards.

3.3.2 Baltimore County will implement new capital and operating/maintenance programs for its county-wide sewerage system, consistent with the recent Consent Decree entered into with federal and state agencies.

- During 2006, the County completed improvements (mostly intended to better prevent overflows during power outages) at two sewage pumping stations in the Loch Raven watershed: Springdale A and Merryman's Branch. A major upgrade project at the Texas sewage pumping station (also in the Loch Raven watershed) began in 2006 and continued during 2007, with significantly improved backup power installed by early 2008.
- No recent updates.

3.3.3 Carroll County will implement computer-based inspection/maintenance systems for the Hampstead and Freedom sewer service areas.

- The strategy is complete. The Carroll County Bureau of Utilities has implemented CityWorks Asset Management software for the water and sewer systems in Hampstead

and Freedom. It is currently being used for work orders and problem logs associated with these water and sewer systems. Documentation of maintenance of these systems has been integrated. The software also will allow staff to view as-built plans in the field.

3.3.4 Baltimore and Carroll Counties will continue to maintain their respective Master Water and Sewerage Plans (as required under state law) so as to reinforce the reservoir- protection goals and policies which are contained in their master land-use plans. (See also section 3.6.)

- Reservoir-protection policies are included in the local plans.

### 3.4 Septic Systems

3.4.1 The signatories will seek funding through the Chesapeake Bay Restoration Fund to carry out a study regarding the extent to which residential septic systems in the reservoir watersheds contribute nutrients, sodium and pathogens to the tributary streams.

- In 2011, Baltimore County EPS initiated the Bay Restoration Fund Septic System Upgrade Grant Program, which provides funding for the installation and first five years of maintenance for onsite sewage disposal systems (OSDS) that employ the best available technology for nitrogen reduction (BAT). The funding is based on owner's income eligibility and prioritized based on property's proximity to the Chesapeake Bay, whether or not the septic system is failing.
- Through the same grant program, Baltimore County EPS can fund connections to public sewer and abandonment of existing OSDS for properties in service areas with wastewater treatment plants (WWTP) that are meeting enhanced nutrient removal criteria (ENR) or Biological Nutrient Removal (BNR). As of 2017, only Patapsco WWTP is meeting ENR. Back River WWTP is under construction. Baltimore County is working to identify properties that will meet the grant criteria and encourage property owners to participate.
- Both of these efforts will serve to reduce the impact of nitrogen to streams, reservoirs and the Chesapeake Bay and meet the targeted goals in the Watershed Implementation Plans.

3.4.2 Financial assistance for income-eligible residents for the repair of failing septic systems will continue to be provided by Baltimore County through its Single-Family Rehabilitation Loan and Emergency Repair Program.

- Program continues.  
<https://www.baltimorecountymd.gov/Agencies/planning/housingopportunities/sfrehabemergencyrepair.html>
- Maryland Department of Housing and Community Development also offers assistance through the Maryland Housing Rehabilitation Program, which is designed to bring properties up to applicable building codes and standards.  
<http://dhcd.maryland.gov/Residents/Pages/mhrp-sf/default.aspx>

3.4.3 Baltimore and Carroll Counties will promote the proper maintenance of septic systems by homeowners through education conducted via the development-approval process. The Carroll County Health Department (a state agency) will continue to distribute brochures to the public on proper septic system operation.



- The “Onsite Sewage Disposal Systems: A Guide to Maintenance” is available on Baltimore County’s website at: <http://resources.baltimorecountymd.gov/Documents/Environment/groundwatermanagement/osdsmaintguide2011.pdf>
- Carroll County Health Department continues to provide educational materials to the public regarding septic system, some of which are available on their website at: <http://cchd.maryland.gov/environmental-health-private-sewerage/>.

3.4.4 The Baltimore County Soil Conservation District will continue to distribute its educational booklet for rural homeowners, which includes information on the proper maintenance of septic systems. Carroll County will consider the publication of a similar booklet.

- The Baltimore County SCD estimates that, by the end of 2007, about 1,000 copies of this booklet were distributed to homeowners by itself and by the County DEPRM.

3.4.5 Baltimore and Carroll Counties will continue to license septic system scavengers and will provide facilities for septage disposal into public sewer systems. (Septage can be put into the Baltimore County sewer system at two points in the reservoir watershed areas. In Carroll County, septage is accepted at the site of the Westminster WWTP, which is located outside the reservoir watersheds.)

- Programs continue.

3.4.6 The Baltimore County Department of Environmental Protection and Sustainability (DEPS) and the Carroll County Health Department will continue to administer septic system regulations and design standards which are intended to ensure reliable service and to prevent septic system failures.

- Programs continue.

3.4.7 The Baltimore County DEPS and the Carroll County Health Department will conduct sanitary surveys, as needed, to identify areas of failing septic systems and to evaluate the alternatives available for making corrections.

- Baltimore County has conducted sanitary surveys of 3 areas in 2017 and recommended sewer extensions to 36 improved properties.

3.4.8 The Department of the Environment (MDE) will develop a protocol to evaluate and verify the stated performance of "best available technology" being used to remediate conventional on-site wastewater disposal systems which have experienced problems.

- MDE published a final regulation on September 13, 2012, that requires nitrogen-removal technology for all OSDS serving new construction on land draining to the Chesapeake Bay and Atlantic Coastal Bay Critical Area (Critical Area). This regulation includes provisions that establish minimum operation and maintenance requirements for the life of the nitrogen-removal technology to ensure that these systems do not fall into disrepair and damage the environment. Individuals who either install and/or maintain the nitrogen-removing technologies must complete a course of study approved by MDE and be certified by the manufacturer. This regulation took effect January 2, 2013.

- In 2016, MDE finalized a regulatory action reforming the universal requirement that BAT septic systems be installed outside the Chesapeake Bay and the Critical Area for all new construction. The final regulation instead allows the installation of conventional septic systems outside the Critical Area. However, large septic systems with design flows of 5,000 gallons per day or more must still install BAT. Furthermore, local governments will not be preempted from requiring a BAT system outside the Critical Area to protect public health or waters of the State.
- As of January 2018, MDE has evaluated seventeen proprietary technologies for BRF eligibility. These technologies must undergo field verification of performance in Maryland. Twelve Maryland installations of each technology must be sampled on a quarterly basis for four quarters. The results of this sampling must indicate a minimum of 50 percent nitrogen removal to successfully complete field verification.
  - Class I: 9 approved stand-alone units
  - Class II: 5 technologies undergoing field verification; cannot be funded until the verification process is complete
  - Class III: 2 technologies that must be used with a Class IV disposal system to be eligible for funding
  - Class IV: 2 technologies that must be used in a combination with a Class I or Class III; the system designs must be approved by the MDE Onsite Division to be eligible for funding

3.4.9 MDE will evaluate the legal/financial options for providing long-term maintenance of existing innovative on-site disposal.

- In 2016, MDE adopted regulation requiring a two-year operation and maintenance contract and a two-year warranty for all BAT systems sold in Maryland. Low-income families may be eligible for a 50 percent reimbursement of five years' worth of operations and maintenance.

### **3.5 Urban Nutrient Management**

3.5.1 The Department of Agriculture (MDA) will continue to operate a statewide training and certification program for commercial lawn care companies, which addresses the proper use of lawn fertilizers and pesticides. Baltimore County will continue to offer on a periodic basis fertilizer/pesticide training to institutional grounds managers (for facilities such as business parks, hospitals and schools.)

- MDA continues to train and certify commercial applicators.
- The Fertilizer Use Act of 2011, has eliminated phosphorus from standard lawn fertilizers, increased the amount of slow-release nitrogen, and modified the instructions for use on the product packaging, resulting in a reduction of nutrient pollution.

3.5.2 Baltimore County will continue to conduct programs involving street-sweeping, stormdrain-inlet cleaning, and storm pipe cleaning in its urbanized areas, in support of urban nonpoint source control objectives (by reducing pollutant inputs.)

- Programs continue.

3.5.3 Carroll County will continue to regularly inspect inlets and storm sewers in commercial and industrial areas.

- Program continues.

3.5.4 Baltimore City and Baltimore County will conduct a cooperative study of the water-quality benefits of regular street-sweeping and stormdrain-inlet cleaning.

- Baltimore City and the Center for Watershed Protection (CWP) monitored the runoff from selected city streets that were being swept regularly. The intent was to be able to estimate the average annual nutrient load reductions (in storm runoff) that could be expected to result from routine street-sweeping.
- The project has ended, and CWP released the final report in September 2008. (<https://www.worldsweeper.com/Street/Studies/CWPStudy/CBStreetSweeping.pdf>)
- Based in part on the City's controlled study of the runoff from city streets that were swept with certain kinds of sweepers at monthly and at weekly intervals, a conceptual model was developed that estimated the likely range of expected pollutant-removal efficiencies achieved by mechanized sweeping. Total solids loads could be reduced by from 9 to 31%, total phosphorus loads could be reduced by 3-8%, and total nitrogen loads could be reduced by from 3-7%.
- Under the catch-basin portion of this study, Baltimore County carried out work in selected urban areas that measured the monthly accumulation of solids and debris in 100 stormdrain inlets. Samples were taken from 16 of these inlets for categorization purposes and for limited lab analysis. A conceptual model was developed during this study that would permit the estimation of the efficiency with which stormdrain inlets trap or store solid materials that otherwise would reach local waterways. The model predicted the following annual pollutant-removal rates as the result of regular catch-basin cleaning: between an 18% and a 35% reduction in the annual total solids load; between a <1% and a 2% reduction in the annual total phosphorus load; and from a 3% to a 6% reduction in the annual total nitrogen load.

3.5.5 The two counties and Baltimore City will continue to evaluate a variety of urban best management practices under the technical work required by their NPDES/MS4 (municipal stormwater) permits, which are issued by MDE.

- Baltimore County instituted a long-term study of Scotts Level Branch (in the Gwynns Falls watershed), in an attempt to document overall water quality improvements in the stream as a number of planned urban runoff BMPs are installed there.
- In 2013, Baltimore County initiated a study on the pollutant removal effectiveness of self-converted dry ponds. Many of these older ponds have converted to shallow marsh or forested wetlands and are perhaps providing greater pollutant removal efficiency than the original design that focused on water quantity management only. This data is needed by the county to better target its restoration efforts. Baltimore County is also monitoring a number of restoration projects for effectiveness in restoring the aquatic community.
- Carroll County continues to work toward compliance with their MS4 permit.

### **3.6 Land-Use Planning and Zoning**

3.6.1 Baltimore County will continue to apply Resource Conservation (RC) zoning in the reservoir watersheds, with allowed residential densities and performance standards that are protective of water quality.

- Baltimore County's zoning policies and practices continue to protect against land conversion in the reservoir watersheds that likely would degrade water quality.

3.6.2 Baltimore County will maintain insofar as possible the current limits of extension of the Urban-Rural Demarcation Line (URDL) in the Loch Raven and Liberty watersheds. (The Prettyboy watershed lies well outside of the URDL line.) The URDL essentially represents Baltimore County's urban growth boundary.

- Policy continues.

3.6.3 Baltimore and Carroll Counties will maintain the current extent of conservation and agricultural zoning in the reservoir watersheds, insofar as possible.

- The net acreage of reservoir watershed land protected through Resource Conservation zoning in Baltimore County remained at approximately 92.5% following the 2016 Comprehensive Zoning Map Process.
- The current extent of agricultural and conservation zoning in Carroll County has been maintained to date. However, the adopted Land Use Designations on the County comprehensive plans may not maintain this strategy if a comprehensive rezoning is implemented to make the zoning consistent with the Land Use Designations.

3.6.4 Baltimore and Carroll Counties will protect the reservoir watersheds by limiting insofar as possible additional urban development zoning within the reservoir watersheds.

- The current extent of agricultural and conservation zoning in Carroll County has been maintained to date. However, the adopted Land Use Designations on the County comprehensive plans may not maintain this strategy if a comprehensive rezoning is implemented to make the zoning consistent with the Land Use Designations.

3.6.5 The Baltimore County and Carroll County master land-use plans will continue to support the goals of the Reservoir Watershed Management Agreement and the commitments made in this Action Strategy.

- Policy continues in effect.

3.6.6 The signatories will work with the Maryland Department of Natural Resources (DNR) to include the reservoir watersheds in the Forest Legacy Program and to seek funding for protection of selected forested areas.

- Maryland's 2006 "Assessment of Need" for the Forest Legacy Program, submitted by DNR to the US Forest Service, included forested lands in the reservoir watersheds. The

Forest Legacy Program provides matching funds for voluntary conservation easements intended to protect forested lands. However, funding is not yet available for this area.

### **3.7 Resource Protection and Restoration; Development Guidelines**

3.7.1 Baltimore and Carroll Counties will continue to implement the sensitive-area- protection provisions of their development regulations for non-tidal wetlands, steep slopes, floodplains and water courses, forests, water bodies, and natural land areas. These regulations are intended to protect important ecosystem functions and tributary stream quality.

- Policies continue in effect.

3.7.2 Baltimore County will work to establish a comprehensive forest resource management program in the watersheds, with the goal of ensuring the ecological and economic sustainability of forest resources as a means to help stabilize watershed hydrology and to help protect water quality.

- Since adoption of the 2005 Action Strategy, Baltimore County has developed and begun implementation of a comprehensive forest resource management program that includes reservoir watersheds. The overall priority forest strategy has 4 goals: to conserve existing forests, strategically reforest areas with high-function potential, maintain and restore forest health, and provide education for and work with landowners who manage 75% of the County's forest resources.
- Baltimore County's "2007 State of Our Forests" report remains the authority on the county's forest conditions. It includes maps of many forest resources and describes the Montreal Process Criteria and Indicators for forest management.

3.7.3 The signatories will encourage the Maryland DNR to manage its land holdings in the reservoir watersheds so as to benefit reservoir protection.

3.7.4 Baltimore City will work with Baltimore and Carroll Counties to evaluate the adequacy of land-acquisition and development-rights easement programs (e.g., Rural Legacy, etc.) for protecting critical or sensitive areas in the reservoir watersheds which are vulnerable to development. Following this evaluation, the City and the two counties will develop a strategy for supplementing current preservation and/or acquisition efforts in the reservoir watersheds.

- Each jurisdiction is implementing its individual programs to protect critical or sensitive areas in the reservoir watersheds. However, there has not yet been an effort to develop a cooperative and coordinated strategy.

3.7.5 Baltimore City and Baltimore County will work cooperatively with Maryland DNR to develop a comprehensive deer management program for the reservoir watershed areas, with an initial focus on the Loch Raven watershed. [During 2006] the City and the County will develop a preliminary set of recommendations for deer management, and will present these recommendations to the BMC Management Committee.

- Cooperative Deer Herd Management: Since 2011, Baltimore County has worked with the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) -

Wildlife Services, the Maryland Department of Natural Resources (MD DNR) Forest Service, and the Baltimore City Reservoir Watershed Management programs to determine how to best implement deer herd management as necessary to control excessive impacts of deer on forest vegetation.

- In March 2011, the Coalition for Responsible Deer Management requested that the Baltimore County Council take action to control deer in County Parks, which was previously not authorized. The Coalition letter to the Council was signed by 25 organizations and individuals, including County and private nature councils, leading land preservation organizations, ornithological organizations, watershed associations, and other wildlife and plant advocacy organizations. As a result, Bill 21-11 was approved, authorizing a deer cooperator program.
- Deer Management at Baltimore County Parks: Starting in 2011, Baltimore County entered a Cooperative Service Agreement with the USDA APHIS program to monitor and control populations of white tailed deer at Oregon Ridge and Cromwell Valley Parks as part of our forest health program. Under this agreement, deer surveys are first conducted to determine the deer population at each park. Deer harvest operations are then conducted to bring the number of deer at the park to a sustainable population.

3.7.6 Baltimore County will continue to implement its capital improvement program for stream restoration and for upgrading of existing stormwater BMPs to stabilize selected stream channels and to improve water quality in the reservoir watersheds.

- Restoration program continues.

3.7.7 Carroll County will continue its multi-year process of systematically assessing the condition and integrity of various tributary streams in the reservoir watersheds. Portions of these streams will be selected on a priority basis for restoration work, to be supported with County capital funds.

- Carroll County has completed and submitted to MDE restoration plans for all nine of its watersheds, per the requirements of the NPDES MS4 permit, including the three reservoir watersheds.

3.7.8 Baltimore and Carroll Counties will evaluate and implement, where desirable, the site-design recommendations of the Builders for the Bay Roundtable, in order to enhance resource protection in the reservoir watersheds.

- The Builders for the Bay Program is no longer active in Baltimore County.
- Carroll County completed a “Builders for the Bay” final report in July 2008. The County continues to track implementation of the report’s recommendations.

3.7.9 Baltimore and Carroll Counties will continue to apply their regulations for the design, construction and operation of golf courses. These guidelines address water-quality and habitat-protection issues, including appropriate nutrient application and pesticide management, as well as the preferred designs for wetlands crossings and guidance on the removal of vegetation.

- Policies continue in effect.

## **4.0 Management of Municipal Watershed Property**

4.0.1 Baltimore City will continue its efforts to maintain diverse and vigorously-growing forest communities on the City-owned watershed properties surrounding the three reservoirs.

- These efforts continue; refer to items 4.0.2 through 4.0.4.

4.0.2 When and where appropriate, Baltimore City will implement the recommendations of the *Comprehensive Forest Conservation Plan for Long-term Watershed Protection on the City of Baltimore's Reservoirs* (DNR Forest Service, 2003.) These recommendations are aimed at improving the health, diversity and sustainability of the forests surrounding the lakes. [During 2006] the City will evaluate the DNR report and develop a list of recommended actions for implementation.

- During 2008 and 2009, Baltimore City, in cooperation with Baltimore County, implemented a deer population management plan for the Loch Raven Reservoir watershed property, in order to reduce deer browse pressure on natural tree-seedling regeneration, thereby protecting the long-term sustainability of the forest surrounding the reservoir. This change in policy addressed a key recommendation of the 2003 DNR report.
- The City is developing an improved “woods road” maintenance program, focusing on taking soil-stabilization and erosion-control measures intended to reduce sediment loads to the reservoirs from interior forest roads.
- Boundary encroachment: The City has initiated actions against six adjacent private property owners at Loch Raven who have encroached on City watershed property. The Department of Public Works and the Department of Law are working jointly on these cases.

4.0.3 New or expanded recreational or commercial facilities should not be constructed in the City-owned watersheds. Existing facilities should be managed so as to not represent a significant threat to the health of the City-owned forests, nor to the water quality of the reservoirs.

- This policy continues in effect.

4.0.4 Baltimore City will continue to take action to discourage or prevent unauthorized recreational uses of the City-owned watersheds which present a significant threat to public safety, forest health, and/or reservoir water quality.

- In early 2008, the City hired the first member of a new Watershed Ranger force to focus its attention on dealing with/discouraging unauthorized recreational uses of the City-owned watersheds. A standing force of 13 rangers eventually will be in place to deal with these types of issues in the three different areas.

4.0.5 Baltimore City DPW officials will continue to meet periodically with the “Friends of the Watersheds” advisory group. This group serves as a forum for nearby community associations, watershed advocates, and recreational users’ groups to exchange information and views with

City managers and to discuss problems and opportunities involving the reservoirs and the City-owned watersheds.

- Baltimore City DPW officials have discontinued the periodic meetings of the “Friends of the Watersheds” advisory group. However, beginning late in 2007, citizens’ groups working primarily in the Gunpowder watershed formed a new working group, the Reservoir Watershed Coalition, which focuses on habitat protection issues and restoration projects in the public lands (Gunpowder State Park and the City-owned watershed properties). The coalition meets quarterly, and Baltimore City watershed managers from the City’s Reservoir Natural Resources Section regularly attend their meetings. (Refer also to item 7.0.4.)

## **5.0 Toxics, Pathogens, Potential Spills, and Disinfectant Byproduct Precursors**

5.0.1 The Department of the Environment (MDE), working in cooperation with the Hazardous Waste Facility Siting Board, will enforce the provision in State law which prohibits the siting of any hazardous waste facility that would “adversely affect” a public water supply, such as the reservoirs.

- This policy continues in effect.

5.0.2 The Reservoir Program participants will continue to stay abreast of new developments and new issues relating to potential toxics problems in the reservoirs.

- Policy continues.
- The signatories to the *2005 Reservoir Watershed Management Agreement* do not have evidence of a toxics problem in the reservoirs at this time (except for mercury, addressed below.) Baltimore City labs routinely screen for some specific toxic compounds in the raw water (prior to treatment), and they find no violations of EPA standards.

5.0.3 MDE will continue to support fish-consumption “advisories” for fish taken from the three reservoirs, based on the potential for bioaccumulation of mercury present in the lakes’ water columns. Such advisories have been issued for most Maryland lakes. The source of the mercury is atmospheric, with much of it coming here from out of state.

- This policy continues in effect.

5.0.4 Baltimore City will analyze the raw (untreated) reservoir water for a range of pathogens, in compliance with new federal EPA requirements (the Long-term 2 Enhanced Surface Water Treatment Rule).

- The City continues to be in compliance with EPA’s Long-term 2 Enhanced Surface Water Treatment Rule. This includes daily analysis of the raw water entering the two treatment plants for total coliform bacteria and for fecal coliform or *E. Coli* bacteria, and monthly analysis of the water for *Giardia* and *Cryptosporidium*.

5.0.5 Baltimore City will track sodium and chloride levels in both the raw water and the finished water. Using the information gained, Reservoir Program participants, working through the RTG, should establish a goal for sodium concentration in the lakes. This goal should relate to the



current EPA health advisories for water consumed by individuals who are on a sodium-restricted diet.

- The Baltimore County Baseflow Monitoring Program has since been replaced by Trend Monitoring Program. Data collected in the 2011 – 2012 timeframe indicated that the Liberty Reservoir watershed had the highest mean sodium concentration of 27.7 mg/L based on 58 samples, followed by Loch Raven watershed with 24.6 mg/L (230 samples) and Prettyboy with 14.0 mg/L (73 samples). The mean concentrations for all watersheds increased since the last report. This may be due to the change in monitoring protocols that includes both baseflow and storm event monitoring.

5.0.6 Baltimore City, in cooperation with other Reservoir Program signatories, will investigate the principal sources of the “precursors” (organic substances present in the raw water) of the disinfection byproducts (DBPs) which have been detected at various points in the metropolitan water system. The research would include a study of the relationship between sub-watershed land cover, total organic carbon/dissolved carbon in the tributaries and the reservoirs, and DBP precursors in the raw water.

- The decision on whether or not to proceed with this study is pending. (See Item 1.1.3)

5.0.7 Reservoir Program signatories, working with other agencies as appropriate, will study the routine transport of hazardous materials over the bridges crossing the reservoirs and their major tributaries, and will make recommendations on the prevention of and response to accidental spills on or near those bridges. The potential hazards of ruptured pipelines will also be evaluated.

5.0.8 Reservoir Program signatories will review and comment on the existing arrangements and established procedures for notification of all appropriate agencies in the event of a significant spill or discharge of a hazardous substance in any of the reservoir watersheds.

- The strategy is complete. However, an update is needed on the status of the comments and the final product.

## **6.0 Reservoir Watershed Program: Coordination and Administration**

6.0.1 The six major jurisdictions in the Baltimore region will continue to fund the operation and coordination of the Reservoir Watershed Protection (Management) Program by making annual payments to the Baltimore Metropolitan Council, with each jurisdiction’s contribution based in part on the volume of Baltimore City or (raw) reservoir water consumed by that jurisdiction in the previous fiscal year.

- The jurisdictions have continued to support the regional program.

6.0.2 Program participants, working through the Reservoir Technical Group (RTG), will prepare a biennial report on progress made in implementing the *2005 Action Strategy for the Reservoir Watersheds*, including the quantification of cumulative accomplishments, such as the estimated reduction of the annual pollutant loads to each reservoir.

- While biennial reports have not been finalized every two years, this document covers decisions made and actions taken up to 2017.

6.0.3 Program participants will encourage greater participation by the municipalities (Westminster, Hampstead and Manchester) in the Reservoir Watershed Management Program.

- Carroll County formed the Water Resources Coordination Council (WRCC) in 2007. Members include representatives from each municipality, the County, and the Carroll County Health Department. The WRCC meets monthly and discusses and coordinates on a wide range of water resource and water quality issues. The WRCC members worked cooperatively to develop a Water Resources Element, the same document which was adopted by the County and seven municipalities. The WRCC also serves as the local WIP team for countywide Chesapeake Bay TMDL issues, strategies, and milestone reporting.

## **7.0 Public Awareness**

7.0.1 Reservoir Program participants, working through the Reservoir Technical Group, will continue to identify and pursue opportunities for public education programs relating to reservoir protection, including outreach to schools.

- Baltimore City holds watershed awareness events at or near the reservoir dams, such as Dam Jam.

7.0.2 The Reservoir Watershed Protection Program will continue over the years to distribute its progress reports and technical reports to public agencies and to interested citizens' groups.

- This draft Progress Report is available online at [www.baltometro.org](http://www.baltometro.org).

7.0.3 Reservoir Program participants will use the Baltimore Metropolitan Council (BMC) website to disseminate current information and to promote public awareness about the Reservoir Program and its activities and accomplishments.

- This continues to be implemented.

7.0.4 Reservoir Program signatories will continue to assist and encourage the efforts of local citizens' organizations which are concerned about watershed management issues and reservoir protection.

- During 2016 and 2017, the Baltimore County EPS provided "watershed association restoration planning and implementation grants" to the Gunpowder Valley Conservancy (GVC's area of interest includes the Loch Raven tributaries) and the Prettyboy Watershed Alliance, for staff support.

### **Significant projects not included in the 2005 Reservoir Action Strategy: Watershed Action Plans, TMDL Implementation Plans**

- Watershed Plans: Small Watershed Action Plans (SWAPs) have been developed by Baltimore County for Liberty Reservoir, and multiple planning areas in the Loch Raven watershed. Due to its large size and variable land use, the Loch Raven Reservoir watershed is divided into five planning areas, the last of its SWAPs will be completed in 2018. A Watershed Restoration Action Strategy (WRAS) was developed for the Prettyboy Reservoir by Baltimore County in conjunction with Carroll and York counties.

The WRAS is similar to the SWAP; both seek to identify water quality issues in the watershed and opportunities for watershed restoration. These watershed plans were developed with public participation through steering committees, public meetings, and public comment periods. Approximately every five years, the SWAPs will be reviewed and revised to achieve target pollutant reductions. The plans are available online at: <https://www.baltimorecountymd.gov/Agencies/environment/watersheds/swap.html>

- TMDL Implementation Plans: Under its current Municipal Separate Storm Sewer System (MS4) permit, Baltimore County is required to develop implementation plans for all of its local Total Maximum Daily Loads (TMDLs). Implementation Plans for the TMDLs in existence at the time of the permit's issuance were developed in 2014. The County has one year from the approval date for new TMDLs to develop Implementation Plans. All TMDLs have been addressed to date.