

**10.0 Permit Requirements**

**Part IV. Program Review and Annual Progress Reporting**

**A. Annual Reporting**

1. Annual progress reports, required under 40 CFR 122.42(c), will facilitate the long-term assessment of Baltimore County’s NPDES stormwater program. The County shall submit annual reports on or before June 15<sup>th</sup> of each year that include:
  - e. The identification of water quality improvements or degradation

**10.1 Introduction**

The following analysis provides a recalculation of watershed pollutant loads for nitrogen and phosphorus based on guidance from Maryland Department of the Environment on pollutant loading analysis for the Water Resources Element and the Chesapeake Bay Program – Phase 4.3 Watershed Model (10.2). It also presents a summary of the pollutant load reductions (water quality improvements) that have resulted from implementation of the management programs required under this permit. It includes reductions due to implementation of stormwater Best Management Practices (Section 1), reductions due to street sweeping and storm drain cleaning programs (Section 3), and reductions due to capital restoration projects (Section 7). Further reductions resulting from illicit connection removals (Section 5) and education activities (Section 4) are discussed under the appropriate section. Actual pollutant load reductions due to illicit connection removals and education activities have not been determined.

With the completion of a number of Total Maximum Daily Load analyses for impaired waters, target load reductions for nutrient, sediment, and bacteria have been determined for a number of watersheds. In addition, additional Water Quality Analyses and proposed modification of the biological listing criteria have resulted in changes to the impairment listings (2008 Integrated Report). Table 10-1 summarizes the reductions required for urban stormwater where they have been determined, on a percentage basis.

**Table 10-1: Status of TMDLs and TMDL Reduction Requirements for Urban Stormwater**

<b>Watershed</b>	<b>Total Phosphorus</b>	<b>Total Nitrogen</b>	<b>Sediment</b>	<b>Bacteria</b>	<b>Biological</b>	<b>Other (Metals, Toxics)</b>
Deer Creek	NA	NA	NA	NA	NA.	NA
Prettyboy	54% (15% Urban)	NA	NA	In Process	NA	Complete
Loch Raven	50% (15% Urban)	NA	25%	In Process	Not Comp.	Complete
Lower Gunpowder	Not Comp.	Not Comp.	NA	NA	Not Comp.	NA
Little Gunpowder	NA	NA	NA	NA	NA	NA
Bird River	NA	NA	Not Comp.	NA	Not Comp.	NA
Gunpowder River	Not Comp.	Not Comp.	Not Comp.	NA	Not Comp.	Not Comp.

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Middle River	Not Comp.	Not Comp.	Not Comp.	NA	NA	Not Comp.
Liberty Res.	Not Comp.	Not Comp.	Not Comp.	In Process	Not Comp.	Complete
Patapsco	15%*	15%*	Not Comp.	NA	Not Comp.	Not Comp.
Gwynns Falls	15%*	15%*	Not Comp.	67.2-93.2%	Not Comp.	NA
Jones Falls	15%*	15%*	Not Comp.	92.4-95.3%	Not Comp.	Not Comp.
Back River	15%	15%	Not Comp.	95%	Not Comp.	Complete
Baltimore Harbor	15%*	15%*	Not Comp.	Not Comp.	Not Comp.	Complete

\* Based on TMDL developed for tidal Baltimore Harbor

Additional TMDLs have been completed for chlordane (Back River and Lake Roland), and for mercury in fish tissue (Prettyboy Reservoir, Loch Raven Reservoir, and Liberty Reservoir (not EPA approved)). However, these TMDLs have limited options to address inputs from stormwater discharge due to the nature of the source of pollution (chlordane – historic, mercury – air deposition). A number of listings for impairment have been removed due to Water Quality Assessments that have indicated that the level of particular pollutants is below the existing standards. The most recent Water Quality Assessments have indicated that Jones Falls is not impaired for zinc, and the Patapsco is not impaired for lead or zinc. A summary of the current status of all TMDLs and Water Quality Assessments can be found on the Maryland Department of the Environment web site; <http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/Sumittals/index.asp>.

The Maryland Tributary Strategies for meeting the Chesapeake Bay Program goals has identified a 24% reduction in nitrogen and a 42% reduction of phosphorus from urban non-point sources. This provides an additional reduction target for nutrients that in some cases exceeds the reductions determined by the TMDL analysis. The differences are due to the target water body being local tidal waters or reservoirs versus the entire Chesapeake Bay. Thus it may be possible to meet local tidal water quality standards, but additional nutrient reductions may be needed to permit the Chesapeake Bay to meet its water quality standards. In the case of the reservoirs the TMDLs are for phosphorus only due to the fact that fresh water is usually phosphorus limited. The models indicate that reductions in nitrogen would result in limited improvement in reservoir water quality.

The Chesapeake Bay Program – Watershed Model Phase 5.0 will be available in December 2009. The Chesapeake Bay TMDL for nutrients and sediment will be based on this model, as well as, the Airshed Model and the Estuarine Model.

## **10.2 Pollutant Load Calculations**

The pollutant load calculations were revised from last years' report. The pollutant loading rates for nitrogen and phosphorus were derived from two sources, the technical guidance provided by Maryland Department of the Environment (MDE) entitled *User's Guide for Nutrient Load Analysis Spreadsheet in Support of the Water Resources Element* (MDE 2008) and the Chesapeake Bay Program – Watershed Model Phase 4.3.

The MDE technical guidance provided loading rates for Baltimore County based on three basins, Western Shore (above the fall line), Western Shore (below the fall line), and Susquehanna (above the fall line). These loading rates are based on the Chesapeake Bay Program Watershed Phase 4.3 and include the full implementation of the Maryland Tributary Strategy for nutrient reduction, thereby eliminating the need to consider nutrient

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controls. For consideration of the impacts related to urban development, Baltimore County determined that the urban loading rates without the implementation of urban BMPs would best serve the intent of the MS4 Permit in tracking restorations actually taken and the progress in meeting the various TMDLs that have been developed to date. Thus the final model of nutrient loads was a hybrid between the MDE guidance document for loading rates for all non-urban land uses and the segment specific nutrient loading rates for urban land uses.

The Chesapeake Bay Program (CBP) Watershed Model Phase 4.3 provides loading rates by model segment with the urban land uses divided into pervious urban and impervious urban. The loading rate for urban pervious and urban impervious were determined by dividing the 2010 – no BMP model results by the 2010 acreage derived for each segment. For Baltimore County there are five Model Phase 4.3 segments, however, the Gunpowder Basin is designated as all one segment (there are seven 8-digit watersheds in the segment), with the effect of Prettyboy and Loch Raven Reservoirs already taken into consideration. Since the Prettyboy Reservoir and the Loch Raven Reservoir have individual TMDLs for phosphorus, it was determined to develop loadings by applying the loading rates for comparable piedmont and coastal plain segments in Baltimore County. The loading rates applied to each watershed, the MDE segment and the CBP segment used in the pollutant loading analysis are displayed in Table 10-2 for nitrogen and Table 10-3 for phosphorus.

**Table 10-2: Nitrogen Per Acre Pollutant Rate, MDE Segment and CBP Segment**

	<b>Deer Creek</b>	<b>Prettyboy Loch Raven Lower Gunpowder Little Gunpowder Falls Gwynns Falls Jones Falls</b>	<b>Bird River Gunpowder River Middle River Back River Baltimore Harbor</b>	<b>Liberty Patapsco River</b>
MDE Seg	Sus	AFL	BFL	AFL
CBP Seg	140	480	860	490
Impervious Urban	8.44	8.06	8.06	8.06
Pervious Urban	11.03	14.86	15.77	12.84
Crop	12.23	16.55	13.54	16.55
Pasture	8.42	7.35	5.64	7.35
Livestock	15.62	24.87	19.68	24.87
Forest	2.36	1.41	1.29	1.41
Water	10.61	10.05	10	10.05
Bare soil	8.42	7.35	5.64	7.35

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**Table 10-3: Phosphorus Per Acre Pollutant Rate, MDE Segment and CBP Segment**

	Deer Creek	Prettyboy Loch Raven Lower Gunpowder Little Gunpowder Falls Gwynns Falls Jones Falls	Bird River Gunpowder River Middle River Back River Baltimore Harbor	Liberty Patapsco River
MDE Seg	Sus	AFL	BFL	AFL
CBP Seg	140	480	860	490
Impervious Urban	0.51	0.51	0.51	0.51
Pervious Urban	0.67	2.11	2.28	1.79
Crop	0.85	0.72	0.69	0.72
Pasture	0.44	0.73	0.66	0.73
Livestock	1.60	1.18	0.99	1.18
Forest	0.03	0.02	0.02	0.02
Water	0.57	0.57	0.57	0.57
Bare soil	0.44	0.73	0.66	0.73

In order to determine the acres of impervious cover associated with urban land use, the MDP 2002 (modified to make it current with the 2005 planimetric layer) land use GIS layer was overlain with the planimetric buildings and roadways developed from the 2005 aerials for each watershed. This is another revision from last years' report where the 1996-1997 planimetric layer was used. The estimated pollutant loads by watershed are present in Table 10-4 for nitrogen and Table 10-5 for phosphorus. Each watershed load is broken down into the urban load, the agricultural load, and the forest load with the percentages of each. Note that the nitrogen load calculations include an estimate of the septic load for each watershed.

**Table 10-4: Watershed Nitrogen Loads (%)**

Watershed	Urban Load	Septic Load	Agricultural Load	Forest Load	Total Load
Deer Creek	5,455 (8.6)	5,027 (8.0)	46,764 (74.0)	5,948 (9.4)	63,194
Prettyboy	24,831 (12.1)	15,312 (7.5)	147,713 (72.0)	17,356 (8.5)	205,212
Loch Raven	371,774 (27.6)	149,751 (11.1)	743,460 (55.2)	82,929 (6.2)	1,347,914
Lower Gunpowder Falls	125,190 (41.6)	36,297 (12.1)	123,950 (41.2)	15,357 (5.1)	300,794
Little Gunpowder Falls	40,636 (23.8)	25,172 (14.7)	95,007 (55.7)	9,654 (5.7)	170,469
Bird River	113,591 (72.8)	8,401 (5.4)	26,621 (17.1)	7,387 (4.7)	156,000
Gunpowder River	27,561 (72.3)	2,208 (5.8)	3,613 (9.5)	4,740 (12.4)	38,122
Middle River	57,540 (87.7)	1,871 (2.9)	3,788 (5.8)	2,401 (3.4)	65,600
<b>Upper Western Shore Totals</b>	<b>766,578 (32.7)</b>	<b>244,039 (10.4)</b>	<b>1,190,916 (50.7)</b>	<b>145,772 (6.2)</b>	<b>2,347,295</b>
<b>Patapsco/Back River</b>					
Liberty	33,628 (25.1)	18,407 (13.7)	69,369 (51.8)	12,481 (9.3)	133,885
Patapsco River	211,725 (66.3)	25,189 (7.9)	50,648 (15.8)	15,870 (5.0)	303,459
Gwynns Falls	280,749 (88.5)	15,529 (4.9)	12,854 (4.1)	7,990 (2.5)	317,122
Jones Falls	195,435 (68.7)	37,575 (13.2)	39,726 (14.0)	11,541 (4.1)	284,277
Back River	226,221 (93.0)	4,045 (1.7)	5,993 (2.5)	7,079 (2.9)	243,338
Baltimore Harbor	124,379 (94.2)	962 (0.7)	4,650 (3.5)	2,053 (1.6)	132,044
<b>Patapsco/Back River</b>	<b>1,072,137 (81.6)</b>	<b>101,706 (7.7)</b>	<b>183,240 (13.9)</b>	<b>57,014 (4.3)</b>	<b>1,314,097</b>
<b>County Load</b>	<b>1,838,715 (48.9)</b>	<b>345,745 (9.2)</b>	<b>1,374,156 (36.5)</b>	<b>202,786 (5.4)</b>	<b>3,761,402</b>

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**Table 10-5: Watershed Phosphorus Loads (%)**

<b>Watershed</b>	<b>Urban Load</b>	<b>Agricultural Load</b>	<b>Forest Load</b>	<b>Total Load</b>
Deer Creek	331 (9.4)	3,108 (88.4)	76 (2.2)	3,515
Prettyboy	3,369 (31.2)	7,181 (66.5)	246 (2.3)	10,796
Loch Raven	49,393 (56.5)	36,871 (42.2)	1,176 (1.3)	87,440
Lower Gunpowder Falls	16,437 (70.6)	6,620 (28.4)	218 (0.9)	23,275
Little Gunpowder Falls	5,429 (49.6)	5,382 (49.2)	137 (1.3)	10,948
Bird River	14,785 (90.8)	1,376 (8.5)	115 (0.7)	16,276
Gunpowder River	3,757 (93.6)	184 (4.6)	74 (1.8)	4,015
Middle River	7,425 (96.9)	199 (2.3)	37 (0.5)	7,661
<b>Upper Western Shore</b>	<b>100,926 (61.8)</b>	<b>60,290 (36.9)</b>	<b>2,078 (1.3)</b>	<b>163,294</b>
<b>Patapsco/Back River</b>				
Liberty	4,362 (55.5)	3,316 (42.2)	177 (2.3)	7,855
Patapsco River	26,928 (89.8)	2,822 (9.4)	225 (0.8)	29,975
Gwynns Falls	35,611 (97.9)	704 (1.9)	113 (0.3)	36,428
Jones Falls	25,272 (92.2)	1,970 (7.2)	164 (0.6)	27,406
Back River	29,005 (98.6)	308 (1.0)	110 (0.4)	29,423
Baltimore Harbor	15,984 (98.3)	237 (1.5)	32 (0.2)	16,253
<b>Patapsco/Back River</b>	<b>137,161 (93.1)</b>	<b>9,358 (6.4)</b>	<b>821 (0.6)</b>	<b>147,340</b>
<b>County Load</b>	<b>238,087 (76.5)</b>	<b>70,278 (22.6)</b>	<b>2,899 (0.9)</b>	<b>311,264</b>

The same type of analysis was used to determine the loading rates to stormwater management facilities (Section 1) and for stormwater management retrofits and conversions (Section 7).

### **10.3 New Nutrient Reduction and Impervious Cover Addressed Tracking Added This Year**

Starting with the 2009 Annual Report, the nutrient reductions attributable to the Baltimore County Community Reforestation Program and the efforts of Watershed Associations are included. See Section 7 for a description of how the reductions were calculated. We will continue to seek methods for tracking other efforts to include in future reports. These other efforts include the Treemendous Program, the Growing Home Campaign, and the number of septic connections to the sanitary sewer. Assessing the effects of education on nutrient reduction is anticipated to take longer and would best be done through cooperation of other MS4 permittees and MDE.

The impervious cover addressed by the Storm Drain Cleaning Program and the Street Sweeping Program was calculated for the first time this year. The methods are detailed in Section 3.

### **10.4 Summary of Pollutant Reduction Programs**

Six components of the County's overall effort to reduce pollutant loads are summarized in Tables 10-6 and 10-7, which address the Upper Western Shore and the Patapsco/Back River drainages, respectively. The components are the Stormwater Management Program (Section 1), the Storm Drain Cleaning Program (Section 3), the Street Sweeping Program (Section 3), the Capital Improvement Program (Section 7), the Community Reforestation Program (Section 7), and Watershed Association restoration actions (Section 7). The urban loads for each watershed are presented in each table, along with the progress to date in reducing phosphorus and nitrogen, and in addressing impervious cover. This is a

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change from previous reports where TSS reductions were reported. We currently have not developed a satisfactory TSS loading rate analysis. This will be done in the future.

If a TMDL has been developed, the pollutant load reduction expressed as a percentage is shown. In the nutrient TMDLs developed to date, the expectation for the urban non-point source load reduction is 15%. In the case of Prettyboy and Loch Raven Reservoirs, this is less than the over all load reduction needed to meet water quality standards in the receiving waters. The Maryland Tributary Strategies urban pollutant load reduction for nitrogen and phosphorus are 24% and 42%, respectively. However, with the results from the development of the Chesapeake Bay Program – Phase 5 Watershed Model available in December 2009, it is expected that the urban reductions will be assigned by tidal segment and will therefore change for the next annual report.

**Table 10-6: Pollutant Removal (Pounds) by Upper Western Shore Watersheds Attributed to BMP's**

<b>Upper Western Shore</b>			
<b>Deer Creek</b>			
	<b>Impervious Cover (ac.)</b>	<b>TP</b>	<b>TN</b>
Stormwater Management	0	0	0
Inlet Cleaning	1.6	0.8	2
Street Sweeping	0	0	0
Restoration Projects	0	0	0
Reforestation Projects	0	0	0
Watershed Association Projects	0	0	0
<b>Totals</b>	<b>1.6</b>	<b>0.8</b>	<b>2</b>
<b>Urban Watershed Imp./Load</b>	<b>166</b>	<b>331</b>	<b>5,455</b>
<b>% Urban Load Removed</b>	<b>0.4</b>	<b>0.2</b>	<b>0.0</b>
<b>Prettyboy Reservoir</b>			
	<b>Impervious Cover (ac.)</b>	<b>TP</b>	<b>TN</b>
Stormwater Management	4.6	25.0	184
Inlet Cleaning	0	0	0
Street Sweeping	0	0	0
Restoration Projects	0	0	0
Reforestation Projects	0	0	0
Watershed Association Projects	0	0	0
<b>Totals</b>	<b>4.6</b>	<b>25.0</b>	<b>184</b>
<b>Urban Watershed Imp./Load</b>	<b>506.5</b>	<b>3,369</b>	<b>24,831</b>
<b>TMDL % Reduction/Imp.</b>		54% (15% Urban)	NA
<b>% Urban Load Removed</b>	<b>0.9</b>	<b>0.7</b>	<b>0.7</b>
<b>Loch Raven Reservoir</b>			
	<b>Impervious Cover (ac.)</b>	<b>TP</b>	<b>TN</b>
Stormwater Management	615.4	1,619.8	12,595
Inlet Cleaning	20.8	10.6	27
Street Sweeping	394	200.8	518
Restoration Projects	472.8	370.6	5,608
Reforestation Projects	0	244.5	1,645
Watershed Association Projects	0	46.4	326
<b>Totals</b>	<b>1503</b>	<b>2,492.7</b>	<b>20,719</b>
<b>Urban Watershed Imp./Load</b>	<b>6,560</b>	<b>49,393</b>	<b>371,774</b>
<b>TMDL % Reduction</b>		50% (15% Urban)	NA
<b>% Urban Load Removed</b>	<b>22.9</b>	<b>5.0</b>	<b>5.6</b>

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**Table 10-6: Pollutant Removal (Pounds) by Upper Western Shore Watersheds Attributed to BMP's (continued)**

<b>Lower Gunpowder River</b>			
	<b>Impervious Cover (ac.)</b>	<b>TP</b>	<b>TN</b>
Stormwater Management	256.8	710.6	5,872
Inlet Cleaning	45.5	23.2	60
Street Sweeping	219	111.7	288
Restoration Projects	433.9	251.4	4,743
Reforestation Projects	0	5.3	36
Watershed Association Projects	0	0	0
<b>Totals</b>	<b>955.2</b>	<b>1102.2</b>	<b>10,999</b>
<b>Urban Watershed Imp./Load</b>	<b>2,282</b>	<b>16,437</b>	<b>125,190</b>
<b>% Urban Load Removed</b>	<b>41.9</b>	<b>6.7</b>	<b>8.8</b>
<b>Little Gunpowder River</b>			
	<b>Impervious Cover (ac.)</b>	<b>TP</b>	<b>TN</b>
Stormwater Management	27.8	173.0	1,329
Inlet Cleaning	3.7	1.9	5
Street Sweeping	48	24.5	63
Restoration Projects	0	0	0
Reforestation Projects	0	0	0
Watershed Association Projects	0	0	0
<b>Totals</b>	<b>79.5</b>	<b>199.4</b>	<b>1,397</b>
<b>Urban Watershed Imp./Load</b>	<b>611.9</b>	<b>5,429</b>	<b>40,636</b>
<b>% Urban Load Removed</b>	<b>13.0</b>	<b>3.7</b>	<b>3.4</b>
<b>Bird River</b>			
	<b>Impervious Cover (ac.)</b>	<b>TP</b>	<b>TN</b>
Stormwater Management	414.5	974.0	8,380
Inlet Cleaning	8.0	4.1	11
Street Sweeping	202	103.0	266
Restoration Projects	513.8	595.0	8,659
Reforestation Projects	0	23.2	167
Watershed Association Projects	0	0	0
<b>Totals</b>	<b>1138.3</b>	<b>1699.3</b>	<b>17,483</b>
<b>Urban Watershed Imp./Load</b>	<b>2,553</b>	<b>14,785</b>	<b>113,591</b>
<b>% Urban Load Removed</b>	<b>44.6</b>	<b>11.5</b>	<b>15.4</b>
<b>Gunpowder River</b>			
	<b>Impervious Cover (ac.)</b>	<b>TP</b>	<b>TN</b>
Stormwater Management	27.7	70.7	547
Inlet Cleaning	2.9	1.5	4
Street Sweeping	21	10.5	27
Restoration Projects	17.6	46.3	367
Reforestation Projects	0	74.9	488
Watershed Association Projects	0	0	0
<b>Totals</b>	<b>69.2</b>	<b>203.9</b>	<b>1433</b>
<b>Urban Watershed Imp./Load</b>	<b>396</b>	<b>3,757</b>	<b>27,561</b>
<b>% Urban Load Removed</b>	<b>17.5</b>	<b>5.4</b>	<b>5.2</b>

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**Table 10-6: Pollutant Removal (Pounds) by Upper Western Shore Watersheds Attributed to BMP's (continued)**

<b>Middle River</b>			
	<b>Impervious Cover (ac.)</b>	<b>TP</b>	<b>TN</b>
Stormwater Management	82.5	158.9	1,217
Inlet Cleaning	1.4	0.7	2
Street Sweeping	75	38.4	99
Restoration Projects	69.6	686.2	2,325
Reforestation Projects	0	20.0	133
Watershed Association Projects	0	0	0
<b>Totals</b>	<b>228.5</b>	<b>904.2</b>	<b>3,776</b>
<b>Urban Watershed Imp./Load</b>	<b>1,162</b>	<b>7,425</b>	<b>57,540</b>
<b>% Urban Load Removed</b>	<b>19.7</b>	<b>12.2</b>	<b>6.6</b>

**Table 10-7: Pollutant Removal (Pounds) by Patapsco/Back River Watersheds Attributed to BMP's**

<b>Patapsco / Back River</b>			
<b>Liberty Reservoir</b>			
	<b>Impervious Cover (ac.)</b>	<b>TP</b>	<b>TN</b>
Stormwater Management	33.2	85.0	699
Inlet Cleaning	0.0	0.0	0
Street Sweeping	21	10.5	27
Restoration Projects	0	0	0
Reforestation Projects	0	3.6	24
Watershed Association Projects	0	0	0
<b>Totals</b>	<b>54.2</b>	<b>99.1</b>	<b>750</b>
<b>Urban Watershed Imp./Load</b>	<b>562</b>	<b>4,362</b>	<b>33,628</b>
<b>% Urban Load Removed</b>	<b>9.6</b>	<b>2.3</b>	<b>2.2</b>
<b>Patapsco River</b>			
	<b>Impervious Cover (ac.)</b>	<b>TP</b>	<b>TN</b>
Stormwater Management	395.2	786.6	5,891
Inlet Cleaning	42.5	21.7	56
Street Sweeping	473	241.0	262
Restoration Projects	138.7	100.3	1,413
Reforestation Projects	0	92.1	617
Watershed Association Projects	0	8.6	59
<b>Totals</b>	<b>1049.4</b>	<b>1250.3</b>	<b>8,298</b>
<b>Urban Watershed Imp./Load</b>	<b>3,853</b>	<b>26,928</b>	<b>211,725</b>
<b>TMDL % Reduction</b>		15%	15%
<b>% Urban Load Removed</b>	<b>27.2</b>	<b>4.6</b>	<b>3.9</b>
<b>Gwynns Falls</b>			
	<b>Impervious Cover (ac.)</b>	<b>TP</b>	<b>TN</b>
Stormwater Management	1,209.3	1,744.8	15,569
Inlet Cleaning	141.4	72.1	186
Street Sweeping	890	454.0	1,171
Restoration Projects	70.5	69.7	880
Reforestation Projects	0	6.3	43
Watershed Association Projects	0	0	0
<b>Totals</b>	<b>2,311.2</b>	<b>2,346.9</b>	<b>17,849</b>
<b>Urban Watershed Imp./Load</b>	<b>6,262</b>	<b>35,611</b>	<b>280,749</b>
<b>TMDL % Reduction</b>		15%	15%
<b>% Urban Load Removed</b>	<b>36.9</b>	<b>7.4</b>	<b>6.4</b>

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**Table 10-7: Pollutant Removal (Pounds) by Patapsco/Back River Watersheds Attributed to BMP's (continued)**

<b>Jones Falls</b>			
	<b>Impervious Cover (ac.)</b>	<b>TP</b>	<b>TN</b>
Stormwater Management	371.9	1,119.5	10,147
Inlet Cleaning	45.3	23.1	60
Street Sweeping	188	96.0	248
Restoration Projects	323.1	244.7	3,204
Reforestation Projects	0	48.6	332
Watershed Association Projects	0	26.7	183
<b>Totals</b>	<b>928.3</b>	<b>1,558.6</b>	<b>14,174</b>
<b>Urban Watershed Imp./Load</b>	<b>3,423</b>	<b>25,272</b>	<b>195,435</b>
<b>TMDL % Reduction</b>		15%	15%
<b>% Urban Load Removed</b>	<b>27.1</b>	<b>6.2</b>	<b>7.3</b>
<b>Back River</b>			
	<b>Impervious Cover (ac.)</b>	<b>TP</b>	<b>TN</b>
Stormwater Management	518.0	788.0	6,733
Inlet Cleaning	68.2	34.8	90
Street Sweeping	633	323.0	833
Restoration Projects	469.4	2,853.1	8,640
Reforestation Projects	0	40.6	270
Watershed Association Projects	0	2.2	15
<b>Totals</b>	<b>1688.6</b>	<b>4,041.7</b>	<b>16,581</b>
<b>Urban Watershed Imp./Load</b>	<b>5,298</b>	<b>29,005</b>	<b>226,221</b>
<b>TMDL % Reduction</b>		15%	15%
<b>% Urban Load Removed</b>	<b>31.9</b>	<b>13.9</b>	<b>7.3</b>
<b>Baltimore Harbor</b>			
	<b>Impervious Cover (ac.)</b>	<b>TP</b>	<b>TN</b>
Stormwater Management	48.1	83.4	566
Inlet Cleaning	29.6	15.1	39
Street Sweeping	260	132.7	342
Restoration Projects	271.7	1,006	4,547
Reforestation Projects	0	13.6	91
Watershed Association Projects	0	0	0
<b>Totals</b>	<b>609.4</b>	<b>1,250.8</b>	<b>5,585</b>
<b>Urban Watershed Imp./Load</b>	<b>2,813</b>	<b>15,984</b>	<b>124,379</b>
<b>TMDL % Reduction</b>		15%	15%
<b>% Urban Load Removed</b>	<b>21.7</b>	<b>7.8</b>	<b>4.5</b>

### **10.5 Progress in Meeting MS4 Impervious Restoration, TMDLs, and Maryland Tributary Strategies**

This section discusses the progress made to date in meeting the impervious cover addressed by water quality and restoration efforts in the current MS4 Permit (Section 10.4.1), the TMDLs urban non-point nutrient reduction targets (10.4.2), and the current Maryland Tributary Strategies (10.4.3)

#### **10.5.1 MS4 Impervious Restoration**

The current MS4 Permit required that Baltimore County address 20% of the County controlled impervious cover by June 15, 2010. The next term of the permit is anticipated to require an additional 10% impervious cover be addressed over the 5-year term of the

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permit. Table 10-8 summarizes the Baltimore County efforts to date. The data is compiled from Tables 10-6 and 10-7 above.

**Table 10-8: Impervious Cover Addressed by Water Quality Improvement Efforts to Date**

Watershed	Impervious Cover to Be Addressed	20% Target	Impervious Cover Addressed	% Addressed
<b>Upper Western Shore</b>				
Deer Creek	166	33.2	1.6	0.4
Prettyboy	507	101.4	4.6	0.9
Loch Raven	6,560	1,312	1,503	22.9
Lower Gunpowder Falls	2,282	456.4	955.2	41.9
Little Gunpowder Falls	612	122.4	79.5	13.0
Bird River	2,553	510.6	1,138.3	44.6
Gunpowder River	396	79.2	69.2	17.5
Middle River	1,162	232.4	228.5	19.7
<b>Upper Western Shore</b>	<b>14,238</b>	<b>2,847.6</b>	<b>3,979.9</b>	<b>28.0</b>
<b>Patapsco/Back River</b>				
Liberty	562	112.4	54.2	9.6
Patapsco River	3,853	770.6	1,049.4	27.2
Gwynns Falls	6,262	1,252.4	2,311.2	36.9
Jones Falls	3,423	684.6	928.3	27.1
Back River	5,298	1,059.6	1,688.6	31.9
Baltimore Harbor	2,813	562.2	609.4	21.7
<b>Patapsco/Back River</b>	<b>22,211</b>	<b>4,441.8</b>	<b>6,641.1</b>	<b>29.9</b>
<b>County Impervious</b>	<b>36,449</b>	<b>7,289.4</b>	<b>10,621.0</b>	<b>29.1</b>

With the inclusion of street sweeping and storm drain cleaning, the county is currently addressing 29.1% of the impervious cover controlled by Baltimore County. That estimate is a liberal estimate, in that it does not account for the overlap in the various water quality improvement efforts. Future reports will attempt to correct this deficiency. It is anticipated that the ability to address additional impervious cover will become more difficult over time as the easier projects are completed. We will rely on our Small Watershed Action Plans to identify actions needed to meet the various TMDLs that are developed for each watershed for a variety of constituents. Implementation of those plans and meeting the TMDL reduction requirements will be considered as meeting the impervious cover requirement in each planning area. It is not anticipated that a water quality device will treat every impervious acre.

### 10.5.2 TMDL Progress

Baltimore County has not yet developed a mechanism for estimating bacteria loads, nor efficiencies of the various urban best management practices in reducing bacteria loads. Table 10-9 presents the progress in meeting TMDLs for nutrients.

**Table 10-9: Progress in Meeting Nutrient TMDLs Where Developed**

Watershed	Phosphorus		Nitrogen	
	Target	Progress	Target	Progress
Prettyboy	15% (54%)	0.7%	NA	NA
Loch Raven	15% (50%)	5.0%	NA	NA
Patapsco	15%	4.6%	15%	3.9%
Gwynns Falls	15%	7.4%	15%	6.4%
Jones Falls	15%	6.2%	15%	7.3%

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Back River	15%	13.9%	15%	7.3%
Baltimore Harbor	15%	7.8%	15%	4.5%

As can be seen from Table 10-9 the target reductions for phosphorus and nitrogen have not been met. In the cases of Prettyboy and Loch Raven Reservoir watersheds, the target phosphorus reduction is much higher (shown in parentheses), however, the reduction scenario developed by Maryland Department of the Environment indicates a 15% reduction of phosphorus from urban lands.

**10.5.3 Maryland Tributary Strategies**

Based on modeling by the federal EPA – Chesapeake Bay Program, nutrient and sediment pollutant load reductions needed for the Chesapeake Bay to attain water quality standards have been determined. These load reductions have been allocated to the various states within the Chesapeake Bay drainage area. Maryland has developed Tributary Strategies for the 10 basins within the state. Baltimore County lies within two of the tributary basins, the Upper Western Shore and the Patapsco/Back River basins. The Tributary Strategies identify the actions needed to achieve tidal Chesapeake Bay water quality standards. Actions to address urban non-point source reductions are expected to achieve a 24% reduction in nitrogen and a 42% reduction in phosphorus from urban lands. These goals may be revised, and made more specific to tidal water segments when the Phase 5 watershed model is complete in December 2009.

At this point in time, Baltimore County is not tracking all of the strategies for which pollution reduction credit can be awarded. We are uncertain on how to obtain credit for the educational activities that fall under the designation of urban and mixed nutrient management. Our tracking for reforestation needs to be improved to differentiate between urban pervious and mixed-open planting. For now, the acreage is combined.

The strategies developed apply to all of the jurisdictions within a Tributary Strategy basin, and have not been partitioned by jurisdiction. Table 10-10 presents the urban strategy for the Upper Western Shore, while Table 10-11 presents the urban strategy for the Patapsco/Back River. The strategy column in both tables represents the target for all jurisdictions within the Tributary Strategy basin, while the progress column only represents Baltimore County progress in meeting the urban strategy.

*Stormwater Management:* The stormwater management strategy represents the acreage of land that flows to a stormwater management facility (see Section 1), and includes only those facilities that have been built. It also includes the construction of new stormwater management facilities through the capital program (see Section 7), but not the conversion of existing facilities.

*Erosion and Sediment Control:* The acreage of disturbance for calendar year 2008 only is included (see Section 2). This represents the acreage under sediment control. Missing the target for this measure does not represent a failure, but reflects the pattern of development through time. Under the current economic conditions development is down. A better measure for this BMP would be that 100% of the acreage under development is under sediment control.

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*Stream Restoration:* The stream restoration strategy represents the target linear feet of urban stream restoration. The information for this measure comes from the individual watershed restoration tables in Section 7.

**10-10: Upper Western Shore Urban Tributary Strategy**

Urban BMP Type	Units	Strategy	Progress
Stormwater Management	Acres	56,784	12,278
Erosion and Sediment Control	Acres/Yr	5,576	327.7
Nutrient Management, Urban	Acres	67,206	NT
Nutrient Management, Mixed	Acres	86,984	NT
Buffers Forested, Urban	Acres	93	69.9
Tree Planting, Mixed Open	Acres	433	17.7
Tree Planting, Urban Pervious	Acres	597	
Stream Restoration, Urban	Linear feet	87,368	80,810

NT = Not Tracked

**10-11: Patapsco/Back River Urban Tributary Strategy**

Urban BMP Type	Units	Strategy	Progress
Stormwater Management	Acres	99,252	16,797
Erosion and Sediment Control	Acres/Yr	11,063	341.8
Nutrient Management, Urban	Acres	112,861	NT
Nutrient Management, Mixed	Acres	28,171	NT
Buffers Forested, Urban	Acres	160	24.0
Tree Planting, Mixed Open	Acres	691	43.0
Tree Planting, Urban Pervious	Acres	205	
Stream Restoration, Urban	Linear feet	82,421	44,238

NT = Not Tracked

In order to assess the progress in meeting the Maryland Tributary Strategy nutrient load reduction, the individual watershed load reductions from Tables 10-6 and 10-7 were summed, along with the individual watershed urban non-point nutrient loads. The overall percentage reduction for nitrogen and phosphorus due to urban BMPs for each tributary basin was calculated. The results are presented in Table 10-12.

**10-12: Tributary Strategy Urban Non-point Nutrient Load Reduction Progress**

	Upper Western Shore		Patapsco/Back River	
	Nitrogen	Phosphorus	Nitrogen	Phosphorus
Urban Load (#s)	<b>766,578</b>	<b>100,926</b>	<b>1,072,137</b>	<b>137,161</b>
Urban BMP Load Reduction (#s)	55,975	6,628	63,237	10,547
Urban BMP Load Reduction (%)	7.3 %	6.6 %	5.9 %	7.7%
Trib Strategy – Target Reduction (%)	24 %	42 %	24 %	42 %

## 10.6 Summary

Nutrient pollutant load reduction from urban sources is progressing through the use of a variety of urban best management practices. As of this time, we have not achieved the target percentage reductions for either the TMDLs developed to date, nor the Tributary Strategies. However, we are meeting the NPDES Permit requirement in addressing impervious cover through water quality improvements. Baltimore County will work towards establishing a mechanism to account for urban nutrient management progress through our education programs.