

3.0 Permit Requirements

D. Management Programs

1. Stormwater Management

An acceptable stormwater management program shall be maintained in accordance with Environment Article, Title 4, Subtitle 2, Annotated Code of Maryland. Activities to be undertaken by the County shall include, but not be limited to:

- a. Implementing the stormwater management design policies, principles, methods, and practices found in the latest version of the *2000 Maryland Stormwater Design Manual*. This includes:
 - i. Comply with the Stormwater Management Act of 2007 (Act) by implementing environmental site design (ESD) to the MEP for new and redevelopment projects;
 - ii. Tracking the progress toward satisfying the requirements of the Act and identifying and reporting annually the problems and modifications necessary to implement ESD to the MEP; and
 - iii. Reporting annually the modifications that have been or need to be made to all ordinances, regulations, and new development plan review and approval process to comply with the requirements of the Act.
- b. Maintaining programmatic and implementation information including, but not limited to:
 - i. Number of Concept, Site Development, and Final plans received. Plans that are re-submitted as a result of a revision or in response to comments should not be considered separate projects;
 - ii. Number of redevelopment projects received;
 - iii. Number of stormwater exemptions issued; and
 - iv. Number and type of waivers received and issued, including those for quantity control, quality control, or both. Multiple requests for waivers may be received for a single project and each should be counted separately, whether part of the same project or plan. The total number of waivers requested and granted for qualitative and quantitative control shall be documented.

Stormwater program data shall be recorded on MDE's annual report database and submitted as required in PART V of this permit.

- c. Maintaining construction inspection information according to COMAR 26.17.02 for all ESD treatment practices and structural stormwater

management facilities including the number of inspections conducted and violation notices issued by Baltimore County.

- d. Conducting preventative maintenance inspections, according to COMAR 26.17.02, of all ESD treatment systems and structural stormwater management facilities at least on a triennial basis. Documentation identifying the ESD systems and structural stormwater management facilities inspected, the number of maintenance inspections, follow-up inspection, the enforcement actions used to ensure compliance, the maintenance inspection schedules, and any other relevant information shall be submitted in the County's annual reports.

3.1 Introduction

The Stormwater Management Program addresses the impacts on stormwater quantity and quality resulting from new development and redevelopment after the construction phase is complete. These impacts are mainly associated with the increase in impervious area due to the installation of roadways and buildings. Baltimore County has been delegated authority by the State of Maryland to enforce stormwater management regulations. The Stormwater Management Program is located within the EPS – Stormwater Management Section. EPS currently implements the requirements of the 2000 Maryland Stormwater Design Manual, revised in 2009, for new and redevelopment activities. The Stormwater Management Act of 2007 was incorporated into the County's regulations in May 2010. The delegation of this program is periodically reviewed by the Maryland Department of the Environment (MDE) and has consistently passed the review requirements.

The Stormwater Management Program contains several components, including:

- review of stormwater management facilities plans,
- review of variance and associated fee-in-lieu requests,
- as-built inspections,
- triennial inspections, and
- maintenance of public stormwater management facilities.

All inspections of public and private facilities and maintenance of public facilities are conducted by the Stormwater Management Section.

3.2 Plan, and Variance and Fee-in-lieu Reviews

3.2.1 Plan Reviews

During fiscal year 2015 the following new plan reviews were conducted:

- Concept Plans – 88
- Site Development Plans – 34
- Final Development Plans – 484

This does not include multiple reviews for the same development project, only new projects. In FY 2015, there were 5 exemptions granted.

3.2.2 Variance and Fee-in-lieu Reviews

A variance in accordance with the Baltimore County Council Bill 33-4-113 may be approved for a project when exceptional circumstances are applicable to the site. This

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option is only acceptable to Baltimore County if it is proven to be infeasible to provide stormwater management (SWM) on site and a suitable outfall has been identified for the project. An accompanying fee-in-lieu is generally required with variance approval. The fee-in-lieu money is utilized by EPS's Watershed Restoration Section for water quality restoration projects. In FY 2015, there were a total of 61 variances granted: 21 of those variances required a fee-in-lieu. Projects do not receive their grading permit until the fee-in-lieu money is received. Twelve of the twenty one projects that were approved for fee-in-lieu have not yet paid as of June 30, 2015 and therefore did not start development in fiscal year 2015. Table 3-1 shows the number of projects, amount of fee-in-lieu due, and the fee-in-lieu money received by watershed during fiscal year 2015.

Table 3-1: Fee-in-lieu money received from July 1, 2014 through June 30, 2015

Watershed	# of Projects	Fee-in-lieu Due	Fee-in-lieu Collected
Upper Western Shore			
Deer Creek	0	\$0	\$0
Prettyboy Reservoir	0	\$0	\$0
Loch Raven Reservoir	4	\$23,808	\$18,720
Lower Gunpowder Falls	3	\$21,108	\$15,600
Little Gunpowder Falls	0	\$0	\$0
Bird River	3	\$253,080	\$30,240
Gunpowder River	2	\$17,880	\$0
Middle River	1	\$7,885	\$0
Upper Western Shore Total	13	\$323,761	\$64,560
Patapsco/Back River			
Liberty Reservoir	0	\$0	\$0
Patapsco River	4	\$72,760	\$26,200
Gwynns Falls	3	\$11,132	\$11,132
Jones Falls	4	\$21,564	\$21,564
Back River	6	\$14,805	\$14,481
Baltimore Harbor	0	\$0	\$0
Patapsco/Back River Total	17	\$120,261	\$73,377
County Totals	30	\$444,022	\$137,937

3.3 Approved Stormwater Management Facility Analysis

The database of approved stormwater management facilities indicates that a total of 4,315 facilities have been approved through June 30, 2015. Of the 4,315 approved facilities 2,759 have been built and have approved as-builts (1,015 public and 1,744 private). Table 3-2 lists approved facilities, but not necessarily built, by watershed, type and ownership.

The 4,315 approved facilities listed in Table 3-2 will, if built, serve 40,472 acres of land. The private facilities represent 61% of all approved facilities and 45% of the drainage area served by stormwater management facilities.

It is possible for a facility to be active, that is functioning and passing regular inspections, but not have an approved as-built. This scenario occurs in several situations. For example, sometimes a developer builds a facility but never submits an as-built drawing. These facilities without approved as-builts still provide important stormwater management as intended. There are 2,759 built facilities with approved as-builts serving 29,765 acres of land, with 45% of the drainage area served by private facilities. However, when we include built facilities without approved as-builts, that number increases to 3,233

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built facilities serving 35,470 acres of land. Table 3-3 shows the total approved and built facilities by watershed and includes facilities with and without approved as-builts.

In order to avoid double counting, these figures do not include those facilities that have been converted by the County, nor those facilities that have been installed as retrofits to address water quality. Converted and retrofit facilities are discussed further in Section 10 of this report.

Stormwater management facilities classified as detention ponds provide minimal water quality. An assessment of the existing stormwater management facilities and possibilities for conversion is a component of each watershed management plan. Conversions are typically cost effective only for facilities with greater than ten acres of drainage. However, to meet the pollutant reduction requirements facilities with acreage less than 10 acres are also considered. Preparation of Small Watershed Action Plans (see Section 10) will result in assessing each built stormwater management facility for conversion possibilities.

Table 3-2: Approved Stormwater Management Facilities by Watershed through Fiscal Year 2015

Watershed	Detention Ponds, Underground Storage & Oil/Grit Separator				Extended Detention Ponds			
	Private		Public		Private		Public	
	#	D.A.	#	D.A.	#	D.A.	#	D.A.
Upper Western Shore								
Deer Creek	0	0	0	0	0	0	0	0
Prettyboy Reservoir	0	0	0	0	0	0	5	36
Loch Raven Reservoir	83	869	22	1,095	111	977	63	1,415
Lower Gunpowder Falls	16	148	33	693	40	237	58	775
Little Gunpowder Falls	4	4	2	10	6	15	8	93
Bird River	41	561	26	618	63	404	72	779
Gunpowder River	1	14	3	39	2	4	4	30
Middle River	4	7	6	90	15	105	4	32
UWS Totals	149	1,603	92	2,544	237	1,742	214	3,159
Patapsco/Back River								
Liberty Reservoir	4	2	1	8	9	59	11	197
Patapsco River	34	356	36	1,282	85	630	74	674
Gwynns Falls	111	1,147	44	1,525	205	1,736	160	2,231
Jones Falls	46	677	23	602	104	935	35	647
Back River	63	276	23	383	99	614	43	383
Baltimore Harbor	12	174	18	181	16	131	1	79
Patapsco/Back R. Tot	270	2,632	145	3,981	518	4,104	324	4,211
County Totals	419	4,234	237	6,525	755	5,846	538	7,370

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Table 3-2: Approved Stormwater Management Facilities by Watershed through Fiscal Year 2015 (continued)

Watershed	Retention Ponds and Wet Ponds				Infil. Basins, Trenches, Dry Wells, Porous Paving, Level Spreader			
	Private		Public		Private		Public	
	#	D.A.	#	D.A.	#	D.A.	#	D.A.
Upper Western Shore								
Deer Creek	0	0	0	0	0	0	0	0
Prettyboy Reservoir	0	0	0	0	1	16	1	13
Loch Raven Reservoir	16	482	10	358	78	239	20	217
Lower Gunpowder Falls	2	297	11	166	11	23	27	84
Little Gunpowder Falls	1	50	2	21	8	117	2	32
Bird River	22	516	26	948	25	59	12	52
Gunpowder River	13	124	6	114	4	22	3	2
Middle River	18	332	14	300	13	18	4	7
UWS Totals	72	1,799	69	1,907	140	494	69	408
Patapsco/Back River								
Liberty Reservoir	1	22	0	0	22	45	2	3
Patapsco River	14	364	15	231	62	154	13	208
Gwynns Falls	20	1,025	16	345	75	128	29	188
Jones Falls	8	953	8	227	28	85	25	86
Back River	23	242	13	944	24	28	11	19
Baltimore Harbor	9	73	11	402	11	17	1	2
Patapsco/Back R. Tot	75	2,679	63	2,150	222	456	81	505
County Totals	147	4,478	132	4,057	362	951	150	913
Watershed	Sand Filter, Bioretention, Filter Strip, Swales				Environmental Site Design			
	Private		Public		Private		Public	
	#	D.A.	#	D.A.	#	D.A.	#	D.A.
Upper Western Shore								
Deer Creek	0	0	0	0	0	0	0	0
Prettyboy Reservoir	2	3	6	73	9	5	1	0
Loch Raven Reservoir	84	426	102	835	44	73	18	63
Lower Gunpowder Falls	26	71	41	306	27	34	2	5
Little Gunpowder Falls	8	10	9	79	6	15	1	0
Bird River	79	238	76	474	30	52	12	42
Gunpowder River	8	16	3	14	1	0	3	2
Middle River	32	86	11	43	11	49	2	4
UWS Totals	239	850	248	1,824	128	228	39	116
Patapsco/Back River								
Liberty Reservoir	19	56	26	166	5	7	4	15
Patapsco River	78	226	50	339	32	55	9	39
Gwynns Falls	148	615	107	474	42	39	18	16
Jones Falls	81	166	43	221	39	40	6	10
Back River	83	214	49	247	30	56	17	6
Baltimore Harbor	13	31	3	5	8	5	2	6
Patapsco/Back R. Tot	422	1,308	278	1,452	156	202	56	93
County Totals	661	2,158	526	3,276	284	431	95	209

Note: Drainage areas are rounded to the nearest acre.

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Table 3-3: Total Facilities Built by Watershed and Ownership through Fiscal Year 2015

Watershed	Detention Ponds Underground Storage & Oil/Grit Separator				Extended Detention Ponds			
	Private		Public		Private		Public	
	#	D.A.	#	D.A.	#	D.A.	#	D.A.
Upper Western Shore								
Deer Creek	0	0	0	0	0	0	0	0
Prettyboy Reservoir	0	0	0	0	0	0	5	36
Loch Raven Reservoir	76	845	20	859	99	883	60	1,251
Lower Gunpowder Falls	11	135	30	640	38	214	53	729
Little Gunpowder Falls	0	0	2	10	6	15	6	75
Bird River	36	481	25	604	52	301	67	744
Gunpowder River	0	0	3	39	1	2	4	30
Middle River	4	7	6	90	14	104	4	32
UWS Totals	127	1,468	86	2,242	210	1,520	199	2,896
Patapsco/Back River								
Liberty Reservoir	4	2	0	0	7	54	10	186
Patapsco River	30	241	32	1,263	75	548	66	596
Gwynns Falls	85	621	41	1,511	183	1,607	146	2,116
Jones Falls	39	636	23	602	93	879	32	603
Back River	46	171	19	372	83	580	38	322
Baltimore Harbor	8	168	15	178	15	130	1	79
Patapsco/Back R. Tot	212	1,839	130	3,927	456	3,799	293	3,902
County Totals	339	3,307	216	6,169	666	5,319	492	6,797
Watershed	Retention Ponds and Wet Ponds				Infil. Basins, Trenches, Dry Wells, Porous Paving, Level Spreader			
	Private		Public		Private		Public	
	#	D.A.	N	D.A.	#	D.A.	#	D.A.
Upper Western Shore								
Deer Creek	0	0	0	0	0	0	0	0
Prettyboy Reservoir	0	0	0	0	0	0	1	13
Loch Raven Reservoir	14	474	7	311	50	223	20	217
Lower Gunpowder Falls	2	297	9	138	6	13	25	80
Little Gunpowder Falls	1	50	2	21	5	114	2	32
Bird River	19	480	22	841	19	55	10	52
Gunpowder River	7	47	5	114	4	22	3	2
Middle River	12	229	11	266	9	14	4	7
UWS Totals	55	1,577	56	1,692	93	441	65	404
Patapsco/Back River								
Liberty Reservoir	1	22	0	0	13	27	1	2
Patapsco River	12	358	13	219	47	137	13	208
Gwynns Falls	18	802	11	295	65	110	28	187
Jones Falls	6	944	8	227	24	84	24	85
Back River	17	220	11	922	15	17	5	14
Baltimore Harbor	5	38	7	723	9	14	1	2
Patapsco/Back R. Tot	59	2,385	50	2,386	173	388	72	498
County Totals	114	3,962	106	4,078	266	829	137	901

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Table 3-3: Total Facilities Built by Watershed and Ownership through Fiscal Year 2015 (continued)

Watershed	Sand Filter, Bioretention, Filter Strip, Swales				Environmental Site Design			
	Private		Public		Private		Public	
	#	D.A.	#	D.A.	#	D.A.	#	D.A.
Upper Western Shore								
Deer Creek	0	0	0	0	0	0	0	0
Prettyboy Reservoir	0	0	5	43	1	0	0	0
Loch Raven Reservoir	51	349	90	788	20	25	4	8
Lower Gunpowder Falls	14	23	29	259	11	21	0	0
Little Gunpowder Falls	8	10	6	48	1	7	0	0
Bird River	47	146	43	253	14	29	7	15
Gunpowder River	5	13	3	14	0	0	0	0
Middle River	12	58	6	33	1	1	1	1
UWS Totals	137	598	182	1,439	48	83	12	25
Patapsco/Back River								
Liberty Reservoir	13	24	6	41	2	0	1	2
Patapsco River	50	160	35	260	6	3	3	22
Gwynns Falls	93	370	47	306	14	12	3	3
Jones Falls	58	135	33	184	19	9	3	8
Back River	58	149	38	204	18	33	3	2
Baltimore Harbor	6	20	0	0	4	3	1	2
Patapsco/Back R. Tot	278	859	159	995	63	60	14	38
County Totals	415	1,457	341	2,434	111	143	26	63

Note: Drainage areas are rounded to the nearest acre.

Figure 3-1 displays the number of approved facilities, both private and public, by watershed. The Gwynns Falls watershed continues to have the greatest total number of existing and newly approved facilities. The large number of facilities in the Gwynns Falls watershed can be attributed to the fact that the Owings Mills growth area was built mostly after SWM regulations were in place. Many older communities, developed prior to regulatory authority, do not have any SWM facilities. Deer Creek, Prettyboy Reservoir, Liberty Reservoir, the Little Gunpowder Falls and the Gunpowder River watersheds have only a few facilities, which is reflective of fewer development projects and the small size of those watersheds. This pattern has not changed from past reports.

Figure 3-2 displays acreage to be served by approved private stormwater management facilities by watershed, and Figure 3-3 displays the same information for public facilities.

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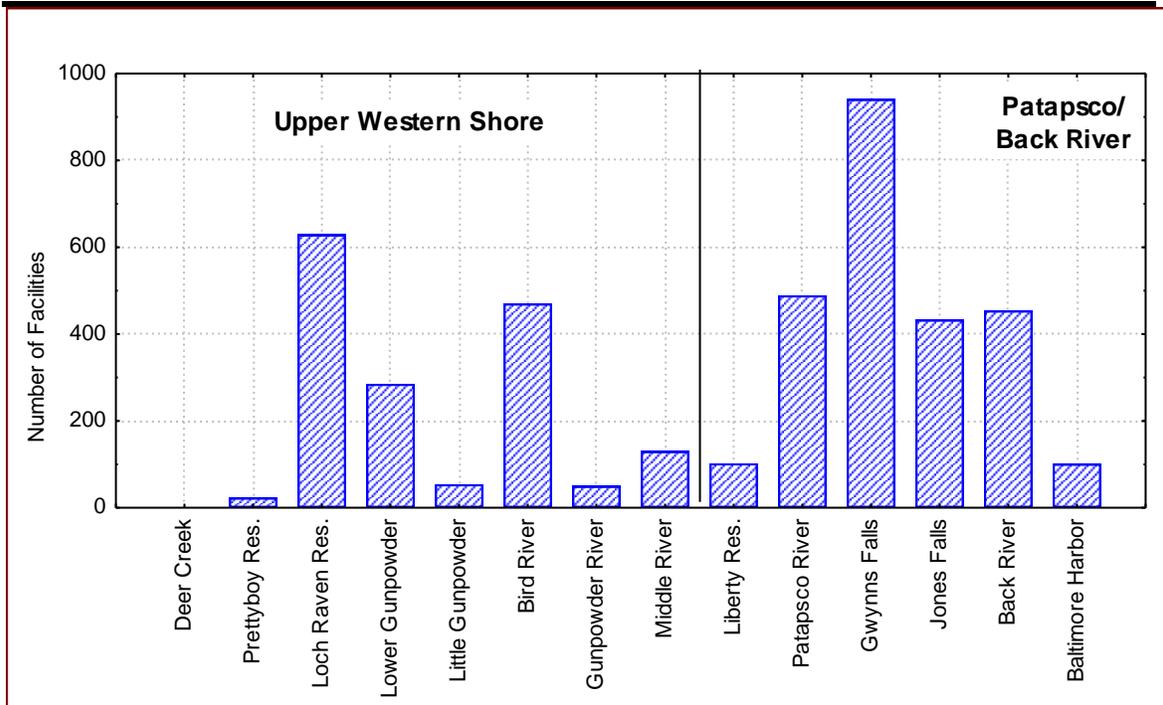


Figure 3-1: Number of Approved SWM Facilities by Watershed through Fiscal Year 2015

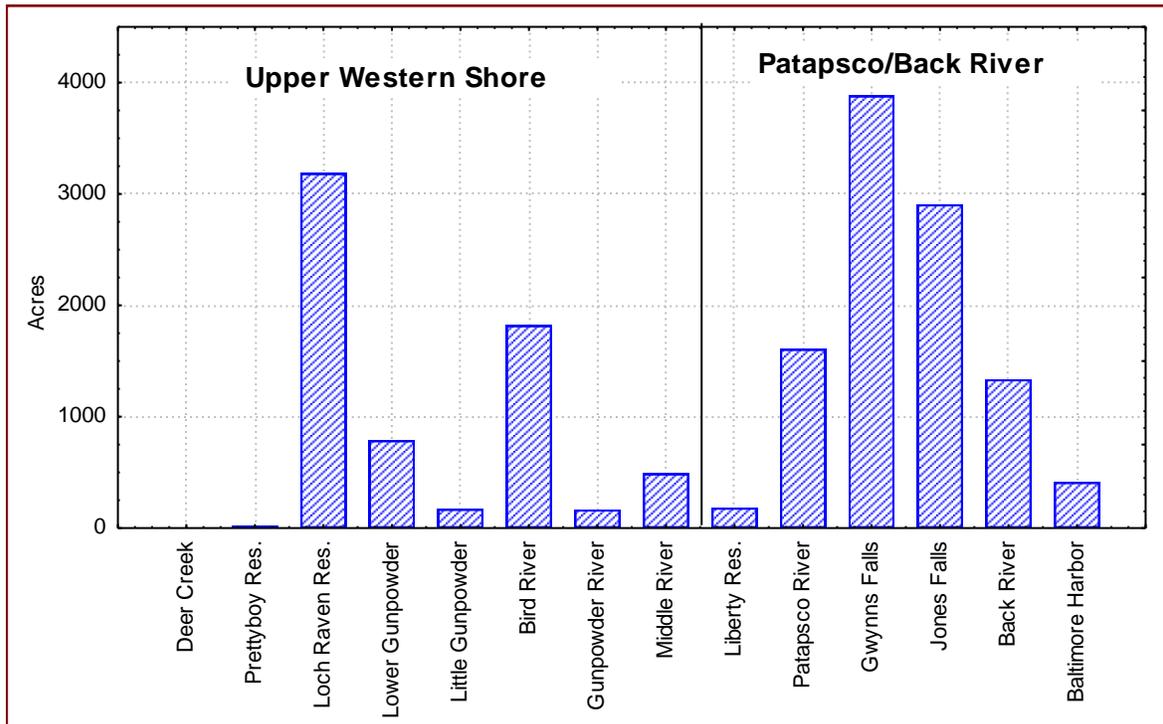


Figure 3-2: Acreage Served by Approved Private SWM Facilities by Watershed through Fiscal Year 2015

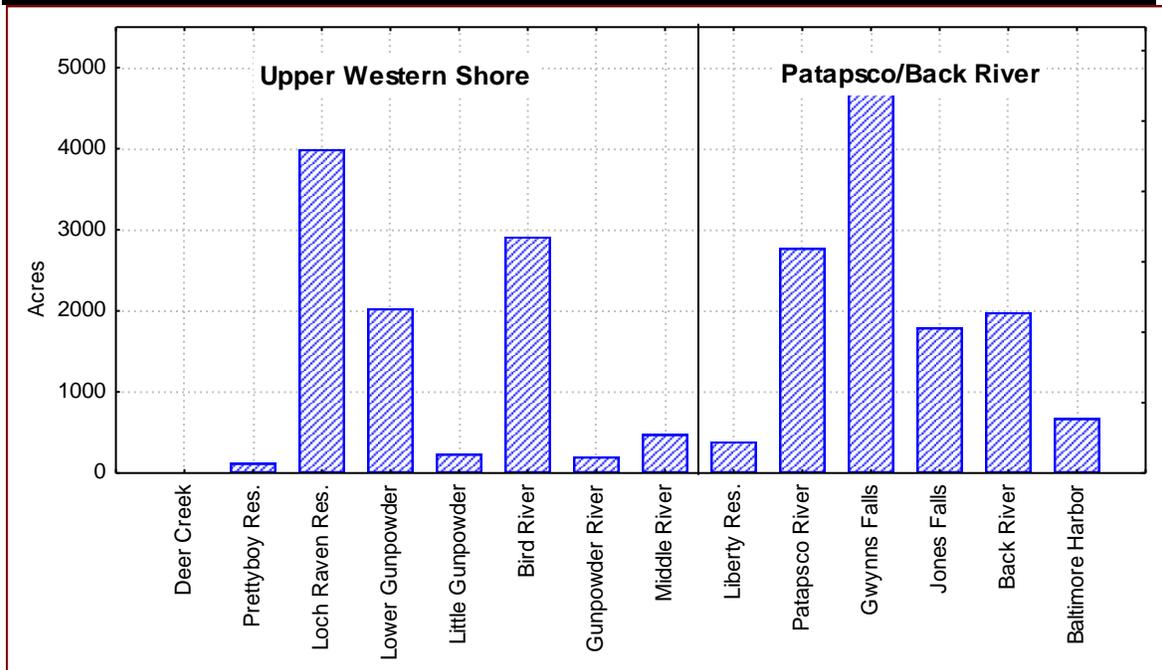


Figure 3-3: Acreage Served by Approved Public SWM Facilities by Watershed through Fiscal Year 2015

3.3.1 As-built Analysis

As stated earlier, it is possible for a facility to be active, that is functioning and passing regular inspections, but not have an approved as-built. This scenario occurs in several situations. Table 3-4 presents the SWM facilities by sector that do not have an as-built with their corresponding drainage area and pollutant removal capabilities. This analysis includes all facilities, including retrofits, conversions, redevelopment and new development. Table 3-5 presents the load reductions for facilities without as-builts.

Table 3-4: Count and Drainage Area of SWM Facilities with Missing As-builts

	Count	Drainage Area (acres)
Public Stormwater Facilities	301	3,780
Private Stormwater Facilities	192	1,685
Total	493	5,465

Table 3-5: Load Reductions from SWM Facilities with Missing As-builts

	TN (pounds)	TP (pounds)	TSS (pounds)
Public Stormwater Facilities	6,498	551	653,530
Private Stormwater Facilities	3,838	377	530,198
Total	10,335	928	1,183,728

When an inspection happens for a facility with no approved as-built, the inspector attempts to contact the pond owner to ask for an as-built.

In order to address the missing as-builts, the County proposes several methods, depending on whether the facility is privately or publically owned. For private facilities, the County will determine if there are any monies being withheld from the developer. If

so, developers could be incentivized to submit an as-built in order to get their security deposit back. The stormwater remediation fee may also be an incentive for developers to submit an as-built. If the property has an approved as-built, they may be eligible for a credit towards their stormwater remediation fee.

For public facilities, there is typically no security deposit required, so there is often no financial incentive to prepare and submit an as-built, or to pass an as-built inspection. EPS is working with other agencies in the County to determine a plan to address missing as-builts.

3.4 Inspections

As of October 1, 2013, all SWM inspections and maintenance have been consolidated under the Stormwater Management Section. Prior to October 1, 2013, staff in the Stormwater Engineering Section completed all as-built inspections and one-year inspections, while all three-year inspections of public facilities were conducted by the Capital Programs and Operations Section and for private facilities by the Stormwater Engineering Section. Increases in inspection staff in FY2014, hiring of a crew chief and contractual maintenance of public facilities have increased both the number of three year inspections conducted and the maintenance of public facilities.

Table 3-6 presents the SWM facility inspections conducted by EPS during the reporting period of July 1, 2014 through June 30, 2015.

Table 3-6: SWM Inspections from July 1, 2014 through June 30, 2015

	As-built	One year	Three year	Totals
Public Stormwater Facilities	61	71	425	557
Private Stormwater Facilities	91	120	725	936
Totals	152	191	1,150	1,493

A total of 152 as-built inspections were completed for the reporting period. A total of 191 one year inspections were completed. Approval of the one year maintenance inspection initiates the three-year maintenance inspection cycle. A total of 425 three-year inspections were completed for public facilities and 725 three year inspections were completed for private facilities. A total of 1,150 three year inspections of public and private stormwater facilities were conducted. The inspection program’s goal is to inspect all built facilities every three years. A total of 1,493 inspections were completed for all built facilities. There are 1,320 public facilities built with and without as-builts so the County’s goal is to inspect 440 facilities: there are 1,913 private facilities built with and without approved as-builts so the goal is to inspect 638 facilities. While the County missed its public facility inspection goal by just 15 facilities, it exceeded its private inspections by 87 facilities.

3.5 Stormwater Management Facility Maintenance

The Baltimore County Department of Environmental Protection and Sustainability has an operations crew in the Stormwater Management Section, responsible for inspection and maintenance of public facilities. Their staff consists of one supervisor, five field crew members with one vacancy. Additionally there are two contracted inspectors and two contracted field crews consisting of four field workers for each crew for a total of eight field crew members. The crews are divided geographically into eastern and western districts. The private facility inspection staff consists of a supervisor and five inspectors.

The implementation of the stormwater remediation fee resulted in an increase in the number of inspectors, with 3 additional inspectors being added in FY 2014, and a new crew chief for the maintenance crews. In addition, starting in FY 2014, some of the inspection and maintenance work is now performed by contractual services. These staff additions have resulted in an improved inspection and maintenance program.

A database has been developed to track all routine maintenance and responses to complaints. Table 3-7 summarizes the number of maintenance visits due to complaints versus routine maintenance. There were 77 routine maintenance assessments and 86 complaint driven site assessments during the reporting period for a total of 163 maintenance visits.

Table 3-7: Stormwater Facility Maintenance Visits by Type FY 2015

# of Routine Maintenance Visits	# of Complaint Maintenance Visits
77	86

3.6 Constructed Stormwater Management Facility Data Analysis

An analysis of the databases related to stormwater management facilities indicated that a total of 3,233 facilities have been built to date. The 3,233 built facilities have a combined drainage area of 35,470 acres. The drainage areas of 3,093 built facilities have been delineated and digitized into the County GIS. As new facilities are built their drainage areas will also be added to the GIS data layer. Overall, built stormwater management facilities serve 22.7% of the designated urban acreage (156,099 acres). This is exclusive of the stormwater facilities converted by the county for greater pollutant removal efficiency and retrofits installed by the county. The total urban acreage is based on the October 2011 Maryland Assessment Scenario Tool (MAST) data.

The drainage areas were overlaid on the National Land Cover Database 2011 land use data and the Baltimore County 2011 impervious surface data to determine the specific land use and impervious cover draining to each facility. Table 3-8 presents a summary of the land use served by built SWM facilities by watershed. It should be noted that the date of the creation of the GIS land use data layer might precede the building of a number of the stormwater management facilities. This fact will result in some error in the determination of land use draining to those facilities.

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Table 3-8: Constructed SWM Facility Drainage Area Land Use (Acres) through June 30, 2015

Watershed	Pervious Urban	Impervious Urban	Forest and Wetlands	Pasture	Crops	Extractive	Open Water	Total Acres
Upper Western Shore								
PR	24.8	12.2	28.4	5.5	16.3	0	0	87.2
LR	2,640.5	1,495.5	1,058.5	230.2	201.4	0.2	7.5	5,633.8
GU	1,312.3	563.6	301.0	80.6	53.9	3.4	0	2,314.8
LG	138.4	47.6	98.1	44.7	28.1	0	0	357.0
BI	1,903.7	1,210.8	321.0	26.4	35.4	10.9	0	3,508.1
GR	133.3	84.3	24.4	0.1	0.9	9.7	1.5	254.2
MR	386.3	239.4	31.0	0	0	4.1	0.1	660.8
Total	6,539.3	3,653.3	1,862.6	387.4	335.9	28.3	9.1	12,816.0
Patapsco/Back River								
LI	123.7	85.3	42.1	27.3	47.3	0	0	325.6
PA	1,691.8	1,158.8	496.7	161.0	143.8	0	0	3,652.2
GW	3,635.3	2,461.2	527.1	39.5	93.2	2.4	0	6,760.8
JF	1,846.7	957.6	769.2	51.6	60.9	3.2	2.0	3,701.1
BR	1,216.3	969.7	131.8	0.6	0.1	3.5	11.9	2,322.1
BH	433.1	331.6	30.8	0	0	0	0	795.5
P/B	8,946.9	5,964.2	1,997.7	280.1	345.3	9.1	13.9	17,557.2
County	15,486.2	9,617.5	3,860.3	667.6	681.2	37.4	23.0	30,373.2

LR = Loch Raven Reservoir

LG = Little Gunpowder Falls

PA = Patapsco River

JF = Jones Falls

BR = Back River

PR = Prettyboy Reservoir

BI = Bird River

LI = Liberty Reservoir

MR = Middle River

GU = Lower Gunpowder Falls

GR = Gunpowder River

GW = Gwynns Falls

BH = Baltimore Harbor

3.7 Pollutant Loads

MDE and the EPA Chesapeake Bay Program currently endorse two methods for calculating stormwater management facility load reductions: the "BMP Removal Rate Adjustor Curve" method (Schueler and Lane 2015a, Maryland Department of the Environment 2014) and, for facilities that do not qualify for the curve method, the "Approved CBP BMP Efficiency Rates" method (Schueler and Lane 2015a, 12 & 40).

These methods, which are documented in detail in SOP RT-010: Tracking, Verification, and Pollutant Load Calculations: Stormwater Management Facilities (Baltimore County EPS, 2015), were used for the 3,093 facilities that are currently active with drainage areas digitized. The results of the analysis are displayed in Tables 3-9 (Total Nitrogen), 3-10 (Total Phosphorus), and 3-11 (Total Suspended Solids), respectively. These tables and figures do not include conversions, retrofits or redevelopment projects which are analyzed in Section 10.

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Table 3-9: Total Nitrogen Removal by SWM Facility Type and Watershed (pounds)

Watershed	Total pounds of N to SWM	Pounds of Removal by Facility Type						Total Removed	
		DP	EDP	WP	INF.	FIL.	ESD	Pounds	%
Upper Western Shore Watersheds									
Prettyboy Reservoir	997	0	95	0	43	150	3	292	20.0
Loch Raven Reservoir	67,725	761	4,706	1,488	2,848	3,892	251	13,946	20.6
Lower Gunpowder Falls	27,959	437	2,119	1,150	520	555	88	4,870	17.4
Little Gunpowder Falls	3,774	5	233	216	433	290	35	1,211	32.1
Bird River	25,752	319	1,442	1,993	605	838	147	5,345	20.8
Gunpowder River	1,481	11	29	237	63	69	0	409	27.7
Middle River	3,189	27	170	261	64	146	6	675	21.2
Totals	130,877	1,560	8,795	5,347	4,576	5,941	529	26,748	20.4
Patapsco/Back River Watersheds									
Liberty Reservoir	4,354	1	554	81	247	359	2	1,245	28.6
Patapsco River	37,746	573	2,434	1,282	1,127	1,460	28	6,904	18.3
Gwynns Falls	96,292	988	9,264	2,652	2,224	2,254	59	17,441	18.1
Jones Falls	43,979	518	3,107	2,821	953	1,227	106	8,732	19.9
Back River	16,285	175	1,114	1,005	74	669	74	3,112	19.1
Baltimore Harbor	3,713	28	277	111	67	105	10	598	16.1
Totals	202,369	2,283	16,750	7,953	4,693	6,074	279	38,032	18.8
County Total	333,246	3,843	25,545	13,300	9,269	12,015	808	64,780	19.4

Table 3-10: Total Phosphorus Removal by SWM Facility Type and Watershed (pounds)

Watershed	Total pounds of P to SWM	Pounds of Removal by Facility Type						Total Removed	
		DP	EDP	WP	INF.	FIL.	ESD	Pounds	%
Upper Western Shore Watersheds									
Prettyboy Reservoir	53	0	5	0	2	13	0	20	39.0
Loch Raven Res.	3,693	76	258	122	197	326	17	997	27.0
Lower Gunpowder	1,404	42	110	112	34	42	5	344	24.5
Little Gunpowder	191	1	13	15	21	28	1	78	40.9
Bird River	2,500	57	140	315	66	127	14	718	28.7
Gunpowder River	164	2	3	47	5	12	0	69	41.8
Middle River	318	5	17	39	9	26	1	96	30.3
Totals	8,323	182	545	649	334	575	37	2,323	26.0
Patapsco/Back River Watersheds									
Liberty Reservoir	252	0	31	7	16	30	0	85	33.6
Patapsco River	2,148	59	140	120	84	137	3	541	25.2
Gwynns Falls	5,411	105	529	278	132	210	5	1,258	23.2
Jones Falls	2,251	51	165	223	54	96	7	596	26.5
Back River	1,704	38	116	164	10	104	7	439	25.8
Baltimore Harbor	368	5	28	20	9	11	1	74	20.2
Totals	12,135	257	1,009	813	305	587	22	2,993	24.7
County Total	20,459	439	1,554	1,462	639	1,162	60	5,316	26.0

Table 3-11: Total Suspended Solids Removal by SWM Facility Type and Watershed (tons)

Watershed	Total TSS To SWM	Tons of Removal by Facility Type						Total Removed	
		DP	EDP	WP	INF.	FIL.	ESD	#	%
Upper Western Shore Watersheds									
Prettyboy Reservoir	45,632	0	12,821	4	2,277	14,173	159	29,435	64.5
Loch Raven Reservoir	3,508,093	74,031	752,813	141,119	208,114	355,020	16,688	1,547,785	44.1
Lower Gunpowder Falls	1,565,271	47,741	373,055	150,119	41,603	60,807	5,660	678,985	43.4
Little Gunpowder Falls	217,908	644	43,498	22,940	27,828	33,778	1,192	129,879	59.6
Bird River	1,001,529	22,131	170,505	162,157	29,114	64,263	5,652	453,821	45.3
Gunpowder River	76,685	842	4,507	27,024	2,579	7,316	0	42,267	55.1
Middle River	150,515	2,074	26,163	22,139	4,775	15,161	354	70,667	47.0
Totals	6,565,634	147,463	1,383,362	525,501	316,289	550,518	29,705	2,952,838	45.0
Patapsco/Back River Watersheds									
Liberty Reservoir	240,846	221	89,541	10,322	16,893	30,470	143	147,589	61.3
Patapsco River	2,354,242	66,189	472,277	152,233	94,517	182,413	2,576	970,205	41.2
Gwynns Falls	6,811,907	131,659	2,037,626	452,729	164,309	314,465	6,916	3,107,704	45.6
Jones Falls	1,285,548	29,127	291,375	156,290	33,414	64,009	4,514	578,729	45.0
Back River	612,803	13,493	127,615	73,952	3,881	45,586	2,614	267,140	43.6
Baltimore Harbor	158,206	2,177	38,603	11,428	4,155	5,311	341	62,015	39.2
Totals	11,463,551	242,865	3,057,036	856,953	317,168	342,256	17,105	5,133,383	44.8
County Total	18,029,186	390,328	4,440,398	1,382,454	633,457	1,192,774	46,810	8,086,220	44.9

3.8 Historic BMP Clean-up Process

As part of the historic BMP clean-up, Baltimore County addressed a variety of deficiencies in our SWM data. A comparison was conducted between this year's submittal which includes all the historic BMP cleanup data and last year's FY 2014 submittal but for the same time period (everything through FY 2014). In particular, water quality volume, BMP type, and drainage areas were closely reviewed and revised as needed.

The most significant change is the change in depth (inches) of rainfall treated for water quality per impervious acre (WQv). During the same reporting period, the WQv before the historic bmp clean-up was 549 inches; after the clean-up it was 2,521 inches for a difference of 1,972 inches treated.

While addressing deficiencies, plans were reviewed and sometimes drainage areas needed to be revised or delineated in our database. Before the clean-up there were 2,870 facilities with delineated drainage areas accounting for 32,785 acres. After the clean-up for the same installation time period, there were 3,162 facilities with delineated drainage areas accounting for 33,725 acres.

BMP type previously was often mis-categorized so during the BMP clean-up process, in addition to updating water quality and missing attributes, the BMP type was assessed. During the clean-up it was determined several facilities that were previously listed as one type of BMP were actually conversions or retrofits. These facilities were categorized back to their original BMP and another conversion record was made. Many of these conversions were actually built in FY15 which could account for the decrease in overall count of facilities and drainage area through FY14. Table 3-12 shows the change in BMP types before and after the BMP clean-up.

Table 3-12: Comparison of BMP Type Before and After Clean-up

BMP	2014	Clean-up	Difference
	Count	Count	Count
Detention	555	582	+27
Environmental Site Design	137	98	-39
Extended Detention	1,158	1,189	+31
Filtering Practice	756	718	-38
Infiltration Practice	403	409	+6
Wet Pond or Wetland	220	222	+2
County Total	3,229	3,221	-8

3.9 Summary

Baltimore County operates a comprehensive stormwater management program. EPS has always taken a firm stand on requiring water quality treatment even when quantity management was not required. EPS continues to require all projects to explore and implement methods for water quality treatment. EPS uses the option to accept a fee-in-lieu payment if an exhaustive search has resulted in no practicable opportunity for on-site treatment.

The stormwater management facility maintenance program within EPS has continued to inspect both publicly and privately owned facilities and maintain public facilities. The staff has compiled an extensive database of inspections and maintenance operations for the publicly and privately owned stormwater facilities. These inspections, and the

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resulting actions, are improving the overall pollutant reduction efficiency of all stormwater facilities.

Constructed stormwater management facilities serve ~22.7 % of the total urban land, 156,099 acres (87,452 P/B and 68,647 UWS), in Baltimore County. For the areas served by these facilities a significant amount of pollutants are removed annually. Facilities designed and constructed for water quantity management represent an opportunity for water quality improvement through conversion to water quality facilities that will be explored through the Small Watershed Action Plan planning process (Section 10).