BALTIMORE CITY

MS4 ANNUAL REPORT

Reporting Period: July 1, 2018 to June 30, 2019

BALTIMORE CITY
DPW
DEPARTMENT OF PUBLIC WORKS

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List of Appendices (*italicized text indicates electronic files only*)

1 Introduction

This report includes the progress of compliance for the period of Fiscal Year (FY) 2019, in association with Baltimore City's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Discharge Permit (Permit Number: 11-DP-3315, MD0068292). The current permit was issued on December 27, 2013. The City's current permit, which expired on December 6, 2019, is administratively continued until a new permit is issued. The City continues to be responsible for compliance of the current permit conditions. Annual report periods follow the City's fiscal calendar: July 1 to June 30. This Annual report has been formatted to match the reporting requirements as listed in Part V of the current permit.

1.1 Permit Administration

Designation of individual to act as a liaison between the City and the Maryland Department of Environment (MDE) for the implementation of this permit:

Kimberly L. Grove, P.E.
Chief, Office of Compliance and Laboratories
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Baltimore, MD 21215
410-396-0732
Kimberly.grove@baltimorecity.gov

Two organization charts (as of June 30, 2019) are provided in Appendix A of this report:

- City agency organization chart with designations of MS4 permit condition responsibilities.
- DPW organization chart.

On May 2, 2019, Bernard C. "Jack" Young became the 51st mayor of Baltimore City, upon the departure of Catherine Pugh. Brandon M. Scott was then elected President of the City Council by members of the City Council. During FY 2019, Steve Sharkey and Chichi Nyagah-Nash became the new Directors of the Departments of Transportation and General Services, respectively. Mr. Sharkey had previously been the Director of General Services.

Within the Department of Public Works, Matt Garbark assumed the role of the Deputy Director upon the departure of Dale Thompson. Yosef Kebede assumed the role of Acting Head of the Bureau of Water and Wastewater upon the departure of James Price. The Department re-organized in April 2019 to reduce the number of direct reports to the Director.

1.2 Legal Authority

The City maintained adequate legal authority in accordance with NPDES regulations 40 CFR 122.26(d) (2) (i) during FY 2019.

2 Implementation Status

Table 2-1 is a summary of the status for implementing the components of the stormwater management program that are established as permit conditions.

Table 2-1: Summary of Implementation Status

Permit Condition	Component	Due	Status as of June 30, 2019
Part IV.C. Source Identification	GIS Data	Annual report	Baltimore City transitioned the source identification to the MS4 Geodatabase as part of the FY 2018 Annual Report.
Part IV.D.1 Stormwater Management	Identification of problems and modifications of ESD to MEP	Annual report	No problems identified during this reporting period.
	Modification to ordinances to eliminate impediments to ESD to MEP	Annual report	No modifications were initiated during this reporting period.
Part IV.D.2 Erosion and Sediment Control	Responsible personnel certification 3 / year	Annual Report	The City's program was replaced by MDE's on-line program.
	Inventory of projects > 1 acre	Initial 4/1/14 then quarterly	Included in Appendix C.
Part IV.D.3 Illicit Discharge Detection and Elimination	Alternative program for MDE submittal	12/27/14	The City is using the same alternative analysis (Ammonia Screening) as reported since 1998. Results are discussed in Section 5.3. Results are provided in Appendices D and K.
	Annual visual surveys of commercial / industrial areas	Annual	See Section 5.3.
Part IV.D.4 Trash and Litter	Inventory and evaluation all solid waste operations	12/27/14	Part of *Public Outreach Strategy for Trash and Litter Programs for the City of Baltimore*, submitted February 20, 2015.
	Public education and outreach strategy	12/27/14	See Section 5.5.
	Evaluation of effectiveness of education program	Annual Report	See Section 5.5.
Part IV.D.5 Property Management and Maintenance	NOIs and SWPPPs submitted for NPDES stormwater general permit coverage for industrial permits	6/30/14	NOIs and SWPPPs were submitted for the City's solid waste facilities, fleet maintenance facilities, and wastewater treatment plants.
	Alternative maintenance program	12/27/14	No alternative maintenance program is being proposed.

Permit Condition	Component	Due	Status as of June 30, 2019
Part IV.D.6 Public Education	Maintain a compliance hotline for water quality complaints	Annual Report	2 customer service requests to 3-1-1 system were added in November 2014. See Sections 5.2 and 5.3.
Part IV.E.1 Watershed Assessment	Detailed watershed assessments of entire City	12/27/18	Updated assessments for Baltimore Harbor and North Lower Branch of Patapsco Watersheds were submitted to MDE on December 14, 2018; the public comment period started on November 20, 2018 but was extended to January 16, 2019.
Part IV.E.2 Restoration Plans	Impervious surface assessment consistent with MDE methods = baseline	12/27/14	MDE approved the baseline impervious area on July 28, 2015. On June 6, 2019, MDE deemed that this requirement was met based on FY 2018 Annual report data.
	Restoration of 20% of City's impervious surface area	12/27/18	
	Restoration Plan for each WLA approved by EPA prior to the effective date of the permit	12/27/14	Local and Bay TMDLs for nutrients and sediments were conditionally approved by MDE on May 9, 2018; see Section 6.5 and 6.6.1 for outstanding information and revised progress estimations. Bacteria TMDL implementation plan was approved by MDE on May 9, 2018. A modified implementation schedule, per the modified Consent Decree, was submitted to MDE on June 28, 2018. See Section 6.6.2 for progress. A modified PCB implementation schedule was submitted to MDE on September 14, 2018. See Section 6.6.4 for progress.

Permit Condition	Component	Due	Status as of June 30, 2019
	Restoration Plan for subsequent TMDL WLA	One year of approval	*Implementation Plan for the Middle Branch / Northwest Branch TMDL in Baltimore City* was submitted on January 4, 2016. A clarification memo was submitted to MDE on September 14, 2018. See Section 6.6.2 for progress.
Part IV.E.4. TMDL Compliance	Annual assessment to evaluate the effectiveness of the City's restoration plans	Annual Report	See Section 3 and 6.
Part IV.F. Assessment of Controls	Continue assessments	Annual Report	See Section 3.2 and Appendices C and H.
Part IV.G. Program Funding	Fiscal analysis of the capital, operation, and maintenance expenditures necessary to comply with all conditions of this permit	Annual Report	See Section 4 and Appendix I.

The MS4 geodatabase included rules for completed records related to mandatory fields. As a short-term solution to complete the database, Baltimore City used designated values as a "null" value. These values are listed in Appendix B.

3 Narrative Summary of Data

3.1 Rainfall

The NOAA weather station at BWI Airport showed calendar year 2018 as the highest recorded annual rainfall, almost 25 inches above normal. Thus, the total rainfall for FY 2019 was significantly higher than previous years within this permit period, as shown in Table 3-1. In addition to the total rainfall, the NOAA station also reported the highest number of days with more than 0.1 inch rainfall. These two factors can impact sampling results, by increasing the pollutant load and also potentially diluting the measured concentration of the pollutant. DPW also noted a significant increase in reported groundwater seeps and basement flooding due to groundwater. The increased groundwater levels can also impact groundwater migration rates of pollutants to streams, in addition to increasing sanitary sewer overflows due to infiltration.

DPW operates and maintains a series of rain gauges throughout the City as part of the City's Flood ALERT system. DPW uses the four gauges shown Figure 3-1 for analysis of rainfall events exceeding one inch to evaluate reported flooding events. The rainfall records for the four rain gauges demonstrate variability of rainfall across the City and compared to NOAA's BWI Airport system, as shown in Table 3-2. Although the rain gauges showed 85 to 96 days with recorded daily rainfall exceeding 0.1 inch; only 50 of those days were reported in the NOAA station and all 4 DPW stations. This variability can affect evaluations of the influence on rain events on sampling results and trash / debris collection operations.

Table 3-1: Summary of Annual Rainfall (NOAA)

Fiscal Year	2015	2016	2017	2018	2019
Rainfall, in.	55	42	38	44	68
Days > 0.1 in	85	76	73	74	96

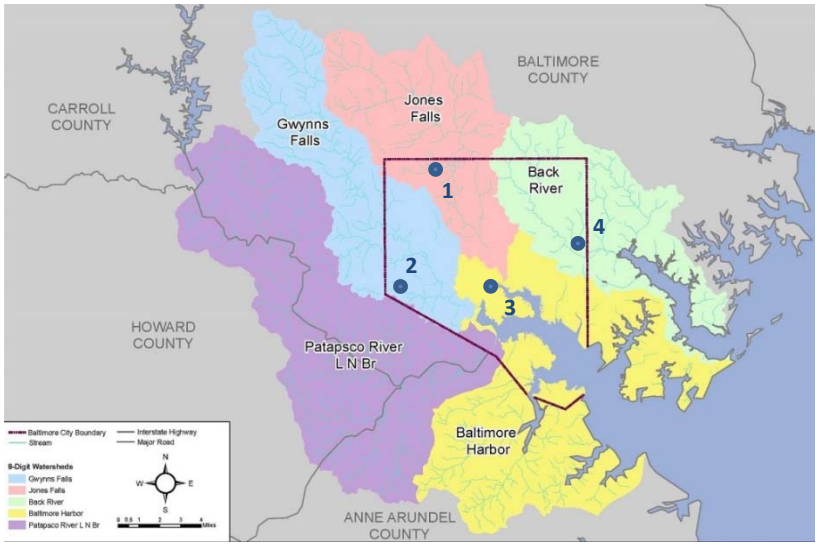


Figure 3-1: Daily Rainfall for FY 2017 and 2018

Table 3-2: Summary of Variability in Rainfall Data for Baltimore

Location	NOAA	DPW, 1	DPW, 2	DPW, 3	DPW, 4
Total Rainfall in FY 2019, in	67.98	68.22	62.16	64.92	57.68
Days > 0.1 in	96	88	91	91	85
Days > 1.0 in	14	19	17	20	17
Max. Daily Rainfall	4.79	3.24	3.08	2.60	2.44

3.2 Stream Impact Sampling

DPW continued the Stream Impact Sampling (SIS) program, which now includes monthly sampling at 33 outfall or stream locations. The SIS program was initiated in 1997; the results are available on-line at the City's website and updated quarterly. The sampling program includes sampling results for nutrients, sediment, bacteria, metals and other health indicators. The results of the sampling events for this reporting period are included in Appendix D.

The station at Central & Lancaster was inaccessible due to construction of a new bridge from March 2017 through March 2019. Sampling resumed there in April 2019. The stations at Tiffany Run and at Harford Road were temporarily inaccessible to sample in November and December 2018 due to construction; only 10 samples were collected from those two locations during FY 2019.

The SIS program attempts to grab samples during dry weather to avoid any influence of wet weather events (increase in loading from surfaces or decrease in concentration due to dilution); however, almost 42% of the sampling events occurred during or within 24 hours of a rain event exceeding 0.1 inch / day.

3.2.1 Nutrient Monitoring

During FY 2019, 368 samples were analyzed for nutrients as part of the SIS program. Table 3-3 shows the evaluation of historic nutrient analysis (2009 through the reporting period), following a concept that the State used in its Maryland Water Quality Inventory, 1993-1995. A water quality level was assigned for each station's sample sets compared to a prescribed threshold for each parameter: "normal" if the percentage was less than 11%; "elevated" if it was between 11% and 25%; and "high" if it was greater than 25%. This assignment is color coded Tables 3-3 and 3-4.

In addition to the individual sampling results for total phosphorus (Appendix D), Table 3-3 summarizes the SIS results for total phosphorus, specifically the portion of sampling results above the total phosphorus threshold of 0.1 mg / L. Appendix E contains graphs of the annual results for total phosphorus (percent of samples in relation to threshold and geometric mean) for each station from FY 2010 to FY 2019.

Nineteen (19) of the SIS stations sampled in FY 2019 were below historic average (i.e. the % of samples above the threshold for FY 2019 was less than Pre-FY 2019 values). Furthermore, the average total

phosphorus for all non-tidal SIS stations, except for Hamilton (Back River watershed) was only 0.16 mg / L. Six (6) of those SIS stations only had a maximum total phosphorus result of 0.11 mg /L.

The graphs for the total phosphorus show a peak in geometric mean (GM) occurred in FY 2011 and 2012, then a sharp decrease in FY 2013 reaching minimums for FY 2014; followed by an overall increase from FY 2015 to FY 2019. This pattern of a peak total phosphorus occurring in FY 2011 and 2012 was also shown in the graphs of the % samples exceeding the threshold. Most of the non-tidal SIS stations have an annual GM that was below the threshold, except for Hamilton, JF 11.5, Gwynns Run Carroll Park. In the tidal SIS stations, only Light Street and Waterview Aveune stations were below the threshold. The stations at Janey Run and Reedbird showed a sharp increase in TP GM from FY 2017 to 2019.

Table 3-3: Summary of Total Phosphorus for SIS Program

Station	Percent of Samples Total Phosphorus >=0.1 mg/L			Maximum Total Phosphorus Results	
	Pre-FY 2019[4]	FY 2019	All Samples	Pre-FY 2019[4]	FY 2019
Back River Watershed Herring Run Sub-watershed					
PERRING PKWY	15%	17%	15%	0.27	0.11
MT. PLEASANT GC	23%	25%	23%	0.42	0.16
CHINQUAPIN RUN	24%	33%	25%	0.46	0.22
TIFFANY RUN	12%	10%	12%	0.29	0.1
HARFORD RD.	17%	10%	16%	0.41	0.11
WRIGHT AVE.	24%	17%	24%	0.42	0.11
PULASKI HWY.	11%	8%	11%	0.34	0.51
Back River Watershed Moores Run Sub-watershed					
MARY AVE.	35%	42%	36%	0.87	0.19
HAMILTON AVE.	37%	42%	38%	0.43	0.5
RADECKE AVE.	19%	33%	21%	0.32	0.14
BIDDLE ST. & 62ND ST.	32%	8%	29%	0.39	0.18
Jones Falls Watershed					
SMITH AVE.	24%	17%	23%	0.36	0.14
WESTERN RUN	24%	17%	23%	0.52	0.11
STONY RUN	21%	17%	20%	0.33	0.13
JF 11.5 [1]	93%	50%	81%	3.1	0.17
LOMBARD ST.	29%	42%	30%	0.61	0.19
Gwynns Falls Watershed					
POWDER MILL	35%	36%	35%	0.94	0.23
PURNELL DR.	21%	9%	19%	0.32	0.11
DEAD RUN DNST.	26%	25%	26%	0.33	0.13
GWYNNS FALLS PKWY.	31%	36%	32%	0.42	0.14
GRUN HILTON ST.	32%	27%	32%	0.51	0.14

Station	Percent of Samples Total Phosphorus >=0.1 mg/L			Maximum Total Phosphorus Results	
	Pre-FY 2019[4]	FY 2019	All Samples	Pre-FY 2019[4]	FY 2019
GF HILTON ST.	24%	0%	22%	0.34	0.099
MAIDENS CHOICE	25%	27%	25%	0.48	0.14
GRUN CARROLL PARK	56%	64%	57%	0.51	0.19
WASHINGTON BLVD.	27%	45%	25%	0.34	0.11
Baltimore Harbor Watershed					
LINWOOD & ELLIOTT [2]	52%	45%	51%	0.36	0.31
LAKEWOOD & HUDSON [2]	37%	36%	37%	0.28	0.19
CENTRAL & LANCASTER [3]	48%	33%	48%	1.4	0.17
LIGHT ST.	36%	25%	35%	2.9	0.16
WARNER & ALLUVION	47%	42%	46%	0.77	0.39
WATERVIEW AVE.	25%	17%	24%	1.9	0.12
JANEY RUN	29%	33%	30%	0.38	0.68
Patapsco River Watershed					
REEDBIRD AVE.	30%	42%	32%	0.37	0.24
Notes:					
1 Sampling began at JF 11.5 in January 2016.					
2 Sampling began at LINWOOD & ELLIOTT and LAKEWOOD & HUDSON in March 2013.					
3 No samples were collected at the CENTRAL & LANCASTER station from January 2017 through March 2019 because access to the station was blocked by construction.					
4 Pre-FY 2019 includes samples from January 2009 to June 2018.					
Key					
	Normal: <= 11% of Samples				
	Elevated: Between 11-25% of Samples				
	High: >25% of Samples				

In addition to the individual sampling results for total phosphorus (Appendix D), Table 3-4 summarizes the SIS results for total nitrogen, specifically the portion of sampling results above the total nitrogen threshold of 3.0 mg / L. Appendix F contains graphs of the annual results for total nitrogen (percent of samples in relation to threshold and geometric mean) for each station from FY 2010 to FY 2019.

All but 5 of SIS stations sampled in FY 2019 were above the historic average (i.e. the % of samples above the threshold for FY 2019 was less than Pre-FY 2019 values). All of the total nitrogen GM increased since FY 2018. Nine (9) of the SIS stations showed historic total nitrogen results. The GM for the SIS stations still remains below the threshold of 3.0 mg / L, except for the stations at Hamilton, Mary Avenue, Stony Run, Gwynns Run Carroll Park, Lakewood, Linwood, and Reedbird Avenue. The total nitrogen results for Stony Run and Reedbird were consistently above the threshold between October 2018 and May 2019.

Table 3-4: Summary of Total Nitrogen for SIS Program

Station	Percent of Samples Total Nitrogen >= 3.0 mg/L			Maximum Total Nitrogen Results	
	Pre-FY 2019[4]	FY 2019	All Samples	Pre-FY 2019[4]	FY 2019
Back River Watershed Herring Run Sub-watershed					
PERRING PKWY	3%	8%	4%	3.74	3.13
MT. PLEASANT GC	8%	42%	12%	8.07	6.11
CHINQUAPIN RUN	24%	42%	26%	5.78	3.71
TIFFANY RUN	5%	30%	8%	4.91	3.48
HARFORD RD.	5%	30%	8%	6.86	3.81
WRIGHT AVE.	1%	25%	4%	3.31	5.49
PULASKI HWY.	5%	33%	8%	4	3.65
Back River Watershed Moores Run Sub-watershed					
MARY AVE.	15%	33%	17%	7.2	6.8
HAMILTON AVE.	54%	75%	56%	7.38	5.29
RADECKE AVE.	10%	25%	12%	7.1	3.41
BIDDLE ST. & 62ND ST.	1%	8%	2%	3.4	5.68
Jones Falls Watershed					
SMITH AVE.	3%	8%	3%	4.18	3.05
WESTERN RUN	3%	8%	3%	4.4	6.04
STONY RUN	24%	75%	30%	5.66	4.71
JF 11.5 [1]	93%	100%	95%	16.56	4.71
LOMBARD ST.	7%	0%	7%	9.99	2.97
Gwynns Falls Watershed					
POWDER MILL	13%	36%	15%	14.89	4.79
PURNELL DR.	1%	9%	2%	3	5.26
DEAD RUN DNST.	2%	0%	2%	5.69	2.12
GWYNNS FALLS PKWY.	11%	9%	11%	6.2	4.14
GRUN HILTON ST.	9%	45%	13%	4.3	3.45
GF HILTON ST.	0%	20%	2%	2.8	3.6
MAIDENS CHOICE	5%	27%	6%	3.9	3.88
GRUN CARROLL PARK	44%	100%	49%	4.91	4.24
WASHINGTON BLVD.	2%	18%	4%	11.99	13
Baltimore Harbor Watershed					
LINWOOD & ELLIOTT [2]	90%	100%	91%	7.59	7.66

Station	Percent of Samples Total Nitrogen >= 3.0 mg/L			Maximum Total Nitrogen Results	
	Pre-FY 2019[4]	FY 2019	All Samples	Pre-FY 2019[4]	FY 2019
LAKEWOOD & HUDSON [2]	73%	100%	78%	7.2	4.77
CENTRAL & LANCASTER [3]	16%	33%	17%	7.78	3.01
LIGHT ST.	12%	8%	12%	25.02	4.14
WARNER & ALLUVION	17%	42%	20%	8.55	3.97
WATERVIEW AVE.	14%	67%	19%	5.99	13.31
JANEY RUN	10%	0%	9%	3.8	2.65
Patapsco River Watershed					
REEDBIRD AVE.	9%	67%	15%	4.4	4.54
Notes:					
1 Sampling began at JF 11.5 in January 2016.					
2 Sampling began at LINWOOD & ELLIOTT and LAKEWOOD & HUDSON in March 2013.					
3 No samples were collected at the CENTRAL & LANCASTER station from January 2017 through March 2019 because access to the station was blocked by construction.					
4 Pre-FY 2019 includes samples from January 2009 to June 2018.					
Key					
	Normal: <= 11% of Samples				
	Elevated: Between 11-25% of Samples				
	High: >25% of Samples				

Further discussion of these results in relation to the local TMDL implementation plans are provided in Section 6.6.1 of this Annual Report.

3.2.2 Bacteria Monitoring

3.2.2.1 E. Coli Monitoring

DPW measures fecal bacteria with e. coli most probable number (MPN) counts at twenty-four (24) stations that are in non-tidal waters. In 2017, the water quality criteria for bacteria indicators were changed in COMAR 26.08.02.03-3 as follows:

- Geometric mean (GM) for e. coli for 90+ days must be less than 126 MPN / 100 ml
- Less than 10% of single sample results of e. coli may be greater than the standard threshold value (STV) of 410 MPN / 100 ml
- Dissolved oxygen must be greater than 5 mg /L
- pH must be between 6.5 and 8.5
- Water temperature may not exceed 90°F (32° C) for Class I and 75°F (23.9°C) for Class IV waters

The most notable changes were the simplification of the STV; full-body contact thresholds are no longer used. Previous MS4 annual report evaluations with respect to the former full-body contact thresholds are no longer applicable. Table 3-5 lists the results of SIS sampling for e. coli with respect to these water quality criteria. Appendix G contains graphs of the annual GM for e. coli for each station from FY 2010 to FY 2019. Similar to total nitrogen, the majority of the SIS stations showed an increase in GM for e.coli, however no station exceeded the historic high recorded during or before FY 2012.

None of the stations met all of the water quality criteria for FY 2019. The only station that had a GM for e. coli that was below 126 MPN/100 ml was Dead Run. This station came close to meeting the criterion of less than 10% of e. coli below 410 MPN/100 ml. However, temperature and pH criteria were exceeded.

Similar to the total nitrogen results, the majority of the SIS stations (19 out of 24) showed an increase in the GM of e. coli from FY 2018 to FY 2019. All of the stations, except for Wright Ave., met the dissolved oxygen criterion. The temperature criterion was met at all fourteen (14) of the class I stations. However, the temperature criterion was met at only two (2) of the ten (10) class IV stations. The pH criterion was met at only four (4) of the stations: twenty (20) of the stations had a maximum for pH above 8.5.

Table 3-5: Summary of E. Coli Sampling for SIS Program for FY 2019

Station	Class	E. Coli (MPN/100 ml)		Min. DO (mg/L)	Max. Temp (°C)	pH Range
		GM	% > STV			
Back River Watershed Herring Run Sub-watershed						
PERRING PKWY	IV	765	67%	7.49	25.40	7.00 to 8.74
MT. PLEASANT GC	IV	551	42%	7.36	24.85	6.99 to 8.47
CHINQUAPIN RUN	IV	569	58%	8.15	28.47	7.21 to 8.83
TIFFANY RUN	IV	368	70%	7.65	25.70	7.24 to 8.59
HARFORD RD.	IV	618	50%	7.99	27.76	7.25 to 8.53
WRIGHT AVE.	IV	633	67%	4.19	26.18	7.16 to 8.57
PULASKI HWY.	IV	297	33%	7.54	26.97	7.21 to 8.34
Back River Watershed Moores Run Sub-watershed						
MARY AVE.	I	1,271	83%	8.21	24.03	6.98 to 8.16
HAMILTON AVE.	I	1,743	92%	7.16	24.01	7.11 to 8.56
RADECKE AVE.	I	830	67%	7.03	24.80	7.25 to 8.65
BIDDLE ST. & 62ND ST.	I	896	67%	6.38	25.95	7.19 to 8.31
Jones Falls Watershed						
SMITH AVE.	I	454	42%	8.11	26.64	7.30 to 9.31
WESTERN RUN	I	1,223	92%	8.27	25.67	7.10 to 8.51
STONY RUN	IV	535	58%	8.11	23.75	7.23 to 8.82
JF 11.5	IV	3,380	100%	8.49	21.94	7.14 to 8.97

Station	Class	E. Coli (MPN/100 ml)		Min. DO (mg/L)	Max. Temp (°C)	pH Range		
		GM	% > STV					
Gwynns Falls Watershed								
POWDER MILL	I	439	50%	7.73	24.35	7.03	to	8.63
PURNELL DR.	I	692	75%	8.74	25.02	7.60	to	8.99
DEAD RUN DNST.	IV	122	11%	9.12	25.08	7.41	to	8.98
GWYNNS FALLS PKWY.	I	423	58%	8.73	20.89	7.26	to	8.96
GRUN HILTON ST.	I	655	58%	8.01	24.80	7.08	to	8.67
GF HILTON ST.	I	298	45%	7.89	26.17	7.12	to	9.02
MAIDENS CHOICE	I	411	67%	8.19	25.65	7.12	to	8.90
GRUN CARROLL PARK	I	3,429	92%	6.57	22.29	6.58	to	8.69
WASHINGTON BLVD.	I	2,142	92%	8.41	26.02	7.46	to	8.86

3.2.2.2 Enterococci Monitoring

DPW currently measures fecal bacteria with enterococci most probable number (MPN) counts at nine (9) stations. However, for most of FY 2019, access to the Central & Lancaster station was blocked by construction. With so few samples, Central & Lancaster has been left out of the analysis below. Samples for enterococci counts are collected at these stations twice per month. In 2017, the water quality criteria for bacteria indicators were changed in COMAR 26.08.02.03-3 as follows:

- Geometric mean (GM) for enterococci for 90+ days must be less than 35 MPN / 100 ml
- Less than 10% of single sample results of e. coli may be greater than the standard threshold value (STV) of 130 MPN / 100 ml
- Dissolved oxygen must be greater than 5 mg /L
- pH must be between 6.5 and 8.5
- Water temperature may not exceed 90°F (32° C) for Class I and 75°F (23.9°C) for Class IV waters

The most notable changes were the simplification of the STV; full-body contact thresholds are no longer used. Previous MS4 annual report evaluations with respect to the former full-body contact thresholds are no longer applicable. Table 3-6 lists the results of SIS sampling for enterococci with respect to these water quality criteria. Appendix G contains graphs of the annual GM for enterococci for each station from FY 2010 to FY 2019. Similar to total nitrogen, the majority of the SIS stations showed an increase in GM for enterococci.

None of the stations met all of the water quality criteria for FY 2019. Light St. is the only station that had a GM for enterococci counts close to the criterion of 35 MPN/100 ml. However, the percentage of enterococci counts from the Light St. station exceeding the STV is far greater than the 10% criterion. Only five (5) of the stations met the dissolved oxygen criterion. The temperature criterion was met at all of the stations. The pH criterion was met at only one (1) station (Linwood & Elliott): seven (7) of the stations had a maximum for pH above 8.5.

Table 3-6: Summary of Enterococci Sampling for SIS Program

Station	Class	Enterococci (MPN/100 ml)		Min. DO	Max. Temp	pH Range
		GM	% < STV			
Jones Falls Watershed						
LOMBARD ST.	I	375	65%	7.43	27.59	7.20 to 8.81
Baltimore Harbor Watershed						
WATERVIEW AVE.	I	98	52%	7.74	23.63	7.18 to 9.15
WARNER & ALLUVION	I	387	70%	4.38	29.27	7.28 to 9.33
LIGHT ST.	I	48	35%	5.91	30.61	6.66 to 8.62
LAKEWOOD & HUDSON [1]	I	1,209	100%	6.67	26.15	7.25 to 8.84
LINWOOD & ELLIOTT [1]	I	3,051	100%	4.09	25.84	7.26 to 8.31
JANEY RUN	I	126	52%	4.21	31.79	6.84 to 8.95
Patapsco River Watershed						
REEDBIRD AVE.	I	167	61%	6.05	29.55	7.36 to 8.72

3.3 Biological and Habitat Monitoring

DPW collected macroinvertebrate samples in the spring of 2019; the results will be included in the FY 2020 Annual Report. Instead, DPW will present the results for the macroinvertebrate samples collected in the spring of 2018. DPW uses a combination of fixed and random sampling. There are 8 fixed stations, two of which are associated with the long-term discharge characterization of Moores Run. The results for those two stations are discussed in Section 3.2.2 of this report. For the random sampling, one of three watersheds is completed each year. During the spring of 2018, random sampling was completed in the Gwynns Falls watershed.

Table 3-7 presents the benthic index of biotic integrity (BIBI) scores for 6 fixed stations from 2002 through 2018. Three out of six of the stations showed a decline in the scores from 2017 to 2018; the other three stations had scores that stayed the same. One station rated “poor” with a score of 2.4; while the other five stations rated “very poor” with scores of 1.0, 1.3 and 1.7.

Table 3-7: Macroinvertebrate BIBI Scores for Fixed Stations

Year	Gwynns Falls Watershed		Jones Falls Watershed			Back River Watershed
	Station 250 Dead Run	Station 430 Maidens Choice Run	Station 880 Stony Run	Station 949 Stony Run	Station 1053 Stony Run	Station 1235 Biddison Run
2002	1.7	NS	NS	NS	1.3	NS
2003	1.0	NS	NS	NS	1.0	3.3
2004	1.0	NS	NS	NS	1.0	1.3
2005	1.0	NS	NS	NS	1.3	1.9
2006	1.7	NS	NS	NS	NS	1.3
2007	NS	NS	NS	NS	1.0	1.3
2008	NS	NS	NS	NS	1.0	1.6
2009	1.3	NS	NS	NS	1.3	1.0
2010	1.3	1.0	1.3	1.7	2.3	1.9
2011	2.3	1.7	1.3	1.0	1.7	1.3
2012	1.0	1.0	1.0	1.0	1.0	1.6
2013	1.0	1.0	1.0	1.0	1.0	2.1
2014	1.7	1.3	1.7	1.3	2.0	1.9
2015	2.3	1.7	1.3	1.3	1.3	2.4
2016	1.0	1.3	1.0	1.0	1.0	1.9
2017	2.7	2.0	1.3	1.0	1.7	3.0
2018	1.3	1.3	1.3	1.0	1.7	2.4

DPW sampled 10 random stations in the Gwynns Falls watershed in 2018. The BIBI scores for these 10 samples ranged from 1.0 through 2.0: eight samples between 1.0 and 1.7, which are rated as "very poor"; and two samples equal 2.0, which is rated as "poor". Random sampling was performed in the Gwynns Falls watershed in 2003, 2006, 2009, 2012, 2015 and 2018. Figure 3-2 graphically shows the distribution of the BIBI scores for each of those 6 years. The distribution for the 2018 set of samples is very similar to that for 2015, except that, for the 2015 set, there was one sample that rated 3.0 (which rates as "fair").

The BIBI, embeddedness, epifaunal and habitat scores for all fixed station and random station samples from 2018 are listed in the *Biological Monitoring* table of the *MDE NPDES MS4 Geodatabase* (Appendix C of this report).

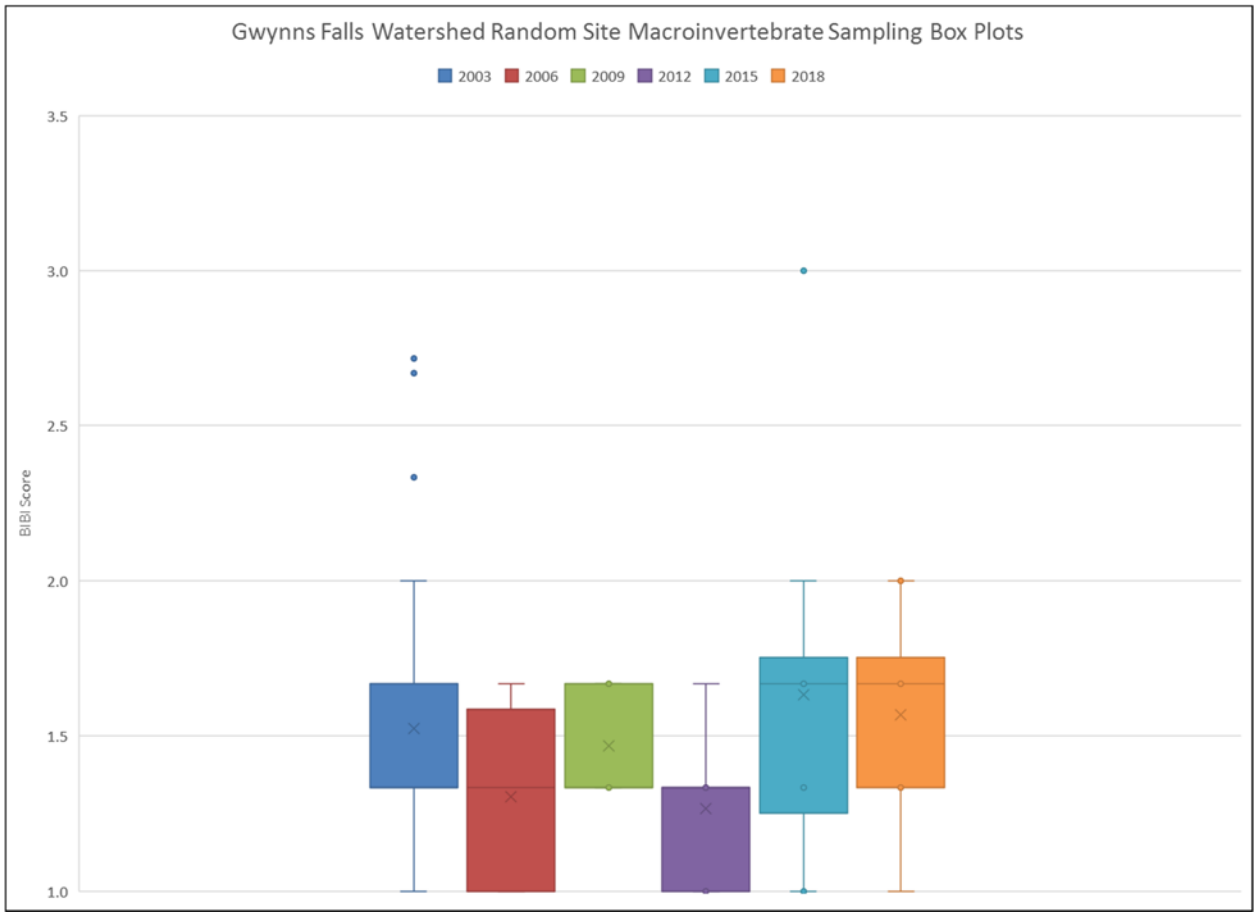


Figure 3-2: BIBI Scores for Macroinvertebrate Samples Random Sampling in the Gwynns Falls Watershed

3.4 Watershed Assessment at Moores Run

3.4.1 Chemical Monitoring

During this reporting period, nine (9) storm events and twelve (12) base flow events were monitored at Hamilton Avenue, the outfall station associated with the long-term discharge characterization for the Moores Run and at Radecke Avenue, the in-stream station associated with the long-term discharge characterization for the Moores Run. DPW only monitored nine (9) storms in FY 2019; not twelve (12) as required by the permit.

There were two storm events on September 17, 2018 at these stations. The afternoon event did not have sufficient rise in the flow through the Hamilton Avenue outfall to trigger the automated sampler; however, there was sufficient rise in the Moores Run at the Radecke Avenue station to trigger its automated sampler. All of the bottles for the Radecke Avenue sampler were used during that afternoon event. Consequently, when there was a second event in the late evening, no samples were collected at Radecke Avenue. Samples were collected for the late evening event at the Hamilton Avenue station.

The storm event on July 17, 2018, was limited in the area of rainfall. It rained in the watershed leading to the two sampling stations, but the rainfall was limited at the rain gauge that DPW uses for record-keeping for the long-term discharge characterization monitoring. Consequently, for this event, there is no assigned rainfall, rainfall duration or rainfall intensity.

The results of the monitoring events are provided in Appendix C of this report.

In addition to these monitoring events, these two locations were monitored as part of the Ammonia Screening program. The results of that monitoring are included in Appendix D of this report.

3.4.2 Biological Monitoring

DPW collects macroinvertebrate samples at two fixed locations for the long-term discharge characterization of the Moores Run. As shown in Table 3-8, every sample from 2002 through 2018 at both stations has been rated as "very poor"; BIBI scores were below 2. The BIBI, embeddedness, epifaunal and habitat scores for all fixed station and random station samples from 2018 are listed in the *Biological Monitoring* table of the *MDE NPDES MS4 Geodatabase* (Appendix C of this report).

Table 3-8: Macroinvertebrate BIBI Scores for Fixed Stations Moores Run Watershed

Year	Station 1367 Moores Run	Station 1659 Moores Run Tributary
2002	1.3	1.3
2003	1.3	1.7
2004	1.0	1.0
2005	1.3	1.3
2006	1.7	1.7
2007	1.3	1.3
2008	not sampled	1.7
2009	1.3	1.3
2010	1.3	1.7
2011	1.3	1.7
2012	1.7	1.0
2013	1.3	1.3
2014	1.7	1.3
2015	1.3	1.0
2016	1.7	1.0
2017	1.3	1.7
2018	1.7	1.3

3.4.3 Habitat Assessment

DPW performed a habitat assessment survey of the upper Moores Run watershed on July 10, 2019. The results, along with thirteen other assessments completed from May 18, 2005 through June 7, 2018, are included in Appendix H of this report. After averaging the scores for the eleven segments for each assessment, the 2019 assessment had the lowest average scores for these categories: instream habitat, epifaunal substrate, trash rating and bank vegetative protection. Figure 3-3 shows that after rising from 2008 through 2014, there has been a steep decline for the average of the trash rating scores for the past four assessments.

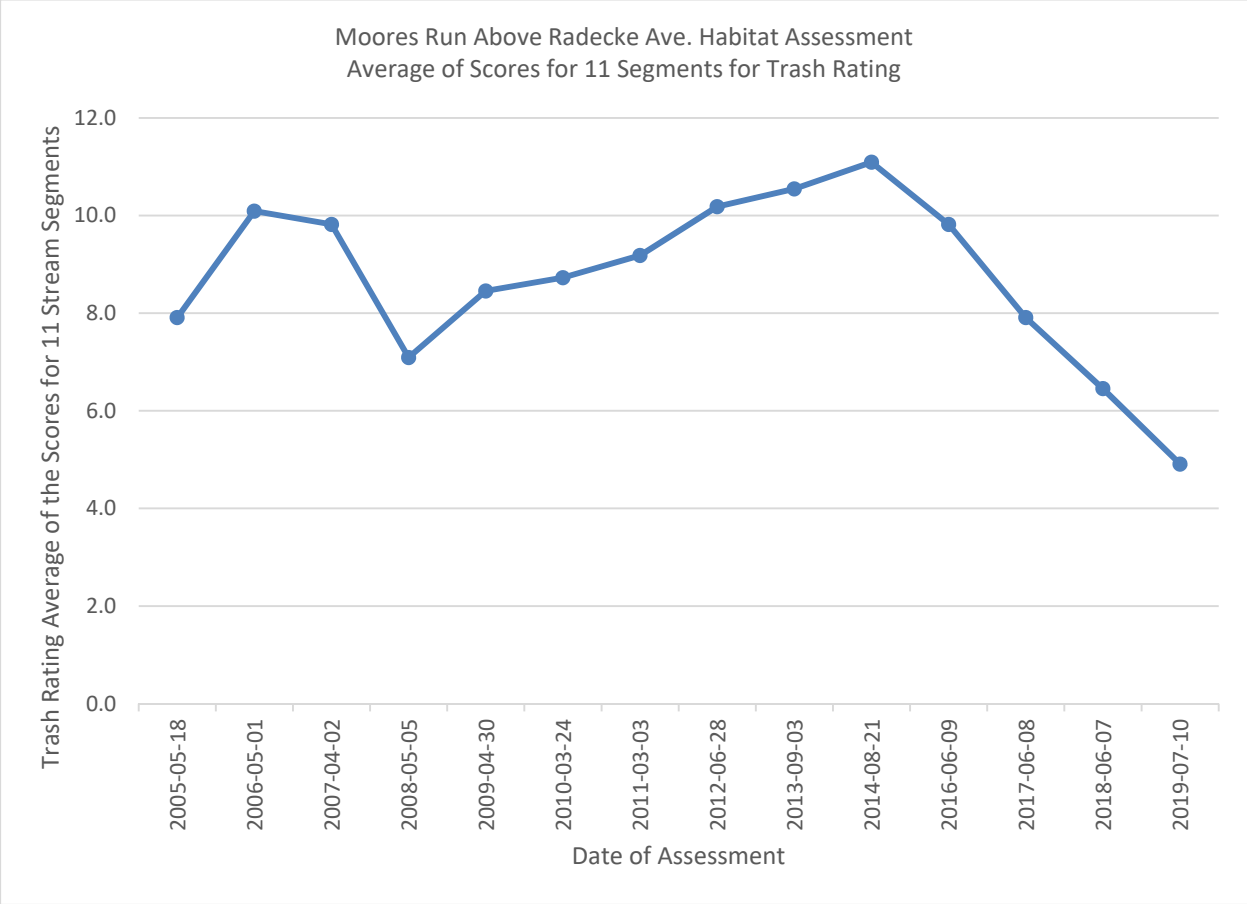


Figure 3-3: Moores Run Habitat Assessments: Trash Rating Scores

3.4.4 Geomorphic Monitoring

No additional activity was performed in FY 2019.

3.4.5 Stormwater Management Assessment at Stony Run

No additional activity was performed in FY 2019.

4 Expenditures and Proposed Budget

4.1 Expenditures and Budgets Related to MS4 Permit Compliance

DPW is predominantly responsible for compliance with the City's MS4 permit. Although the efforts of other City agency services are reported in this Annual Report for permit conditions like property maintenance, inspections and enforcement, the expenditure information shown in Table 4-1 is strictly limited to DPW services. Annual expenditures and budgets for FY 2019 and 2020 are summarized in Table 4-2. This information is also included in the geodatabase in Appendix C.

The expenditures and budgets shown in Tables 4-1 and 4-2 do not include debt service payments, to avoid confusion with expenditures made using debt service mechanisms like bonds. This follows a similar format as the Financial Assurance Plan, included in Appendix K of this Annual Report. Debt service payments for the stormwater program in FY 2019 were on the order of $2,691,720.

Table 4-1: Fiscal Analysis of FY 2018 Expenditures

Description of Total Annual Cost	Actual
Source ID (Geodatabase Mgt.)	$283,986
Stormwater management	$551,822
Erosion and sediment	$706,634
Illicit detection/elimination (IDDE)	$1,816,333
Trash elimination	$527,256
Property management	$11,609
Inlet cleaning	$4,246,445
Street sweeping	$6,708,883
Public education	$156,888
Watershed assessment	$179,209
Watershed restoration (all projects)	$5,767,761
Chemical monitoring	$111,957
Biological monitoring	$79,059
TMDL assessment	$38,203
Total NPDES program	**$21,186,045**
Other activities related to stormwater*	$9,191,130
Total Stormwater	**$30,377,175**
Funded by Stormwater Utility	$22,366,950
Funded by W/WW Utility	$2,031,580
Funded by Other Sources	$5,329,743

Note: "Other activities" include the maintenance and remediation of stormwater infrastructure (collection system).

Table 4-2: NPDES Program Expenditures and Budgets

Fiscal Year	Operations	Capital	Total
FY 2019 (Expenditure)	$15,426,017	$5,760,028	$21,186,045
FY 2020 (Budget)	$16,514,881	$6,015,900	$22,530,781

4.2 Stormwater Fee and Stormwater Utility

The Stormwater Utility is an enterprise fund, established in 2013, to protect the use of revenue received from the stormwater restoration fee and other miscellaneous. The predominant source of revenue for the stormwater utility is the stormwater restoration fee. Other sources of revenue are as follows:

- Plans review fees for stormwater management and erosion and sediment control
- Penalty fines for stormwater management and erosion and sediment control
- Fees in lieu of on-site stormwater management (quantitative and qualitative control)

The stormwater restoration fee was established in the City Code in June 2013; the first bills were issued in September 2013. The fee structure and rate was established to remain constant for four years (FY 2014 through 2017) and remained the same through FY 2019. A 9% rate increase is approved by the Board of Estimates to begin in FY 2020 with additional 9% increase in FY 2021 and 2022. The supporting rate study is available on DPW's website. The required Watershed Protection and Restoration Program report, as prescribed by MDE, is included in Appendix I of this report. Note that the stormwater fee expenditure for capital projects includes the payment of debt service mechanisms.

4.3 Grant Support by DPW

DPW used the stormwater utility fund to provide $195,901 direct funding[1], matched by $112,358 from the Chesapeake Bay Trust, for the following projects which had grants issued in FY 2019. It should be noted that the grants, while encumbered, were not expended until August 2019 (FY 2020).

DPW Funded projects:

- **Civic Works Baltimore Center for Green Careers ($24,654)** – delivery of a comprehensive, certification-based occupational and essential skills training in stormwater management to one pilot cohort of 16 underserved Baltimore City residents facing significant barriers to employment over 12 months.
- **Southeast CDC ($27,984)** – Expand the Harris Creek Greening Stewards training by providing workshops to learn the basics of tree well maintenance, rain garden maintenance, alley cleaning, and litter removal, including direct engagement of 10 local teens in the training.
- **Harris Creek EcoPark ($68,365)** – funding to construction two rain gardens that will treat 6,534 square feet of impervious area.

[1] DPW provided $200,000 for Chesapeake Bay Trust's Outreach & Restoration grant program. Approximately two percent (2%) of the amount ($4,099) was an administration fee for CBT to manage the grant program.

- **Peoples Community Lutheran Church ($74,997)** – funding to construct a rain garden that will treat 6,970 square feet of impervious area.

CBT funded projects (match)

- **Tree Planting in the Mondawmin Neighborhoods ($49,991)** – funding for Blue Water Baltimore to plant 180 street trees in two Mondawmin neighborhoods.
- **Mt. Lebanon Stormwater Plantern and Cistern ($17,021)** – funding to install a stormwater planter to treat 1,285 square feet of roof and a cistern that will collect 1,540 square feet of drainage.
- **Glenwood Life Recovery Garden ($25,000)** – funding will include the removal of invasive vines and dead trees, the planting of conservation landscaping with native plants, and outreach events that connect recovery and watershed health.
- **National Wildlife Federation Sacred Grounds ($15,000)** – providing educational workshops to 14 places of worship in the Gwynns Falls watershed to increase the environmental knowledge and stewardship ethic in the faith community, and to connect faith institutions with local environmental organizations that can provide assistance with implementing projects.
- **Civic Works Baltimore Center for Green Careers ($5,346)** – see above for the description of the project.

5 Enforcement Actions, Inspections and Public Education

5.1 Stormwater Management Program

Programmatic and implementation information for the period of this Annual Report (July 1, 2018 to June 30, 2019) is as follows:

- Number of Concept Plans received: 190
- Number of Site Development Plans received: 144
- Number of Final Plans received: 144
- Number of Redevelopment projects received: 55
- Numbers of Stormwater exemptions issued: 280

DPW received and approved as-built drawings for 23 stormwater management BMPs between July 1, 2018 and June 30, 2019. The required data for these BMPs are in Appendix C of this report. A summary of waivers and variances for this time period is provided in Table 5-1.

Table 5-1: **Summary of Waivers and Variances**

Description	**Requested**	**Granted**
Quantitative Control Waiver	14	14
Qualitative Control Waiver	52	52
Quantitative and Qualitative Waiver	10	10
Redevelopment Waiver	55	55
Phased Development Waiver	1	1
Administrative Waiver	0	0
Variance	1	1
Total	**133**	**123**

No changes to the City's ordinance or code related to the stormwater management program (Article 7, Division II) were pursued during this time.

During this reporting period, 16 inspections of ESD treatment practices and structural stormwater management facilities were conducted as part of preventive maintenance inspections. Of those inspections, no facilities required one or more follow-up inspections. Of the facilities inspected, none of the inspections resulting in identifying a facility that was removed. The removed facilities were installed prior to 2000, and were not reported in the BPM inspection tables, because mandatory fields require us to provide information that cannot be reported.

5.2 Erosion and Sediment Control

The City added a new customer service request for erosion and sediment control in 2014. Complaints are reported via phone, internet or mobile phone application and tracked through the 3-1-1 system. During FY 2019, a total of 179 service requests were received. The service requests resulted in 2 stop work orders and $7,200 penalty fine.

During this reporting period, 2,647 inspections were conducted for compliance with approved erosion and sediment control plans. A total of 27 violation notices were issued by the City, resulting in a sum of $48,400 received as penalty fines and 10 stop work orders. The summary information regarding earth disturbances exceeding one acre are included in Appendix C of this report.

No changes to the City's ordinance or code related to the erosion and sediment control program (Article 7, Division III) were pursued during this time.

5.3 Illicit Discharge Detection and Elimination (IDDE)

5.3.1 Routine Field Screening Locations

DPW conducts an MDE-approved alternative to IDDE: ammonia screening (AS) and stream impact sampling (SIS) to initiate pollution source tracking (PST) investigations. The AS and SIS sampling locations are included in the geo-reference data provided in Appendix C. The monitoring results from the surveys for the AS and SIS programs for FY 2019 are included in Appendix D of this report. These monitoring results, plus historic data, are also available on-line at the City's DPW website.

5.3.2 Microbial Source Tracking

DPW initiated Microbial Source Tracking (MST) DNA analysis in an effort to supplement the existing chemical indicators used to track wastewater contamination in the streams and storm drain systems. The analyses were performed by Dr. Wolf Pecher through a contract between DPW and the University of Baltimore. MST analysis was primarily used during PST investigations where high levels of the primary wastewater indicators (ammonia nitrogen and bacteria) were found, but various investigative techniques were exhausted (dye testing, CCTV of pipelines, visual inspection, and historical mapping review) and yielded no sanitary sewer sources. If the samples contained a high number of human markers and a sewage equivalent greater than 1%, the investigation would remain open for further monitoring and investigation. If the number of human markers was low and the sewage equivalent was less than 1%, the investigation was discontinued.

Between July 2018 and June 2019, sixteen (16) samples from two (2) sampling events were submitted for analysis. The sampling sites chosen were based on seven (7) Pollution Source Tracking (PST) investigations, in addition to sites from two (2) watersheds with historically high ammonia values. The samples were analyzed for the number of human and canine DNA markers as well as a percent sewage equivalent. The percent sewage equivalent was a comparison of the number of human markers from a sample to the number of human markers found in wastewater samples taken from the influent at the Back River Wastewater Treatment Plant.

Of the seven (7) PST investigations with MST DNA samples submitted, three (3) were discontinued due to the sewage equivalent value being less than 1%. For two (2) PST investigations, which had reached SDUO designation and required sanitary sewer repairs, the MST results helped to confirm abatement. One (1) PST investigation with a sampling site value of 1.36% sewage equivalent was continued and eventually solved and abated. One (1) PST investigation with high human markers and a value of 64.44% sewage equivalent remains open with an active investigation. Further MST samples have been taken beyond June 2019 in an effort to track the sewage source.

For the two (2) watersheds with historically high ammonia values, if any of the sites resulted in a sewage equivalent greater than 1% a new PST investigation would be open. The sewage equivalent for these sites ranged from 0.04 to 0.52% and therefore no new PST investigations were opened.

The two reports from Dr. Wolf Pecher for the sample sets analyzed during FY 2019, and a table summarizing the results of the sixty-four (64) samples processed from FY 2017 through FY 2019 are included in Appendix J of this report.

5.3.3 3-1-1 Customer Service Request for Polluted Water

Complaints are reported via phone, internet or mobile phone application and tracked through the 3-1-1 system. Complaints that are designated with the type "WW Waterway Pollution Investigation" are initially assigned to the Water Quality Monitoring and Investigations (WQMI) Section of OCAL. During FY 2019, a total of 112 service requests were received. Thirteen (13) of these requests were duplicates of other requests already received by WQMI. Thirty-eight (38) requests were determined to be mistakenly designated as "WW Waterway Pollution Investigation", then forwarded by WQMI staff to the appropriate agency. Consequently, there were sixty-one (61) complaints handled by WQMI during FY 2019. Thirteen (13) complaints resulted in a pollution source tracking investigation. Five (5) of these investigations led to the discovery of an illicit discharge or activity that was removed or corrected:

- One (1) sewage input from a private property to the storm drain system; this was designated as sanitary discharge of unknown origin (SDUOs) at some point during the investigation;
- One (1) business discharging water from its ice machine through its sump pump into the street;
- One (1) business discharging water from its boiler into a stream;
- One (1) related to a water main break that caused sediment to flow into a storm drain inlet; and
- One (1) business whose grease storage was improper, which allowed grease to runoff into a storm drain inlet.

These illicit discharges are included among those further discussed in Section 5.3.4.

5.3.4 Pollution Source Tracking (PST)

DPW initiates PST investigations based on the results of field screening, 3-1-1 customer service requests or requests from other programs (such as Blue Water Baltimore, MDE or EPA). During FY 2019, a total of 167 PST investigations were conducted: 147 PST investigations were initiated during FY 2019 and the other 20 were a continuation of PST investigations initiated prior to FY 2019. The PST investigations resulted in mobilizing to 999 locations in the open channel and storm drain system to conduct water quality chemical analyses, make observations, drop dye, etc. As a result of the PST investigations, the following illicit discharges were identified and abated, with further details provided in Appendix O of this report:

- Forty-nine (49) dry weather sanitary sewer overflows (SSOs) from the public sewer; nine (9) of these were designated as sanitary discharge of unknown origin (SDUOs) at some point during their investigations;

- Ten (10) sewage inputs from private properties to the storm drain system; nine (9) of these were designated as sanitary discharge of unknown origin (SDUOs) at some point during their investigations;
- Eight (8) drinking water transmission losses; and
- Six (6) with other types of illicit discharge:
    - One (1) related to a construction site where erosion and sediment controls needed to be corrected;
    - One (1) related to a water main break that caused sediment to flow into a storm drain inlet;
    - One (1) business discharging water from its boiler into a stream;
    - One (1) business discharging water from its ice machine through its sump pump into the street;
    - One (1) business discharging water from its washing machines through its sump pump into the street; and
    - One (1) business whose grease storage was improper, which allowed grease to runoff into a storm drain inlet.

Additionally, seventeen (16) illicit discharge sources were located and await further repairs:

- One (1) sanitary sewage input from a private property; and
- Fifteen (15) drinking water transmission losses.

5.3.5 FOG Program

Since November 2013, DPW has conducted an inspection program to reduce fats, oils and grease (FOG) within the sanitary sewer system. The FOG Program has a two-pronged approach that manages FOG from both the private and public sides of the property line by:

- Requiring all food services establishments (FSE) that have the potential to discharge FOG-laden wastewater to have an adequate grease control device (GCD), and
- Reducing build-up of fats, oils and grease in the sewer lines using a commercial grade degreaser.

FOG education efforts are focused on both residents and owners of FSEs. Flyers are included with water bills. Outreach at festivals and community meetings have included distribution of education materials. All education materials are available on the City's DPW website.

The DPW - Pollution Control Section performs the inspections and educates FSEs about FOG best management practices. There were 4,139 inspections of FSEs during FY 2019: this is an increase of 12% compared to the 3,710 inspections during FY 2018. During FY 2019, 1,012 FSEs (25%) were found not to be in compliance. There were 1,218 notices of violation (NOV) issued to the non-compliant FSEs. Four (4) FSEs were issued consent agreements. A breakdown by type of NOV is included in Appendix K of this Annual Report.

5.3.6 Exterior Lead Paint Removal Waste Control Program

This program is administered by the DPW - Pollution Control Section. During FY 2019, there were 180 permitted sites. Inspectors made 169 site visits and issued 42 stop work notices requiring corrective action. There were no documented illegal discharges to the storm drain system.

5.3.7 NPDES Industrial Discharge Permits

The City has fourteen (14) municipal facilities covered under the NPDES Industrial Discharge Permit. During FY 2015, NOIs for these facilities and updated stormwater pollution prevention plans (SWPPPs) were submitted to MDE. Permit conditions related to staff training and routine inspections are managed by the responsible agency. DPW implemented an internal environmental compliance audit program in FY 2016, which consisted of site walkthrough inspections and SWPPP audits. In addition to the internal environmental compliance audit program, a geodatabase was created to monitor each facility's last quarterly inspection and SWPPP trainings.

5.4 Property Management and Maintenance

5.4.1 Street Sweeping and Trash Reduction

In FY 2019, the mechanical street sweepers operated by DPW- Bureau of Solid Waste removed 8,930 tons of debris while sweeping 99,803 miles of street surface. The tonnage was the lowest recorded for this permit period, most likely due to the historic rainfall occurring during FY 2019 (Section 3.1 of this report). Street sweeping tonnage and mileage for qualifying activities (minimum frequency of 2 passes / month) are listed in the MS4 geodatabase (Appendix C) and on Table N2 (Appendix N) of this report. During FY 2019, DPW initiated the policy to suspend street sweeping operations during days where air temperatures were below freezing. The efficiency of the street sweeping operations, specifically in the expanded areas, is still hindered by the coordination of parked vehicles. New parking sign installation began in the summer of 2017 and plans to continue through FY 2020. Any other trash reduction initiatives?

5.4.2 Inlet Cleaning

In May 2016, DPW completed the installation of screens and inserts for 414 inlets as a pilot program to improve the efficiency of inlet cleaning and street sweeping by preventing trash and debris from entering the storm pipe system. Modified inlets were installed in five neighborhoods: McElderry Park, Oliver, Baltimore-Linwood, Franklin Square, and Carrollton Ridge. The modifications were only being made to a portion of the 1,092 inlets located within the selected neighborhoods, based on inlet type and the proximity to routine street cleaning routes. Each of the inlets were inspected by DPW staff at least quarterly to gauge the need for cleaning. In February 2019, the contracted efforts for pro-active inlet cleaning in these neighborhoods was delayed during to procurement. The efforts resumed in July 2019. In FY 2019, a total of 32 tons of debris was collected from the inlets in the 5 targeted neighborhoods.

DPW- Utility Maintenance Division also initiated a targeted pro-active inlet cleaning program in 2017 for approximately 424 inlets, selected based on sump condition and proximity to the Mayor's Violence Reduction Initiative. Each of the inlets are cleaned quarterly, yielding a total of 183 tons of debris collection in FY 2019. Additionally, DPW- Utility Maintenance Division continued its daily reactive

cleaning of the City's storm drain inlets, removing approximately 767 tons of debris from 5,321 inlets in the City's public storm drain system. Since Quarantine Road landfill prohibits the unloading of saturated debris, the weight measurement is based on the weight of the debris after it was spread and dried within a bermed area at the maintenance yard.

5.4.3 Harbor Cleaning

The City employs a fleet of thirteen boats to debris from the Harbor each year. The Marine Operations Section utilizes the boats to collect floating debris and trash in the water. As shown in Table 5-2, FY 2019 debris collections were significantly high compared to the rest of the permit period. This may be attributed to the historic rainfall occurring during FY 2019 (Section 3.1 of this report).

Table 5-2: Summary of Harbor Cleaning

Fiscal Year	Debris Collected (tons)
2015	311
2016	435
2017	322
2018	305
2019	449

5.4.4 Middle Branch Shoreline Cleaning

In FY 2019, DPW continued to contract shoreline cleaning services in the Middle Branch. This service supplements the skimmer boat operations, since the shallow water conditions of the Middle Branch prevent access for the skimmer boats. Contracted shoreline cleaning services were conducted between July 23 to October 19, 2018 and then between December 24, 2018 to January 19, 2019. A total of 6,039 bags were collected, yielding approximately 36.2 tons of material collected. Shoreline cleaning services will continue in FY 2020.

5.4.5 Integrated Pest Management

The City needs to amend the amount of herbicide reported applied during FY 2018. In the FY 2018 annual report, the City stated that Department of Recreation and Parks (BCRP) had applied 6.5 gallons of concentrated glyphosate (Round Up equivalent), which contained 19.5 pounds of glyphosate acid. Later research showed that instead 14.5 gallons was used, which contained 43.5 pounds of glyphosate acid.

During FY 2019, the BCRP applied 18 gallons of concentrated glyphosate (Round Up equivalent), which contained 54 pounds of glyphosate acid. This is an increase of 10.5 gallons (24%) compared to FY 2018. BCRP currently has four (4) Public Agency Applicators who are certified by MDA (2 in Horticulture and 2 in Parks). All have attended MDA approved training to maintain their certifications. All registered (not certified) applicators are re-registered annually with MDA as per the State process.

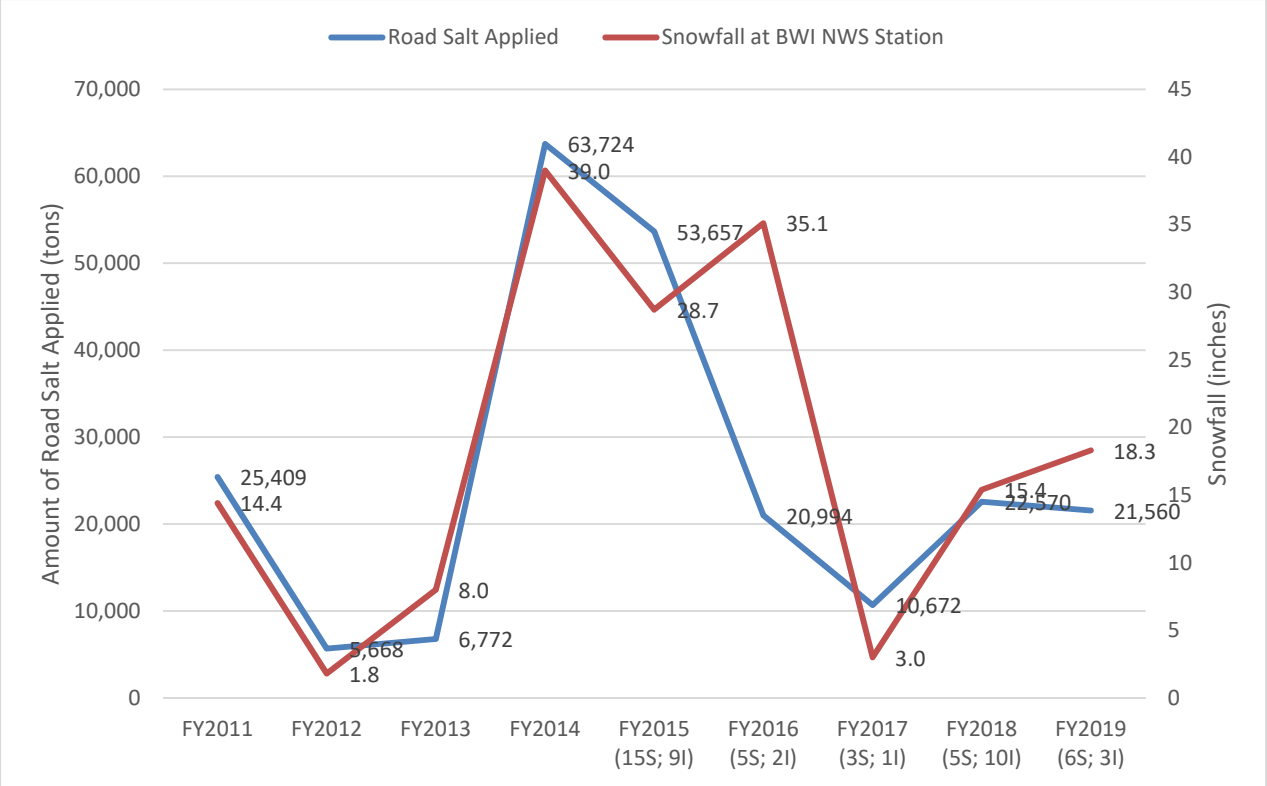
During FY 2019, the Department of Transportation (DOT) did not apply any herbicide because there was no one on staff with a license to apply herbicide. The Baltimore City Public Schools System reports that no herbicides were applied on school properties during FY 2019. In total for these three departments,

there were 54 pounds of glyphosate acid applied during FY 2019 compared to 43.5 pounds applied during FY 2018, which is an increase of 24%.

5.4.6 Deicing Materials

DOT applied 21,505 tons of road salt (sodium chloride) during FY 2019. This is a slight decrease of 5% from the 22,570 tons that were applied during FY 2018. Additionally, DOT applied a brine solution on two days prior to storms. DOT applied a total of 50,000 gallons of brine solution on those two days. DOT used 55 tons of salt to make that amount of brine solution. Thus DOT used a total of 21,560 tons of salt during FY 2019. The snowfall total recorded at BWI for FY 2019 was 18.3 inches- compared to 15.4 inches for FY 2018. During FY 2019, there were six (6) storms and three (3) days of icy conditions for which DOT applied road salt.

Figure 5-1 depicts the amount of road salt and the amount of snowfall recorded at the National Weather Service station at BWI Airport for each fiscal year, from FY 2011 through FY 2019. Note that 30 inches out of the 35.1 inches of snow fell in one event in FY 2016, specifically on January 21-22, 2016. That is why that pair of numbers (20,994 tons of road salt applied and 35.1 inches of snowfall) are not well related with the other pairs of numbers.



Note: For FY 2015 through FY 2019, S = number of snow events; I = number of Ice events

Figure 5-1: Road Salt Applied by City of Baltimore and Snowfall at BWI by Fiscal Year

5.5 Public Education and Outreach

5.5.1 Education and Outreach Activities

A summary of outreach events is provided in the following table:

Table 5-3: Summary of Outreach Activities for FY 2019

Description	Details
Public Presentations on the MS4 WIP	• 13 presentations were given to communities where MS4 projects are to be located
School presentations providing information on trash reduction, recycling, rats, and storm drains, related to the health of the harbor	• 12 Presentations • 8 Schools • 524 Students
Community events where DPW provided educational materials on environmental topics	• Artscape – 7/20/18 – 7/22/18 • Back to School Rally – 8/4/18 • National Night Out – 8/7/18 • AFRAM – 8/10/18 – 8/11/18 • Dam Jam – 8/25/18 • Mayor Young's Senior Symposium – 9/20/18 • Mayor's Youth Summer Block Party Tour (6) – various times throughout June – September • DPW in the Community – 12/11/18, 12/12/18, 12/15/18, 12/18/18, 1/4/19 • 45th District Community Meeting – 1/12/19 • Annual Modified Consent Decree – 1/23/19 • Councilman Henry's District-wide Meeting – 2/26/19 • New Bethlehem Baptist Church Community Day – 3/30/19 • FEMA Flood Map Open House – 4/2/19 • 9th District Forum – 4/6/19 • Taxpayers' Night – 4/9/19 • 28th Annual Law Day – 4/13/19 • 8th District Resource Fair – 5/4/19 • Big Truck Day 5/11/19 • Life Celebration Church Community Day • 5th District Resource Fair – 5/13/19 • Harlem Park Family Night – 516/19 • Lillian Jones Resource Fair – 5/18/19 • Caregivers Conference – 5/22/19

Description	Details
	• CM Burnett Pop Up – 5/24/19 • Less Waste Better Baltimore – 6/4/19, 6/15/19 • 13th District Town Hall – 6/13/19 • Housing Street Festival – 6/28/19
Incentives related to trash reduction	• "Less Waste, Better Baltimore" master plan to provide a long-term strategy for reducing solid waste generation, offering more options for reusing or repurposing waste materials, and increasing recycling rates (see above for public meeting dates): https://publicworks.baltimorecity.gov/Less-Waste-Better-Baltimore • Household Hazardous Waste collections (First Friday/Saturdays; July-October 2018, April-June 2019) • Discount Recycle Bin sales/Free Paper Shredding/Plastic bag takebacks (various dates) • Promoted the Recycle Coach webpage and app • Continued to provide disposal service for the Water Wheel, a public-private project at the Jones Falls outfall to the Inner Harbor

Baltimore's stormwater restoration fee has a credit program which includes a fee reduction for participation in registered stormwater participation events. These include community clean-ups, stream and harbor clean-ups, tree plantings, and installation of community BMPs. Outreach efforts and information promoting these types of trash reduction efforts and BMP installations have included information on the DPW's web site, and providing flyers at DPW attended events. The results of the registered stormwater participation events for FY19, as reported to DPW[2], are as follows:

- 18 stormwater participation events completed
- 513 volunteers participated
- 5.15 tons of trash collected
- 16 trees planted and/or maintained[3]

DPW also provided outreach materials for stormwater participation credits to participants in the Mayor's Fall 2018 and Spring 2019 Clean-ups.

[2] No data was received for 5 of the clean-up events.
[3] Trees are reported as afforestation.

5.5.2 Workforce Development Programs

5.5.2.1 Baltimore City Water Industry Career Mentoring Program

In January 2015, DPW and the Mayor's Office of Employment Development, together with the Chesapeake Water Environment Association (CWEA), launched the Baltimore City Water Industry Career Mentoring Program. The program had two goals: (1) educating local young adults about the water industry and its career opportunities; and (2) developing a pipeline of future workers with the right skills to fill entry-level positions in the field. The mentoring program targeted City residents between the ages of 18 and 24 who had their high school diploma or GED, but were unemployed or underemployed, and not engaged in post-secondary education or job training. In November 2017, the program was re-branded as Y-H20—the Youth Water Mentoring Program, which will serve as a national model for other cities.

5.5.2.2 National Green Infrastructure Certification Program (NGICP)

DPW coordinated with the Water Environment Federation and 14 partner organizations to develop the National Green Infrastructure Certification Program (NGICP). The purpose of the NGICP was to set national certification standards for green infrastructure construction, inspection, and maintenance workers. Designed to meet international best practice standards, the certification advances the establishment of sustainable communities by promoting green infrastructure as an environmentally and economically beneficial stormwater management option, supporting the development of proficient green workforces, and establishing a career path for skilled green infrastructure workers. Baltimore participated on both the technical advisory group and strategic advisory group, in addition to actively developing both the training curriculum and exam questions. Baltimore hosted one training session and exam for the region in the Fall 2018.

5.5.3 GROW Center

In Fiscal Year 2018, DPW launched a feasibility study for a concept known as "GROW Centers". GROW stands for Green Resources and Outreach for Watersheds, and will be places that links existing community greening networks to much needed sources of free/low cost materials and technical expertise for stormwater management installation and vacant lot revitalization. The GROW Centers would provide the following services:

- Materials for purchase. Mulch, bricks, crushed concrete, wood products, salvaged building materials and other quality-controlled materials that would be free and/or available for purchase by city residents and non-profits to use in micro-practice installation such as rain gardens, community gardens, and permeable paths and walkways. Trees, plants and quality-controlled materials like bio-soils will also be available in manageable volumes.
- Education and training. Experts will provide advice and guidance on green infrastructure projects, including hands-on training sessions, workshops, and educational classes on design, the proper use of the materials, securing funds and resources, and maintenance.

The feasibility study consists of two efforts – 1) the testing of the concept through a series of "pop-up" events, and 2) the development of an Alternatives Analysis and Business Plan. Both efforts will be funded in part by a grant from the USDA Forest Service received in FY2017.

FY19 saw was the second year of holding GROW Center events – pop-ups and workshops. In the Fall of 2018 four pop-ups were held in various locations across Baltimore, three in partnership with other organizations and events. In the Spring of 2018 four pop-ups were held, as well as five workshops. Summary results are:

- 428 people attended from 100+ different neighborhoods
- 12 partner organizations participated
- 214 trees were given away along with 24+ cubic yards of mulch
- 100 recycling bins were sold

Figure 5-2: Photos of GROW Center Pop-up events from FY 2019.

5.5.4 Effectiveness of Education Program for Trash and Litter

Public education and outreach is an essential strategy to achieve the long-term, sustained prevention of trash entering our streams and waterways. Whereas DPW is the responsible party for implementing and providing solid waste services, public education and outreach requires partnerships to be effective. Partnerships involve voluntarily actions and/or cooperation by State, federal, private, non-profits, and community groups and residents, and can be both structural and non-structural practices.

5.5.4.1 B'More Beautiful

BMORE Beautiful is a City-led peer to peer beautification program that launched April 2017. The goal of the program is to change behaviors and attitudes towards the beautification of the City as well as encourage residents, businesses and organizations to become directly involved in activities and projects that will keep their neighborhoods clean. To meet this goal, the City works closely with neighborhoods on beatification projects and cleanliness challenges, as well as provides educational literature, outreach materials and other resources that residents can use to Keep BMORE Beautiful.

After completing a 2 year pilot, BMORE Beautiful is on pace to expand citywide. BMORE Beautiful is currently active in 55 neighborhoods.

1. 4x4
2. Belair Edison
3. Bocek
4. Boyd Booth
5. Broadway East
6. Brooklyn
7. Canton
8. CARE
9. Carrollton Ridge
10. Cherry Hill
11. CHM
12. Curtis Bay
13. Darley Park
14. Druid Heights
15. Evergreen Lawn
16. Franklintown Road
17. Franklin Square
18. Greektown
19. Greenmount West
20. Hampden
21. Harlem Park
22. Highlandtown
23. Hopkins Bayview
24. Howard Park
25. Johnston Square
26. Langston Hughes
27. Matthew Henson
28. McElderry Park
29. Milton-Montford
30. Mondawmin
31. Morrell Park
32. Mosher
33. Oliver
34. Park Heights
35. Parklane
36. Patterson Park
37. Penn-North
38. Pigtown
39. Remington
40. Reservoir Hill
41. Rosemont
42. Sandtown Winchester
43. South Baltimore
44. Upton
45. Waverly
46. West Arlington
47. Westport
48. Irvington
49. Edmondson Village
50. Violetville
51. O'Donnell Heights
52. Mt. Clare
53. Yale Heights
54. Westgate
55. Penn Lucy

In each neighborhood a volunteer resident block captain is responsible for:

- RECRUITING neighbors to sign the pledge and participate in BMORE Beautiful;
- ORGANIZING ongoing beautification and cleaning activities;
- LEADING others to change their negative behaviors regarding neighborhood cleanliness; and
- EDUCATING their neighbors on how to comply with specific City Code requirements and how they can keep their neighborhood beautiful through simple, easy-to-follow behaviors.

BMORE Beautiful continues to support neighborhood beautification efforts through three popular grant programs:

- **Love Your Block Grant:** The Love Your Block Grant was designed to support the City's goals of "revitalizing and renewing" neighborhoods. Eligible groups may receive funding ($500- 1,500) for the purpose of enhancing neighborhood appearance.
- **Say YES! (Youth Environmental Stewards) Grant:** Say YES! Program was designed as community engagement opportunity for youth to earn while they learn. Organizations may apply for a grant to engage within their community on a variety of beautification projects. Youth are selected and supervised by community leaders. The Say YES! Program has a 10-week Spring and Fall session; a 6-week summer session was introduced in the FY 2019. Youth are responsible for completely weekly perception surveys that are submitted at the end of the session.
- **Care-A-Lot Grant:** Care-A- Lot Grant is an opportunity for organizations to provide maintenance services for up to 25 vacant lots during the "Grow Season". Maintenance services include mowing and removing trash and litter. This program is targeted to support the maintenance of City-owned vacant lots. In FY 2019, BMORE Beautiful introduced an equipment funding opportunity to help support community maintaining and transforming Care-A-Lot locations.

In FY 2019 , BMORE Beautiful achieved the following:

- 2 Neighborhood Captain Meetings
- 7 Baseline Community Surveys
- 81 BMORE Beautiful Community Clean-ups
- 35 Love Your Block Projects
- 586 Care-A-Lot vacant lots
- 156 Say YES! Participants

5.5.4.2 Mayor's Fall and Spring Clean-ups / Community Pitch-ins

The Mayor's Spring and Fall Clean-ups are opportunities for residents to organize community clean-ups and beautification projects. The purpose of the clean-ups is to collect litter and trash. DPW provides bags to residents, coordinates dumpsters, and picks up the trash from each location. In FY19:

- 464 communities participated
- 6,524 residents volunteered
- 113.57 tons (Spring)[4]

[4] No tonnage data was available for Fall 2018.

DPW also coordinates the Community Pitch-in program, which provides up to 4 dumpsters/year to community groups. In FY19, 1,018 requests were made for dumpsters (a 28% increase over FY18), with 16,576.97 tons of debris collected (a 314% increase over FY18). These events focus on larger debris collection, like old furniture and other material that is likely to be dumped.

6 Water Quality Improvements

6.1 MS4 Restoration and TMDL Watershed Implementation Plan (WIP)

The City submitted its WIP to MDE on December 22, 2014. A revised calculation of the baseline impervious area, with supporting GIS files and responses to the specific MDE comments, was submitted to MDE on June 30, 2015. MDE approved the baseline impervious area and 20% restoration goal of 4,291 acres on July 28, 2015. The WIP was revised based on public and MDE comments and submitted to MDE on August 24, 2015.

DPW is in the process of updating the baseline to reflect changes in industrial permitting and as-built data for BMPs installed prior to 2010, resulting in a lower baseline impervious area. To be conservative, the proposed restoration plans cited in Section 6 of this Annual Report refer only to the WIP (August 2015) and current MDE-approved baseline impervious area.

6.2 Milestone Schedule

The WIP included programmatic and project milestones as part of an accountability framework for restoring the Chesapeake Bay. The proposed milestone schedule and status as of June 30, 2019, related to the Chesapeake Bay TMDL, are included in Appendix M. Note that the original proposed milestone schedule only extended to FY 2018, which was the last anticipated fiscal year to occur before the expiration of the current permit.

6.3 Implementation of Projects, Programs, and Partnerships

6.3.1 Project Implementation and Tracking

The progress status of the projects listed in the WIP is provided in Appendix N of this Annual Report, specifically Table N-1. The original plan scope, cost and schedule are shown in addition to the current projections. The Lower Lower Stony Run stream restoration project was completed. The Chinquapin Run stream restoration project continued through the construction phase, coinciding with a sanitary system improvements. Several projects related to impervious area removal at schools were initiated in FY 2019, with construction completion scheduled for FY 2020. The current projections are based on the project progress as of June 30, 2019. Each of the current proposed projects, with specific locations, is included in the restoration BMPs tables of the georeference database in Appendix C.

Table N-1 listed afforestation efforts by Tree Baltimore for the proposed WIP. Although the Stormwater Utility funded some of Tree Baltimore's efforts, it was easier to list all of the Tree Baltimore efforts under Partnership (Table N-3).

6.3.2 Program Implementation and Tracking

The progress status of the programs listed in the WIP is provided in Appendix N of this Annual Report, specifically Table N-2. Current program implementation and corresponding georeference database records are reported, based on frequency and geographic distribution of the operation (tonnage by watershed) in the georeference database (Appendix C of this report).

The reference metric and methodology for street sweeping changed from tonnage to miles, to coincide with adopted methodology of the Chesapeake Bay Program. The area swept used a conservative, estimated sweeper path of 56 inches, which is the width listed by Elgin (street sweeper manufacturer) for the suction nozzle and side broom. The extended broom would increase the path width to 78 inches, and thus increase the area swept by 39%. The calculation for the area for street sweeping is as follows:

$$\text{Area Swept} = \frac{\text{Miles swept} * 56 \text{ in} * (5280 \text{ LF / mile})}{(12 \text{ inches / LF})\ (43{,}560 \text{ SF / acre})} = 0.57 * \text{Miles swept}$$

The following factors used to calculate the equivalent impervious area and nutrient reduction for street sweeping were based on Table 3.E of the MDE Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated: Guidance for National Pollutant Discharge Elimination System Stormwater Permits, dated August 2014 (MS4 Accounting Guidelines):

- Impervious Acre Equivalent: 0.13
- Total nitrogen removal efficiency: 5% / acre
- Total phosphorus removal efficiency: 6% / acre
- Total suspended solids removal efficiency: 25% / acre

IDDE efforts are also listed in Table N-2. Supporting calculations for each type of IDDE effort is included in Appendix L of this report.

6.3.3 Partnership Implementation and Tracking

The progress status of the partnerships listed in the WIP is provided in Appendix N of this Annual Report, specifically Table N-3. All restoration BMPs with approved plans and status of "completed" in the georeference database (Appendix C), implemented to meet development requirements, were simply listed in the Table N-3 under development, using conservative pollutant removal efficiencies for pond and bioretention retrofits in type D soils. Specific projects completed by volunteer efforts are listed in Table N-3, in addition to the afforestation efforts by Tree Baltimore. The afforestation efforts are listed by watershed and assume that 80% of the trees were planted in pervious areas (i.e. on a grass field or in an existing tree pit).

6.4 Impervious Area Restoration

The progress status of implementation of proposed projects, programs, and partnerships of the WIP is provided in Appendix N. Since most of the projects are still in the design phase, the majority of the impervious area restoration is provided by programs, specifically street sweeping. A summary of the impervious area restoration efforts (Appendix N) is provided in Table 6-1 and shows that the City has exceeded the impervious area restoration goal (4,291 acres) as of June 30, 2019.

Table 6-1: Summary of Impervious Surface Restoration (ISR) Efforts

Description	ISR Completed by June 30, 2019 (ac)
Projects	101
Programs	6,161
Partnerships	659
Total	**6,921**

6.5 Bay TMDL Compliance

In FY 2018, MDE transitioned from the Maryland Assessment Scenario Tool (MAST) to the Chesapeake Bay Assessment Scenario Tool (CAST). The evaluation of Bay TMDL compliance using CAST will be included in the FY 2019 Annual Report. As an alternative to CAST, an estimation of the pollutant removals (% reduction) using the MS4 Accounting Guidelines is provided in Appendix O, specifically Table O-2. Only increased mileage was used for street sweeping after baseline TMDL conditions were established (December 2009) in estimating pollutant reductions. Previous Annual Reports (prior to FY 2018) had used the total street sweeping for pollutant reductions. Only preventive Inlet cleaning was included in the estimate. The IDDE program was also included.

The evaluation (Table O-2) showed that the City has met the Bay TMDL goal for sediment. The efforts for nitrogen and phosphorus reduction are still insufficient, even with the completion of the current proposed projects. The phosphorus goal may be met if the street sweeping path width or mileage were increased.

6.6 Local TMDL Compliance

6.6.1 Nutrients and Sediment

An analysis of the nutrient and sediment removals, based on the current implementation status, using the current MS4 Accounting Guidelines is provided in Appendix P. Just like the Bay TMDL compliance assessment, load reductions attributed to street sweeping only included the increase in annual mileage collected since TMDL baseline conditions (December 2009). The analysis used a percent reduction methodology with both loads and load reductions calculated based on the MS4 Accounting Guidelines.

The estimated baseline load for nitrogen and phosphorus were significantly higher using the loading factors from the MS4 Accounting Guidelines (Table O-1 of this report), as compared to the baseline load listed in the approved TMDL documents. The progress analysis shows the current planned efforts will be insufficient for meeting the nitrogen goals. The phosphorus goal has been met with the current efforts for Back River, but will not be met for Baltimore Harbor. The phosphorus goal may be met if the street sweeping path width or mileage were increased. Furthermore, the City's SIS monitoring results show a decrease in nutrient and phosphorus concentrations since FY 2012, as described in Section 3.1.1 of this report.

Contrary to the local nutrient TMDLs, the estimated baseline load for sediment was significantly lower using the loading factors for from MS4 Accounting Guidelines (Table O-1) as compared to the baseline load listed in the approved TMDL documents, which were derived biological assessments, not direct measurements of sediment. The analysis showed that the current proposed efforts would be insufficient using the current MS4 Accounting Guidelines for Gwynns Falls (Table P-3) and Jones Falls (Table P-4) watersheds; however, the proposed sediment removal rate for stream restoration (248 lbs / year/ LF) would provide an additional load sediment load reduction for Gwynns Falls and Jones Falls watersheds, upon the completion of the capital projects. The sediment load reduction goals for the Lower North Branch Patapsco watershed are insufficient, even with the completion of the current proposed efforts. No stream restoration projects are planned in that watershed.

6.6.2 Bacteria

The City is under a consent decree in Civil Action No. JFM-02-1524 for unpermitted discharges from the wastewater collection system. A modification to the consent decree was approved on October 6, 2017 in the United States District Court for the District of Maryland by the U.S. Department of Justice, the U.S. Environmental Protection Agency, and the Maryland Department of the Environment. The City submitted a modified implementation plan to reflect the schedule approved as part of the modified Consent Decree. Progress for the milestone implementation schedule (education and IDDE credit study) is included in Table M-1 of Appendix M of this report. The City's progress on a microbial source tracking study is discussed in Section 5.3.2.3 of this report.

The City has continued to make significant capital investments in rehabilitating the sanitary sewer system. Phase I of these capital investments will be completed in FY 2021 and includes the Headworks project, which is expected to reduce the number of wet weather SSOs by 80%. Two sanitary sewer re-alignment and rehabilitation projects were designed in concert with two of the City's stream restoration projects (Chinquapin Run and Powder Mill Run) to reduce land and community disturbance. Further information on these efforts is provided in quarterly Consent Decree reports, posted on the City's website.

The results of the City's routine stream sampling for bacteria are provided in Section 3.1.2 of this Annual Report. The following SIS stations remain a concern:

- All stations in the Back River, Moore Run Subwatershed. Phase I Consent Decree projects should significantly reduce SSOs and thus bacteria loading for this subwatershed.
- JF 11.5 is a structured overflow. Pending the completion of the Headworks project, the structured overflow will be removed.
- Gwynns Falls: all but stations at Dead Run and GF Hilton Street. Phase I Consent Decree projects should significantly reduce SSOs and thus bacteria loading for this subwatershed.
- Lakewood and Linwood stations in Baltimore Harbor. The drainage are for these two stations account for about 15% of the City land area. The storm drain systems inter-connect in and around Patterson Park. The Lakewood station is associated with the sub-watershed known as Harris Creek; this system has endured 4 emergency repairs for sinkholes in and around

Monument Street for the last 10 years due to failure of a 10-foot storm drain tunnel. A $22 million capital rehabilitation project for this system is scheduled to begin in FY 2020. This rehabilitation, in addition to the Phase I Consent Decree projects should significantly reduce bacteria loading.

6.6.3 Trash

On January 5, 2015, EPA approved the report entitled "*Total Maximum Daily Loads (TMDL) of Trash and Debris for the Middle Branch and Northwest Branch Portions of the Patapsco River Mesohaline Tidal Chesapeake Bay Segment, Baltimore City and County, Maryland*". In compliance with the MS4 permit, the City developed the "Baltimore City Trash TMDL Implementation Plan", submitted to MDE on January 4, 2016, to present strategies to meet the TMDL waste load allocations. In addition to the trash reduction efforts noted in the previous sections of this report, progress on the milestone schedule for the trash TMDL is included in Appendix M of this report.

6.6.4 PCB

The City submitted a revised PCB TMDL implementation plan to MDE in September 2018. The plan included details of a collaborative study with USGS and UMBC in the Back River watershed, to be completed by FY 2020. The City is on schedule for this task.

Appendix A: Organization Chart

Mayor of City of Baltimore

Department of Public Works

- Chief of Staff
  - Office of Communications — MS4: D.6
  - Office of Information Technology
  - Office of Safety and Training
  - Office of Materials Management
  - Office of Engineering and Construction — MS4: E.1, E.2, F.2
  - Office of Asset Management — MS4: C, D.3
  - Office of Compliance and Laboratories
    - Water Quality Monitoring & Inspection Section — MS4: C, D.3, F.1, F.2
    - Watershed Planning and Partnerships Section — MS4: D.4, D.6, E.1, E.2, F.2
    - Research and Innovation Section
    - Plans Review & Inspection Section — MS4: C, D.1, D.2
    - Environmental Laboratories
    - Water Quality Laboratories
- Deputy Director and Administrative Offices: Boards and Commissions; Contract Administration; Fiscal Management; Grants Management; Human Resources; Legal and Regulatory Affairs; Legislative Affairs — MS4: D.5.a, D.6
- Bureau of Water and Wastewater
  - Utility Maint. Division — MS4: D.4, D.5.b.ii
  - Customer Svc Division — MS4: D.6
  - Environmental Services Div.
  - Wastewater Facilities Div. — MS4: D.5.a
  - Pollution Control Section — MS4: D.3
- Bureau of Solid Waste
  - Facilities Management — MS4: D.5.a
  - Street Sweeping — MS4: D.4, D.5.b.i
  - NW Quad Services — MS4: D.4
  - NE Quad Services — MS4: D.4
  - SW Quad Services — MS4: D.4
  - SE Quad Services — MS4: D.4

Department of Planning

- Office of Sustainability — MS4: C, D.6

Department of Recreation and Parks — MS4: C, D.5.b.iii, D.6

Department of Housing and Community Development

- Office of Permits & Building Inspections — MS4: C, D.1, D.2, D.3

Department of General Services

- Fleet Management Division — MS4: D.5.a

Department of Transportation — MS4: C, D.1, D.2, D.5.b.iii & iv

Office of Emergency Management — MS4: D.3

Department of Finance

MS4 Permit Condition Key:

C. Source ID (GIS)
D.1 Stormwater Management
D.2 Erosion and Sediment Control
D.3 Illicit Discharge Detection and Elimination (IDDE)
D.4 Trash Elimination
D.5.a – Property Management (NPDES regulated city facilities)
D.5.b.i – Street Sweeping
D.5.b.ii – Inlet cleaning
D.5.b.iii – Vegetation management
D.5.b.iv – De-icing materials
D.6 – Public education
E.1 Watershed assessment
E.2 – Watershed Restoration (projects)
F.1 – Chemical/ biological monitoring and physical assessment
F.2 TMDL Assessment

City of Baltimore Organization Chart in Reference to MS4 Permit Conditions as of June 30, 2019

Department of Public Works Organization Chart*

Rudolph S. Chow, P.E.
Director

Matthew Garbark,
Deputy Director
Fiscal Management, Troy Brogden
Human Resources, LaToya Curtis
Contract Administration, Tonorah Houston-Burgee
Boards and Commissions, Deena Joyce
Legal and Regulatory Affairs, Paul DeSantis
Grants Management, Anne Haskins-Brookover
Legislative Affairs, Marcia Collins

Johnnie Hemphill,
Chief of Staff
Asset Management, Carlos Espinosa, P.E.
Communications and Strategic Performance, Yolanda Winkler
Compliance and Laboratories, Kimberly Grove, P.E.
Engineering and Construction, Lauren Swiecicki
Information Technology, Yugandhar Narala
Materials Management, Ingrid Rivera
Safety and Training, Barbara Rodgers

John Chalmers,
Head of Bureau of Solid Waste
Disposal Services Division, James Rohrbach
Northwest Quadrant, Vacant
Southeast Quadrant, Vacant
Southwest Quadrant, Peggy Smallwood
Northeast Quadrant, Yvonne Moore- Jackson
Southeast Quadrant, Robin Ghee (acting)
Mechanical Street Sweeping, Vacant
Inner Harbor, Downtown Business District, Muriel Rich
Support Services, Vacant

Johnnie Hemphill,
Head (Acting) of Bureau of Solid Waste
Customer Support and Services, Byran Davis
Environmental Services, Deborah Pitts
Wastewater Facilities, Mike Gallagher
Utility Maintenance, Anthony Galloway

*Note: Reflects organization structure as of June 30, 2019.

Appendix B: Summary Table of Null Values in the MS4 Geodatabase

Summary of Null Values Used on MDE Geodatabase

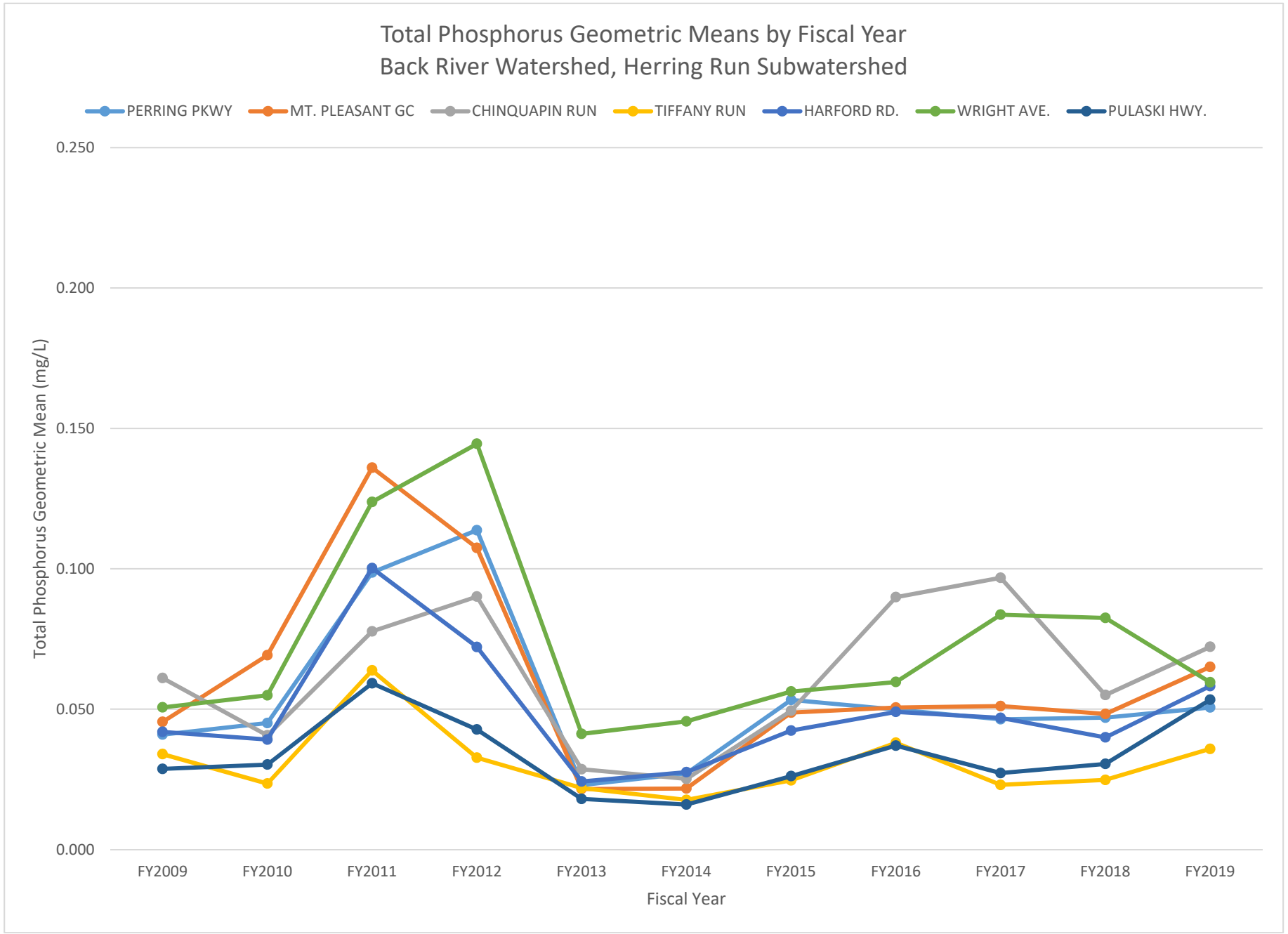
Table	Field	Value	Comments	Schema
Biological Monitoring	EVENT_TIME	12:00	Not recorded in field report.	
	FIBI	-999	FIBI is not done; it is not required for this permit.	X
	EMBEDDEDNESS	-999	Not recorded in field report.	
Chemical Monitoring	WATER_TEMP	-999	Not recorded in field report.	
	pH	-999	Not recorded in field report.	
	BOD_dt	-999	Not recorded in field report.	
	BOD_EMC0	-999	Not recorded in field report.	
	BOD_EMC_dt	-999	Not recorded in field report.	
	TSS_dt	-999	Not recorded in field report.	
	TSS_EMC0	-999	Not recorded in field report.	
	TSS_EMC_dt	-999	Not recorded in field report.	
BMPPOI	IMP_ACRES	-999	Data not shown on as-built plans	
	APPR_DATE	1/1/1900	Data not shown on as-built plans	
	BUILT_DATE	1/1/1900	Data not shown on as-built plans	X
RestBMP	IMP_ACRES	-999	For projects not constructed	
	BUILT_DATE	1/1/1900	For projects not constructed	
	PE_ADR	-999	For projects not constructed	
	PROJECTED_IMPL_YR	9999	For projects not constructed	
	IMPL_COST	-999	Missing data or data was not recorded	
BMP	BMP_DRAIN_AREA	-999	Data not shown on as-built plans	
	BUILT_DATE	1/1/1900	Data not shown on as-built plans	
AltBMPPoly	IMPL_COST	-999	Total program costs are shown Section 4, but not broken down by frequency / watersheds.	
Outfall	DIM_OUTFALL	-999	Missing data	
	HT_OUTFALL	-999	Missing data	
	WT_OUTFALL	-999	Missing data	
BMP_Inspections	REINSP_DATE	1/1/1900	For facilities which have been removed	X
IDDE	LAST_RAIN	1/1/1900	Data was not recorded at sampling time	
	SCREEN_TIME	1200	Data was not recorded at sampling time	
	WATER_TEMP	-999	Data was not recorded at sampling time	
	AIR_TEMP	-999	Data was not recorded at sampling time	
	ALGAEGROW	N	Data was not recorded at sampling time	
	ODOR	SE	Data was not recorded at sampling time	
	DEPOSITS	N	Data was not recorded at sampling time	
	VEG_COND	N	Data was not recorded at sampling time	
	STRUCT_COND	N	Data was not recorded at sampling time	
	EROSION	N	Data was not recorded at sampling time	
NarrativeFile	MDE_STATION_ID	-999	Document is not associated with a monitoring site.	X

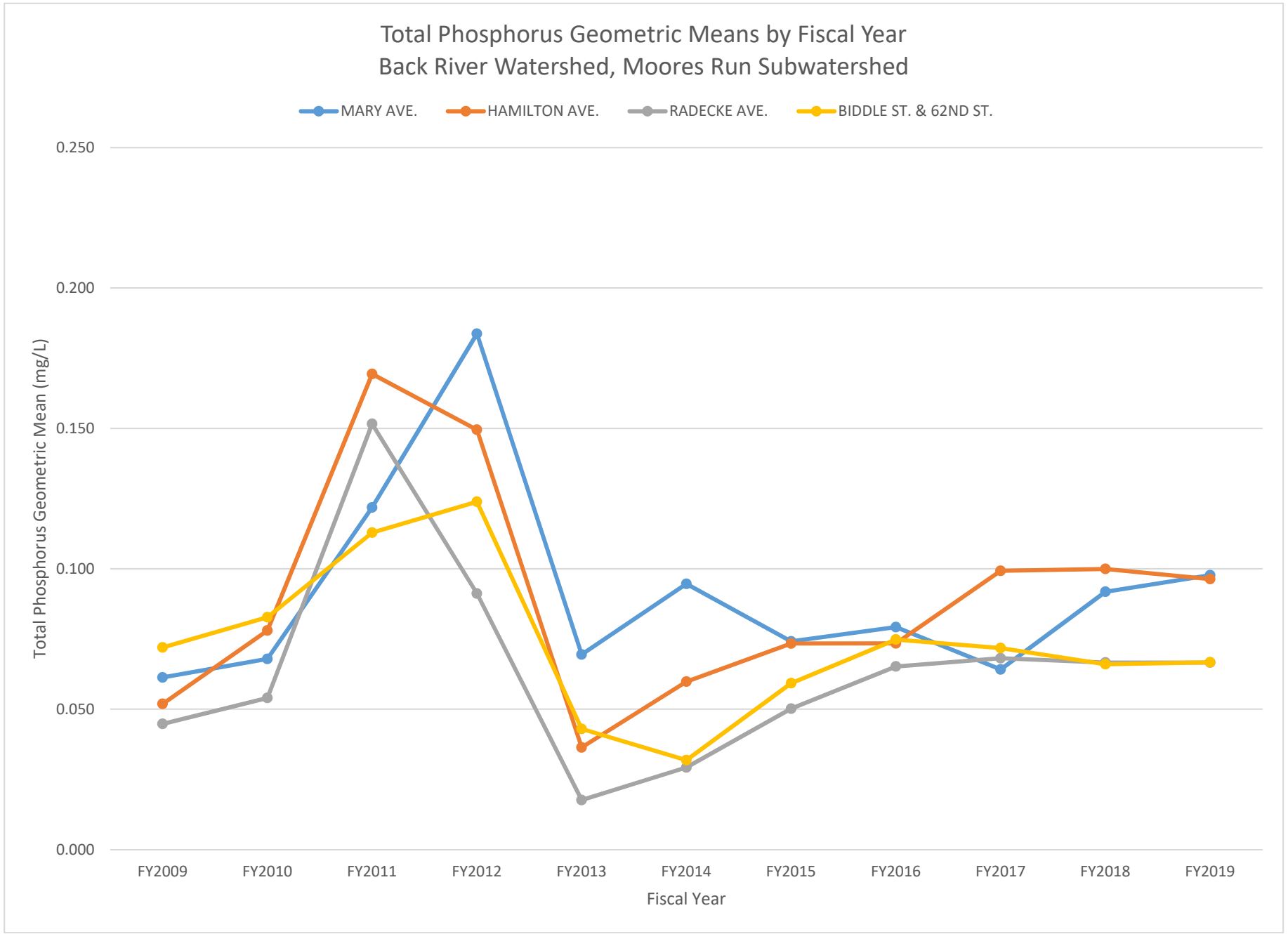
Note: Schema indicates MDE plans to change the field to optional in next generation of database.

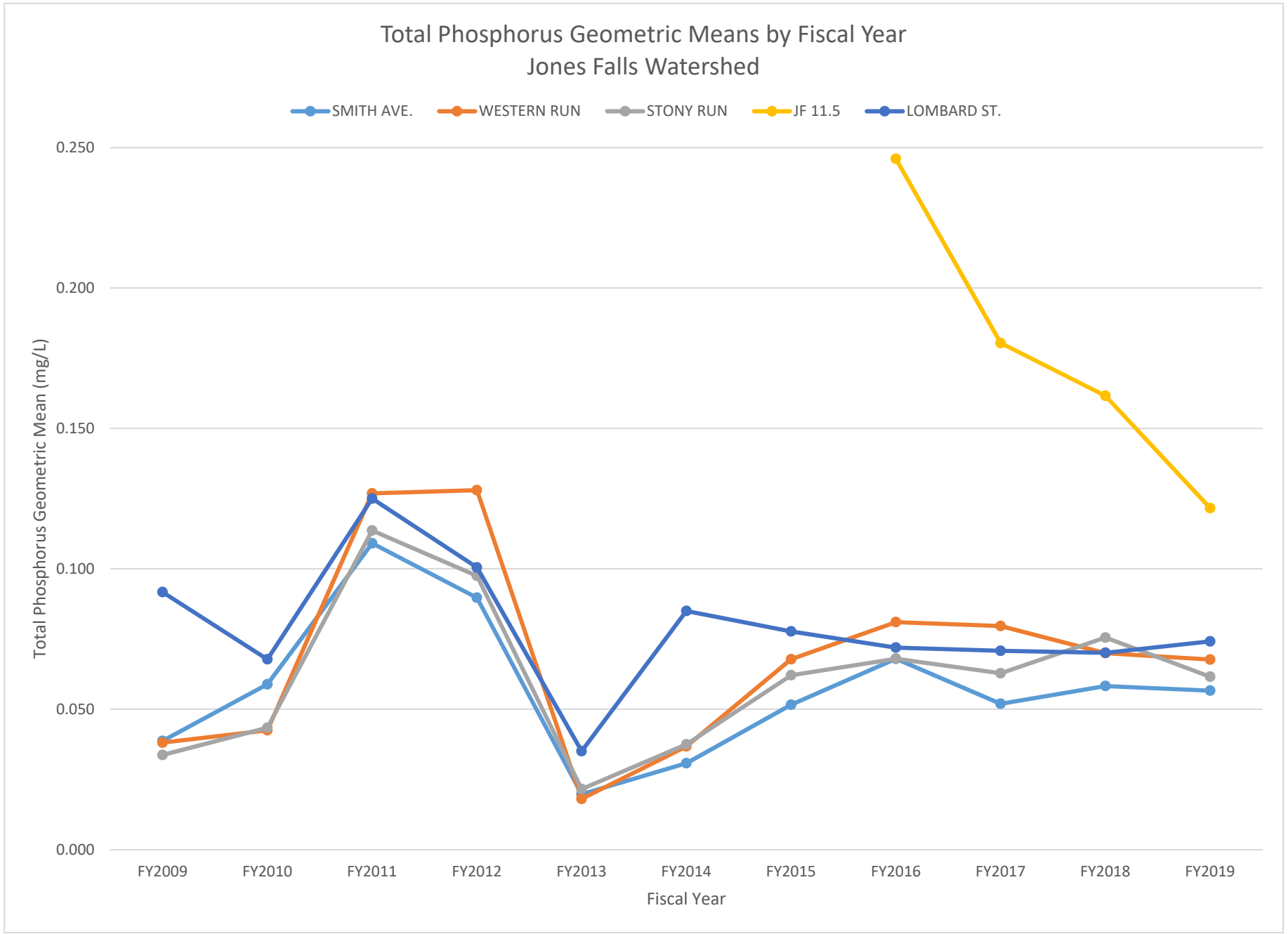
Appendix C: Source Information using MS4 Geodatabase (*electronic files only*)

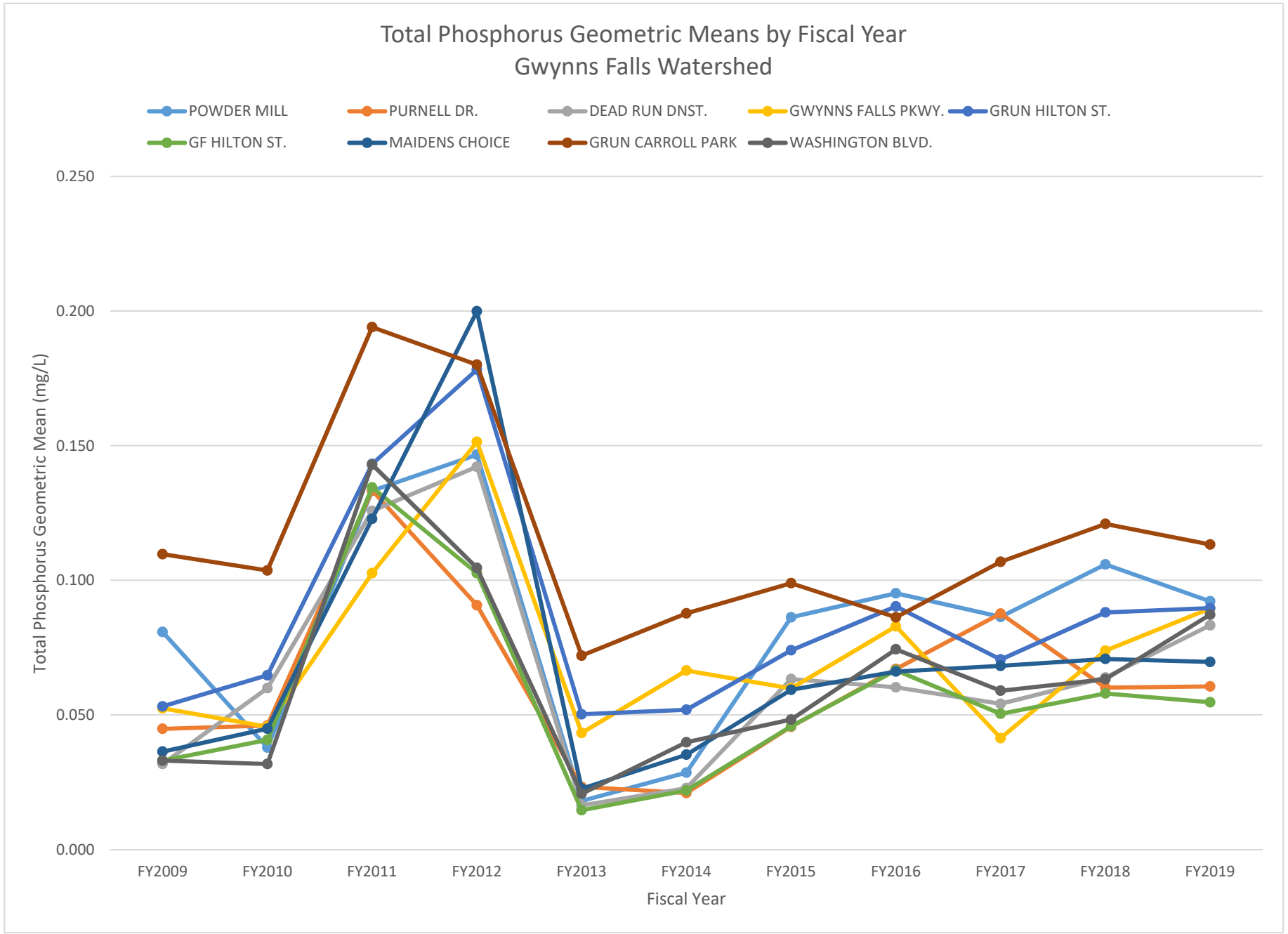
Appending D: Ammonia Screening and Stream Impact Sampling Results (*electronic files only*)

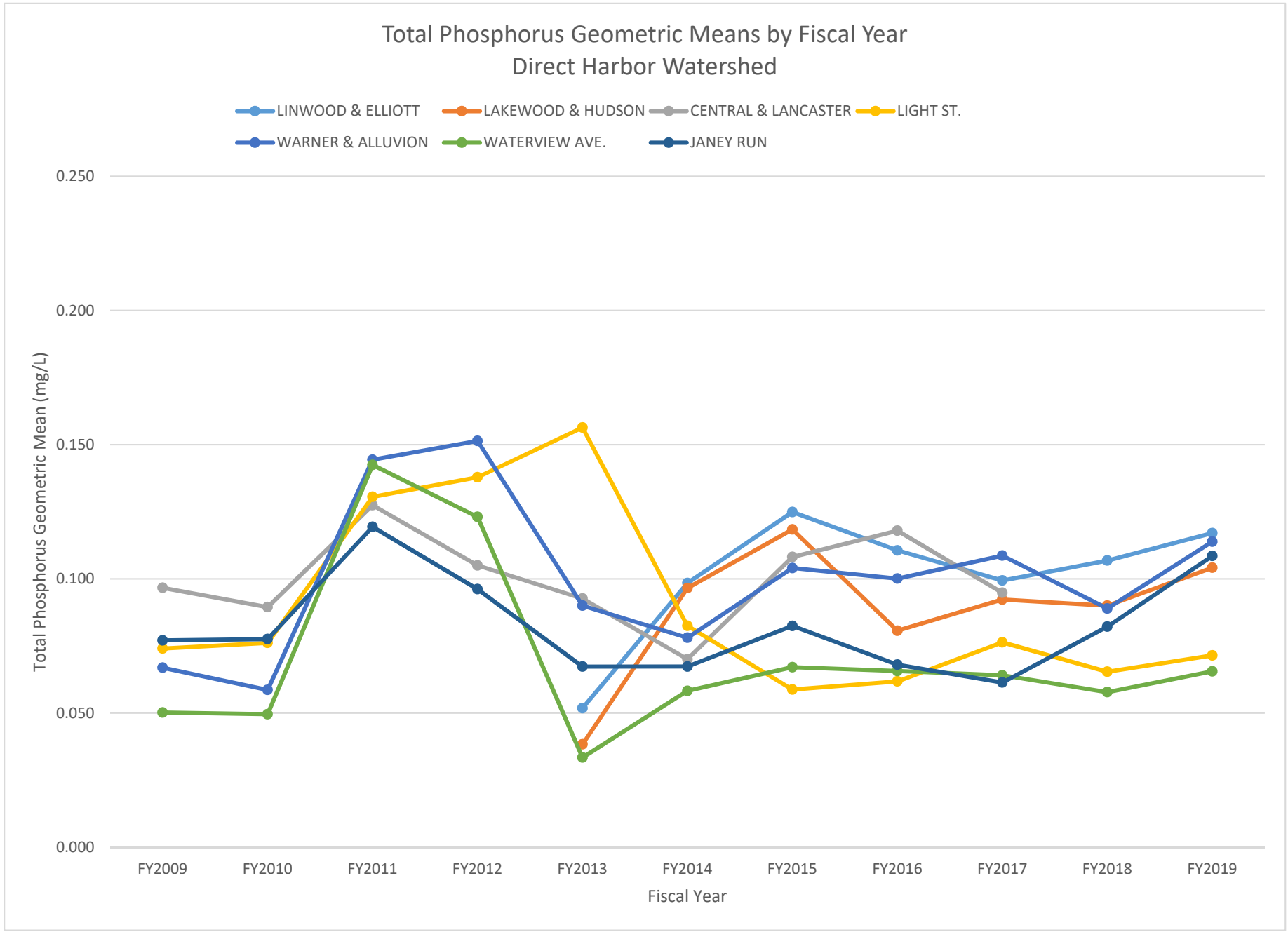
Appendix E: Total Phosphorus Monitoring Histographs

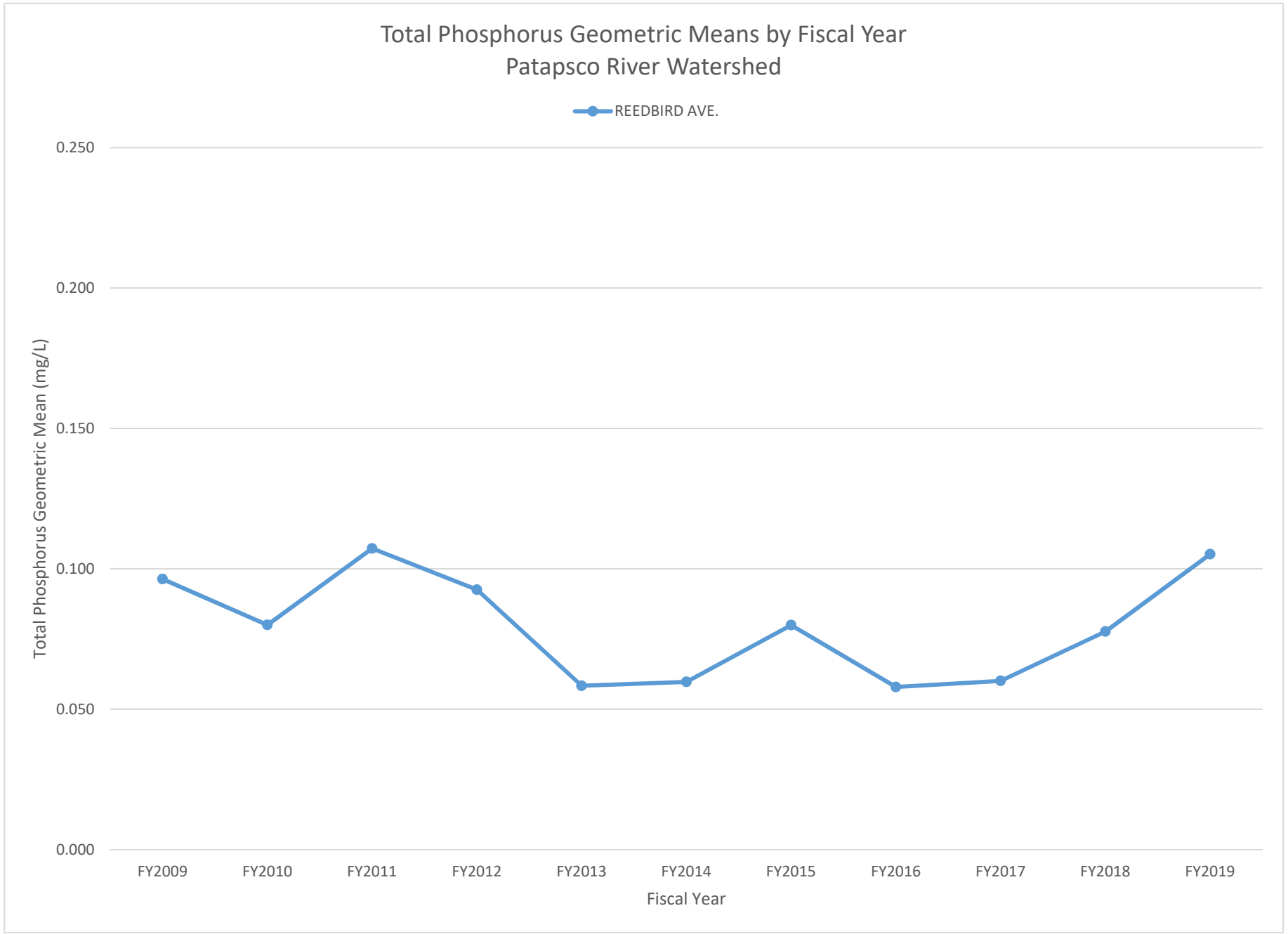

Total Phosphorus Geometric Means by Fiscal Year
Back River Watershed, Herring Run Subwatershed
PERRING PKWY
MT. PLEASANT GC
CHINQUAPIN RUN
TIFFANY RUN
HARFORD RD.
WRIGHT AVE.
PULASKI HWY.
0.250
0.200
0.150
0.100
0.050
0.000
Total Phosphorus Geometric Mean (mg/L)
FY2009
FY2010
FY2011
FY2012
FY2013
FY2014
FY2015
FY2016
FY2017
FY2018
FY2019
Fiscal Year

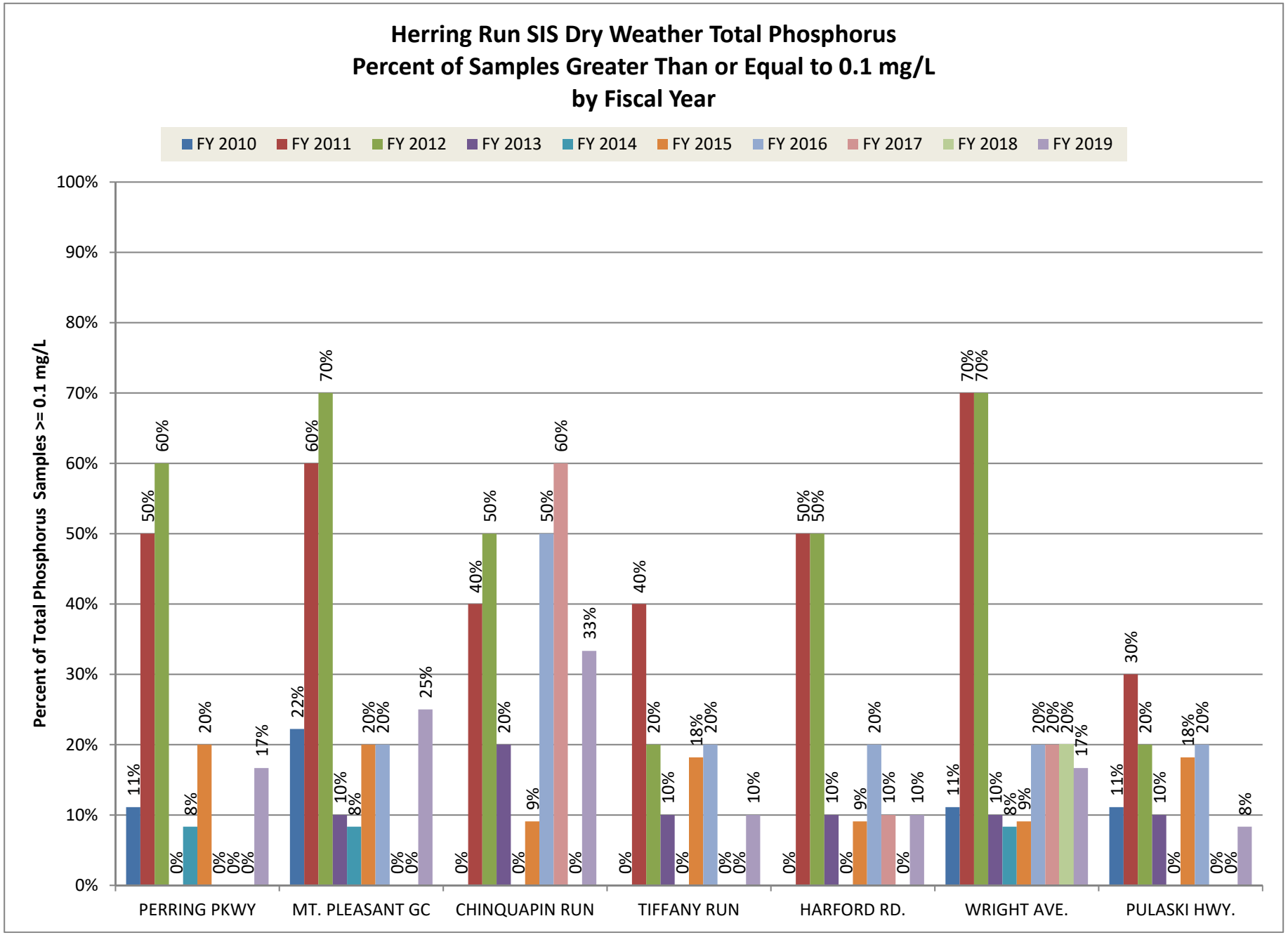

Total Phosphorus Geometric Means by Fiscal Year
Back River Watershed, Moores Run Subwatershed
MARY AVE.
HAMILTON AVE.
RADECKE AVE.
BIDDLE ST. & 62ND ST.
0.250
0.200
0.150
0.100
0.050
0.000
Total Phosphorus Geometric Mean (mg/L)
FY2009
FY2010
FY2011
FY2012
FY2013
FY2014
FY2015
FY2016
FY2017
FY2018
FY2019
Fiscal Year

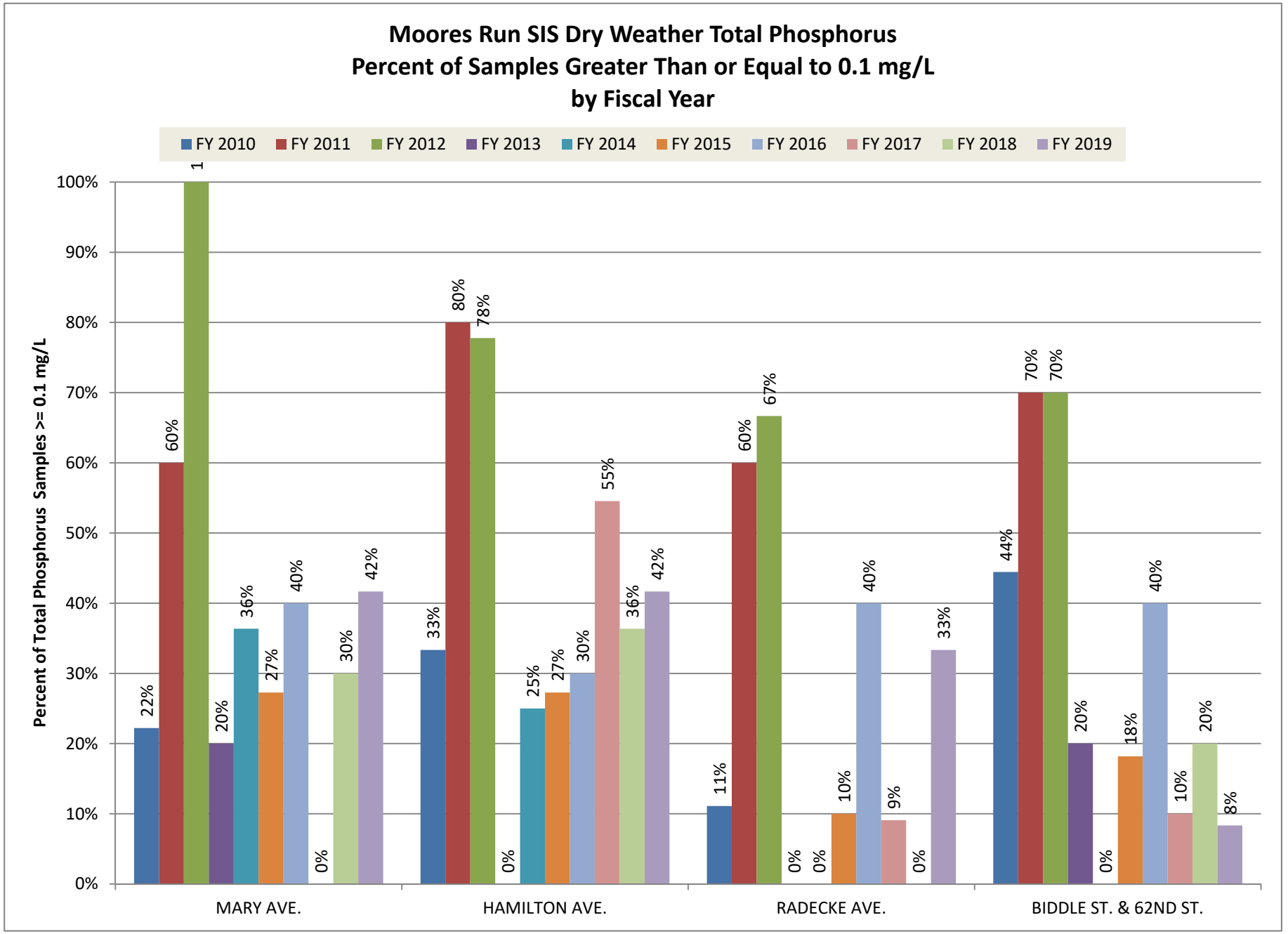

Total Phosphorus Geometric Means by Fiscal Year
Jones Falls Watershed
SMITH AVE.
WESTERN RUN
STONY RUN
JF 11.5
LOMBARD ST.
0.250
0.200
0.150
0.100
0.050
0.000
Total Phosphorus Geometric Mean (mg/L)
FY2009
FY2010
FY2011
FY2012
FY2013
FY2014
FY2015
FY2016
FY2017
FY2018
FY2019
Fiscal Year

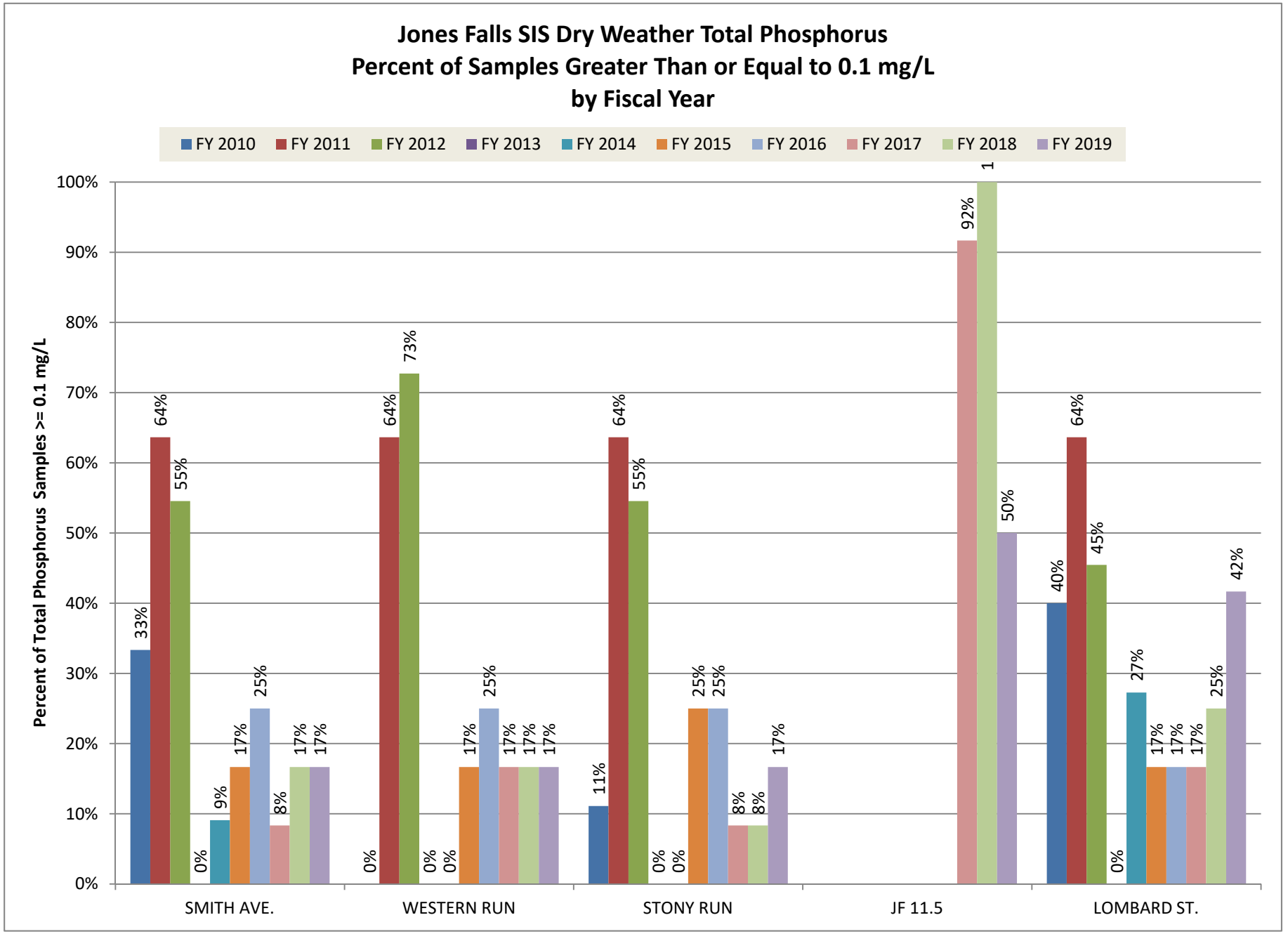

Total Phosphorus Geometric Means by Fiscal Year
Gwynns Falls Watershed
POWDER MILL
PURNELL DR.
DEAD RUN DNST.
GWYNNS FALLS PKWY.
GRUN HILTON ST.
GF HILTON ST.
MAIDENS CHOICE
GRUN CARROLL PARK
WASHINGTON BLVD.
0.250
0.200
0.150
0.100
0.050
0.000
Total Phosphorus Geometric Mean (mg/L)
FY2009
FY2010
FY2011
FY2012
FY2013
FY2014
FY2015
FY2016
FY2017
FY2018
FY2019
Fiscal Year

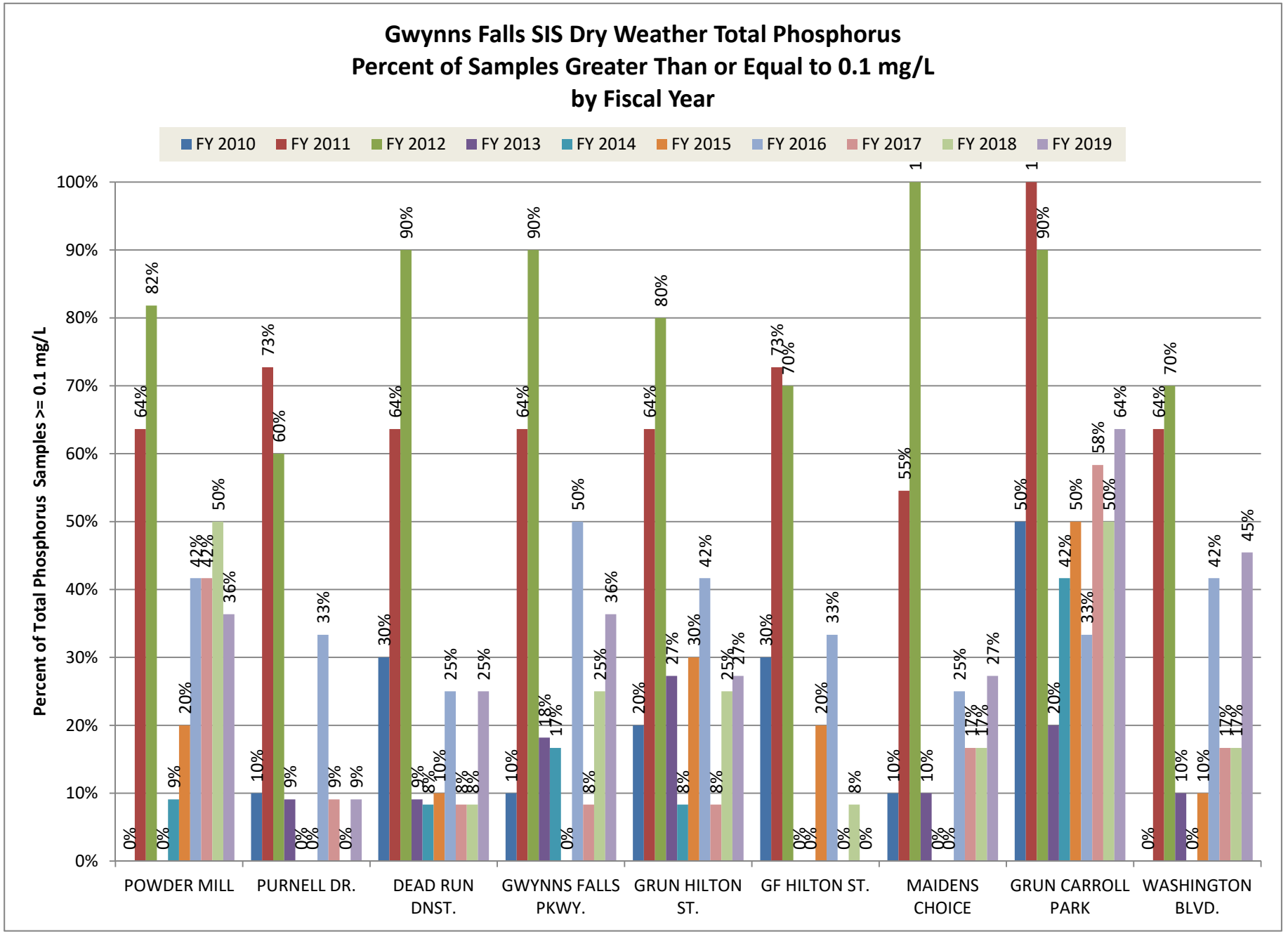

Total Phosphorus Geometric Means by Fiscal Year
Direct Harbor Watershed
LINWOOD & ELLIOTT
LAKEWOOD & HUDSON
CENTRAL & LANCASTER
LIGHT ST.
WARNER & ALLUVION
WATERVIEW AVE.
JANEY RUN
Total Phosphorus Geometric Mean (mg/L)
0.250
0.200
0.150
0.100
0.050
0.000
FY2009
FY2010
FY2011
FY2012
FY2013
FY2014
FY2015
FY2016
FY2017
FY2018
FY2019
Fiscal Year

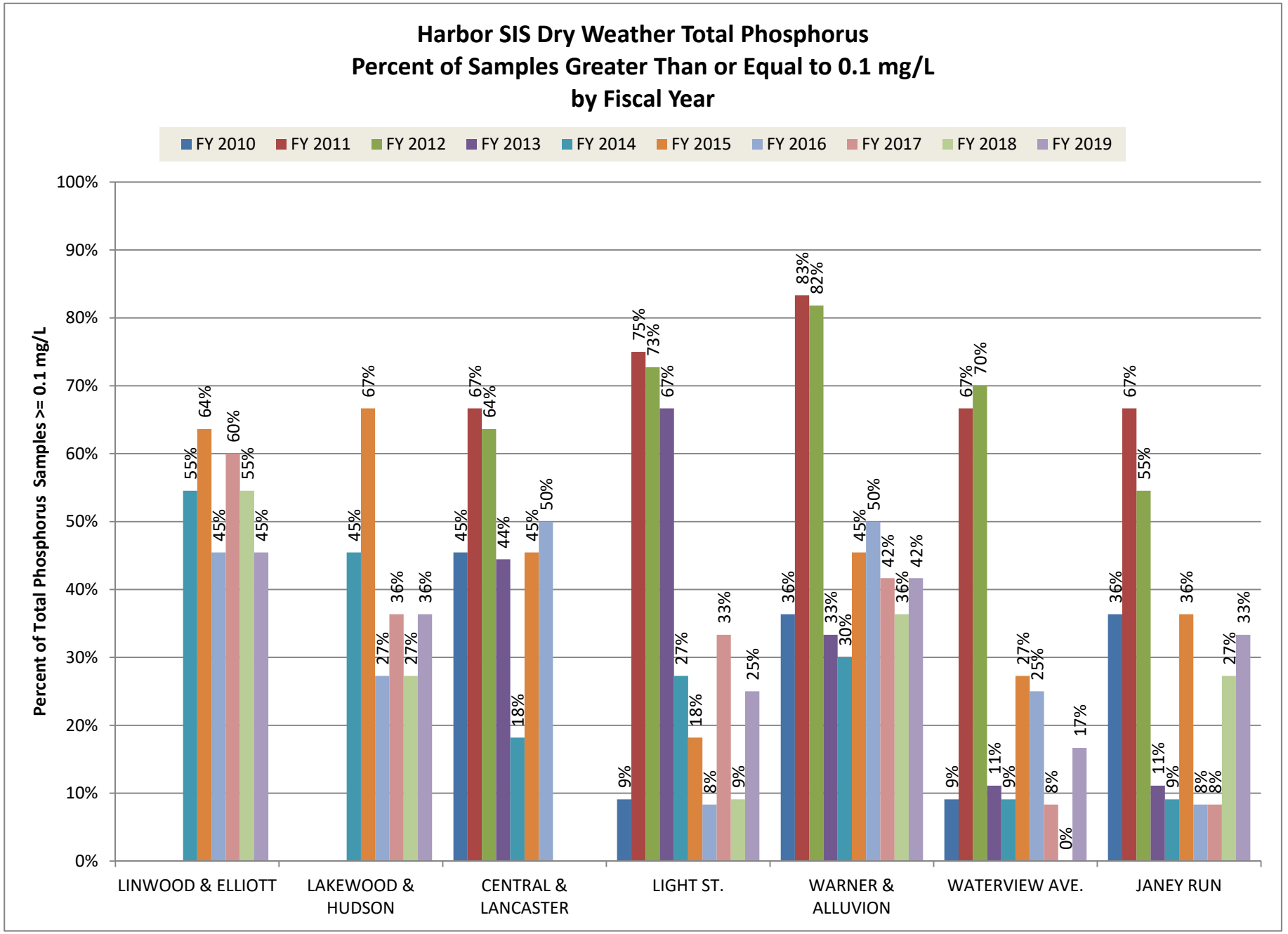

Total Phosphorus Geometric Means by Fiscal Year
Patapsco River Watershed
REEDBIRD AVE.
0.250
0.200
0.150
0.100
0.050
0.000
Total Phosphorus Geometric Mean (mg/L)
FY2009
FY2010
FY2011
FY2012
FY2013
FY2014
FY2015
FY2016
FY2017
FY2018
FY2019
Fiscal Year

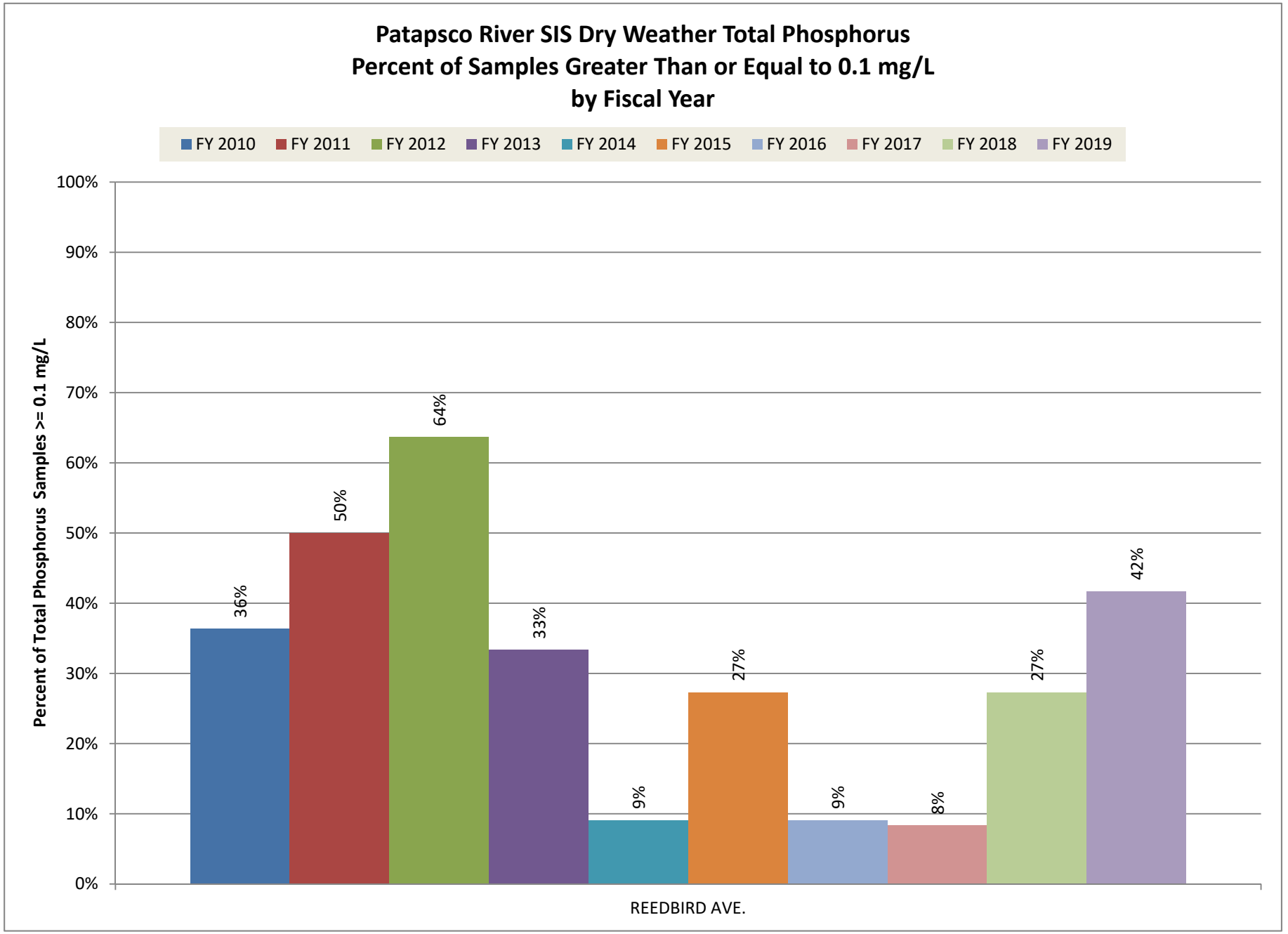

Herring Run SIS Dry Weather Total Phosphorus
Percent of Samples Greater Than or Equal to 0.1 mg/L
by Fiscal Year
FY 2010
FY 2011
FY 2012
FY 2013
FY 2014
FY 2015
FY 2016
FY 2017
FY 2018
FY 2019
Percent of Total Phosphorus Samples >= 0.1 mg/L
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
PERRING PKWY
MT. PLEASANT GC
CHINQUAPIN RUN
TIFFANY RUN
HARFORD RD.
WRIGHT AVE.
PULASKI HWY.


Moores Run SIS Dry Weather Total Phosphorus
Percent of Samples Greater Than or Equal to 0.1 mg/L
by Fiscal Year
FY 2010
FY 2011
FY 2012
FY 2013
FY 2014
FY 2015
FY 2016
FY 2017
FY 2018
FY 2019
Percent of Total Phosphorus Samples >= 0.1 mg/L
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
22%
60%
1
20%
36%
27%
40%
0%
30%
42%
33%
80%
78%
0%
25%
27%
30%
55%
36%
42%
11%
60%
67%
0%
0%
10%
40%
9%
0%
33%
44%
70%
70%
20%
0%
18%
40%
10%
20%
8%
MARY AVE.
HAMILTON AVE.
RADECKE AVE.
BIDDLE ST. & 62ND ST.

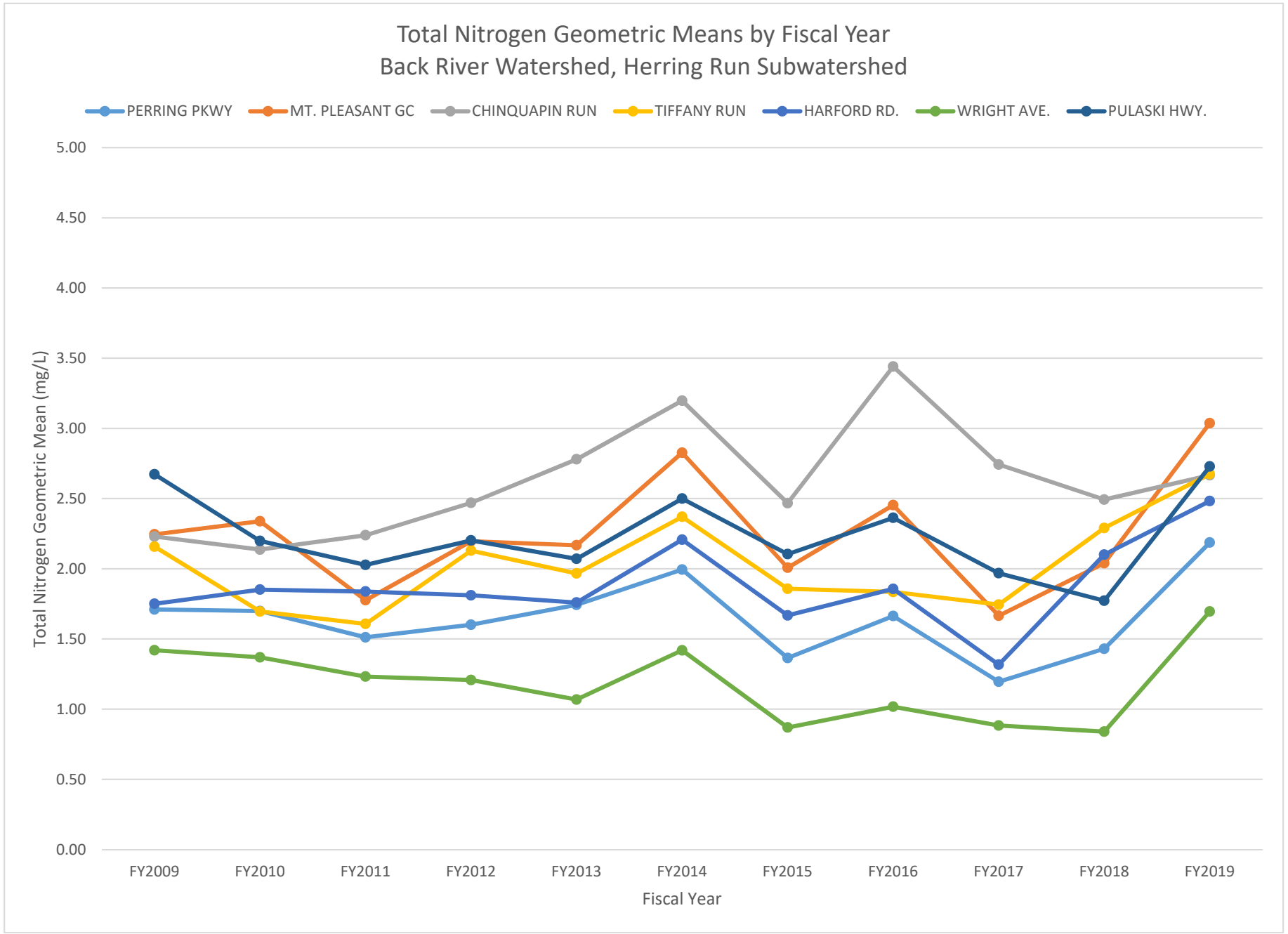

Jones Falls SIS Dry Weather Total Phosphorus
Percent of Samples Greater Than or Equal to 0.1 mg/L
by Fiscal Year
FY 2010
FY 2011
FY 2012
FY 2013
FY 2014
FY 2015
FY 2016
FY 2017
FY 2018
FY 2019
Percent of Total Phosphorus Samples >= 0.1 mg/L
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
SMITH AVE.
WESTERN RUN
STONY RUN
JF 11.5
LOMBARD ST.
33%
64%
55%
0%
9%
17%
25%
8%
17%
17%
0%
64%
73%
0%
0%
17%
25%
17%
17%
17%
11%
64%
55%
0%
0%
25%
25%
8%
8%
17%
92%
1
50%
40%
64%
45%
0%
27%
17%
17%
17%
25%
42%

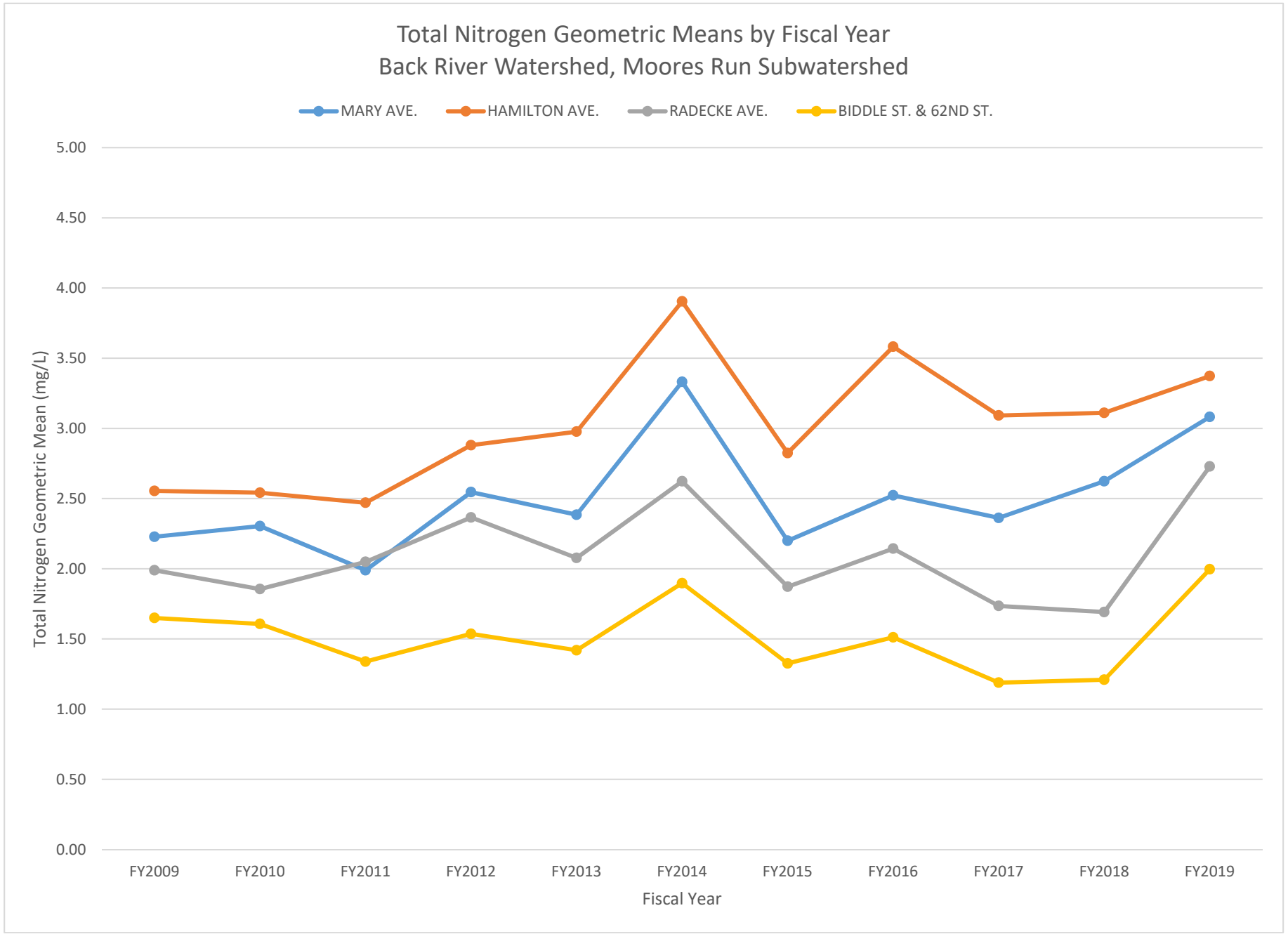

Gwynns Falls SIS Dry Weather Total Phosphorus
Percent of Samples Greater Than or Equal to 0.1 mg/L
by Fiscal Year
FY 2010
FY 2011
FY 2012
FY 2013
FY 2014
FY 2015
FY 2016
FY 2017
FY 2018
FY 2019
Percent of Total Phosphorus Samples >= 0.1 mg/L
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
POWDER MILL
PURNELL DR.
DEAD RUN DNST.
GWYNNS FALLS PKWY.
GRUN HILTON ST.
GF HILTON ST.
MAIDENS CHOICE
GRUN CARROLL PARK
WASHINGTON BLVD.

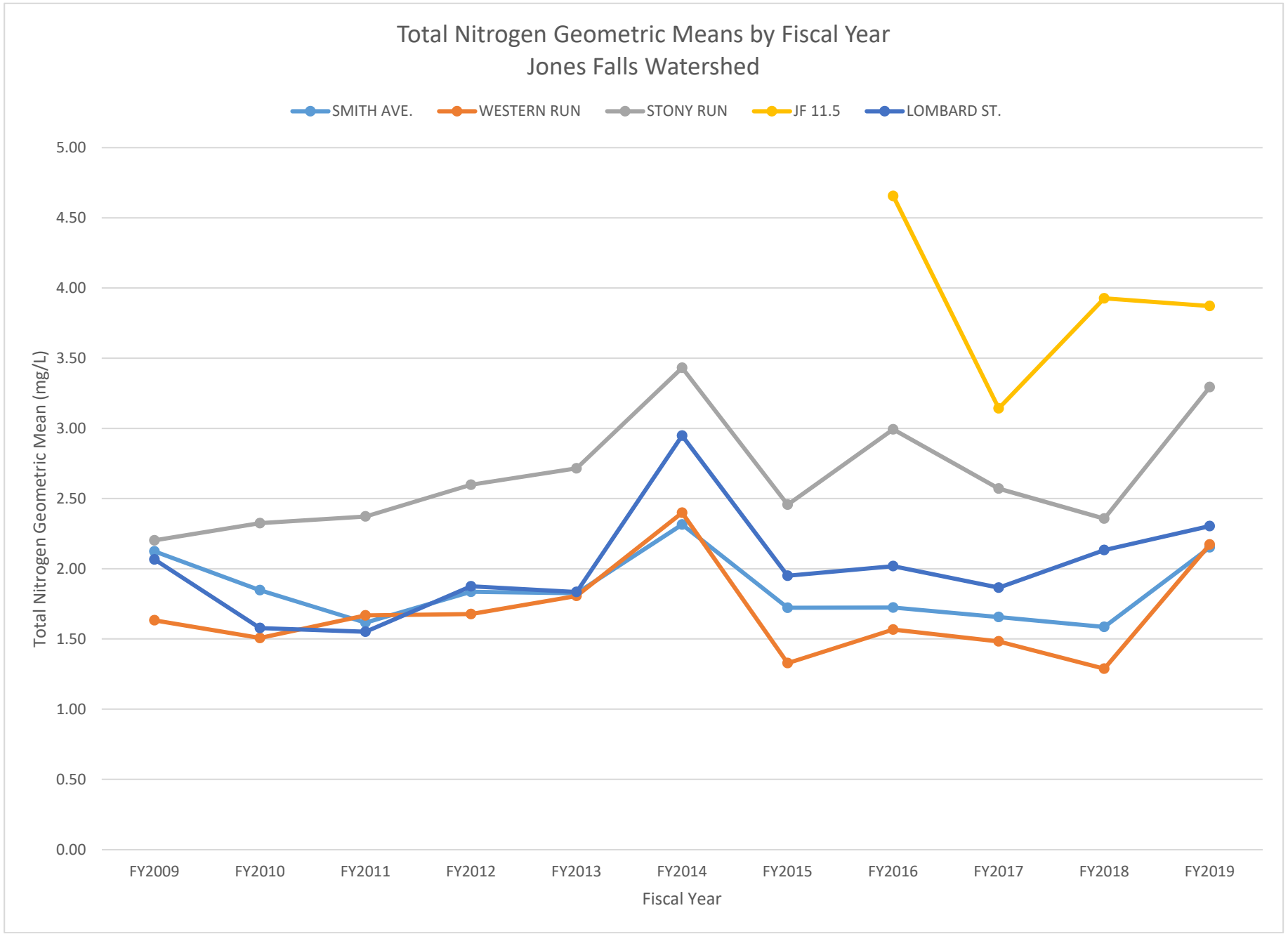

Harbor SIS Dry Weather Total Phosphorus
Percent of Samples Greater Than or Equal to 0.1 mg/L
by Fiscal Year
FY 2010
FY 2011
FY 2012
FY 2013
FY 2014
FY 2015
FY 2016
FY 2017
FY 2018
FY 2019
Percent of Total Phosphorus Samples >= 0.1 mg/L
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
LINWOOD & ELLIOTT
LAKEWOOD & HUDSON
CENTRAL & LANCASTER
LIGHT ST.
WARNER & ALLUVION
WATERVIEW AVE.
JANEY RUN

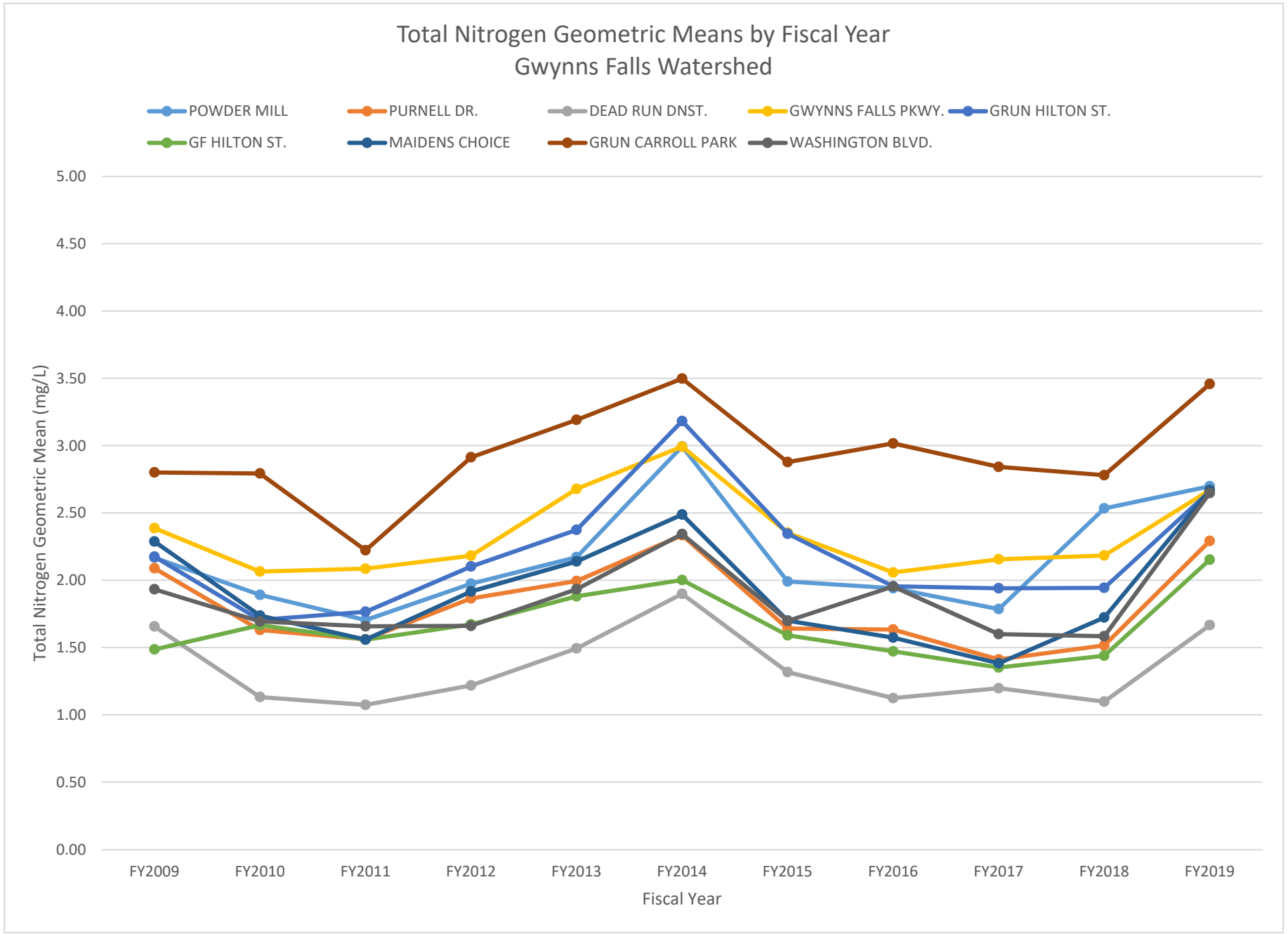

Patapsco River SIS Dry Weather Total Phosphorus
Percent of Samples Greater Than or Equal to 0.1 mg/L
by Fiscal Year
FY 2010
FY 2011
FY 2012
FY 2013
FY 2014
FY 2015
FY 2016
FY 2017
FY 2018
FY 2019
Percent of Total Phosphorus Samples >= 0.1 mg/L
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
36%
50%
64%
33%
9%
27%
9%
8%
27%
42%
REEDBIRD AVE.

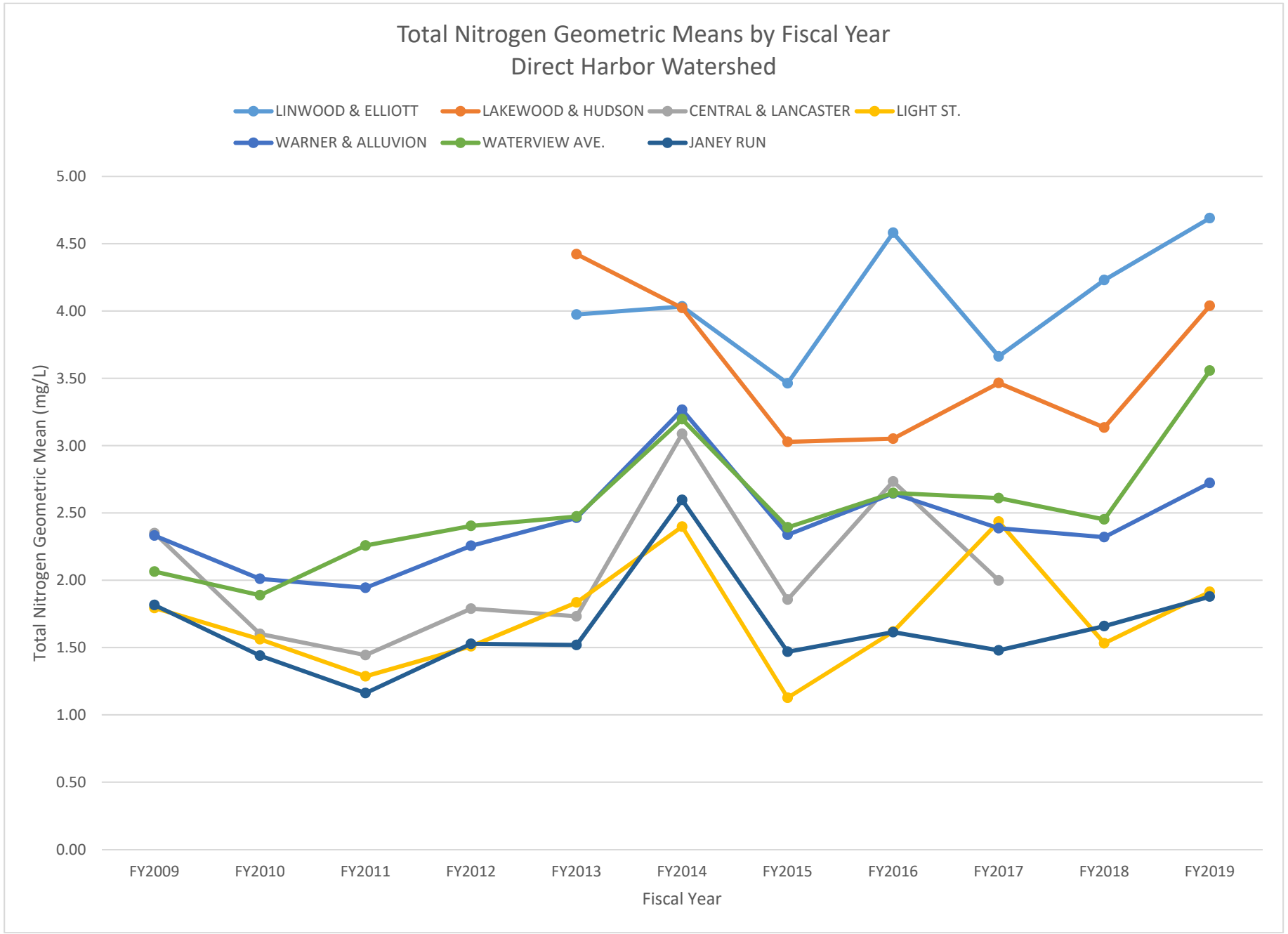
Appendix F: Total Nitrogen Monitoring Histographs

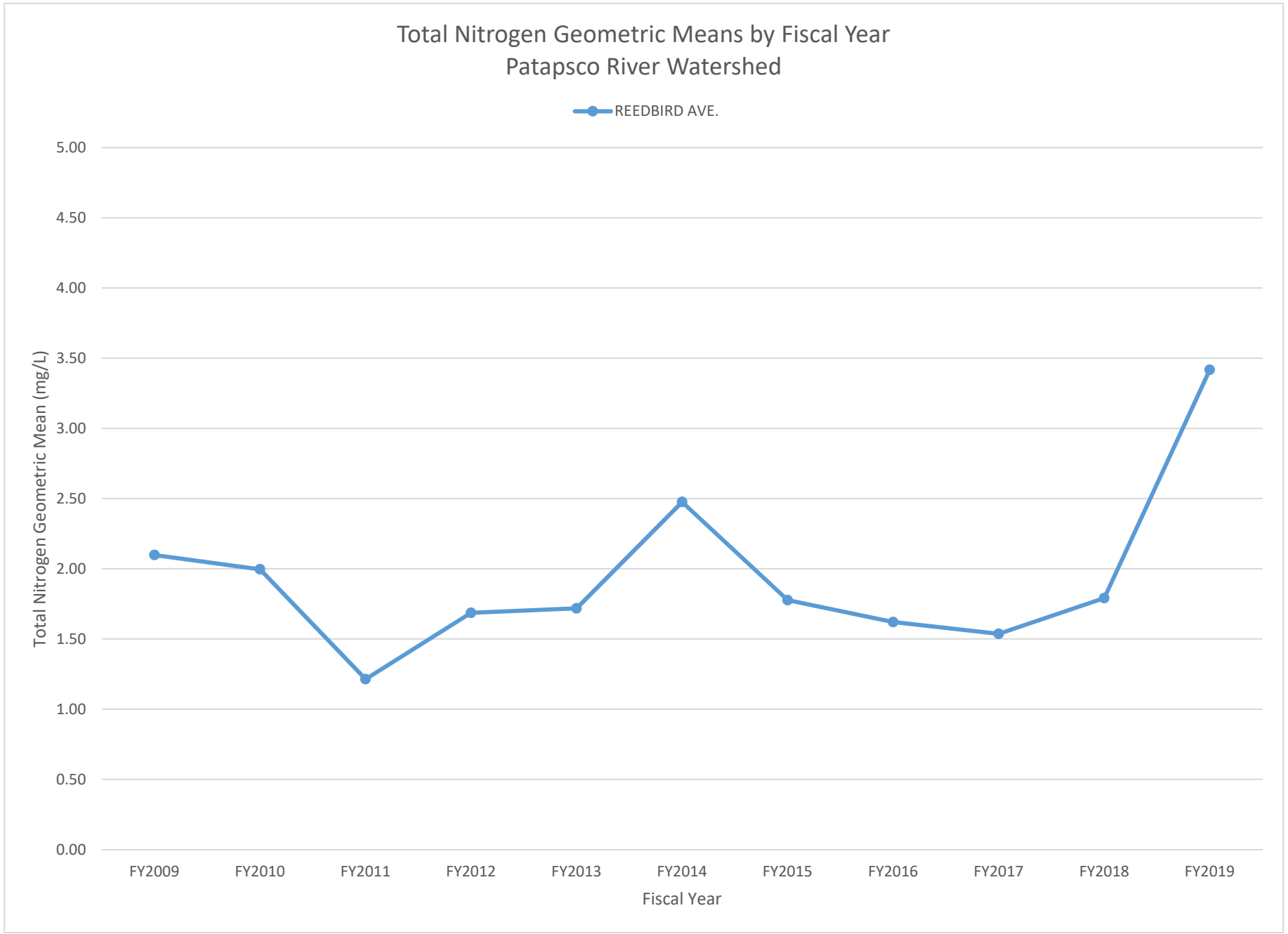

Total Nitrogen Geometric Means by Fiscal Year
Back River Watershed, Herring Run Subwatershed
PERRING PKWY
MT. PLEASANT GC
CHINQUAPIN RUN
TIFFANY RUN
HARFORD RD.
WRIGHT AVE.
PULASKI HWY.
Total Nitrogen Geometric Mean (mg/L)
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
FY2009
FY2010
FY2011
FY2012
FY2013
FY2014
FY2015
FY2016
FY2017
FY2018
FY2019
Fiscal Year

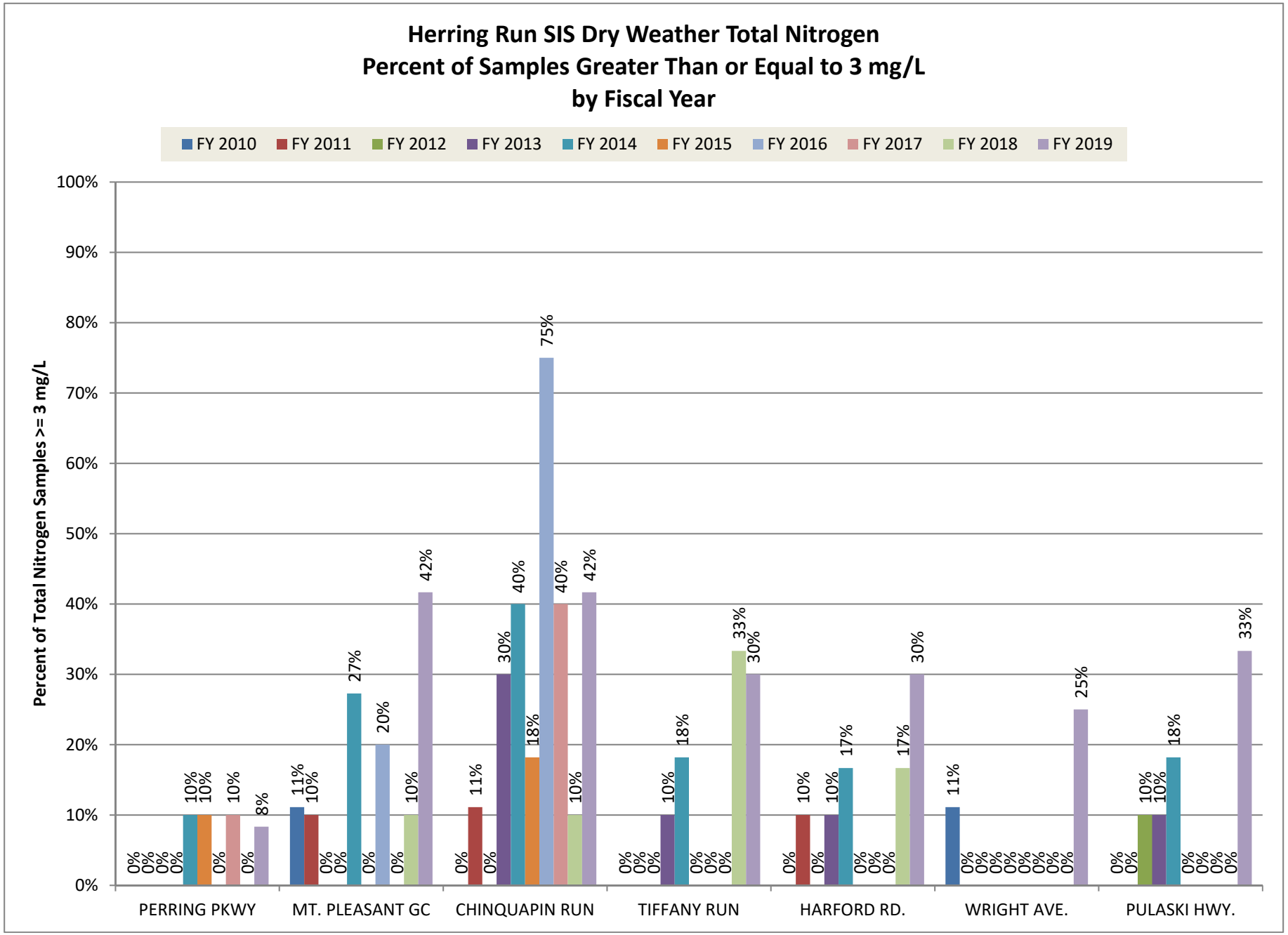

Total Nitrogen Geometric Means by Fiscal Year
Back River Watershed, Moores Run Subwatershed
MARY AVE.
HAMILTON AVE.
RADECKE AVE.
BIDDLE ST. & 62ND ST.
Total Nitrogen Geometric Mean (mg/L)
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
FY2009
FY2010
FY2011
FY2012
FY2013
FY2014
FY2015
FY2016
FY2017
FY2018
FY2019
Fiscal Year

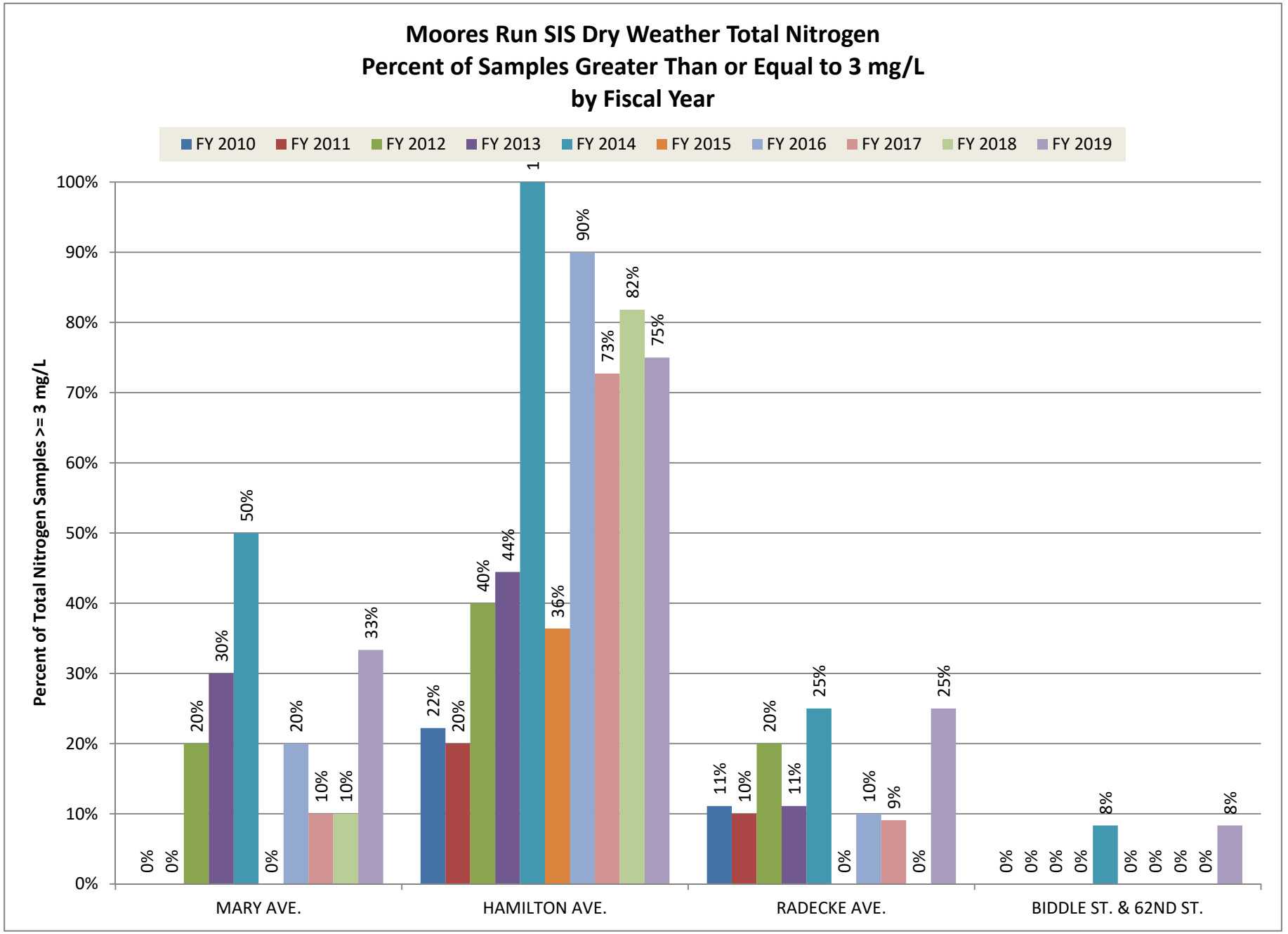

Total Nitrogen Geometric Means by Fiscal Year
Jones Falls Watershed
SMITH AVE.
WESTERN RUN
STONY RUN
JF 11.5
LOMBARD ST.
Total Nitrogen Geometric Mean (mg/L)
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
FY2009
FY2010
FY2011
FY2012
FY2013
FY2014
FY2015
FY2016
FY2017
FY2018
FY2019
Fiscal Year

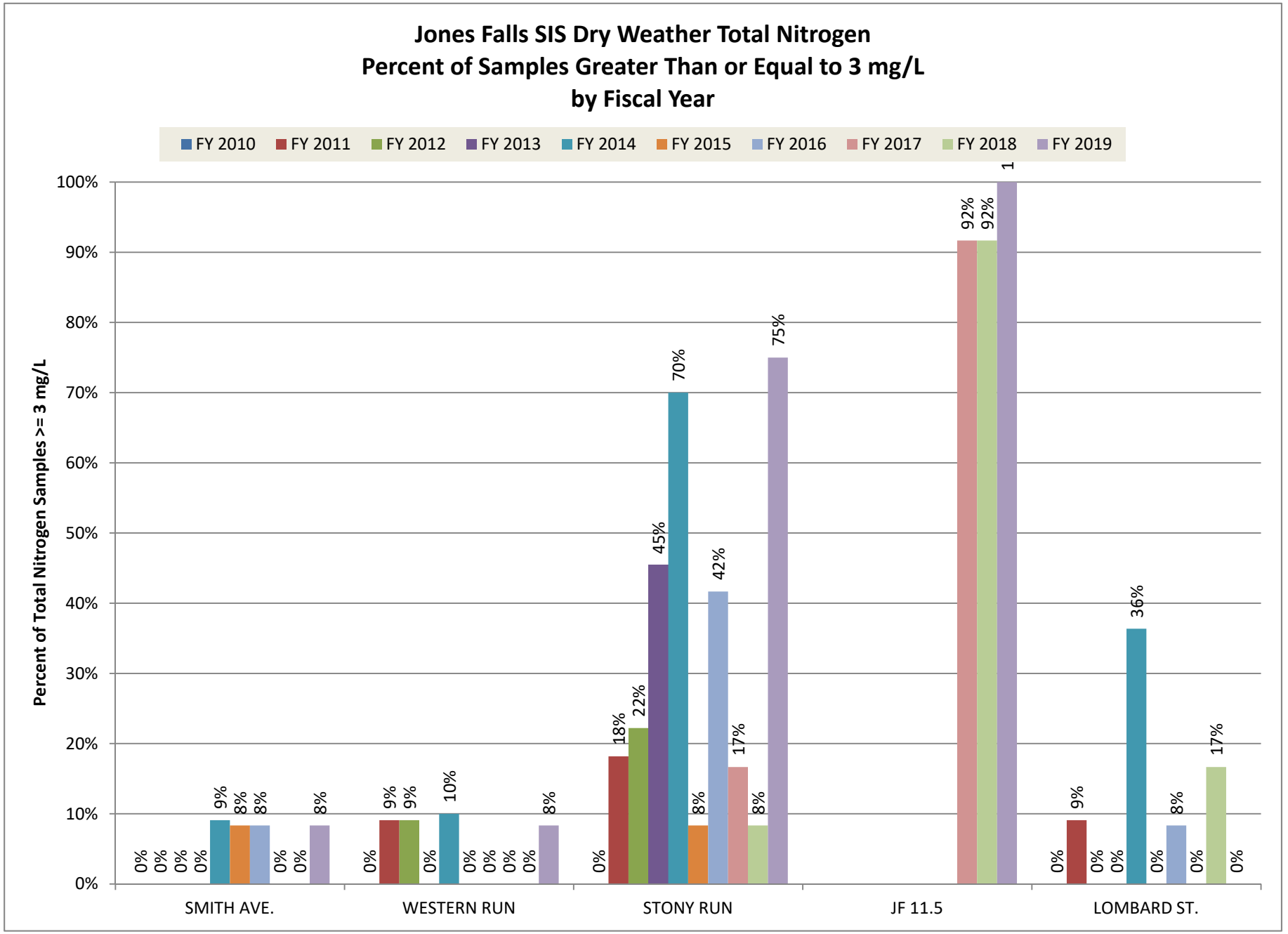

Total Nitrogen Geometric Means by Fiscal Year
Gwynns Falls Watershed
POWDER MILL
PURNELL DR.
DEAD RUN DNST.
GWYNNS FALLS PKWY.
GRUN HILTON ST.
GF HILTON ST.
MAIDENS CHOICE
GRUN CARROLL PARK
WASHINGTON BLVD.
Total Nitrogen Geometric Mean (mg/L)
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
FY2009
FY2010
FY2011
FY2012
FY2013
FY2014
FY2015
FY2016
FY2017
FY2018
FY2019
Fiscal Year

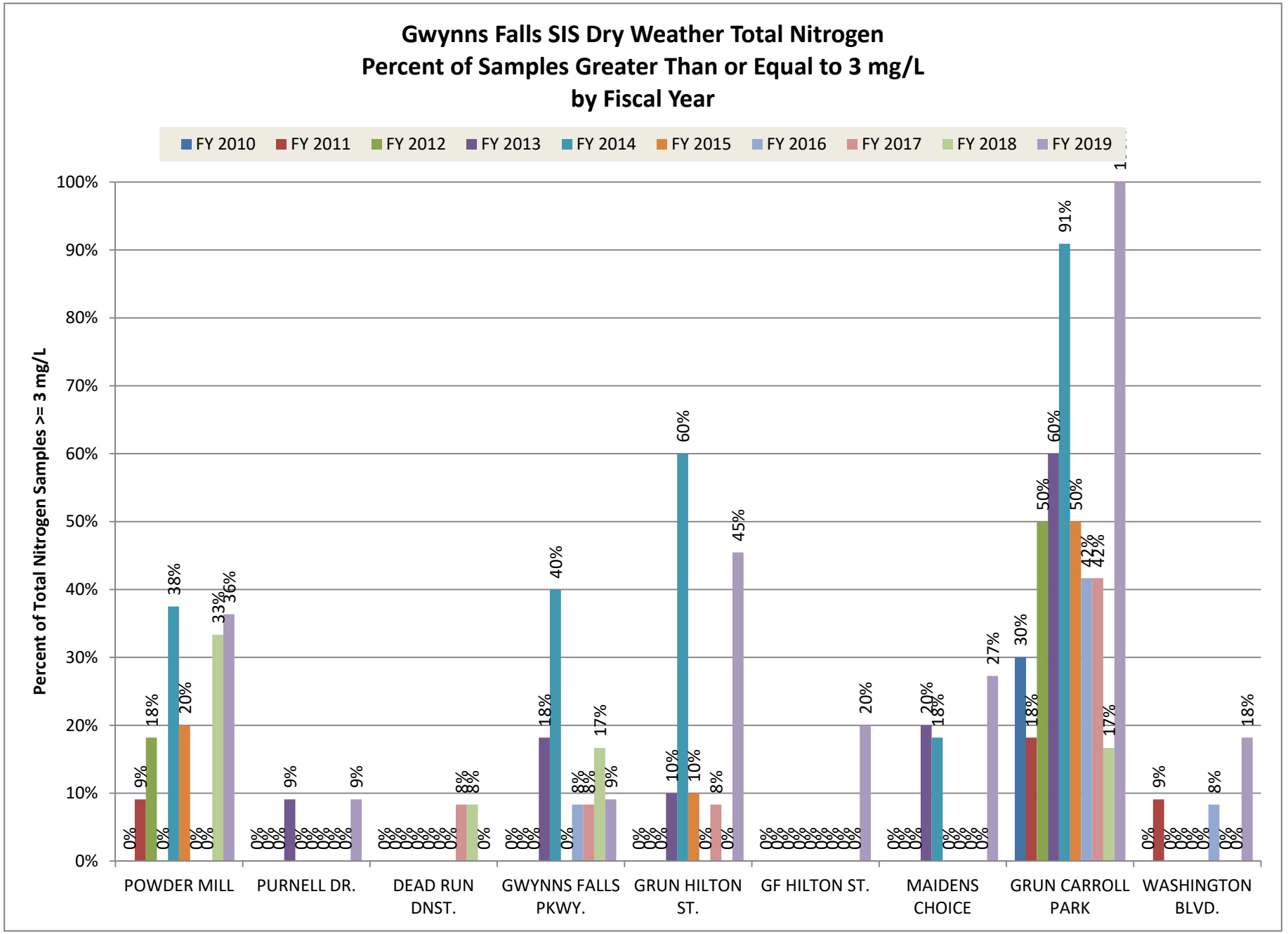

Total Nitrogen Geometric Means by Fiscal Year
Direct Harbor Watershed
LINWOOD & ELLIOTT
LAKEWOOD & HUDSON
CENTRAL & LANCASTER
LIGHT ST.
WARNER & ALLUVION
WATERVIEW AVE.
JANEY RUN
Total Nitrogen Geometric Mean (mg/L)
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
FY2009
FY2010
FY2011
FY2012
FY2013
FY2014
FY2015
FY2016
FY2017
FY2018
FY2019
Fiscal Year

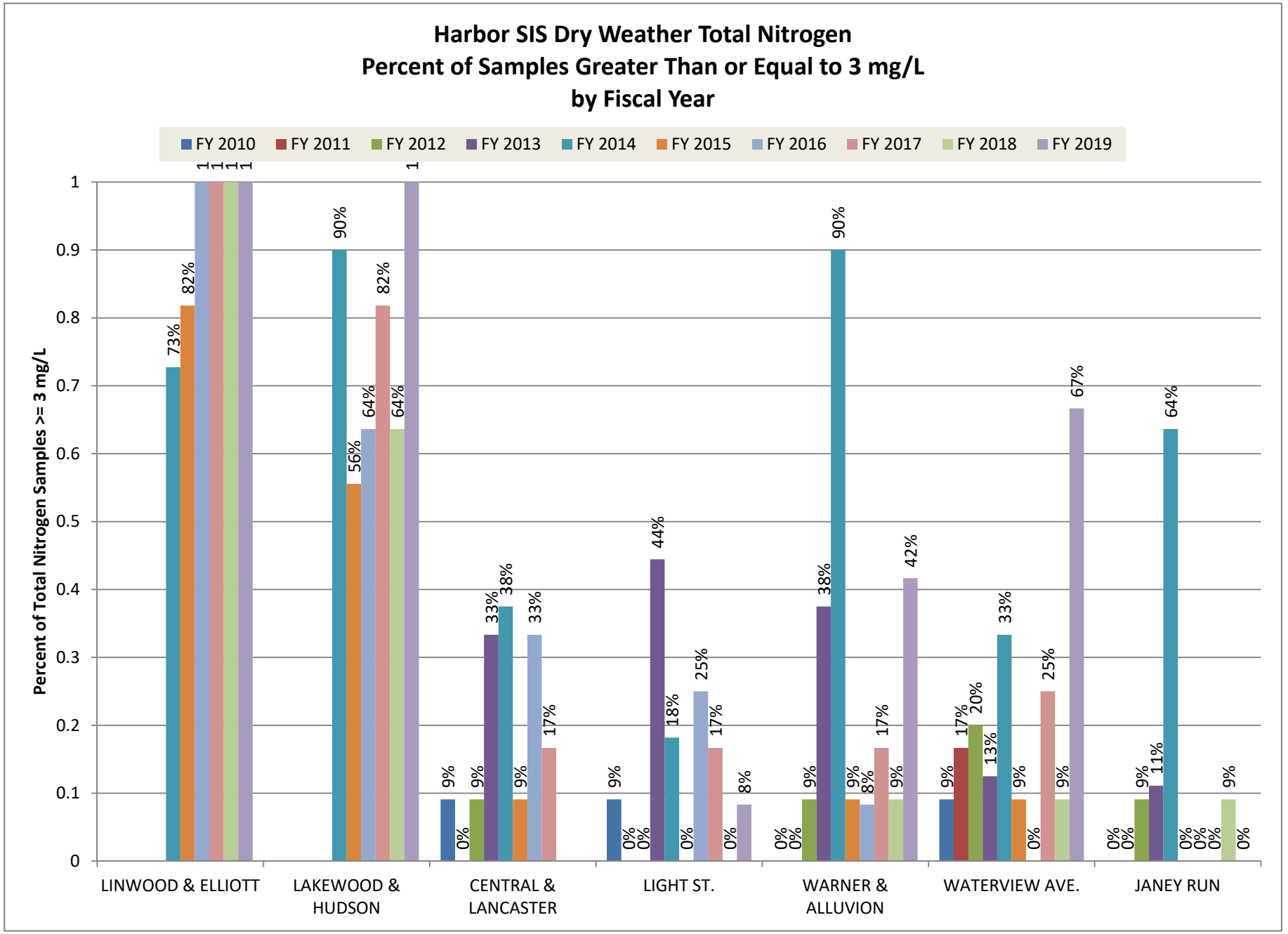

Total Nitrogen Geometric Means by Fiscal Year
Patapsco River Watershed
REEDBIRD AVE.
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Total Nitrogen Geometric Mean (mg/L)
FY2009
FY2010
FY2011
FY2012
FY2013
FY2014
FY2015
FY2016
FY2017
FY2018
FY2019
Fiscal Year

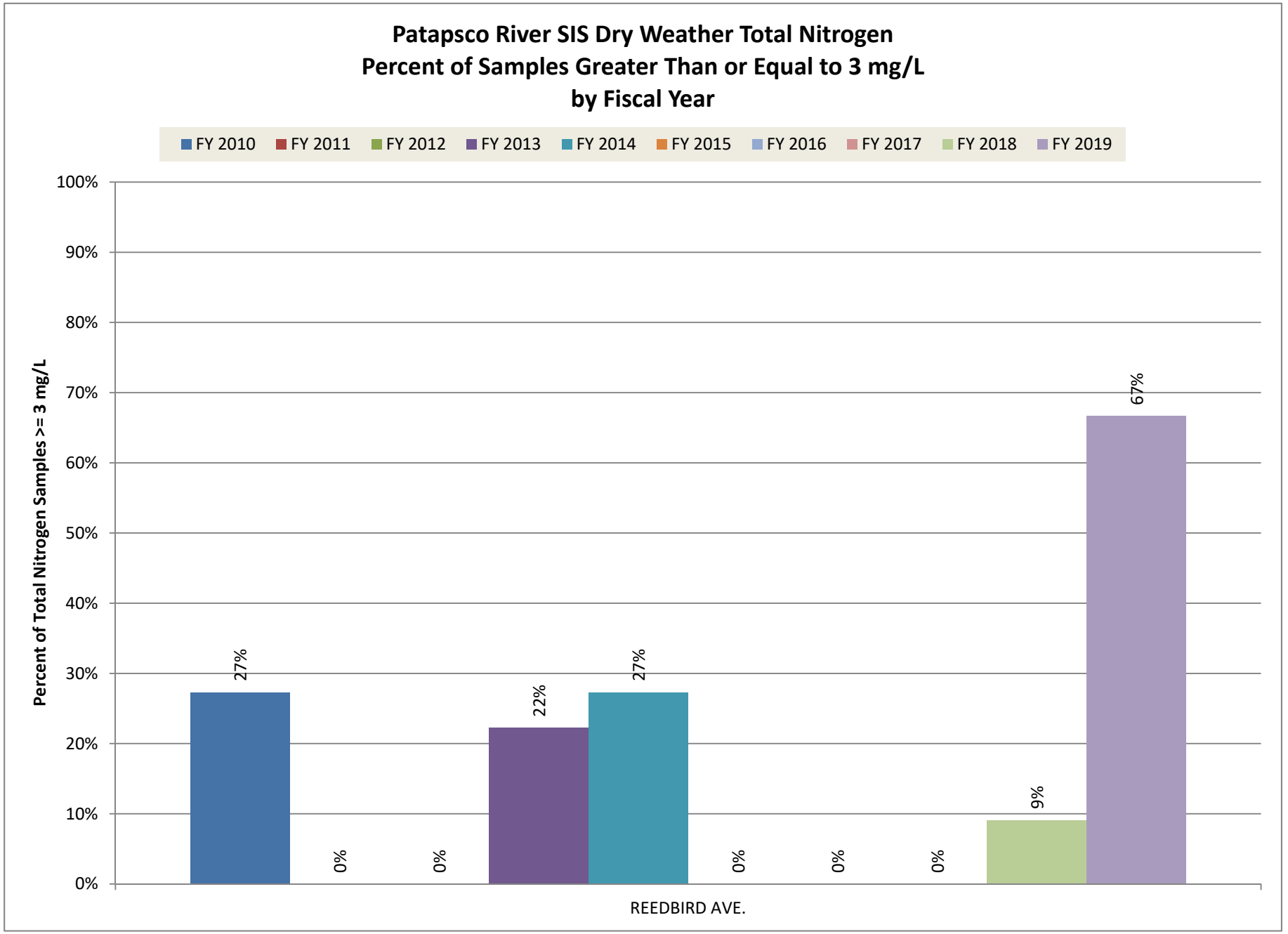

Herring Run SIS Dry Weather Total Nitrogen
Percent of Samples Greater Than or Equal to 3 mg/L
by Fiscal Year
FY 2010
FY 2011
FY 2012
FY 2013
FY 2014
FY 2015
FY 2016
FY 2017
FY 2018
FY 2019
Percent of Total Nitrogen Samples >= 3 mg/L
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
PERRING PKWY
MT. PLEASANT GC
CHINQUAPIN RUN
TIFFANY RUN
HARFORD RD.
WRIGHT AVE.
PULASKI HWY.


Moores Run SIS Dry Weather Total Nitrogen
Percent of Samples Greater Than or Equal to 3 mg/L
by Fiscal Year
FY 2010
FY 2011
FY 2012
FY 2013
FY 2014
FY 2015
FY 2016
FY 2017
FY 2018
FY 2019
Percent of Total Nitrogen Samples >= 3 mg/L
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0% 0% 20% 30% 50% 0% 20% 10% 10% 33%
22% 20% 40% 44% 100% 36% 90% 73% 82% 75%
11% 10% 20% 11% 25% 0% 10% 9% 0% 25%
0% 0% 0% 0% 8% 0% 0% 0% 0% 8%
MARY AVE.
HAMILTON AVE.
RADECKE AVE.
BIDDLE ST. & 62ND ST.


Jones Falls SIS Dry Weather Total Nitrogen
Percent of Samples Greater Than or Equal to 3 mg/L
by Fiscal Year
FY 2010
FY 2011
FY 2012
FY 2013
FY 2014
FY 2015
FY 2016
FY 2017
FY 2018
FY 2019
Percent of Total Nitrogen Samples >= 3 mg/L
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0% 0% 0% 0% 9% 8% 8% 0% 0% 8%
0% 9% 9% 0% 10% 0% 0% 0% 0% 8%
0% 18% 22% 45% 70% 8% 42% 17% 8% 75%
92% 92% 1
0% 9% 0% 0% 36% 0% 8% 0% 17% 0%
SMITH AVE.
WESTERN RUN
STONY RUN
JF 11.5
LOMBARD ST.


Gwynns Falls SIS Dry Weather Total Nitrogen
Percent of Samples Greater Than or Equal to 3 mg/L
by Fiscal Year
FY 2010
FY 2011
FY 2012
FY 2013
FY 2014
FY 2015
FY 2016
FY 2017
FY 2018
FY 2019
Percent of Total Nitrogen Samples >= 3 mg/L
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
POWDER MILL
PURNELL DR.
DEAD RUN DNST.
GWYNNS FALLS PKWY.
GRUN HILTON ST.
GF HILTON ST.
MAIDENS CHOICE
GRUN CARROLL PARK
WASHINGTON BLVD.

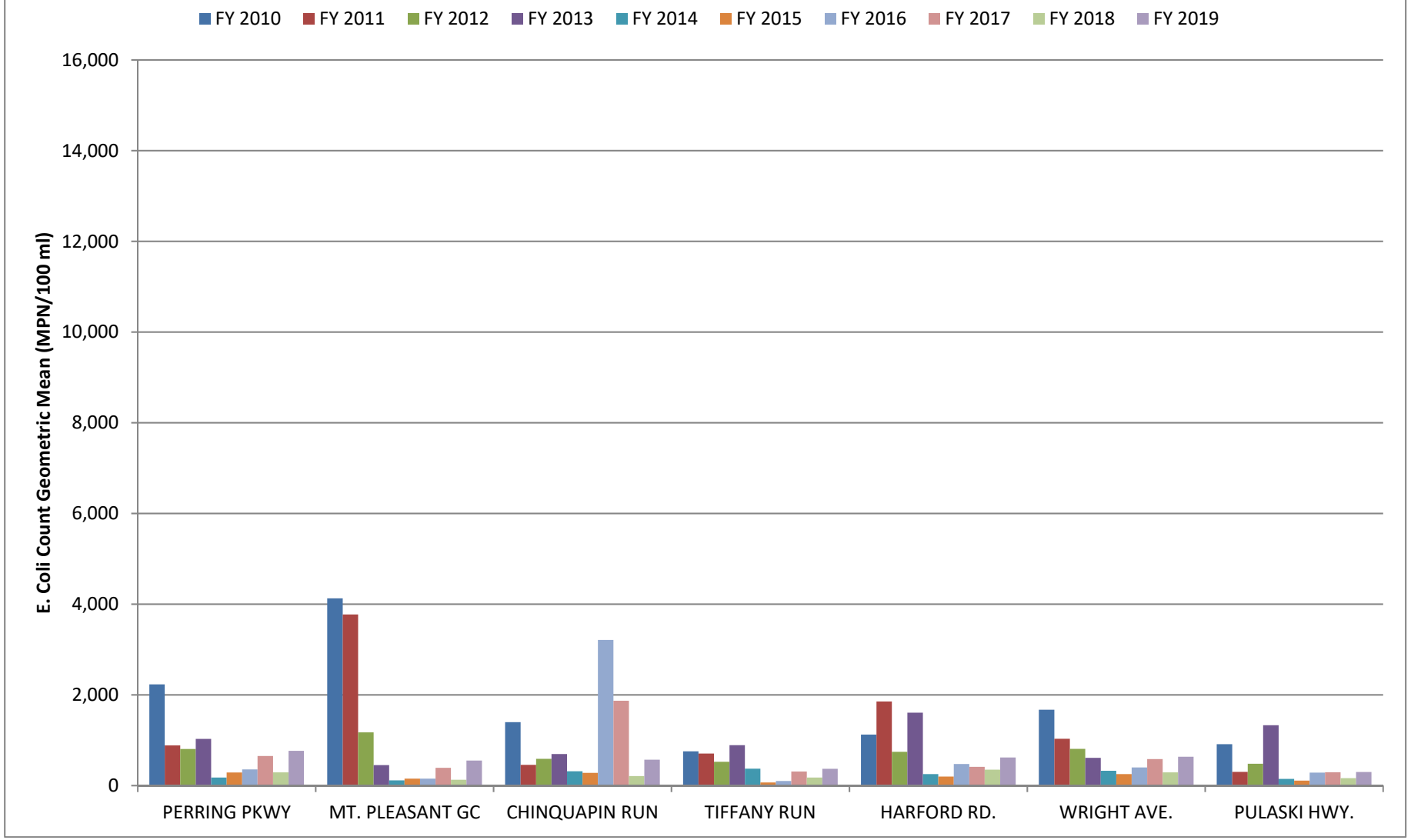

Harbor SIS Dry Weather Total Nitrogen
Percent of Samples Greater Than or Equal to 3 mg/L
by Fiscal Year
FY 2010
FY 2011
FY 2012
FY 2013
FY 2014
FY 2015
FY 2016
FY 2017
FY 2018
FY 2019
Percent of Total Nitrogen Samples >= 3 mg/L
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
LINWOOD & ELLIOTT
LAKEWOOD & HUDSON
CENTRAL & LANCASTER
LIGHT ST.
WARNER & ALLUVION
WATERVIEW AVE.
JANEY RUN


Patapsco River SIS Dry Weather Total Nitrogen
Percent of Samples Greater Than or Equal to 3 mg/L
by Fiscal Year
FY 2010
FY 2011
FY 2012
FY 2013
FY 2014
FY 2015
FY 2016
FY 2017
FY 2018
FY 2019
Percent of Total Nitrogen Samples >= 3 mg/L
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
27%
0%
0%
22%
27%
0%
0%
0%
9%
67%
REEDBIRD AVE.

Appendix G: Bacteria Monitoring Histographs

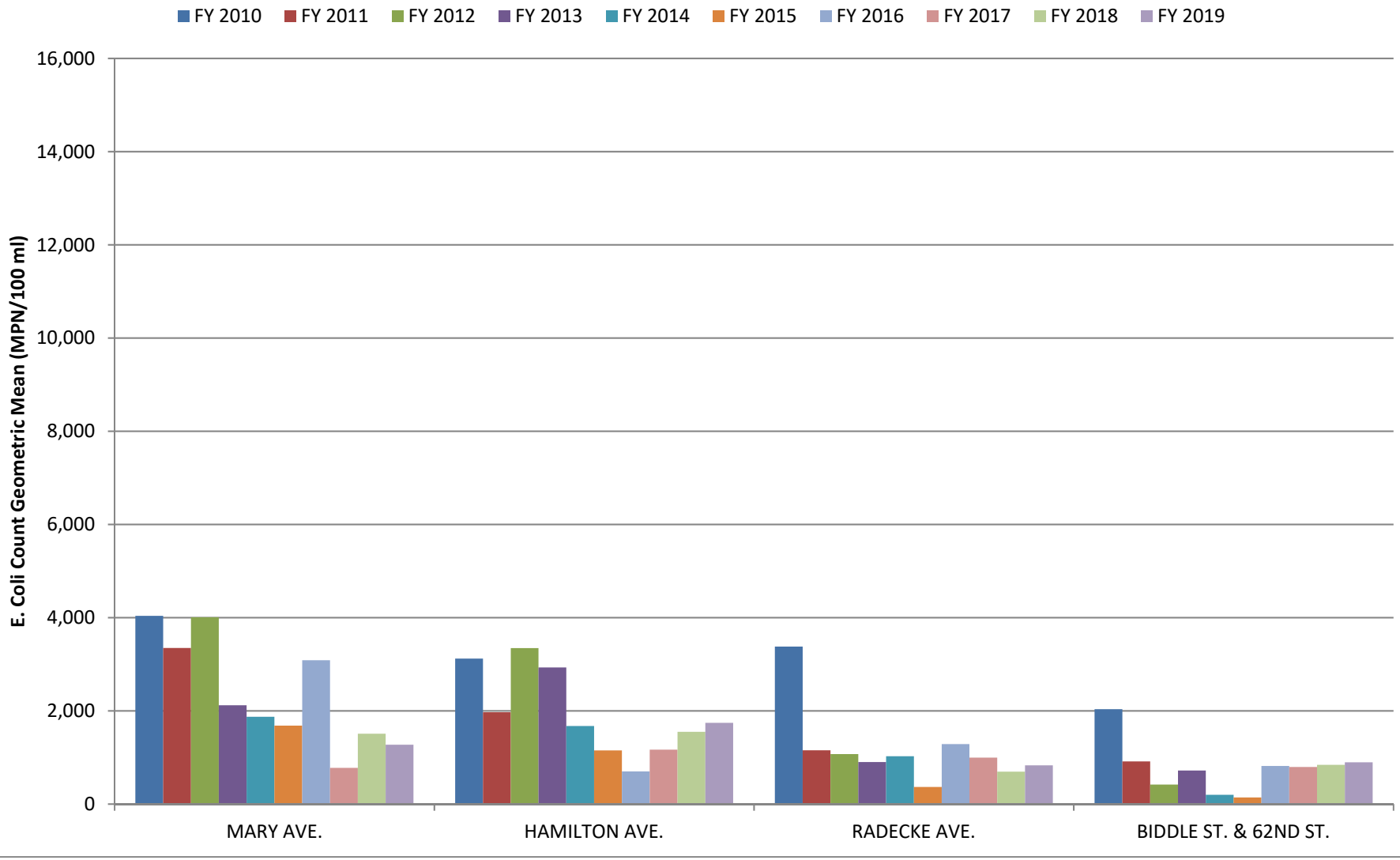
Herring Run SIS Dry Weather E. Coli MPN Count Geometric Means by Fiscal Year

Please note: from COMAR 26.08.02.03-3 the criteria is that the Steady State Geometric Mean Indicator Density be less than or equal to 126 MPN/100 ml for freshwaters.



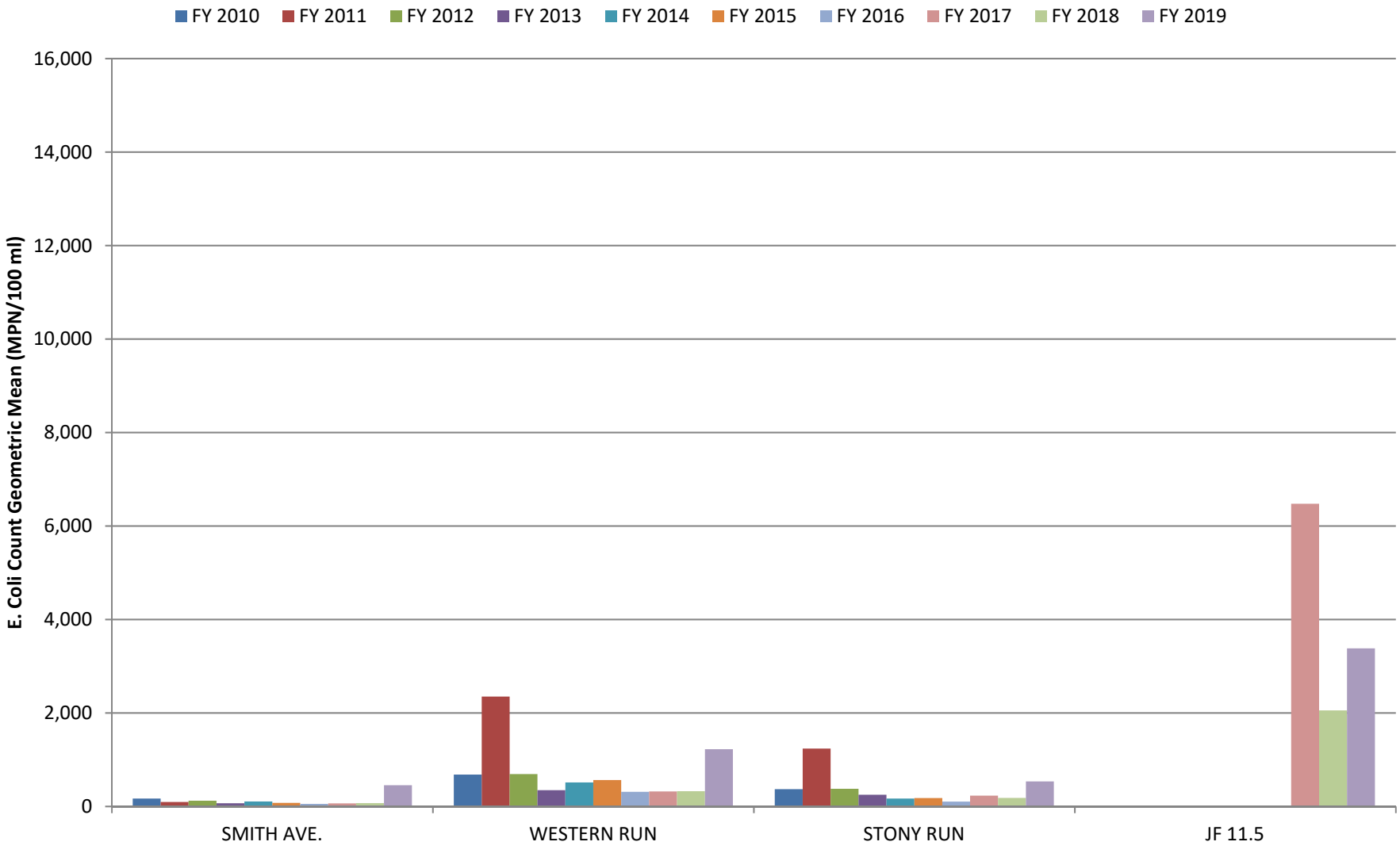
Moores Run SIS Dry Weather E. Coli MPN Count Geometric Means by Fiscal Year

Please note: from COMAR 26.08.02.03-3 the criteria is that the Steady State Geometric Mean Indicator Density be less than or equal to 126 MPN/100 ml for freshwaters.



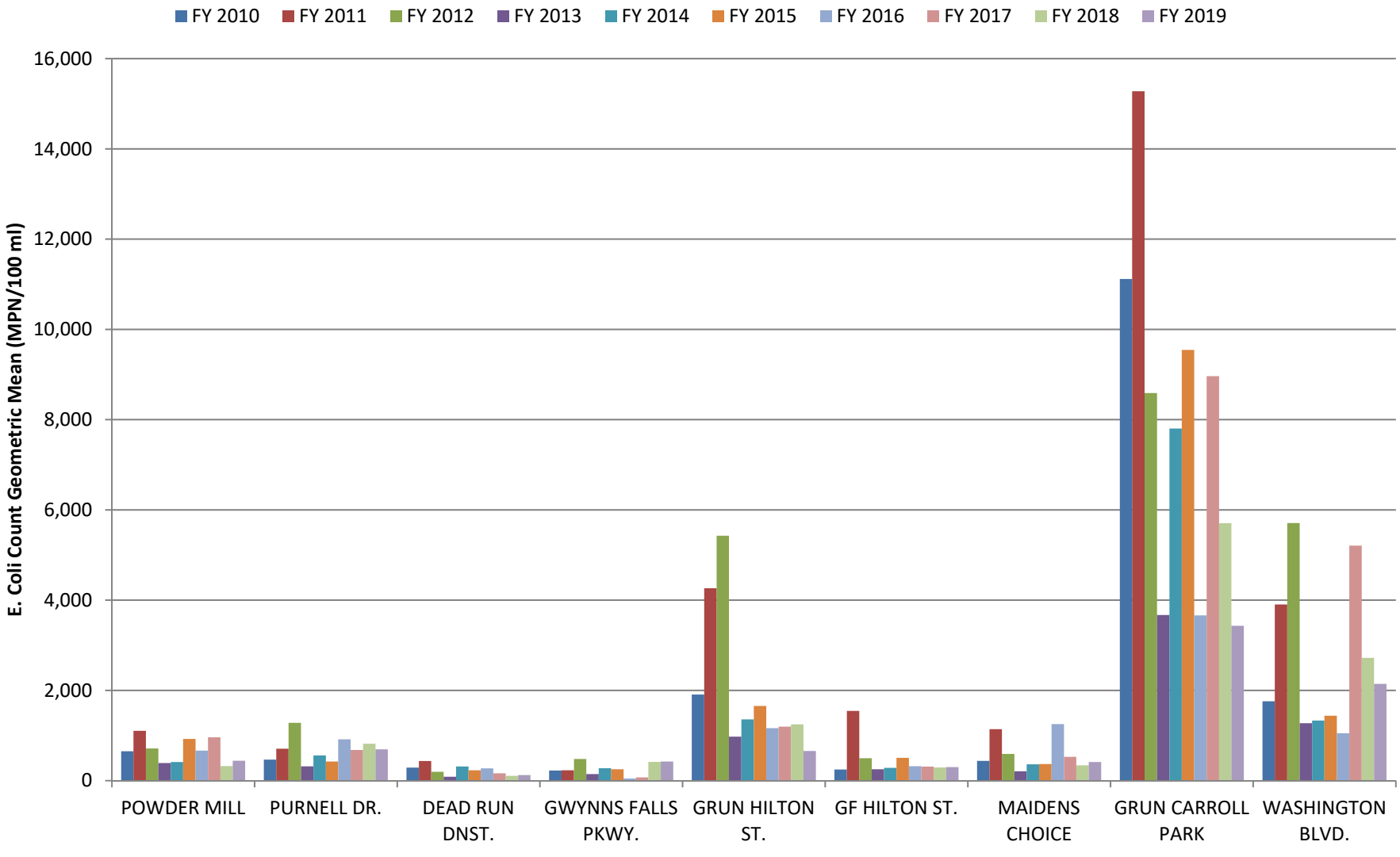
Jones Falls SIS Dry Weather E. Coli MPN Count Geometric Means by Fiscal Year

Please note: from COMAR 26.08.02.03-3 the criteria is that the Steady State Geometric Mean Indicator Density be less than or equal to 126 MPN/100 ml for freshwaters.



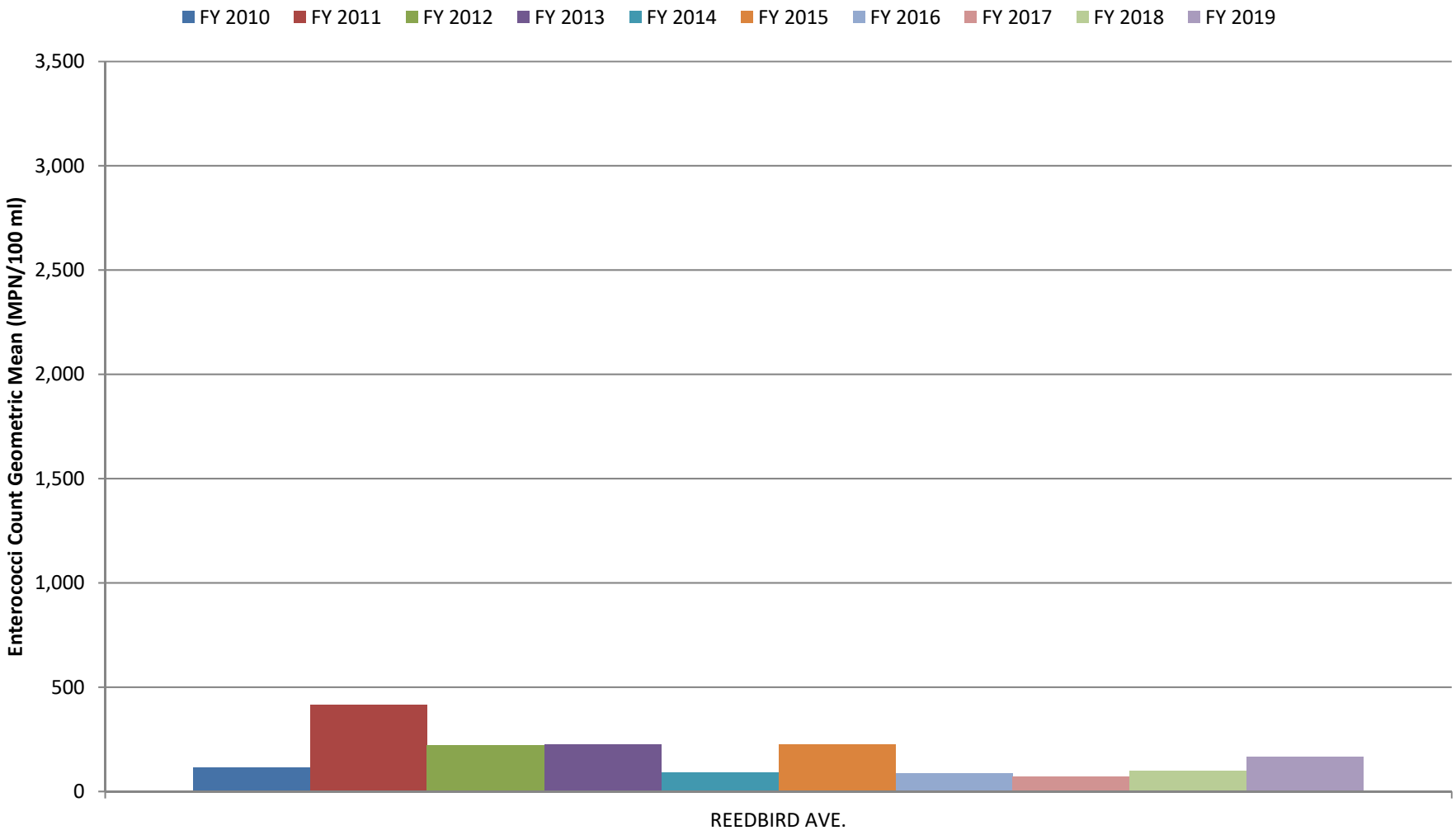
Gwynns Falls SIS Dry Weather E. Coli MPN Count Geometric Means by Fiscal Year

Please note: from COMAR 26.08.02.03-3 the criteria is that the Steady State Geometric Mean Indicator Density be less than or equal to 126 MPN/100 ml for freshwaters.



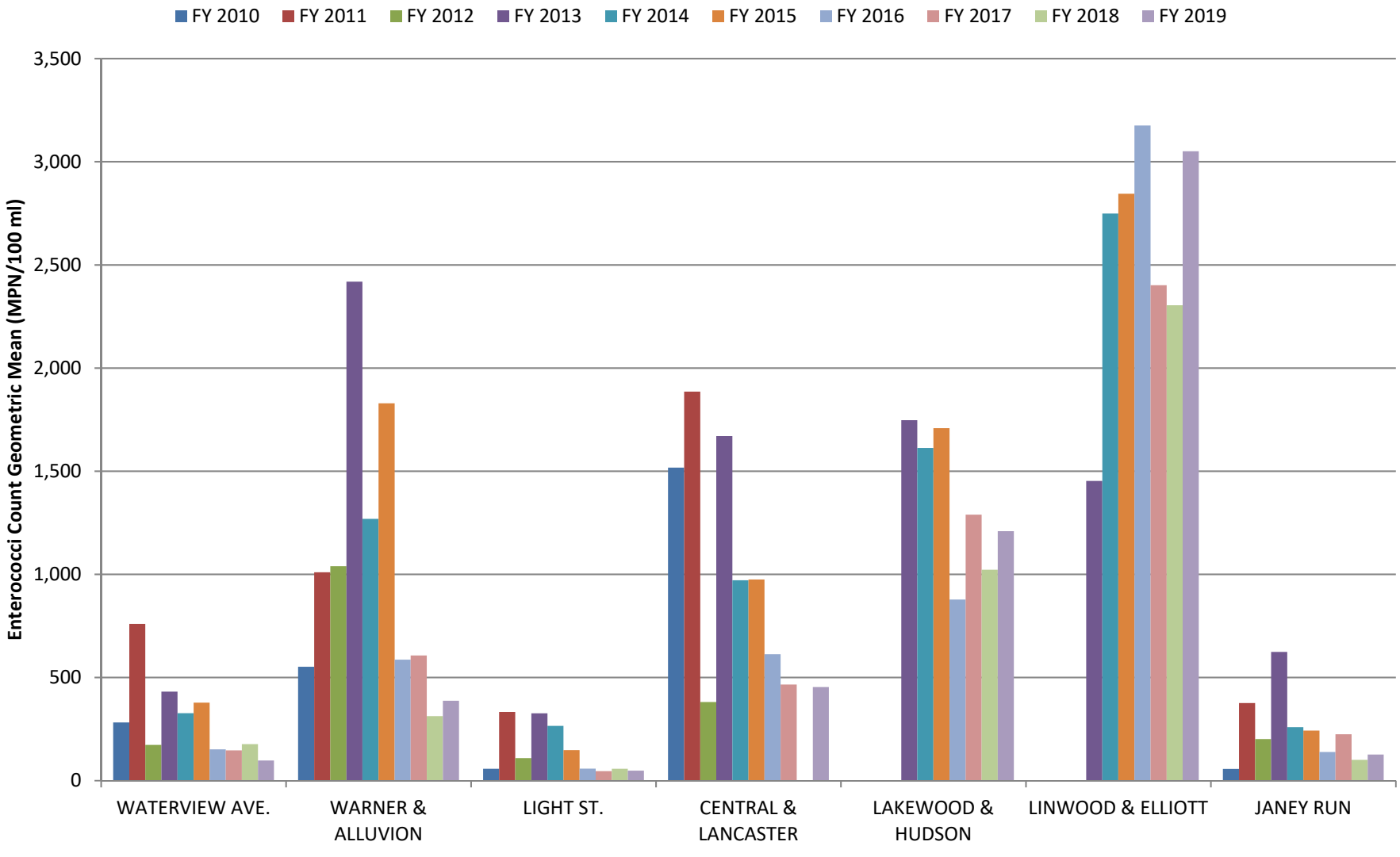
Patapsco River SIS Dry Weather Enterococci MPN Count Geometric Means by Fiscal Year

Please note: from COMAR 26.08.02.03-3 the criteria is that the Steady State Geometric Mean Indicator Density be less than or equal to 35 MPN/100 ml for marine waters.



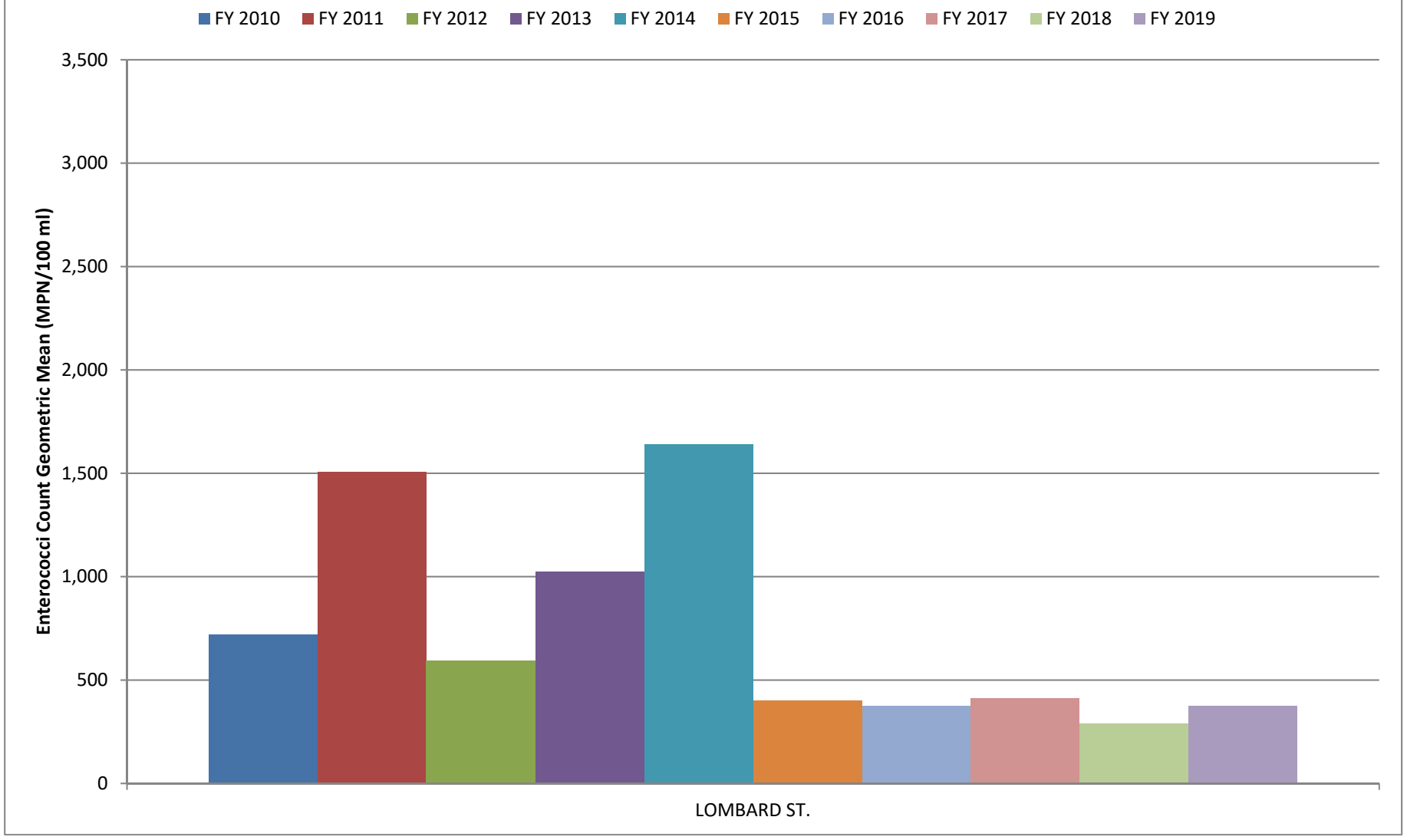
Harbor SIS Dry Weather Enterococci MPN Count Geometric Means by Fiscal Year

Please note: from COMAR 26.08.02.03-3 the criteria is that the Steady State Geometric Mean Indicator Density be less than or equal to 35 MPN/100 ml for marine waters.



Jones Falls SIS Dry Weather Enterococci MPN Count Geometric Means by Fiscal Year

Please note: from COMAR 26.08.02.03-3 the criteria is that the Steady State Geometric Mean Indicator Density be less than or equal to 35 MPN/100 ml for marine waters.



Appendix H: Habitat Monitoring

	Moores Run above Radecke Ave. Segments											
	1	2	3	4	5	6	7	8	9	10	11	Tributary
Parameter												
Instream Habitat												
2005-05-18	16	16	16	4	16	16	16	16	13	16	1	13
2006-05-01	15	16	15	4	15	15	15	14	13	14	1	13
2007-04-02	15	14	16	4	15	11	15	14	13	15	1	15
2008-05-05	15	15	17	4	15	11	11	15	14	14	1	12
2009-04-30	12	14	13	13	13	15	15	15	13	15	3	10
2010-03-24	16	16	18	5	12	17	16	16	13	15	1	15
2011-03-03	17	18	18	6	17	14	14	16	15	15	1	14
2012-06-28	18	16	18	5	15	11	11	10	10	15	2	13
2013-09-03	13	17	16	15	14	14	14	17	14	16	2	12
2014-08-21	15	15	14	12	8	8	15	16	8	13	5	13
2016-06-09	16	17	17	8	17	7	15	16	14	15	1	10
2017-06-08	16	13	17	5	16	13	16	10	10	15	1	10
2018-06-07	16	16	18	3	14	12	12	16	5	12	1	13
2019-07-10	14	13	16	11	15	9	10	10	6	5	2	8
Epifaunal Substrate												
2005-05-18	16	16	16	1	16	16	15	16	13	16	1	14
2006-05-01	14	15	15	4	15	15	14	14	10	14	0	14
2007-04-02	15	14	15	5	15	10	12	10	10	14	0	10
2008-05-05	14	14	17	4	14	10	8	12	11	14	0	12
2009-04-30	10	12	11	11	11	15	13	14	13	15	10	7
2010-03-24	15	14	17	8	11	12	14	11	11	10	7	15
2011-03-03	16	17	17	8	16	14	13	9	12	10	6	13
2012-06-28	12	15	15	8	14	10	14	9	9	10	6	13
2013-09-03	13	16	16	6	10	11	14	15	9	10	8	11
2014-08-21	14	16	13	13	8	8	16	14	8	15	6	13
2016-06-09	15	15	17	10	15	6	8	10	11	10	8	11
2017-06-08	16	14	15	3	14	10	11	8	8	11	8	11
2018-06-07	14	16	16	3	14	12	12	16	5	12	6	9
2019-07-10	14	13	15	11	14	8	7	8	6	6	6	12
Velocity/Depth Diversity												
2005-05-18	8	10	14	6	8	8	8	10	8	9	11	8
2006-05-01	8	10	10	6	11	8	8	11	10	10	6	8
2007-04-02	10	13	12	6	6	8	8	10	9	10	6	10
2008-05-05	8	12	15	6	11	9	9	12	8	9	6	8
2009-04-30	11	11	13	8	10	15	14	15	13	15	2	10
2010-03-24	10	15	14	8	10	11	13	8	12	10	11	15
2011-03-03	10	10	10	11	10	10	14	15	15	10	12	10
2012-06-28	7	14	10	6	10	8	8	13	9	10	1	11
2013-09-03	7	14	10	6	12	8	11	14	7	10	12	10
2014-08-21	8	12	9	12	8	10	10	9	7	10	11	12
2016-06-09	8	14	14	9	16	10	10	15	12	13	11	9
2017-06-08	8	7	14	6	9	10	10	8	7	10	11	8
2018-06-07	10	13	15	6	10	10	10	14	6	10	10	10
2019-07-10	13	14	14	1	10	8	9	10	7	9	6	7
Pool/Glide/Eddy Quality												
2005-05-18	5	7	12	13	10	8	10	15	12	3	13	1
2006-05-01	5	7	10	16	10	8	10	11	12	3	8	1
2007-04-02	5	7	11	16	11	10	9	10	11	4	10	1
2008-05-05	8	14	12	17	12	12	10	14	13	3	8	1
2009-04-30	9	10	13	12	7	9	13	12	11	11	13	5
2010-03-24	8	12	12	13	11	8	13	10	11	9	13	3
2011-03-03	14	14	13	17	14	13	14	15	15	13	15	3
2012-06-28	8	16	6	15	8	7	8	13	10	11	8	11

	Moores Run above Radecke Ave. Segments											
	1	2	3	4	5	6	7	8	9	10	11	Tributary
2013-09-03	**8**	**10**	**8**	**14**	**11**	**9**	**14**	**13**	**9**	**9**	**14**	**4**
2014-08-21	**8**	**13**	**7**	**14**	**7**	**8**	**10**	**9**	**8**	**9**	**13**	**11**
2016-06-09	**8**	**14**	**16**	**13**	**12**	**8**	**8**	**11**	**12**	**12**	**11**	**7**
2017-06-08	**11**	**16**	**8**	**17**	**8**	**0**	**13**	**8**	**7**	**10**	**10**	**6**
2018-06-07	**10**	**14**	**6**	**16**	**13**	**8**	**6**	**12**	**8**	**10**	**10**	**7**
2019-07-10	**8**	**14**	**16**	**15**	**10**	**6**	**6**	**12**	**7**	**11**	**11**	**7**

Riffle/Run Quality

2005-05-18	**11**	**13**	**11**	**3**	**12**	**12**	**13**	**14**	**10**	**14**	**2**	**7**
2006-05-01	**11**	**13**	**11**	**2**	**11**	**13**	**13**	**14**	**12**	**14**	**2**	**7**
2007-04-02	**13**	**15**	**13**	**2**	**13**	**13**	**12**	**14**	**13**	**15**	**0**	**8**
2008-05-05	**13**	**13**	**13**	**1**	**15**	**15**	**14**	**14**	**13**	**13**	**1**	**6**
2009-04-30	**18**	**12**	**15**	**1**	**6**	**13**	**16**	**15**	**8**	**11**	**1**	**8**
2010-03-24	**12**	**12**	**13**	**1**	**13**	**13**	**13**	**13**	**11**	**10**	**2**	**9**
2011-03-03	**15**	**17**	**18**	**14**	**17**	**13**	**15**	**15**	**15**	**15**	**1**	**11**
2012-06-28	**10**	**14**	**15**	**0**	**15**	**10**	**11**	**12**	**10**	**12**	**0**	**7**
2013-09-03	**6**	**9**	**10**	**0**	**6**	**8**	**10**	**13**	**6**	**12**	**1**	**6**
2014-08-21	**6**	**14**	**10**	**8**	**8**	**11**	**12**	**9**	**9**	**12**	**0**	**7**
2016-06-09	**11**	**14**	**14**	**2**	**13**	**8**	**10**	**11**	**8**	**12**	**1**	**6**
2017-06-08	**12**	**12**	**14**	**0**	**13**	**10**	**11**	**8**	**8**	**11**	**0**	**6**
2018-06-07	**14**	**14**	**11**	**10**	**12**	**10**	**14**	**13**	**1**	**13**	**0**	**7**
2019-07-10	**13**	**10**	**10**	**0**	**10**	**7**	**9**	**9**	**7**	**11**	**0**	**7**

Embeddedness (%)

2005-05-18	50	50	50	0	60	70	50	50	70	50	0	50
2006-05-01	50	50	50	0	60	60	60	60	60	50	0	50
2007-04-02	60	60	50	75	60	60	60	50	60	50	0	50
2008-05-05	40	50	50	0	50	60	50	50	50	50	0	50
2009-04-30	10	50	50	70	50	30	20	20	30	20	0	70
2010-03-24	40	40	40	0	40	30	30	30	40	40	0	40
2011-03-03	50	50	50	50	50	60	50	50	50	50	0	50
2012-06-28	30	30	30	0	50	50	30	50	50	20	0	30
2013-09-03	50	50	50	40	50	60	50	50	50	50	0	60
2014-08-21	50	40	50	50	60	50	40	50	50	50	50	50
2016-06-09	50	50	50	50	30	75	50	50	50	50	0	50
2017-06-08	30	50	20	NA	30	60	40	60	60	40	0	50
2018-06-07	40	40	50	NA	30	50	40	40	NA	40	0	50
2019-07-10	30	50	30	NA	20	50	50	30	50	50	0	50

Embeddedness

2005-05-18	**11**	**11**	**11**	**0**	**9**	**7**	**11**	**11**	**7**	**11**	**0**	**11**
2006-05-01	**12**	**11**	**11**	**0**	**9**	**9**	**10**	**10**	**10**	**11**	**0**	**11**
2007-04-02	**10**	**10**	**11**	**3**	**10**	**9**	**10**	**11**	**10**	**11**	**0**	**13**
2008-05-05	**13**	**13**	**13**	**0**	**13**	**8**	**13**	**13**	**13**	**13**	**0**	**12**
2009-04-30	**19**	**11**	**12**	**7**	**11**	**14**	**16**	**16**	**14**	**17**	**0**	**7**
2010-03-24	**14**	**14**	**14**	**0**	**14**	**14**	**13**	**14**	**13**	**13**	**0**	**14**
2011-03-03	**14**	**14**	**14**	**14**	**14**	**9**	**14**	**14**	**14**	**14**	**0**	**14**
2012-06-28	**14**	**14**	**14**	**0**	**11**	**10**	**14**	**10**	**10**	**17**	**0**	**14**
2013-09-03	**11**	**11**	**11**	**13**	**11**	**9**	**11**	**11**	**11**	**11**	**0**	**13**
2014-08-21	**11**	**12**	**11**	**11**	**8**	**11**	**12**	**11**	**11**	**11**	**11**	**11**
2016-06-09	**11**	**11**	**11**	**11**	**13**	**6**	**11**	**11**	**11**	**11**	**0**	**11**
2017-06-08	**14**	**11**	**17**	NA	**14**	**9**	**13**	**9**	**9**	**13**	**0**	**11**
2018-06-07	**12**	**12**	**11**	NA	**14**	**11**	**14**	**12**	**12**	**14**	**0**	**11**
2019-07-10	**14**	**11**	**14**	NA	**16**	**11**	**11**	**14**	**11**	**11**	**0**	**11**

	Moores Run above Radecke Ave. Segments											
	1	2	3	4	5	6	7	8	9	10	11	Tributary
Trash Rating												
2005-05-18	11	8	4	8	9	8	11	7	5	7	9	11
2006-05-01	8	11	11	10	10	11	8	12	3	9	18	11
2007-04-02	8	8	7	12	11	10	9	10	5	10	18	15
2008-05-05	8	8	3	8	6	6	5	5	3	8	18	13
2009-04-30	8	8	3	9	9	8	9	8	8	10	13	6
2010-03-24	8	8	3	8	13	8	8	10	7	11	12	13
2011-03-03	6	6	8	6	13	9	10	6	7	12	18	8
2012-06-28	8	6	7	3	13	13	10	13	12	11	16	14
2013-09-03	6	7	10	13	13	14	10	7	6	12	18	7
2014-08-21	10	6	10	15	13	8	10	10	10	12	18	6
2016-06-09	14	8	3	16	11	10	8	8	6	9	15	7
2017-06-08	7	7	6	11	7	7	6	6	7	7	16	8
2018-06-07	5	5	5	8	8	8	4	2	2	8	16	5
2019-07-10	4	3	2	10	3	5	4	4	5	3	11	8
Channel Alteration												
2005-05-18	16	16	16	16	16	16	16	16	17	17	1	13
2006-05-01	16	16	16	16	16	16	16	16	17	14	1	13
2007-04-02	16	16	16	16	16	16	16	16	16	15	1	15
2008-05-05	17	17	17	17	16	17	17	17	17	15	1	13
2009-04-30	15	16	16	17	16	16	16	16	16	17	1	12
2010-03-24	18	18	18	18	16	17	18	17	18	15	2	15
2011-03-03	17	17	17	17	16	17	17	17	17	15	1	15
2012-06-28	18	18	18	15	15	16	17	18	18	18	1	14
2013-09-03	18	18	18	16	17	18	18	18	18	18	1	14
2014-08-21	18	18	17	17	16	18	18	17	18	18	1	18
2016-06-09	17	17	17	16	17	17	17	16	16	16	2	15
2017-06-08	17	17	18	17	16	18	18	18	18	16	2	15
2018-06-07	17	17	17	15	14	18	16	16	17	16	2	15
2019-07-10	18	18	18	16	13	17	17	17	17	17	2	16
Bank Vegetative Protection												
2005-05-18	11	12	15	15	15	15	18	16	17	11	2	8
2006-05-01	11	13	16	16	14	16	16	16	17	10	2	8
2007-04-02	12	12	16	16	14	14	16	14	16	10	2	10
2008-05-05	14	14	17	15	15	16	13	12	17	10	2	8
2009-04-30	20	18	18	20	16	13	19	15	14	13	1	20
2010-03-24	18	18	17	17	14	18	16	16	18	14	2	15
2011-03-03	17	16	15	17	14	13	15	16	16	13	2	16
2012-06-28	17	16	14	14	17	17	16	16	17	13	2	17
2013-09-03	15	17	17	10	15	18	14	15	16	12	2	16
2014-08-21	18	17	12	13	15	15	12	10	10	11	2	6
2016-06-09	18	17	13	16	16	17	14	12	16	10	2	18
2017-06-08	12	16	17	12	17	14	16	17	15	16	2	18
2018-06-07	18	17	12	10	16	15	12	13	16	16	2	18
2019-07-10	10	10	13	6	15	15	8	12	8	5	2	18
Condition Of Banks												
2005-05-18	18	18	14	18	18	14	16	17	16	8	20	18
2006-05-01	18	13	14	18	18	14	16	17	15	16	20	18
2007-04-02	18	14	15	18	13	14	15	16	14	15	20	16
2008-05-05	18	17	16	16	18	14	15	16	18	16	20	18
2009-04-30	17	12	13	11	17	10	10	18	15	11	20	5
2010-03-24	18	17	16	16	15	17	14	17	18	15	20	18
2011-03-03	18	16	15	16	16	14	15	16	16	16	20	14
2012-06-28	16	17	15	17	18	15	14	16	16	18	20	18
2013-09-03	18	18	17	14	16	14	14	17	16	18	20	16

	Moores Run above Radecke Ave. Segments											
	1	2	3	4	5	6	7	8	9	10	11	Tributary
2014-08-21	**14**	**8**	**10**	**9**	**10**	**8**	**10**	**9**	**9**	**12**	**20**	**15**
2016-06-09	**18**	**16**	**13**	**14**	**17**	**15**	**13**	**15**	**15**	**17**	**18**	**16**
2017-06-08	**17**	**14**	**17**	**12**	**16**	**12**	**12**	**15**	**13**	**17**	**18**	**16**
2018-06-07	**17**	**18**	**16**	**12**	**18**	**15**	**16**	**16**	**17**	**18**	**18**	**17**
2019-07-10	**15**	**14**	**14**	**10**	**17**	**14**	**9**	**12**	**8**	**14**	**18**	**16**

Riparian Vegetative Zone

2005-05-18	**7**	**7**	**9**	**12**	**6**	**6**	**9**	**11**	**10**	**9**	**2**	**2**
2006-05-01	**7**	**7**	**10**	**14**	**6**	**6**	**8**	**11**	**10**	**6**	**2**	**2**
2007-04-02	**7**	**4**	**8**	**15**	**6**	**6**	**11**	**11**	**10**	**6**	**2**	**2**
2008-05-05	**8**	**9**	**12**	**15**	**6**	**6**	**7**	**15**	**12**	**7**	**2**	**2**
2009-04-30	**2**	**4**	**8**	**13**	**5**	**4**	**7**	**10**	**16**	**16**	**5**	**4**
2010-03-24	**10**	**7**	**10**	**15**	**10**	**6**	**8**	**15**	**16**	**3**	**2**	**6**
2011-03-03	**4**	**8**	**8**	**12**	**8**	**4**	**9**	**10**	**7**	**4**	**2**	**7**
2012-06-28	**14**	**14**	**8**	**17**	**10**	**12**	**14**	**18**	**19**	**11**	**2**	**4**
2013-09-03	**6**	**6**	**11**	**14**	**10**	**5**	**6**	**10**	**16**	**9**	**4**	**3**
2014-08-21	**4**	**6**	**14**	**9**	**14**	**7**	**9**	**18**	**16**	**11**	**1**	**5**
2016-06-09	**10**	**11**	**16**	**18**	**14**	**18**	**15**	**18**	**18**	**17**	**4**	**6**
2017-06-08	**16**	**11**	**20**	**20**	**13**	**13**	**17**	**15**	**15**	**14**	**2**	**6**
2018-06-07	**9**	**7**	**13**	**18**	**16**	**15**	**15**	**15**	**18**	**15**	**2**	**10**
2019-07-10	**4**	**4**	**14**	**17**	**5**	**7**	**9**	**11**	**12**	**8**	**3**	**9**

Scoring Color Code		
Score	Category	Color Code
16 to 20	optimal	
11 to 15	suboptinal	
6 to 10	marginal	
0 to 5	poor	

Appendix I: Watershed Protection and Restoration Program (WPRP) Annual Report

Watershed Protection and Restoration Program Annual Report Table

Article 4-202.1(i)(4): "The percentage and amount of funds in the local watershed protection and restoration fund spent on each of the purposes provided in subsection (h)(4) of this section;"

Program Element		Cost	Percent of WPRF
Capital Improvements for Stormwater Management	$	9,481,707	35.11%
O & M of SWM Systems and Facilities	$	12,335,425	45.68%
Public Education and Outreach	$	405,783	1.50%
Stormwater Management Planning (see Md. Environment Code Ann. § 4-202.1(h)(4)(iv))	$	1,242,829	4.60%
Review of Stormwater Management Plans and Permit Applications for New Development	$	1,199,683	4.44%
Grants to Nonprofit Organizations	$	-	0.00%
Adminstration of WPRF	$	2,340,103	8.67%
TOTAL		$27,005,530.00	100.00%

Number of Properties Subject to Fee	229,549
Reporting Year	2019
Permit Number	11-DP-3315
Comments:	Capital improvements of stormwater management includes payment of debt

VERSION 2-28-18

Article 4-202.1(i)(3): "The amount of money deposited into the watershed protection and restoration fund in the previous fiscal year by source;"

Source		Amount
Annual Single Family Residential Fees Collected	$	12,423,488.00
Annual Commercial Fees Collected	$	15,951,406.00
Non-profits, Religious Orgs Fees Collected	$	3,262,587.00
Miscellaneous fees related to development	$	209,748.00
	$	31,847,229.00

VERSION 2-28-18

Note: Revenue by source is estimated based on the total revenue for the stormwater fee, proportional to the customer base (billing) and may not reflect actual proportion of revenue received for the fiscal year.

Appendix J: Microbial Source Tracking Study

Microbial Source Tracking Analysis Report

Wolf T. Pecher, College of Arts and Sciences, University of Baltimore

Sample Date: April 04, 2019

Report: May 13, 2019

1 Results

Eight water samples collected by the Department of Public Works (DPW) on April 04, 2019 were tested for the presence and levels of human and canine fecal waste, and mammalian fecal waste in general. Results are summarized in Table 1.

In addition to the quantitative standards for human and canine fecal contamination, a standard consisting of diluted Back River sewage was analyzed. This provides an internal reference for performance of the method and permits the levels of human fecal waste to be expressed in %sewage equivalent. This will give an empirical estimate of the proportion of raw sewage in the sample, if all human stool stems from sewage.

1.1 Human Fecal Matter Contribution

Out of the eight environmental samples, the water sample collected at 2 39th St (Sample D057) had the highest amount of sewage. Based on the levels of the human marker in raw sewage, and assuming that the source of the human marker in environmental samples is sewage, about 64.4% of the sample was raw sewage. The water samples collected at Dean & McElderly (Sample D059) and W Belveder @ Queensbury Ave (Sample D054) did not show evidence of sewage contamination (Table 1).

1.2 Canine Fecal Matter Contribution

One sample, 35 N Ellwood (Sample D060), showed some amount of canine fecal contamination with a corrected amount of 1.06 µg canine feces in 100 ml sample (Table 1).

1.3 General Mammalian Fecal Matter

Highest (mammalian) fecal contamination was detected at 2 39th St (Sample D057) with 2.48×10^6 copies of the generic marker in 1 ml sample. The second highest level of mammalian fecal contamination was detected at 3811 Canterburry Rd (Sample D056) with 1.05×10^5 copies (Table 1).

2 Method Summary

2.1 Sample Processing & DNA extraction

On April 04, 2019 eight water samples were collected by the Department of Public Works (DPW). The samples and a field blank consisting of 500 ml phosphate buffered water were delivered to the University of Baltimore (UB). Samples were recoded to D054 to D061.

Processing of Environmental Samples. 50 – 500 ml of environmental samples and 500 ml of the field blank were filtered through mixed cellulose ester (MCE) membranes with a pore size of 0.45 μm. Membranes were stored at -80°C prior to DNA extraction.

DNA was extracted from the membranes on April 16, 2016 using the DNeasy® PowerLyzer® PowerSoil® DNA extraction kit (QIAGEN Inc., Germantown, MD) following the manufacturer's recommendation with slight modification to maximize DNA recovery. DNA extracts were eluted in 100 μl elution buffer, divided between analytical and archived samples, and stored at -80°C. An extraction blank was included. Analytical samples were delivered to UMCES/IMET for quantitative molecular microbial source tracking (mMST) analysis.

Sewage Reference. A sewage reference sample was used consisting of DNA extracts from 5 raw sewage samples that were collected from the Back River Watertreatment plant. Briefly, from each sewage sample, 5 ml was filtered through MCE membranes. DNA was extracted from the membranes, eluted in 100 μl elution buffer, and stored as described above for Environmental samples. DNA extracts were pooled prior to analysis.

Canine Reference Sample. A canine reference sample was used consisting of DNA extracts from feces collected from 5 dogs. Briefly, 250 mg of feces was collected from each dog, DNA extracted, eluted in 100 μl elution buffer, and stored as described above. DNA extracts were pooled prior to analysis.

2.2 mMST analysis using qPCR

mMST analysis was performed by Dr. Eric Schott (UMCES/IMET). Briefly, DNA extracts were tested by quantitative Polymerase Chain Recation (qPCR) for the levels of human, and canine fecal contamination with published molecular probes. DNA preparations from environmental samples were diluted 5-fold, and 4 μl of the dilutions used for each qPCR reaction. Using qPCR results on DNA extracts from pooled sewage and dog fecal samples as a reference (4 μl of a 100-fold dilution each), the amount of sewage and canine fecal matter was calculated. The level of contamination was expressed as copy number of human marker per ml sample and %sewage equivalent, and as copy number of canine marker in 1 ml sample and mg or μg of feces in 100 ml sample (Table 1).[1] It should be noted that in the reference sewage sample, canine fecal matter was detected (1.5×10^4 copies of canine marker in 1 ml sewage). Levels of canine fecal matter reported in field samples were adjusted accordingly to reflect the amount from non-sewage canine sources only (Table 1, column "Canine Only").

[1] The concentration of sewage varies, and there is variability of the amount of dog associated gut bacteria in different dogs. Therefore the volume of fecal contamination is an estimate.

Table 1: **Summary of MST Results.** %Sewage equivalent was calculated using the amount of human marker in raw sewage (9.0×10^5 copies in 1 ml) as a reference. Amount of canine feces (μg) in 100 ml was calculated using the amount of canine marker in canine feces (2.77×10^9 copies in 1 g feces) as a reference. **Total**: amount of canine feces (in μg) observed in 100 ml sample; **Canine Only**: amount of canine feces in 100 ml sample corrected for the amount of canine marker in raw sewage (15,000 copies in 1 ml sewage).

					Canine Marker		
		Mammalian Marker	Human Marker			Fecal Waste (μg) in 100 ml	
Sample ID	Sample Description	Copy Nr. in 1 ml	Copy Nr. in 1 ml	%Sewage Equivalent	Copy Nr. in 1 ml	Total	Canine Only
D054	W Belveder @ Queensbury Ave	67,256	3	0.00	3	0.12	0.12
D055	J274	66,600	5,663	0.63	26	0.96	0.00
D056	3811 Canterburry Rd	104,774	7,618	0.84	94	3.40	0.00
D057	2 39th St	2,476,626	581,255	64.44	1,873	67.62	0.00
D058	JF 11.5	93,012	4,676	0.52	50	1.80	0.00
D059	Dean & McElderly	4,900	5	0.00	6	0.20	0.20
D060	35 N Ellwood	29,454	317	0.04	35	1.25	1.06
D061	Linwood & Elliot	32,333	1,153	0.13	10	0.38	0.00

Microbial Source Tracking Analysis Report

Wolf T. Pecher, College of Arts and Sciences, University of Baltimore

Sample Date: November 01, 2018

Report: November 29, 2018

1 Results

Eight water samples collected by the Department of Public Works (DPW) on November 01, 2018 were tested for the presence and levels of human and canine fecal waste, and mammalian fecal waste in general. Results are summarized in Table 1.

In addition to the quantitative standards for human and canine fecal contamination, a standard consisting of diluted Back River sewage was analyzed. This provides an internal reference for performance of the method and permits the levels of human fecal waste to be expressed in %sewage equivalent. This will give an empirical estimate of the proportion of raw sewage in the sample, if all human stool stems from sewage.

1.1 Human Fecal Matter Contribution

Out of the eight environmental samples, the water sample collected at 809 Spedden St had the highest amount of sewage. Based on the levels of the human marker in raw sewage, and assuming that the source of the human marker in environmental samples is sewage, about 1.4% of the sample was raw sewage. The water samples collected at Chesterfield Ave & Kavon Ave and 1248B Harford Rd did not show evidence of sewage contamination (Table 1).

1.2 Canine Fecal Matter Contribution

One sample, Chesterfield Ave & Kavon Ave, showed high amounts of canine fecal contamination with a corrected amount of 1714.75 µg canine feces in 100 ml sample. As mentioned above, at this site no human fecal contamination was observed (Table 1).

1.3 General Mammalian Fecal Matter

Highest (mammalian) fecal contamination was detected at 809 Spedden St with 4.31×10^6 copies of the generic marker in 1 ml sample. The second highest level of mammalian fecal contamination was detected at Chesterfield Ave & Kavon Ave with 8.47×10^5 copies. At this site, only canine fecal contamination was observed (Table 1).

2 Method Summary

2.1 Sample Processing & DNA extraction

On November 01, 2018 eight water samples were collected by the Department of Public Works (DPW). The samples and a field blank consisting of 500 ml phosphate buffered water were delivered to the University of Baltimore (UB). Samples were recoded to D043 to D050.

Processing of Environmental Samples. 50 – 500 ml of environmental samples and 500 ml of the field blank were filtered through mixed cellulose ester (MCE) membranes with a pore size of 0.45 μm. Membranes were stored at -80°C prior to DNA extraction.

DNA was extracted from the membranes March 19, 2018 using the DNeasy® PowerLyzer® PowerSoil® DNA extraction kit (QIAGEN Inc., Germantown, MD) following the manufacturer's recommendation with slight modification to maximize DNA recovery. DNA extracts were eluted in 100 μl elution buffer, divided between analytical and archived samples, and stored at -80°C. An extraction blank was included. Analytical samples were delivered to UMCES/IMET for quantitative molecular microbial source tracking (mMST) analysis.

Sewage Reference. A sewage reference sample was used consisting of DNA extracts from 5 raw sewage samples that were collected from the Back River Watertreatment plant. Briefly, from each sewage sample, 5 ml was filtered through MCE membranes. DNA was extracted from the membranes, eluted in 100 μl elution buffer, and stored as described above for Environmental samples. DNA extracts were pooled prior to analysis.

Canine Reference Sample. A canine reference sample was used consisting of DNA extracts from feces collected from 5 dogs. Briefly, 250 mg of feces was collected from each dog, DNA extracted, eluted in 100 μl elution buffer, and stored as described above. DNA extracts were pooled prior to analysis.

2.2 mMST analysis using qPCR

mMST analysis was performed by Dr. Eric Schott (UMCES/IMET). Briefly, DNA extracts were tested by quantitative Polymerase Chain Recation (qPCR) for the levels of human, and canine fecal contamination with published molecular probes. DNA preparations from environmental samples were diluted 5-fold, and 4 μl of the dilutions used for each qPCR reaction. Using qPCR results on DNA extracts from pooled sewage and dog fecal samples as a reference (4 μl of a 100-fold dilution each), the amount of sewage and canine fecal matter was calculated. The level of contamination was expressed as copy number of human marker per ml sample and %sewage equivalent, and as copy number of canine marker in 1 ml sample and mg or μg of feces in 100 ml sample (Table 1).[1] It should be noted that in the reference sewage sample, canine fecal matter was detected (10^4 copies of canine marker in 1 ml sewage). Levels of canine fecal matter reported in field samples were adjusted accordingly to reflect the amount from non-sewage canine sources only (Table 1, column "Canine Only").

[1] The concentration of sewage varies, and there is variability of the amount of dog associated gut bacteria in different dogs. Therefore the volume of fecal contamination is an estimate.

Table 1: **Summary of MST Results.** %Sewage equivalent was calculated using the amount of human marker in raw sewage (6.96×10^5 copies in 1 ml) as a reference. Amount of canine feces (μg) in 100 ml was calculated using the amount of canine marker in canine feces (2.77×10^9 copies in 1 g feces) as a reference. **Total**: amount of canine feces (in μg) observed in 100 ml sample; **Canine Only**: amount of canine feces in 100 ml sample corrected for the amount of canine marker in raw sewage (10,000 copies in 1 ml sewage).

					Canine Marker		
		Mammalian Marker	Human Marker			Fecal Waste (μg) in 100 ml	
Sample ID	Sample Description	Copy Nr. in 1 ml	Copy Nr. in 1 ml	%Sewage Equivalent	Copy Nr. in 1 ml	Total	Canine Only
D043	Artaban Pl & Rosedale St	360	2	0.00	0	0.00	0.00
D044	Lafayette Ave & Payson St	250	4	0.00	0	0.00	0.00
D045	809 Spedden St	4311158	4661	1.36	0	0.00	0.00
D046	McHenry & Smallwood St	79745	492	0.14	0	0.00	0.00
D047	2700 Loch Raven Ave	165192	3037	0.89	68	2.45	0.00
D048	Chesterfield Ave & Kavon Ave	847474	0	0.00	47498	1714.75	1714.75
D049	Unknown Rd Outfall	67187	3061	0.89	104	3.77	0.55
D050	1248B Harford Rd	802	0	0.00	2	0.06	0.06

Appendix K: Summary of PST Investigations

PST ID	PST Name	Location Description	Watershed	PST Comments	Complainant	Investigation Date	PST Discharge Classification
2697	1400 Key Hwy (Home Maid) FOG	Alley behind 1400 Key Hwy	Baltimore Harbor	cityworks complaint received due to poor conditions of a business's grease storage. Grease waste entering nearby storm drain inlet. OCAL confirmed poor conditions and referred to Pollution Control Section for possible FOG violations. Corrective measures have been made.	Citizen	8/1/2018	Other
2702	Ashburton Reservoir Zone 2 Tanks-Sediment	Liberty Heights & Hilton St	Gwynns Falls	Gwynns Falls Pkwy sampling was extremely turbid, due to sediment. The problem was tracked to a sediment pond at the Ashburton Reservoir Zone 2 Tanks project, at Liberty Heights and Hilton St. Somehow sediment laden water was leaving the pond and entering a 24" storm drain pipe. The project manager proposed making the pond larger and diverting the flow elsewhere. The problem was abated, by the contractor. Sediment is no longer an issue.	OCAL	8/22/2018	Other
2752	1900 Grinnalds Ave Water Main Break	1900 Grinnalds Ave	Gwynns Falls	Cityworks complaint received about sediment in the Gwynns Falls at Annapolis Rd. Sediment was tracked to a broken water main carrying large amounts of clay and soil into the storm drain at 1900 Grinnalds Ave. City water crew was onsite beginning the repair.	Citizen	12/5/2018	Other
2700	Walter P Carter School-Recreation Center Pool	Walter P. Carter School-Recreation Center	Back River	Elevated chlorine detected during routine sampling at North Hill & the Alameda sampling site. Issue tracked back to Walter P. Carter school. The school staff informed analysts that there was work being done on the pool, requiring discharge into the storm drain. Chlorine levels decreased on the second day of investigation to repairs to completed were completed. Investigation terminated.	OCAL	8/16/2018	Potable Water
2729	1301 Filbert St (Curtis Bay Tank)	1301 Filbert St	Baltimore Harbor	Heavy volume of city water found in the storm drain at Patapsco Rd & Coal Pier Rd while evaluating for a OAM CCTV request. Chlorinated water was tracked to a discharge from the Curtis Bay Tank on Filbert St. Water Dept. was contacted (Anthony Rossi). On 10/26/18 water staff confirmed that a valve was unknowingly left open and has since been closed stopping the discharge into the storm drain.	OCAL	10/25/2018	Potable Water
2742	300 block Davis Street (Broken Water Main)	300 block Davis Street	Baltimore Harbor	The city received a complaint from Adam Lindquist of Healthy Harbor that an outfall between Pier 5 and Pier 6 was discharging sediment. The problem was tracked to a water main break at 300 block Davis Street and it was already in the process of being repaired by Baltimore City crews when we located.	Citizen	11/14/2018	Potable Water
2784	4010 Echodale Water Main Leak	4010 Echodale Ave	Back River	Elevated chlorine (0.42 mg/l) levels found during routine sampling survey at Sipple Ave sampling site. There is an existing problem occurring at Frankford Ave. Current leak to locate request is active for this ongoing problem, but another problem is thought to be occurring simultaneously, due to strong chlorine smell and increase flow at outfall. Feb. 22, tracked tracked problem a crew to 4010 Echodale Ave, where a city crew was working on a large subsurface water main break. This break is the major contributor to the chlorine/potable water at the Sipple sampling site. Need to follow up after repairs are completed. Mar. 6, Follow up to recent repair to water main at 4010 Echodale Ave. The chlorine was 0.00 mg/l and the flow decreased. Problem is abated.	OCAL	2/14/2019	Potable Water
2796	Water Leak at Locust Point Wastewater Pumping Station	Locust Point Wastewater Pumping Station	Baltimore Harbor	We received a complaint from Chris Stielpert (410-396-5194) at Eastern Ave Pumping Station about additional water entering into the flow of sewage in the pumping station which they believe to be either drinking water or groundwater. After getting advanced permission to enter the property with a certified to be on the property city personnel (Veronica) accompaningy us, we sampled the flow of water entering the pump station. After sampling underground we noticed on the surface next to the pump house a water meter that was overflowing finished water and it was flowing into the first sanitary manhole upstream of the pump house so we determined this to be the additional contribution to the flow.	City	3/1/2019	Potable Water
2832	427 Drury Lane Water Leak	206 S Rock Glen Rd	Gwynns Falls	Subsurface water main break located at 427 Drury Ln. Send to OAM for L2L.	OCAL	4/23/2019	Potable Water
2841	Rubin Ave. & Emmart Ave. Water Main Break 052219	Intersection of Ruben Ave. and Emmart Ave.	Gwynns Falls	Elevated turbidity levels discovered during routine sampling of Powder Mill sampling site. Stream was extremely cloudy due to sediment infiltration. Investigation led back to a surfaced potable water main break at the intersection of Ruben Ave. and Emmart Ave. Referred to Jon McCombes for repairs on 5/22. Repairs completed on 5/23.	OCAL	5/22/2019	Potable Water
2845	W. Lexington & N Monastary Water Main Flushing 062019	W. Lexington & N. Monastary	Gwynns Falls	Elevated chlorine levels discovered during routine sampling. Source tracked back to R.E. Harrington construction company completing work in the Allendale neighborhood on water main lines. They chlorinate the water to kill off bacteria and then dechlorinate the discharge back into the storm drain to clear water lines. Work is on-going. Point of contact on site are Jeff and Carlos 410-466-4800. They informed PCA's that Steve Washington is the inspector for the city and conducts testing on discharge. 410-396-3440	OCAL	6/20/2019	Potable Water

PST ID	PST Name	Location Description	Watershed	PST Comments	Complainant	Investigation Date	PST Discharge Classification
2733	2140 Aisquith St (Charm City Appliances)	2140 Aisquith St, Northeast side of building along Curtain Ave	Jones Falls	Heavy water observed flowing along the curb on Curtain Ave tracked to the downspouts of 2140 Aisquith St. The shop area where appliances are refurbished/repaired has several washing machine drains and a large utility sink draining into a sump pump. The sump pump discharges into the buildings roof drainage pipe and is connected to an outside downspout. All of the wash water is then discharged onto Curtain Ave. OCAL staff spoke with employees and obtained owner information: Dixon 443-802-1438. Business owner disconnected the wash water discharge from the storm drainage pipes and rerouted it to the building's sanitary system. Confirmed on 11/14/2018.	OCAL	10/30/2018	Private
2763	2200 E Northern Parkway Private SSO	2200 E Northern Parkway	Back River	Private system SSO discover while driving on Perring Parkway. Reported to with Mike Real at 410-444-1313 of MKR Real Estate. Also reported to MDE. Spoke with Mike Real on 12/19 whom indicated his plumber relieved the choke and stopped the overflow.	OCAL	12/18/2018	Private
2806	5008 Lawndale Ave	5008 Lawndale Ave., behind the building at the stream	Jones Falls	Citizen complaint regarding steaming discharge into stream. According to staff at the cleaners the discharge is an overflow to their boiler. Chlorine and temperature are high, referred to Joe Miller at MDE.	Citizen	3/25/2019	Private
2830	Ann St & Thames St (The Point) Sump Discharge	Ann St side of 1734 Thames St.	Baltimore Harbor	Cityworks complaint of standing water in curb along 800 Block of Ann St from frequent sump pump discharge from The Point restaurant. Staff found that sump pump discharges 1-2 gallons of water approximately every 5 minutes. The water travels very slowing along the curb cut to an inlet at the end of the block at Ann St & Lancaster St. Field chemical analysis found everything to be much below our problematic thresholds (Chlorine - 0.0 mg/L, Ammonia - 0.0 mg/L, Optical Brighteners - 7.214 mg/L). However, our Fluoride sample was elevated at 0.433 mg/L. After speaking with the manager (Jess) of The Point, we gained access to the basement to inspect their two sump pumps. We discovered that their ice machines purge cycle is discharging into one of their sump pump pits and then out into the road. We informed the manager of our discovery and she told us she was going to speak with the property owners later in the day and would pass on our inspection findings to them. We then informed the manager that we would be following up in the next week to see their decision in how to proceed with the issue. Since, we were able to confirm with our sample that the fluoride value is elevated we will require them to detach the ice machine from their sump pit and attach it to their waste line. On 4/23/19 we went to The Point to inform them of our findings and the corrections that need to be made, but there was not a manager working so we will need to return another day. After two scheduled meetings with the owner (Erica Russo) were stood up by her, we got HABC involved. We met with Joseph Grisleck from HABC on 6/6/19 at the property and after showing him the situation he issued them a violation and informed them that corrective action needed to be taken to remedy the problem. On 6/18/19 we followed up at the property to see what has been done to correct the problem and we observed that the entire sump pump discharge (ice machine discharge, condensation lines, and any potential rain contributions) had been rerouted to their sanitary line.	Citizen	4/16/2019	Private
2705	3732 Old York Rd	3732 Old York Rd & Chestnut Hill Ave	Jones Falls	Cityworks complaint received about constant sump pump discharge from residence. OCAL staff found that the sump pump was discharging approximately every 3 minutes and it appeared to be contaminated with wastewater. The nearby sanitary mainline was found to be clear and also the house connection. This is a rental property and attempts are being made to contact the owners. OCAL entered the residence on 8/29/18 and found disconnected plumbing was overflowing in the basement, probable due to a backup, and entering the sump basin. Contact with property owner was made on 8/30/18. On 8/31/2018 the property owner claimed the repairs were in progress and would be completed over next couple of days. On 9/5/18 we entered the residence and observed that the homes service lateral had been cleaned and that pipe that was discharging had been repaired and reconnected. Also, we dyed the toilet that was previously found to overflow in the basement and observed the dye in the sanitary line, therefore the problem appears to be abated but will require another visit to confirm. Follow up on 9/6/18 found the sump pump discharge to be dry. (renter info: Bootsy 667-214-9494, Landlord info: Jack 773-827-4269)	Citizen	8/28/2018	SDUO, Private

PST ID	PST Name	Location Description	Watershed	PST Comments	Complainant	Investigation Date	PST Discharge Classification
2712	Artaban Townhome Sanitary	Artaban Townhome community. Private property.	Gwynns Falls	Elevated ammonia discovered during routine ammonia survey. Water grey in color with floatables and raw sewage smell. Problem was tracked to the Artaban Townhouse community. Red dye was deployed in unit 3107 Artaban Pl kitchen sink. 45 minutes later that dye appeared seeping out of the street. Property management was immediately informed of the problem. 9/11/18 AO & VS met with the head of maintenance and plumbing to explain our findings. Their plan is to obtain drawings of the property and to camera the line. On 9/13/2018 OCAL confirmed that the manager of the Artaban Townhome Community had a crew CCTV the sanitary line in addition to snaking the line in an attempt to alleviate any clogs on 9/12/2018. The attempt to alleviate the clogged sanitary was not successful so the manager submitted at request through 311 for a pump truck flushing. Her 311 confirmation number is 18-00707767. Follow up on 9/19/18 found that the sanitary line has been cleared and plumbing contractors have replaced a section of pipe, as well as, adding a new clean out. Ammonia in the down stream storm drain has reduced significantly, however, it is still high. More time is needed for the sewage to clear from the contaminated ground before abatement has been confirmed. Several follow up samples have been taken with various ammonia levels, some low and some elevated. Therefore, a DNA sample was submitted to the University of Baltimore and found an extremely low number of human markers and calculated a 0.00% sewage equivalent. This SDUO is abated.	OCAL	9/7/2018	SDUO, Private
2749	5322 Frederick Ave	In stream next at Frederick Ave and Stonecroft	Gwynns Falls	Sewer lateral leading to apartment complex broken and discharging into stream in excess of 25 gpm. Property Management was notified and the owner Atlantic Realty Group was contacted and is working to repair break. 11/29 reported to MDE Joe Miller. Repair completed on 12/12. Jetter hose is stuck in pipe from Frederick Rd to first private manhole. DPW on-call contractor going to remove hose.	OCAL	12/3/2018	SDUO, Private
2756	813 Spedden St (Auto Barn Towing) SDUO	Trailer/office on south side of 813 Spedden St lot	Gwynns Falls	While investigating high ammonia and a possible sanitary leak during the 809 Spedden St PST (originated from GR Lateral Survey), a sudden discharge was observed flowing from a 4" cast iron pipe directly into a storm drain manhole. The flow had very high ammonia. A second discharge contained clumps of toilet paper. The bathroom within a trailer/office at 813 Spedden St (Auto Barn) produced a positive dye test into the storm drain. The manager stated that 15 years ago the trailer/office was added and the plumbing was connected to existing plumbing from a nearby unused guard shack on the property. On 12/14/18 a request has been made to UMD for CCTV inspection of sanitary main behind the 800 Block of Spedden in order to identify were the dead end is it relation to property line of 813 Spedden St. On 1/8/2019 an attempt was made to locate the sanitary dead end behind 813 Spedden with CCTV. The camera could not reach the dead end because of large debris in the line from possible pipe break at lateral connection to 811 Spedden St. 1/15 met with UMD whom will be doing the repair. 1/28 UMD said they are sending to an on-call contractor. 2/5 OEC notified OCAL that SC973 and SC974 are out of money. The work will be sent to the new on-call under SC980. Repair completed of 8/16/2019.	OCAL	12/11/2018	SDUO, Private
2795	1705 N Longwood St	1705 N Longwood St is a suspect at this time	Gwynns Falls	High ammonia (>3.34mg/L) and bacteria (>4839 MPN) recorded during the Gwynn's Run Hilton St Storm Drain Lateral Survey 2019 on 3/5/2019. On 3/13/19 a suspected direct connection to the storm drain was found on the 2900 Block of Presbury St. The property in question (1705 N Longwood St) is a large subdivided home. Contact with the property owner is needed to conduct dye testing. On 3/15/19 a dye test of 1705 N Longwood St was performed it was present in the storm drain, absent from the sanitary. On 6/20/2019, following contractor repairs to correctly relocate the house connection to the sanitary mainline, the second confirmation of abatement sample was taken and the bacteria was low (219 MPN) so the SDUO is closed and the problem is abated.	OCAL	3/5/2019	SDUO, Private
2798	3000 Presbury St	Northwest corner of Presbury St & Longwood St	Gwynns Falls	Flush of fecal and paper debris observed in the storm drain manhole at Presbury St & Longwood St during the CCTV inspection of the downstream line segment for another PST (1705 N Longwood St, originating from the GR Hilton St Storm Drain Lateral Survey 2019) on 3/14/2019. A CCTV inspection of the upstream line segment followed and a suspected direct connection was found 14' upstream from the Presbury St & Longwood St MH. The pipe is flowing from the direction of 3000 Presbury St. Contact with a resident was unsuccessful, further effort to contact resident is needed to perform dye testing. On 3/15/19 a dye test of 3000 Presbury St was performed by resident and it was present in the storm drain, absent from the sanitary. On 6/20/19 a second confirmation of abatement was done and the bacteria was low (219 MPN) so the SDUO is closed and the problem is abated.	OCAL	3/13/2019	SDUO, Private

PST ID	PST Name	Location Description	Watershed	PST Comments	Complainant	Investigation Date	PST Discharge Classification
2801	1701 N Longwood St	Northeast corner of N Longwood St and Presbury St	Gwynns Falls	Suspicious uncharted connection to the storm drain observed during another PST (1705 N Longwood St, originating from the GR Hilton St Storm Drain Lateral Survey 2019). The connection did not have any indication of waste water, however, the pipe flows from the direction of a small unused church. OCAL staff is attempting to contact property owner to conduct a dye test. On 4/9/19 the property owner met OCAL staff onsite and a dye test confirmed the connection to the storm drain. On 6/20/2019, following contractor repairs to correctly relocate the house connection to the sanitary mainline, the second confirmation of abatement sample was taken and the bacteria was low (219 MPN) so the SDUO is closed	OCAL	3/15/2019	SDUO, Private
2807	211 Longwood Rd	211 Longwood Rd	Jones Falls	4/4/2019 Confirmed house lateral connect to the storm drain. Spoke to homeowner and told her we are still under the investigation stage. Met with OAM (Jamison Smith) whom is contact oncall contractor to clean and inspect main. 4/8 Met with OAM (J. Smith) and IPR (Drew Ghiglieri) to discuss repair of collapse behind 215 Longwood and inspection of sewer pipes. 5/1 S&J a subcontractor for IPR (Drew Ghiglier) was on location exposing the sewer pipe behind the white house to inspect the sewer pipe. Work got put on hold because property owner claimed the contractor damaged the tree. Tree will be taken down by city contractor. 7/12-7/6 Midas was onsite cleaning and cctv inspecting the sewer pipe behind 215 and 211	OCAL	3/26/2019	SDUO, Private
2834	4505 Lasalle Ave House Connection SDUO	4505 Lasalle cleanout	Back River	Elevated ammonia levels and gray water discovered during routine SIS sampling. Investigation led to a suspected direct house connection from 4505 Lasalle to the storm drain. CCTV completed of storm drain and a dye test was conducted in clean out which led to the suspected direct connection. PCA's dye tested other houses and cleanouts along the same block and confirmed no other connections into storm drain. On 4/26/19 a dye test from 4505 Lasalle Ave kitchen sink confirmed that the connection to the storm drain was an active connection for the house. Also, push camera was inserted into the cleanout on the property line and it reached the storm drain. Direct house connection confirmed. Contact with home owner has been made: Kevin Cambell 443-739-0152. (Note:2015-2016 sewer line within the property was replaced by plumber.) On 5/7/2019 UMD performed a lateral launch CCTV inspection confirming that the unused sanitary house connection did exist for the property. On 6/17/2019 residential plumbing contractors connected the home's waste line to the correct sanitary house connection and abated the SDUO.	OCAL	4/23/2019	SDUO, Private

PST ID	PST Name	Location Description	Watershed	PST Comments	Complainant	Investigation Date	PST Discharge Classification
2394	Chesterfield & Kavon SDUO	Chesterfield Ave & Kavon Ave	Back River	Blue Water Baltimore reported high ammonia (1.51 mg/l) at an outfall (20161119-HR-106), Herring Run Park at Shannon Dr. & Kavon Ave. 12/01/16 PST investigation narrowed the problem to the storm drain manhole at Chesterfield Ave & Kavon Ave. Dye test door hangers were placed at 3043 & 3045 Chesterfield. On 12/3/16 a dye test of 3045 Chesterfield was absent in storm drain. On 2/1/2017 a dye test of 3043 Chesterfield (Ms. Harris 410-483-0680) was positive in both sanitary and storm. No external cleanout is available, however, an interior one is. On 2/23/17 many dye tests were performed at 3043 Chesterfield and all were absent in the storm, but present in the sanitary. CCTV was conducted from the interior clean out with the push camera to the main line. Some measurements were taken from the CCTV:105' from cleanout to the main line, 57' from cleanout to the Y connection, 35' from cleanout to the front wall, and 39' from cleanout to what looks like a second cleanout that is buried under a plant bed. Further investigation is required to use the locator for street marking and possibly additional dye testing. 5/3/17, after several weeks of no response from 3043 Chesterfield, to retest property, a retest of the storm drain inlet connection of sample. Due to the high ammonia and other indicators of sewage present, it appears that this problem is still active. Point work was performed on the sanitary lateral service connection at 3043 Chesterfield by Anchor Construction on June 16, 2017. They replaced approximately 4' above the Y connection, the Y connection, and 12' below the Y connection. The ammonia is still high since the repair, but more time is needed to determine if the problem is resolved or not. Need to continue looking for the source. On 11/29/17 we dye 3045 Chesterfield again and this time it showed up in the storm drain inlet connection and both branches of the sanitary at Kavon & Chesterfield. After UM jetted the line for us, we drove the CCTV camera up the south branch of the sanitary line and observed the dye entering through a slightly damaged and offset pipe joint 38 feet up from the manhole. We also observed a cut out in the storm drain inlet connection where the belly of the sanitary main is visible crossing over the pipe at 13 feet down from the inlet. Though it doesn't appear that the sewage is leaving the sanitary pipe as it crosses in the inlet connection, the sewage does enter from the gap between the sanitary pipe and where it sits on the cutout in the inlet connection pipe. On 12/14/17 UMD Construction replaced a section of damaged house connection from 3045 Chesterfield Ave. A dye test below the damaged pipe was absent in the storm drain. On 12/21/17 OCAL performed a follow up dye test of 3045 Chesterfield and found that the house connection is still leaking into the storm drain and the sanitary main on Kavon. Additionally, at this time the sewer main line on Kavon Ave was also found to be leaking (see Chesterfield Ave & Kavon Ave (SSO#5167)). On 1/19/2018 UMD Construction made a second attempt to repair the suspected house connection leak at	Blue Water Baltimore	11/19/2016	SDUO, SSO-Subsurface
2530	4801 Laurel Ave SDUO	106' - 114' East of Woodland Ave & Laurel Ave within storm drain	Jones Falls	Followup of system now that 2900 Block of Woodland SDUO is resolved. Found high ammonia, suspect house on corner. Waiting for CCTV camera to come back from repair. On 1/24/2018 a dye test confirmed that the house connection for 4801 Laurel Ave is leaking into the storm drain were it crosses on Woodland Ave. There was no cleanout found on the property to narrow the location of the leak. A lateral inspection of the house connection found Root Ball Barrel (RBB) with 100 percent cross sectional loss at 43 ft. The request was sent to OAM to have a cleanout installed so the roots can be cut and CIPP installed. OAM sent transmittal to oncall to install a cleanout and replace 12nd of pipe. Repair work completed. Dye testing on 5/3/18 determined lateral is still leaking. Since the dye was placed in the cleanout and the pipe form the cleanout to the property line in new the leak mus be on the city side therefore an SSO was reported. Sent to OAM on 5/3/18 to have CIPP installed in lateral under SC974. Repair work lateral lining was completed on 9/5/18. Followup dye testing verified the lateral is still leaking. Work completed dye test concluded abatement	OCAL	11/30/2017	SDUO, SSO-Subsurface
2594	York Rd & E Coldspring Ln SDUO	4719 York Rd	Herring Run	Sewage leaking into manhole vault from adjacent sanitary. Choke sanitary located with several inches of sludge buildup in manhole indicating several years of occurrence. UMD vacuumed the manhole. They jetted the 18 ft pipe S37OO1022MH and was only able to go 5ft due to blockage. 4/4/18 Transmittal sent to on call (Midas) for CCTV inspection and cleaning. Sent to contractor under SC974 for repair. 5/21/18 construction started. SAK Field Engineer Norman Bright 443-602-2387 Followup found the walls of the storm manhole dry and discharge stopped. Sanitary flowing freely.	OCAL	2/14/2018	SDUO, SSO-Subsurface

PST ID	PST Name	Location Description	Watershed	PST Comments	Complainant	Investigation Date	PST Discharge Classification
2624	3316 Bancroft Rd SDUO	3316 Bancroft Road	Jones Falls	High ammonia reading found at Bancroft outfall which led to investigation on the source of high ammonia. While investigating upstream of the storm drain system, dye test was deployed in order to determine exact location of sanitary line infiltration into the storm drain. Dye test found that the source of sewer water was leaking into the storm drain at approximately 68 ft north of 3316 Bancroft Rd. manhole. A second dye test was conducted to determine what segment of sanitary sewer line was leaking, the results showed that the sanitary is leaking between 3316 and 3315 Bancroft Rd. Defect in pipe located sent for repair under under SC974. Unable to install CIPP until water infiltration is stopped. Leak to Locate did not find any leaks. Dye was added to the storm and found to be leaking into the sanitary pipe. Further investigation found while vacuuming water from the storm that the infiltration did not stop. Sanitary pipe will have CIPP installed. There is excessive infiltration into the sanitary pipe preventing CIPP installation. A pre-liner will be installed and a hot water curing process will be used. Repair work was completed on 9/4/18. Followup on 9/5/18 and verified to be abated. CCTV of storm pipe show additional sewage discharge into the storm drain. Investigation into additional source delayed to wet conditions and moderate flows in the storm drain. On 10/22 further investigation found another sanitary pipe leaking. An SSO report was started for the problem. 1/17/19 CIPP was installed by contractor. 1/23 followup dye test performed and absent in storm. Ammonia still elevated will return when weather is conducive to field work to dye test upstream segments. 2/26 dye sting performed and two more segment were found to be leaking. An SSO report was initiated. CIPP installed in sanitary pipes. No infiltration into storm pipe and outfall is dry.	OCAL	4/5/2018	SDUO, SSO-Subsurface
2665	2800 Block of Springhill Ave SDUO	2808 Spinghill Ave	Gwynns Falls	Elevated ammonia found during Pecks Branch storm drain survey. Sanitary lateral leaking into storm pipe. Even though dye testing was conducted on July 12th the SSO was reported on July 16th after reviewing maps, plans, and CCTV video. At which point is was determined the leak is on the public side. abated	OCAL	6/18/2018	SDUO, SSO-Subsurface
2736	Homewood Ave & Walpert Ave	659 E 25th St	Jones Falls	High ammonia and fecal debris found at the Homewood Ave branch of the Jenkins Run storm drain system during a main line investigation originating from the Jones Falls storm drain lateral survey. Wastewater was then observed entering an uncharted 6" pipe connected to the Northwest inlet connection at Homewood Ave & Walpert Ave. Wastewater was also observed entering the Northeast inlet connection at Homewood Ave & Walpert Ave through a pipe joint. As of 10/31/18 positive dye tests into the storm drain have occurred from the restrooms of 659 & 645 E 25th St. Lateral launching of the house connection from the main line has been ordered. On 11/9/2018 UMD lateral launched the house connection from the sanitary main and we concluded through dye testing that 655 E 25th st was the only one of the three properties connected correctly to the sanitary system. On 11/14/2018 a push camera inserted into a clean out from 659 E 25th St allowed for marking of the illicit direct connection from the building to the storm drain main. 11/19 NM and BK met with OAM in in the field to discuss the issue. Since the properties are not part of the wastewater collection system this is not an SSO and would remain as an SDUO. City will complete repairs to properly connect properties to the collection system. 11/21/18 OEC sent transmittal to Contractor. 11/26/18 NM met with OEC and Contractor to discuss issues in the field. New design for repair was decided upon which would install a sewer main and manholes on Walpert and connect all three buildings to the 8 inch main. 1/9 on-call contractor indicated they will be returning to site to complete the repairs on 1/10. 2/5 contractors are still onsite. 2/14 all three properties are discharging to the sanitary sewer. Leak discovered in the lateral leading to 659 E 25th St. 2/19 met with OAM to discuss approach and possibly being an SSO. It was determined that since this lateral is tied to the collection system and the property line is not in vicinity of the leak location there is high probability that this is now considered and SSO. SSO was created for this lateral pipe. 2/20 Transmittal sent to contractor CIPP install from the sewer main to the building. 3/5 contractor on site performing repair. On 3/8/2019 a follow up dye test of the property confirmed abatement.	OCAL	10/31/2018	SDUO, SSO-Subsurface
2758	Kavon and Shannon Outfall	3039 Shannon Dr	Herring Run	Dye discovered in plunge pool at the outfall when dye testing for the Chesterfield and Kavon SDUO. Pipe repair was complete by UMD on the incoming pipe of the sanitary in the grass next to the trail. Dye is no longer being found at the outfall.	OCAL	12/11/2018	SDUO, SSO-Subsurface
2787	6320 Wirt Ave SSO# 5873 (Bancroft SDUO)	6320 Wirt Ave	Jones Falls	Two pipe segments along this address are leaking into the storm at 3314 Bancroft Ave. Part of 3316 Bancroft Rd SDUO investigation. CIPP installed in sanitary pipes. No infiltration into storm pipe and outfall is dry.	OCAL	2/26/2019	SDUO, SSO-Subsurface

PST ID	PST Name	Location Description	Watershed	PST Comments	Complainant	Investigation Date	PST Discharge Classification
2816	Greenspring Ave & DuPont Ave (Overlook at Sinai Ridge Apartments)(SSO #5946)	Northwest corner of intersection of Greenspring Ave & DuPont Ave	Jones Falls	Waste water was observed in the storm drain at Greenspring Ave & DuPont Ave during the active SSO on 3/29/2019. After the SSO was abated the flow was immediately reduced to a trickle. Follow up on 4/2/2019 found that the trickle remained active and initiated a new investigation. Dye test of lowest cleanout from Sinai Ridge Apts. was positive in the storm drain. On 4/3/2019 an additional dye test was performed in an effort to isolate the area of leakage within the house connection below the cleanout and the test was inconclusive. During the dye test some defects were identified with the push camera. On 4/11/2019 a repeat dye test was performed and determined the leak to be at or outside of the property line. An SSO report was created and UMD will perform point repair from the property line to the sidewalk as needed. On 5/10/2019 a follow up dye test was performed and found recent UMD point repair was had not abated the overflow. On 5/29/2019 a follow up dye test was performed and found that the second UMD point repair did abate the SSO.	OCAL	3/29/2019	SDUO, SSO-Subsurface
2641	4801 Laurel Ave SSO#5358	4801 Laurel Ave	Jones Falls	See SDUO at same address	OCAL	5/3/2018	SSO-Subsurface
2658	4701 Reisterstown Rd	4701 Reisterstown Rd	Gwynns Falls	Elevated ammonia at Pecks Branch Gwynns Falls site. Discovered a choked sanitary pipe discharging into adjacent storm drain pipe. Estimated discharge 5 gpm. Repairs completed.	OCAL	6/6/2018	SSO-Subsurface
2693	3101 Eastern Ave SSO 5470	Source found on Eastern Ave. between Ellwood and Robinson.	Baltimore Harbor	Elevated ammonia of 2.03 ppm found during routine ammonia survey sampling at Linwood and Elliott site. SSO found, choked manhole S53I_033MH. Work order number 18-00518237.	OCAL	7/17/2018	SSO-Subsurface
2719	4121 Marx Ave (SSO #5664)	In the street at 4121 Marx Ave	Herring Run	High ammonia recorded at the Prior & Parkside (0.60 mg/l) ammonia survey site. The problem was tracked to a choked sanitary at 4121 Marx Ave.	OCAL	10/3/2018	SSO-Subsurface
2724	3500 Parkdale Ave SSO # 5682	3500 Parkdale Ave	Jones Falls	Pump inside storm drain failed. OAM and BR WWTP personnel working on repair. Repair completed on 10/24. OCAL discover elevated ammonia in stream on 10/29. investigation discover coupling on pump hose was detached. Coupling was reassembled and discharge stopped.	OCAL	10/17/2018	SSO-Subsurface
2725	3315 Bancroft Rd SSO#5689 (Bancroft SDUO)	3315 Bancroft Rd	Jones Falls	SSO associated with 3316 Bancroft SDUO. Discharge reported as 0.06gpm which was determined using the dilution formula with 0.5gpm in storm and ammonia of 2.33 mg/L	OCAL	10/22/2018	SSO-Subsurface
2728	5400 Frederick SSO #5688	Frederick Ave & Stonecroft Rd	Gwynns Falls	Team noticed sewage in the Maidens Choice stream while servicing Flood Alert station at Northbend Rd. Team tracked problem to the city-county line where an outfall was discharging sewage, at Frederick Ave & Stonecroft Rd. Utility Maintenance found a choked sanitary manhole (S06O_008MH), at 5400 Frederick Ave. Estimated Overflow 25 GPM	OCAL	10/22/2018	SSO-Subsurface
2730	2422 W. Patapsco Ave SSO# 5692	Choked sanitary MH found in parking lot behind Faith Tabernacle church.	Gwynns Falls	Elevated ammonia numbers discovered during routine ammonia survey at the Berlin stream sampling location of .35 ppm. Initial investigation on 10/24 led PCAs to Neiman main storm drain system, but did not produce elevated ammonia numbers despite a strong sewage smell. PCA's continued investigation on 10/25 and ammonia readings peaked to 2.56 ppm at initial sampling location. Source tracked to a choked sanitary manhole off of Patapsco Ave in the rear parking lot of Faith Tabernacle. UMD cleared sanitary choke. Will follow up	OCAL	10/24/2018	SSO-Subsurface
2748	Ravenwood Ave & Longview Ave (choked sanitary)	The sanitary manhole in the intersection of Ravenwood Ave & Longview Ave	Back River	While performing the BR ammonia screening survey we received a high ammonia (0.92 ppm) at our Mannasota & Shannon sample location. Since this site is known for spikes in ammonia which were found to be interference we took a bacteria instead of tracking immediately. When we received the high bacteria (>2420 MPN) we began tracking that next day which led us to a choked sanitary at Ravenwood Ave & Longview Ave. With the help of UMD and their pressure truck the choke was relieved and the sewage infiltration to the storm drain was abated	OCAL	11/20/2018	SSO-Subsurface
2770	W Lexington St & N Warwick Ave (Underdrain) SSO #5816	West side of intersection of W Lexington St & N Warwick Ave	Gwynns Falls	Elevated ammonia (0.29 ppm)received during survey and tracked to the underdrain N Warwick Ave & W Lexington St. In the past we've had sections of the same sanitary line that runs down Lexington lined because it was exfiltrating into this underdrain and entering the storm drain in a similar way. On 1/16/2019 the furthest downstream sanitary mainline segment on Lexington was determined to be the overflowing asset. There appears to be a portion of broken pipe just below the manhole at Lexington & Warwick. UMD has begun repairs on 1/16/2019. On 1/17/2019 the repairs were completed and follow up dye test confirmed the overflow has been abated	OCAL	1/2/2019	SSO-Subsurface
2788	3500 Parkdale Ave SSO#5875	3500 Parkdale Ave	Jones Falls	Sewage ejector pump stopped working. 2/28 Repair is complete and pump is working. Cause was the breaker got tripped.	OCAL	2/27/2019	SSO-Subsurface
2797	6303 Pimlico Rd SSO# 5883	6303 Pimlico Rd	Jones Falls	During outfall survey, found a severely impaired outfall with high ammonia (19.0 mg/l). The problem was tracked to a choked sanitary manhole at 6303 Pimlico Rd.	OCAL	3/8/2019	SSO-Subsurface

PST ID	PST Name	Location Description	Watershed	PST Comments	Complainant	Investigation Date	PST Discharge Classification
2799	6303 Pimlico Rd (SSO# 5900 & 5922)	Southwest corner of 6303 Pimlico Rd	Jones Falls	Ammonia remains high after SSO# 5883 was abated. Dye deployed at 6207 Pimlico Rd sanitary was present in the storm drain. Further investigation required to identify faulty asset. On 3/15/19 dye testing confirmed that there was a sanitary leak downstream from 6207 Pimlico Rd infiltrating the storm drain through an uncharted connection 4' downstream of the inlet at 6303 Pimlico Rd. On 3/19/19 the overflowing sanitary line segment was confirmed by ruling out any downstream leaks and the SSO was reported. Initially there was a choke at 6303 Pimlico Rd, however, the sanitary line segment continued to leak into the storm drain after the line was cleaned and the SSO remains open waiting further inspection and repair by UMD. On 3/22/2019 UMD replaced a section of sanitary pipe where it crosses over the storm drain. Follow up dye test was absent in the storm drain. On 3/27/2019 followed-up to ensure repairs alleviated exposure into storm drain, but ammonia was still elevated (2.63 ppm). Dye deployed in 6207 Pimlico sanitary MH again and was present in the storm drain again. UMD's Rob Johnson responded to the scene. There was also a blockage in the 6303 Pimlico sanitary line that was cleared by UMD. On 3/29/2019 UMD completed a second point repair on the sanitary line where it crosses over the storm drain. Following dye test and chemical indicators were negative in the storm drain. SSO abated.	OCAL	3/14/2019	SSO-Subsurface
2805	Wyman Park Pond SSO# 5906	3700 Tudor Arms	Jones Falls	OAM contacted OCAL to investigate a possible overflow occurring. Upon arrival UMD was at site attempting to stop the overflow. Due to the volume of discharge, >10K SSO sampling was initiated.	OAM	3/21/2019	SSO-Subsurface
2810	309 Edgevale Rd	309 Edgevale Rd.	Jones Falls	Choked sewer pipe at manhole. UMD only able to jet 2 ft up pipe due to break. UMD repair pipe.	OCAL	4/1/2019	SSO-Subsurface
2814	N. Franklintown St. & W. Fairmount Ave SSO# 5921	Sanitary Manhole located at intersection of N. Franklintown St. and W. Fairmount Ave.	Gwynns Falls	During regular ammonia screening, OCAL discovered a high ammonia reading (1.95 ppm)at the 2501 W. Lexington St. Manhole Dead Maiden Site . The high ammonia reading initiated an investigation which lead to OCAL discovering a choked sanitary manhole on the intersection of N. Franklintown St. and W. Fairmount Ave. Control 1 was notified of the choked manhole and arrived on site to mitigate the issue. The cause of the sanitary choke was oils and grease.	OCAL	3/26/2019	SSO-Subsurface
2817	16 Elmwood Rd	16 Elmwood Rd	Jones Falls	6 inch sanitary pipe that is inside storm inlet is backed up and overflowing into the storm. UMD broke open pipe and relieved the choke in the downstream pipe.	OCAL	3/26/2019	SSO-Subsurface
2824	3500 Parkdale Ave	3500 Parkdale Ave	Jones Falls	Pump stopped working. Needed to reset the pump. Open the from of the box in the basement. Turn the toggle switch to OFF. There is a black dial on the inside on right. Turn to the left then back to the right until it clicks. Flip toggle back on and the box will start to buzz indicating it is working.	OCAL	4/1/2019	SSO-Subsurface
2837	E Coldspring Ln & York Rd	West side of intersection of E Coldspring Ln & York Rd	Back River	High ammonia value (0.40mg/L) reported at Northhill-Alameda site during ammonia survey on 6/25/19. Investigation led to a choked sanitary line on the west side of the intersection of E Coldspring Ln & York Rd. Sanitary overflow was infiltrating the storm drain through an inlet connection. UMD arrived and cleared the sanitary line, however, wastewater was still entering the storm drain inlet connection of the NW corner of the intersection. This infiltration could be a result of wastewater saturation in the surrounding soil so OCAL and UMD will follow up first thing in the morning. On 6/26/2019 a follow up confirmed abatement. Wastewater was no longer flowing into the storm drain and downstream ammonia value was returning to	OCAL	6/25/2019	SSO-Subsurface
2878	2501 Shirley Ave SSO#5986	2501 Shirley Ave	Jones Falls	Sanitary sewer leaking into storm pipe. UMD repaired section pf pipe that crosses the storm.	OCAL	5/9/2019	SSO-Subsurface
2695	1601 N. Fulton Ave Rear (SSO #5471)	In the road on Baker St at the rear of the empty lot for 1601 N. Fulton St.	Gwynns Falls	High ammonia (0.96 ppm) found at Gwynns Run @ Carroll Park during survey and it was tracked to an overflowing sanitary manhole located in the street behind the vacant lot at 1601 N. Fulton Ave at approximately 10 GPM. Utility Maintenance showed up after the report was made and relieved the choke with a pressure truck.	OCAL	7/16/2018	SSO-Surface
2696	2601 N. Hilton SSO# 5542	Gwynns Falls Parkway OF at Hanlon Park.	Gwynns Falls	Elevated ammonia >3.34 ppm was recorded during SSO sampling. Investigation found a choked sanitary at 2601 N Hilton St. The choked caused sewage to seep up to the surface at 3214 Piedmont Ave road verge/grass patch. Work order number 594079. SSO report number 594118.	OCAL	8/1/2018	SSO-Surface
2706	Hilton Parkway SSO# 5586	1200 N Franklintown Rd	Gwynns Falls	Choked sewer pipe causing overflow under Hilton Parkway. SSO was discharging from the ground. UMD relieved the choke by send the jetter hose off of the bridge. Joe Miller (MDE) contacted Nick about this issue. He received the complaint about this from surveyors in the area. There was an SSO up pipe from this at Allendale on August 24th.	MDE	8/28/2018	SSO-Surface
2707	Beechfield Ave SSO# 5492	301 S Beechfield Ave	Gwynns Falls	Discovered an SSO after a storm in which the sanitary sewer stack was removed from its base. OAM had a bypass inplace and OCAL is 10K sampling. Rocks had gotten into the pipe and heavy cleaning is being done.	OCAL	7/23/2018	SSO-Surface

PST ID	PST Name	Location Description	Watershed	PST Comments	Complainant	Investigation Date	PST Discharge Classification
2714	6605 Collinsdale Rd Baltimore County SSO	In woods behind address	Back River	Sewer overflow discovered while performing TMDL bacteria sampling. Tracked into the county. Turned over to Baltimore County Sewer Dept. 410-887-7415. Met them onsite and showed them the location.	OCAL	9/6/2018	SSO-Surface
2721	110 W 39th St (SSO #5681)	Median along 39th St at Stony Run Ln	Jones Falls	wastewater observed overflowing from sanitary manhole while in the area for another PST. UMD cleared a choke to abate SSO.	OCAL	10/16/2018	SSO-Surface
2722	Annapolis and Kent	Annapolis and Kent	Gwynns Falls	Contractor broke 84 inch pressure main. Multiple SSO locations.	OAM	10/2/2018	SSO-Surface
2737	Greenspring @ Dupont SSO	North west corner of intersection Greenspring Ave. @ Dupont Ave.	Jones Falls	OCAL received a complaint regarding an overflowing clean-out and arrived on site to investigate. OCAL observed a sanitary clean-out that was percolating water onto the surface underneath the clean-out entry. After testing two samples OCAL confirmed that the water was sewage and called UMD for assistance. The SSO was mitigated and an inspection camera was used to inspect the sanitary clean-out to determine location where line is compromised since sewage was percolating up from the ground. UMD stated it was the second time in the week that they had responded to an overflow at this location.	OCAL	11/2/2018	SSO-Surface
2750	Hilton Parkway SSO# 5749	Manhole on east side of Hilton Parkway bridge where tributary and Gwynns Fall converge.	Gwynns Falls	Surcharging manhole in excess of 25 GPM. NM discover on a followup visit to this routine SSO site,	OCAL	12/5/2018	SSO-Surface
2754	810 N Hilton St SSO# 5758	On the hill side along south bound Hilton Parkway at the the off ramp for Edmondson Ave	Gwynns Falls	Surcharging manhole discharging into street and inlet.	OCAL	12/10/2018	SSO-Surface
2772	Windsor School 4001 Alto Rd SSO# 5810	4001 Alto Rd	Gwynns Falls	Surcharging manhole in the field behind school. This is a private sewer line. BCPS is handling the repair. Brian Webster 443-488-1209, Blayne 443-271-5348. 1/23 spoke with Brian Webster said work was completed on 1/18/19. Followup found repair work to be complete and no sso or sewage entering storm.	OCAL	1/9/2019	SSO-Surface
2781	659 E 25th St SSO#5859 (Homewood & Walpert SDUO)	659 E 25th St	Jones Falls	Sanitary sewer lateral leaking into storm drain inlet. See SDUO investigation: Homewood Ave & Walpert Ave. Sanitary lateral from 659 E 25th St has been lined.	OCAL	2/19/2019	SSO-Surface
2800	2304 N Forest Park Ave SSO#5892	2309 N Forest Park Ave	Gwynns Falls	Overflowing cleanout into street.	OCAL	3/14/2019	SSO-Surface
2802	2807 Elgin Ave (SSO#5903)	Rear of 2807 Elgin Ave, part of Elgin Townhomes	Gwynns Falls	Water flowing on the street observed at Elgin Ave & Dukeland St while sampling for the Gwynn's Run Hilton St Storm Drain Lateral Survey 2019 was tracked to an overflowing cleanout in the rear of 2807 Elgin Ave. UMD arrived and cleared a choke through the cleanout. SSO abated.	OCAL	3/20/2019	SSO-Surface
2811	Edmondson Ave & Upper Ellicott Dr	Edmondson Ave & Upper Ellicott Dr	Gwynns Falls	Manhole surchaging. Bridge contractor install pump to stop. Pump was turned off or removed.	OAM	4/1/2019	SSO-Surface
2813	Greenspring Ave & DuPont Ave (SSO#5927)	Northwest corner of intersection in grass belonging to 2801 Virginia Ave (Overlook at Sinai Ridge)	Jones Falls	Grey water and debris noticed on road side while in transit to another PST investigation. Waste water was overflowing from the ground just below the cleanout for 2801 Virginia Ave. There was also evidence of overflow from another cleanout further up the hill on the same house connection. UMD responded, cleared the house connection choke, and abated the overflow.	OCAL	3/29/2019	SSO-Surface
2825	101 Cotswold Road SSO# 5943	101 Cotswold Road at property front edge.	Jones Falls	Overflowing sanitary manhole, approximately 1.0 GPM	OCAL	4/10/2019	SSO-Surface
2839	Cylburn Ave SSO	Cylburn Ave, about 420' northeast of Greenspring Ave, sanitary manhole S15SS1015MH	Jones Falls	Very high ammonia recorded at the Cylburn Sample Site, 19.0 mg/l. The problem was tracked to an overflow sanitary manhole S15SS1015MH, on Cylburn Ave, about 420' northeast of Greenspring Ave.	OCAL	5/20/2019	SSO-Surface
2840	801 Spedden St Overflowing Cleanout	Cleanout in far rear of property by the fence.	Gwynns Falls	Problem was located while following up on an unrelated SDUO. Overflowing cleanout in the rear of the property at 801 Spedden St. SSO was reported and UMD complaint crew came out and relieved with a snake and then used the push camera to confirm that it was abated.	OCAL	4/9/2019	SSO-Surface
2848	Cylburn Ave SSO#	4915 Greenspring Ave	Jones Falls	Sewage discharging from 6 inch underdrain at end of storm outfall drainage protection. Two segments identified as leaking. Bypass pumping installed to abate the SSO. CIPP to be installed in the leaking sewer pipes. 7/16 CIPP lining and grouting began. 7/18 Work complete SSO confirmed abated on 7/19.	OCAL	6/3/2019	SSO-Surface

Table K-2
Summary of FOG Enforcement

ACTION	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Total
No GCD	1	1	2	3	2	1	1	1	0	2	1	1	**16**
No GCD 2nd notice	0	0	1	2	0	2	0	0	0	1	0	0	**6**
No GCD 3rd notice	0	0	0	1	1	0	0	1	1	0	0	0	**4**
Failed 25% Rule	25	29	37	51	19	21	14	18	36	37	48	11	**346**
Failed 25% Rule 2nd Notice	8	4	5	7	7	2	3	26	6	1	2	11	**82**
Failed 25% Rule 3rd Notice	6	0	0	0	0	0	1	6	2		3	0	**18**
Plumbing Code	9	2	3	4	4	1	1	4	1	1		1	**31**
No Maintenance Log	21	26	28	51	20	8	17	16	7	23	52	9	**278**
No Maintenance Log 2nd Notice	4	9	10	8	4	4	4	11	5	6	2	2	**69**
No Maintenance Log 3rd Notice	4	3	4	0	1	0	2	3	2		1	6	**26**
Maintenance Log not-up-to-date	3	3	4	0	10	10	7	5	9	12	3	5	**71**
Maintenance Log not-up-to-date 2nd Notice	2	2	4	2	2	2	1	0	0	1	1	0	**17**
Maintenance Log not-up-to-date 3rd Notice	1	2	0	0	0	1	0	0	2	1		1	**8**
Refused Admittance	7	2	2	9	2	3	3	2	2	5	0	0	**37**
Inadequate Maintenance of GCD, overflow, waste/recycle grease area	30	1	2	8	1	6	1	6	7	14	0	24	**100**
Certain Appurtances require GCD coverage - 1st Notice	13	3	4	9	6	9	7	6	8	0	2	3	**70**
Certain Appurtances require GCD coverage - 2nd Notice	0	0	0	0	0	0	0	3	5	0	0	2	**10**

Table K-2
Summary of FOG Enforcement

ACTION	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Total
Certain Appurtances require GCD coverage - 3rd Notice	0	0	0	0	0	0	0	1	1	0	0	0	**2**
Improperly operating GCD: No or Missing Baffles, not connected, leaking	15	0	8	11	5	8	6	2	7	8	6	2	**78**
Improperly operating GCD: No or Missing Baffles, not connected, leaking 2nd Notice	0	0	0	0	0	0	0	4	1	1	0	1	**7**
Improperly operating GCD: No or Missing Baffles, not connected, leaking 3rd Notice	0	0	0	0	0	0	0	4	1	1	0	0	**6**
Inaccessible GCD	0	2	0	0	1	0	0	0	0	0	2	1	**6**
Inaccessible GCD 2nd Notice	0	1	0	0	0	0	0	0	0	0	0	0	**1**
Inaccessible GCD 3rd Notice	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Rescind NOV	-1	0	0	0	0	0	0	0	0	0	0	0	**-1**
Total	**148**	**90**	**114**	**166**	**85**	**78**	**68**	**119**	**103**	**114**	**123**	**80**	**1,288**

Note:
FSEs may receive multiple NOVs for one inspection.
FSEs may be inspected more than once during the fiscal year.
Changed some of the Plumbing Code violations to "unauthorized discharge".

#FSEs Inspected	**4,139**
#FSEs Issued NOVs	**1,012**
%FSEs issued NOVs	**24.5%**
#FSEs Issued Consent Agreements	**4**

Appendix L: Supporting calculations for IDDE Credit

SDUO ID	Location Description	WS[1]	Start Date	End Date	Elimination Fiscal Year	Measured In-flow (gpm)	Observed Flow consistency	Calc. Daily Flow (gpd)[2]	TN Load Red (lb / year)[3]	TP Load Red (lb / year)[4]	ISR (ac)[5]
15BR01	3018 Pinewood Avenue	BR	12/14/15	2/19/16	2016	0.03	1.0	43.2	4.3	0.8	0.4
15GF01	4500 Block of Bonner St	GF	7/20/15	9/17/15	2016	0.60	0.8	691.2	69.5	12.6	6.9
15GF02	4520 Wakefield Road	GF	7/30/15	10/22/15	2016	0.03	1.0	43.2	4.3	0.8	0.4
15HB01	707 S President St.	BH	12/4/15	1/6/16	2016	0.03	1.0	43.2	4.3	0.8	0.4
15HB02	114 E Lexington St	BH	11/18/15	5/18/16	2016	2	1.0	2880	289.5	52.6	28.8
15JF02	3731 Greenmount Ave	JF	7/10/15	3/12/16	2016	0.10	1.0	144	14.5	2.6	1.4
15JF03	3804 Juniper Road	JF	7/21/15	10/19/15	2016	0.10	1.0	144	14.5	2.6	1.4
15JF07	3501 St Paul Street	JF	12/9/15	12/19/15	2016	10	0.3	4320	434.2	79.0	43.2
16BR02	1501 Edison Highway	BR	6/14/16	8/18/16	2017	0.05	1.0	72	7.2	1.3	0.7
16HB05	3807 Bank St	BH	11/22/2016	1/4/2017	2017	0.1	1.0	144	14.5	2.6	1.4
16JF03	Friends School (Pre-K building)	JF	4/18/16	5/31/16	2016	3	0.3	1296	130.3	23.7	13.0
17BR02	6001 Harford Rd	BR	10/17/2017	11/3/2017	2018	0.22	1.0	316.8	31.8	5.8	3.2
17HB01	2024 Fleet Street	BH	4/21/2017	5/17/2017	2017	0.1	1.0	144	14.5	2.6	1.4
17JF02	101 W Read Street	JF	6/1/2017	1/19/2018	2018	3.9	1.0	5616	564.5	102.6	56.1
17JF03	217-221 W Read St	JF	6/8/2017	9/27/2017	2018	0.07	1.0	100.8	10.1	1.8	1.0

Notes

1. WS = Watershed. BH = Baltimore Harbor, BR = Back River, GF = Gwynns Falls, JF = Jones Falls
2. Daily Flow = Measured In-flow (gpm) * Observed Consistency * 60 min / hr * 24 hr / day
3. TN Load Reduction = Daily flow * 33 mg / L * (8.345×10^{-6} lbs*L/ gal*mg) * 365 days / year [Ref. Protocol 1, IDDE Expert Panel]
4. TP Load Reduction = Daily flow * 6 mg / L * (8.345×10^{-6} lbs*L/ gal*mg) * 365 days / year [Ref. Protocol 1, IDDE Expert Panel]
5. ISR = Impervious Surface Restoration = ((TN Load Reduction / 12.14 lb / acre* year) + (TP Load Reduction / 1.56 lb / acre* year)) /2

SDUO ID	Location Description	WS[1]	Start Date	End Date	Duration (days)	Elimination Fiscal Year	Measured In-flow (gpm)	Flow consist-ency	Calc. Daily Flow (gpd)[2]	Duration (days)	Limited Duration (calc)[3]	TN Red (lb / yr)[4]	TP Red (lb / yr)[5]	ISR (ac)[6]
15JF01	3513 3521 N Calvert St	JF	7/7/15	8/21/15	45	2015	0.20	1	288	45	45	1.8	0.3	0.2
15JF04	3119 N. Calvert St	JF	7/23/15	8/29/15	37	2015	0.05	0.5	36	37	37	0.2	0.0	0.0
15JF05	224 39th St	JF	7/30/15	4/20/17	630	2017	0.09	1	129.6	630	365	6.5	1.2	0.6
15JF06	2101 Rogene Drive	JF	11/14/15	12/15/15	31	2015	5	0.05	360	31	31	1.5	0.3	0.2
15PT01	Fairhaven Avenue	LNBP	7/17/15	8/5/15	19	2015	0.25	0.3	108	19	19	0.3	0.1	0.0
16BR01	1501 Hartsdale Rd	BR	3/1/16	6/6/17	462	2017	0.25	1	360	462	365	18.1	3.3	1.8
16GF01	4500 Block of Wakefield Rd	GF	11/14/2016	7/14/2017	242	2017	0.02	0.5	14.4	242	242	0.5	0.1	0.0
16GF02	2402 Talbot Road	GF	10/18/2016	12/11/2016	54	2016	1	1	1440	54	54	10.7	1.9	1.1
16HB01	Perkins Homes	BH	4/15/16	10/12/17	545	2017	0.7	1	1008	545	365	50.7	9.2	5.0
16HB02	2400 Fairmount Ave	BH	5/31/16	6/24/16	24	2016	0.1	0.05	7.2	24	24	0.0	0.0	0.0
16HB03	Perkins Homes (Ballou Court)	BH	9/2/2016	10/12/2017	405	2017	1	1	1440	405	365	72.4	13.2	7.2
16HB04	2109 E North Ave	BH	11/22/2016	1/13/2017	52	2017	0.02	1	28.8	52	52	0.2	0.0	0.0
16JF01	Dale Rd & Cross Country Blvd	JF	1/7/16	4/20/16	104	2016	1.5	1	2160	104	104	30.9	5.6	3.1
16JF02	Crest Rd & Greenspring Rd	JF	1/8/2016	11/14/2016	311	2016	1.1	1	1584	311	311	67.8	12.3	6.7
16JF04	2900 block of Woodland Ave	JF	11/1/2016	9/7/2017	310	2017	0.05	1	72	310	310	3.1	0.6	0.3
16JF05	5400 Block of Purlington Way	JF	11/21/2016	6/14/2017	205	2017	0.1	1	144	205	205	4.1	0.7	0.4
17GF01	3208 Milford Ave	GF	8/9/2017	12/7/2017	120	2017	0.16	1	230.4	120	120	3.8	0.7	0.4
17GF02	4202 Maine Ave	GF	8/15/2017	9/15/2017	31	2017	0.1	1	144	31	31	0.6	0.1	0.1
17GF03	5104 Norwood Ave	GF	9/27/2017	8/21/2018	328	2018	0.017	1	24.48	328	328	1.1	0.2	0.1
17JF01	5114 N Charles St, Friends School	JF	3/30/2017	7/26/2017	118	2017	10	0.2	2880	118	118	46.8	8.5	4.7
17JF04	1001 Wilmot Court	JF	7/14/2017	10/19/2017	97	2017	1.5	1	2160	97	97	28.8	5.2	2.9
17JF05	1035 Wilmot Court	JF	10/19/2017	1/3/2018	76	2018	1.5	1	2160	76	76	22.6	4.1	2.2
17JF06	2231 Crest Rd	JF	11/8/2017	11/22/2017	14	2017	0.05	1	72	14	14	0.1	0.0	0.0
18BR01	4206 Frankford Ave	BR	1/25/2018	1/25/2018	0.61	2018	2	1	2880	1	1	0.2	0.0	0.0
18BR02	York Rd & E Coldspring Ln (4711 Yo	BR	2/14/2018	8/15/2018	182	2018	0.01	1	14.4	182	182	0.4	0.1	0.0
18BR03	Kavon & Shannon Dr Outfall	BR	12/13/2018	2/6/2019	55	2019	0.05	1	72	55	55	0.5	0.1	0.1
18GF01	Frederick Ave & Catherine St	GF	6/8/2018	7/26/2018	48	2018	0.5	1	720	48	48	4.8	0.9	0.5
18GF02	2800 Block of Springhill Ave	GF	7/12/2018	11/21/2018	132	2018	0.015	1	21.6	132	132	0.4	0.1	0.0
18GF03	Artaban Townhome Sanitary	GF	9/7/2018	12/6/2018	90	2018	0.5	1	720	90	90	8.9	1.6	0.9
18GF04	5322 Frederick Ave.	GF	11/28/2018	12/12/2018	14	2018	13.64	1	19641.6	14	14	37.9	6.9	3.8
18JF01	4801 Laurel Ave.	JF	1/24/2018	11/21/2018	301	2018	0.03	1	43.2	301	301	1.8	0.3	0.2
18JF02	3316 Bancroft Road	JF	4/6/2018	10/22/2018	199	2018	1	1	1440	199	199	39.4	7.2	3.9
18JF02	3316 Bancroft Road	JF	10/22/2018	2/23/2019	123	2019	0.5	1	720	123	123	12.2	2.2	1.2
18JF03	3732 Old York Rd	JF	8/29/2018	9/5/2018	7	2018	0.167	1	240.48	7	7	0.2	0.0	0.0
18JF04	Homewood Ave & Walpert Ave	JF	11/1/2018	3/8/2019	127	2019	0.103	1	148.32	127	127	2.6	0.5	0.3
19BR01	4505 Lasalle Ave	BR	4/26/2019	6/18/2019	53	2019	0.0534	1	76.896	53	53	0.6	0.1	0.1
19GF01	4001 Alto Rd	GF	1/10/2019	1/18/2019	8	2019	0.10069	1	144.9936	8	8	0.2	0.0	0.0
19GF02	3000 presbury st.	GF	3/13/2019	6/20/2019	99	2019	0.055	1	79.2	99	99	1.1	0.2	0.1
19GF03	1705 N Longwood st	GF	3/13/2019	6/20/2019	99	2019	0.268	1	385.92	99	99	5.3	1.0	0.5
19GF04	1701 N Longwood st	GF	4/9/2019	6/20/2019	72	2019	0.002	1	2.88	72	72	0.0	0.0	0.0
19JF03	Green spring Ave and Dupont Ave	JF	04/11/19	5/29/2019	48	2019	0.003	1	4.32	48	48	0.0	0.0	0.0

Notes

1. WS = Watershed. BH = Baltimore Harbor, BR = Back River, GF = Gwynns Falls, LNBP = Lower North Branch Patapsco, JF = Jones Falls
2. Daily Flow = Measured In-flow (gpm) * Observed Consistency * 60 min / hr * 24 hr / day
3. Duration is limited to 365 days for calculation of annual load reduction.
4. TN Red =Total Nitrogen Reduction = Daily flow * 33 mg / L * (8.345×10^{-6} lbs*L/ gal*mg) * 365 days / year * 0.5 [Ref. Protocol 2, N-6, IDDE Expert Panel]
5. TP Red = Total Phosphorus Reduction = Daily flow * 6 mg / L * (8.345×10^{-6} lbs*L/ gal*mg) * 365 days / year * 0.5 [Ref. Protocol 2, N-6, IDDE Expert Panel]
6. ISR = Impervious Surface Restoration = ((TN Load Reduction / 12.14 lb / acre* year) + (TP Load Reduction / 1.56 lb / acre* year)) /2

Table L-3

Sewer Exfiltration Reported as SSO, Found by IDDE

SSOID	LOCATION	WS[1]	Report Date	Elimination Fiscal Year	Reported Volume (gal)[2]	TN Red (lb / yr)[3]	TP Red (lb / yr)[4]	ISR (ac)[5]
3498	977 Ellicott Driveway	GF	1/15/2015	2015	19,500	2.7	0.5	0.3
3512	252 N Hilton St	GF	1/25/2015	2015	46,650	6.4	1.2	0.6
3516	Greenspring Ave & Loyola Southway	JF	1/28/2015	2015	8,325	1.1	0.2	0.1
3645	Orville Ave and E Federal St	GF	4/8/2015	2015	34,940	4.8	0.9	0.5
3699	Guilford Ave and 26th St	JF	5/1/2015	2015	7,575	1.0	0.2	0.1
3702	203 Chancery Rd	JF	5/5/2015	2015	9,900	1.4	0.2	0.1
3826	4000 Edmondson Ave	GF	7/7/2015	2015	62,050	8.5	1.6	0.8
3939	5113 Falls Rd	JF	9/16/2015	2015	32,799	4.5	0.8	0.4
4036	5100 Perring Pkwy	BR	11/17/2015	2015	55,400	7.6	1.4	0.8
4074	2900 Waterview Ave & Cherry Hill Rd	LNBP	12/14/2015	2015	12,450	1.7	0.3	0.2
4107	1901 Eagle Dr	GF	1/4/2016	2016	7,860	1.1	0.2	0.1
4110	1901 Eagle Dr	GF	1/6/2016	2016	8,275	1.1	0.2	0.1
4225	5810 Greenspring Ave	JF	3/17/2016	2016	34,992	4.8	0.9	0.5
4402	N Pine St and W Saratoga St	BH	7/4/2016	2016	48,000	6.6	1.2	0.7
4449	N Pine St and W Saratoga St	BH	8/2/2016	2016	54,000	7.4	1.4	0.7
4476	1500 N Chapel St	BH	8/18/2016	2016	83,990	11.6	2.1	1.2
4538	226 S Mount Olivet Ln	GF	10/14/2016	2016	7,779	1.1	0.2	0.1
5024	2501 W Lexington St	GF	8/25/2017	2017	44,250	6.1	1.1	0.6
5051	2505 W Lexington St	GF	9/12/2017	2017	582,639	80.2	14.6	8.0
5073	3500 Parkdale Ave	JF	9/29/2017	2017	57,750	8.0	1.4	0.8
5085	3500 Parkdale Ave	JF	10/7/2017	2017	2,892	0.4	0.1	0.0
5090	508 E Preston St	JF	10/20/2017	2017	41,600	5.7	1.0	0.6
5099	2585 Edmondson Ave	GF	10/25/2017	2017	17,710	2.4	0.4	0.2
5492	301 S Beechfield Ave	GF	7/23/2018	2018	1,309,300	180.3	32.8	17.9
5906	3700 Tudor Arms Ave	JF	3/21/2019	2019	72,080	9.9	1.8	1.0
5986	2501 Shirley Ave	JF	5/9/2019	2019	7,349	1.0	0.2	0.1
6088	914 Wilmington Ave	GF	8/28/2019	2019	16,003	2.2	0.4	0.2
6099	1232 N Franklintown Rd	GF	9/13/2019	2019	1,142,800	157.4	28.6	15.7
6197	3700 Tudor Arms Ave	JF	12/1/2019	2019	194,500	26.8	4.9	2.7

Notes

1. WS = Watershed. BH = Baltimore Harbor, BR = Back River, GF = Gwynns Falls, LNBP = Lower North Branch Patapsco, JF = Jones Falls
2. Reported Volume as listed on SSO report (5-day) to MDE.
3. TN Red =Total Nitrogen Reduction = 33 mg / L * (8.345 x 10^{-6} lbs*L/ gal*mg) * Reported Volume * 0.5 [Ref. Protocol 2, N-6, IDDE Expert Panel]
4. TP Red = Total Phosphorus Reduction = 6 mg / L * (8.345 x 10^{-6} lbs*L/ gal*mg) * Reported Volume * 0.5 [Ref. Protocol 2, N-6, IDDE Expert Panel]
5. ISR = Impervious Surface Restoration = ((TN Load Reduction / 12.14 lb / acre* year) + (TP Load Reduction / 1.56 lb / acre* year)) /2

PST ID	Location	WS[1]	Elimination Fiscal Year	Start Date	End Date	Measured Flow (gpm)	Calc. Daily Flow (gpd)[2]	Duration (days)	Limited Duration (calc)[3]	TN Red (lb / yr)[4]	TP Red (lb / yr)[5]	ISR (ac)[6]
2542	2955 Frederick Ave	BR	2018	12/6/2017	3/16/2018	50	72,000	100	100	51.1	1.5	2.6
2346	5604 Hamlet Ave	BR	2017	10/14/2016	2/14/2017	50	72,000	123	123	62.8	1.8	3.2
2338	Kelly & Poplin	JF	2017	9/21/2016	4/26/2017	30	43,200	217	217	66.5	2.0	3.4
2474	3213 Southern Ave	BR	2017	6/14/2017	7/17/2017	25	36,000	33	33	8.4	0.2	0.4
2433	4000 Glenarm Ave	BR	2017	2/8/2017	12/4/2017	35	50,400	299	299	106.9	3.1	5.4
2192	901 N. Newkirk St	BR	2016	1/7/2016	5/2/2016	12.5	18,000	116	116	14.8	0.4	0.7
2012	118 W. Hamburg St	BH	2016	2/19/2015	3/25/2016	30	43,200	400	365	111.8	3.3	5.7
2286	Greenspring & Springarden	JF	2016	7/7/2016	9/5/2016	2	2,880	60	60	1.2	0.0	0.1
2057	2802 Oakford	JF	2015	6/11/2015	7/2/2015	22.5	32,400	21	21	4.8	0.1	0.2
2033	833 S Linwood	BH	2015	5/28/2015	6/18/2015	12.5	18,000	21	21	2.7	0.1	0.1
2011	23rd & Huntingdon	JF	2015	5/15/2015	12/7/2015	22.5	32,400	206	206	47.3	1.4	2.4
2029	1525 W. 41st St	JF	2015	4/23/2015	9/14/2015	50	72,000	144	144	73.5	2.2	3.7
2004	W Caton Ave & N Culver St	GF	2015	1/27/2015	3/8/2015	5	7,200	40	40	2.0	0.1	0.1
2058	3817 Clifton	GF	2015	6/18/2015	7/10/2015	5	7,200	22	22	1.1	0.0	0.1

Notes

1. WS = Watershed. BH = Baltimore Harbor, BR = Back River, GF = Gwynns Falls, LJF = Jones Falls
2. Daily Flow = Measured In-flow (gpm) * 60 min / hr * 24 hr / day
3. Duration is limited to 365 days for calculation of annual load reduction.
4. TN Red =Total Nitrogen Reduction = Daily flow * 1.7 mg / L * (8.345 x 10^{-6} lbs*L/ gal*mg) * 365 days / year * 0.5 [Ref. Protocol 2, N-7, IDDE Expert Panel]
5. TP Red = Total Phosphorus Reduction = Daily flow * 0.05 mg / L * (8.345 x 10^{-6} lbs*L/ gal*mg) * 365 days / year * 0.5 [Ref. Protocol 2, N-7, IDDE Expert Panel]
6. ISR = Impervious Surface Restoration = ((TN Load Reduction / 12.14 lb / acre* year) + (TP Load Reduction / 1.56 lb / acre* year)) /2

Appendix M: Progress Status of Milestones

Table M-1: Progress Status of Trash WIP Milestones for FY 2019

Milestones	Status
Install Smith Cove Debris Collector (by MPA)	Alternative location was identified by MPA.

Table M-2: Progress Status of Bacteria WIP Milestones for FY 2019

Milestones	Status
Complete Phase I of microbial source detection study to evaluate impact of 20% restoration, infrastructure improvements, and education / outreach. Propose any changes to TMDL baseline and WLA based on changes to non-point source contribution.	MST study will continue into FY 2020. Evaluation will be included in the FY 2020 Annual report.

Table M-3: Progress Status of PCB WIP Milestones for FY 2019

Milestones	Status
Perform a desktop assessment of previously identified sources of PCBs to prepare an updated inventory of known PCB sources in the watershed. Review current and historic permitted discharges and locations of known contaminated sites in the watershed since TMDL approval. Establish a GIS-based map for all locations.	Complete.
Study the mobility of sediment bound PCBs, including one storm sampling event and one low-flow sampling event will be conducted.	Complete
Estimate the bio-available fraction of PCBs in surface water and sediment porewater using passive samplers. These are the PCBs that are available to the benthic organisms that live in the sediment and to the fish in the surface water.	Complete

Appendix N: Progress Status of Projects, Programs, and Partnerships for 20% Impervious Surface Restoration

MS4 WIP Project ID	BMP Type	Watershed	Location	Drainage Area (ac)	Eq. Imp Area Restored (ac)	Estimated Pollutant Removal (lbs / yr)			Estimated Capital Cost	Schedule to Start (FY)		Status as of 6/30/2019	NOTES
						TN	TP	TSS		Design	Construction		
Structural / Traditional BMPs													
S01	SW Pond Retrofit	Gwynns Falls	Gwynns Run, Carrolton Park	38	25	132	17	15,525	$505,000	2016	2018		Removed due to acces constraints with new BGE utility.
												Removed	
S02	SW Pond Retrofit	Gwynns Falls	Seton Business Park Park	62	41	214	27	25,169	$795,000	2016	2018		Not viable based on access and potential for retro-fit.
												Removed	
S03	Pond Retrofit and New Pond	Back River	North Point Road @ Kane and Quad	92	60	317	40	37,260	$3,290,000	2015	2016		Ex. Pond on RCRA site. Retrofit is not practicable.
												Removed	
S04	Wetland / Pond	Back River	Perring Parkway at Cloville (HR-R28B)	23	15	63	13	8,484	$344,000	2016	2018		Access problems. Project deemed not practicable.
												Removed	
S05	Wetland / Pond	Back River	Herring Run Park below Shannon at Lyndale (HR-R15C)	31	20	84	17	11,465	$550,000	2016	2018		Conflict with active recreation (BCRP).
												Removed	
S06	Wetland	Back River	Herring Run Park below Shannon at Kavon Ave (HR-R39)	31	20	84	17	11,465	$550,000	2016	2018		Area restricted for horizontal expansion.
												Removed	
S07	Wetland	Back River	Herring Run Park below Parkside at Sinclair (HR-R15A)	100	65	275	56	37,260	$1,600,000	2016	2018		Conflict with active recreation (BCRP).
												Removed	
S08	Wetland	Back River	Chinquapin Run Park between Belvedere and Alameda (CH-R6A)	69	45	190	39	25,795	$1,840,000	2016	2018		Project was removed since A05 changed, also based on feasibility.
												Removed	
S09	Bioretention Area	Baltimore Harbor	Faring Baybrook Park Rec Center (MC-18a)	5	3	17	3	1,702	$160,000	2016	2018		Same contract as A23.
				5	3	17	3	1,734	$955,080	2016	2022	Under Design	
S10	Bioretention Area	Gwynns Falls	Park Hts Virginia + Homer	3	2	11	2	1,135	$60,000	2016	2018		Access problems.
												Removed	
S11	Shallow extended detention wetland	Jones Falls	West Coldspring and Brand Ave (LJ-R9)	14	9	46	8	4,624	$212,000	2016	2018		Conflict with active recreation (BCRP).
												Removed	
S12	Shallow wetland	Jones Falls	Woodheights and La Plata (LJ-R38)	6	4	21	3	2,102	$96,000	2016	2018		Access problems.
												Removed	
S13	Shallow wetland	Jones Falls	Lower Lower Stony Run	0	0	0	0	0	$0				Part of Project A02. Total costs shown in A02.
				31	20	107	17	10,614	$0	2016	2018	Completed	
			Subtotal Structural / Traditional (WIP):	**475**	**309**	**1,455**	**243**	**181,986**	**$10,002,000**				
			Subtotal Structural / Traditional (Current):	**36**	**24**	**124**	**20**	**12,348**	**$955,080**				

MS4 WIP Project ID	BMP Type	Watershed	Location	Drainage Area (ac)	Eq. Imp Area Restored (ac)	Estimated Pollutant Removal (lbs / yr)			Estimated Capital Cost	Schedule to Start (FY)		Status as of 6/30/2019	NOTES
						TN	TP	TSS		Design	Construction		
ESD Practices													
E01	Micro-bioretention	Baltimore Harbor	Cloverleaf - northwest of I-895 and Frankfurst Ave (MC-30)	0.5	0.4	2.1	0.34	217	$50,000	2016	2019		Postponed until next permit.
												Removed	
E02	Micro-bioretention	Baltimore Harbor	Bush St. Curb bump-out	0.3	0.2	1.2	0.20	127	$80,000	2011	2016		
				0.3	0.2	1.2	0.19	121	$102,900	2011	2017	Completed	
E03	Micro-bioretention	Baltimore Harbor	Lafayette inner block retrofit.	0.9	0.7	4.0	0.64	411	$240,000	2011	2016		
				0.9	0.7	4.0	0.64	411	$308,900	2011	2017	Completed	
E14	Micro-bioretention	Baltimore Harbor	Bay Brook MS (MC-18b)	0.3	0.3	1.5	0.2	157	$54,000	2015	2016		School scheduled for renovation
												Removed	
E15	Micro-bioretention	Baltimore Harbor	Bay Brook MS (MC-18c)	0.2	0.2	1.1	0.2	115	$46,800	2015	2016		School scheduled for renovation
												Removed	
E16	Micro-bioretention	Baltimore Harbor	Bay Brook MS - parking lot (MC-18d)	0.2	0.2	1.1	0.2	115	$34,800	2015	2016		School scheduled for renovation
												Removed	
E18	Micro-bioretention	Baltimore Harbor	Brooklyn / Curtis Bay	1.1	0.9	5.0	0.8	513	$19,800	2015	2016		2 facilities
				0.9	0.7	4.2	0.7	423	$138,728	2016	2019	Under Design	
E19	Micro-bioretention	Baltimore Harbor	Patterson Park (HA-R5A)	0.3	0.2	1.4	0.2	139	$40,000	2016	2018		Conflict with active recreation (BCRP).
												Removed	
E20	Micro-bioretention	Baltimore Harbor	Ellwood Park (HA-R8)	0.2	0.1	0.7	0.1	72	$21,000	2016	2018		Conflict with active recreation (BCRP).
												Removed	
E21	Micro-bioretention	Baltimore Harbor	Patterson Park Adjunct (HA-R6)	0.8	0.6	3.6	0.6	362	$105,000	2016	2018		Conflict with active recreation (BCRP).
												Removed	
E22	Micro-bioretention	Baltimore Harbor	Patterson Park / Highlandtown / Baltimore Highlands	5.1	4.1	24.1	3.79	2,446	$710,000	2016	2018		15 facilities
				1.6	1.3	7.7	1.22	785	$530,276	2016	2019	Under Design	
E23	Micro-bioretention	Back River	Frankford / Greater Lauraville / Belair-Edison / Cedonia	4.6	3.6	21.6	3.40	2,198	$671,000	2016	2018		32 facilities
				4.8	3.8	22.6	3.55	2,295	$883,183	2016	2019	Under Design	
E24	Micro-bioretention	Back River	Erdman Avenue	1.4	1.2	6.8	1.07	694	$128,000	2016	2018		
				0.5	0.4	2.4	0.37	242	$129,926	2016	2019	Under Design	
E25	Micro-bioretention	Back River	Belair Road	0.3	0.2	1.2	0.20	127	$77,000	2016	2018		
				0.3	0.2	1.2	0.20	127	$64,693	2016	2019	Under Design	

MS4 WIP Project ID	BMP Type	Watershed	Location	Drainage Area (ac)	Eq. Imp Area Restored (ac)	Estimated Pollutant Removal (lbs / yr)			Estimated Capital Cost	Schedule to Start (FY)		Status as of 6/30/2019	NOTES
						TN	TP	TSS		Design	Construction		
E26	Micro-bioretention	Jones Falls	Hampden / Remington / Wyman Park	6.3	5.0	29.7	4.67	3,020	$850,000	2016	2018		11 facilities
				1.3	1.0	5.9	0.93	604	$346,821	2016	2019	Under Design	
E27	Micro-bioretention	Gwynns Falls	Howard Park / Grove Park / West Arlington / Fairmount	3.1	2.5	14.9	2.34	1,510	$420,000	2016	2018		14 facilities
				2.9	2.3	13.7	2.15	1,389	$569,043	2016	2019	Under Design	
E28	Micro-bioretention	Gwynns Falls	Hunting Ridge / Rognel Hts / Edmondson Village / Edgewood	3.1	2.5	14.9	2.34	1,510	$420,000	2016	2018		12 facilities
				1.9	1.5	8.9	1.40	906	$371,114	2016	2019	Under Design	
E29	Micro-bioretention	Baltimore Harbor	Sharp-Leadenhall / Federal Hill / Otterbein / S. Baltimore	1.6	1.3	7.4	1.17	755	$215,000	2016	2018		7 facilities
				0.9	0.7	4.2	0.65	423	$208,092	2016	2019	Under Design	
E30	Micro-bioretention	L. N. Branch Patapsco	Cherry Hill	3.1	2.5	14.9	2.34	1,510	$500,000	2016	2018		
				1.9	1.5	8.9	1.40	906	$1,233,400	2015	2019	Under Design	
E31	Micro-bioretention	Baltimore Harbor	Lakeland / Mt. Winans / Westport	1.6	1.3	7.4	1.17	755	$420,000	2016	2018		
				3.3	2.6	15.4	2.43	1,570	$408,851	2016	2019	Under Design	
E32	Micro-bioretention	Baltimore Harbor	McElderry Park / CARE / Milton-Montford / Patterson Place	3.1	2.5	14.9	2.34	1,510	$438,000	2016	2018		
				0.5	0.4	2.4	0.37	242	$324,364	2016	2019	Under Design	
E33	Micro-bioretention	Gwynns Falls	Greater Mondawmin / Walbrook / Rosemont / NW Community Action /	3.1	2.5	14.9	2.34	1,510	$438,000	2016	2018		
				1.0	0.8	4.8	0.75	483	$2,140,081	2016	2019	Under Design	
E34	Micro-bioretention	Jones Falls	Mt. Washington / Glen / Cheswolde / Cross Country	6.3	5.0	29.7	4.67	3,020	$1,350,000	2016	2018		
				0.4	0.3	1.8	0.28	181	$1,284,405	2016	2019	Under Design	
E35	Micro-bioretention	Back River	Cameron Village / Chinquapin Park (upstream to Chinquapin Run)	5.0	4.0	23.8	3.74	2,416	$680,000	2017	2019		
				3.3	2.6	15.4	2.43	1,570	$664,040	2016	2019	Under Design	
E36	Micro-bioretention	Back River	De Wees Park	1.3	1.0	5.9	0.93	604	$180,000	2017	2019		No viable projects founds.
												Removed	
E37	Micro-bioretention	Back River	Orchard Ridge / Armistead Gardens / Orangeville	6.3	5.0	29.7	4.67	3,020	$630,000	2017	2019		No viable projects founds.
												Removed	
E38	Micro-bioretention	Jones Falls	Central Park Heights / Towanda Grantley / Lucille Park	3.1	4.0	14.9	2.34	1,510	$513,000	2017	2019		
				5.0	4.0	23.8	3.74	2,416	$454,742	2016	2019	Under Design	
E39	Micro-bioretention	Gwynns Falls	MorrellPark / Wilhelm Park / Gwynns Falls / Carroll-South Hilton	3.1	6.0	14.9	2.34	1,510	$625,000	2017	2019		
				7.5	6.0	35.6	5.61	3,623	$1,437,153	2016	2019	Under Design	

MS4 WIP Project ID	BMP Type	Watershed	Location	Drainage Area (ac)	Eq. Imp Area Restored (ac)	Estimated Pollutant Removal (lbs / yr)			Estimated Capital Cost	Schedule to Start (FY)		Status as of 6/30/2019	NOTES
						TN	TP	TSS		Design	Construction		
E41	Micro-bioretention	Back River	Clifton Park	0.3	0.2	1.2	0.19	121	$35,000	2017	2019		Conflict with active recreation (BCRP).
												Removed	
E42	Micro-bioretention	Back River	Clifton Park	2.9	2.3	13.7	2.15	1,389	$400,000	2017	2019		Conflict with active recreation (BCRP).
												Removed	
			Subtotal ESD Practices (WIP):	**69**	**60**	**328**	**52**	**33,359**	**$10,391,400**				
			Subtotal ESD Practices (Current):	**39**	**31**	**184**	**29**	**18,715**	**$11,600,712**				
Alternative BMPs (Stream Restoration)-- Drainage Area = Stream Restoration Length (LF)													
A01	Stream Restoration	Gwynns Falls	Leakin Park Stream Restoration at Fairmount Storm Drain	2,080 LF	21	156	141	62,400	$700,000	2010	2014		
				2,080 LF	21	156	141	62,400	$700,000	2010	2014	Completed	
A02	Stream Restoration	Jones Falls	Lower Lower Stony Run	4,500 LF	45	338	306	135,000	$4,030,000	2015	2016		Cost includes S13 and A43.
				4,600 LF	46	345	313	138,000	$4,199,700	2015	2017	Completed	
A03	Stream Restoration	Gwynns Falls	Powder Mill Phase 1	3,900 LF	39	293	265	117,000	$3,420,000	2009	2017		Proposed to align with sanitary improvements.
				3,900 LF	39	293	265	117,000	$6,140,947	2009	2021	Under design	
A04	Stream Restoration	Jones Falls	East Stony Run Project 1	800 LF	8	60	54	24,000	$839,000	2014	2017		
				800 LF	8	60	54	24,000	$1,135,000	2014	2017	Completed	
A05	Stream Restoration	Back River	Chinquapin Run Project 1	2,200 LF	22	165	150	66,000	$3,670,000	2014	2017		Increased length to coincide with sanitary replacement project.
				10,100 LF	101	758	687	303,000	$10,447,503	2014	2021	Under Construction	
A06	Stream Restoration	Back River	Chinquapin Run Project 2	2,600 LF	26	195	177	78,000	$1,772,000	2015	2017		Coincides with A06.
				2,600 LF	26	195	177	78,000	$2,611,876	2015	2021	Under Construction	
A07	Stream Restoration	Gwynns Falls	Franklintown Culvert	2,400 LF	24	180	163	72,000	$1,700,000	2015	2018		Protests from community groups related to tree removal. Alternatives analysis postponed project.
				2,900 LF	29	218	197	87,000	$5,515,082	2015	2022	Under Design	
A08	Stream Restoration	Back River	Lower Moore's Run Project 2	2,500 LF	25	188	170	75,000	$1,960,000	2015	2018		Project no longer.
								0				Removed	
A09	Stream Restoration	Back River	Biddison Run Project 2	3,030 LF	30	227	206	90,900	$3,590,000	2014	2018		Pending right-of-entry agreements.
				3,060 LF	31	230	208	91,800	$3,748,949	2014	2022	Under design	
A10	Stream Restoration	Jones Falls	Western Run at Kelly Avenue	800 LF	8	60	54	24,000	$1,324,600	2015	2018		FEMA review required re-design.
				2,600 LF	26	195	177	78,000	$5,294,935	2016	2023	Under Design	
A11	Stream Restoration	Jones Falls	East Stony Run Project 2	1,340 LF	13	101	91	40,200	$2,040,000	2015	2018		Postponed due to increased scope of A10 and access issues.
												Removed	

MS4 WIP Project ID	BMP Type	Watershed	Location	Drainage Area (ac)	Eq. Imp Area Restored (ac)	Estimated Pollutant Removal (lbs / yr)			Estimated Capital Cost	Schedule to Start (FY)		Status as of 6/30/2019	NOTES
						TN	TP	TSS		Design	Construction		
A12	Stream Restoration	Back River	Biddison Run Projects 3	3,850 LF	39	289	262	115,500	$1,800,000	2014	2018		Will be advertised with A09 - Biddison Run Project 2.
				3,850 LF	39	289	262	115,500	$4,726,935	2014	2022	Under design	
A13	Stream Restoration	Back River	Moore's Run Restoration Project 1	2,500 LF	25	188	170	75,000	$1,822,000	2015	2018		Pending right-of-entry agreements.
				3,700 LF	37	278	252	111,000	$4,909,153	2016	2022	Under Design	
A14	Stream Restoration	Back River	Moore's Run Restoration Project 2	2,800 LF	28	210	190	84,000	$1,822,000	2015	2018		Will be advertised with A13 - Moore's Run Stream Restoration
				2,800 LF	28	210	190	84,000	$3,681,864	2016	2022	Under Design	
A15	Stream Restoration	Back River	Herring Run stream	2,665 LF	27	200	181	79,950	$2,702,000	2015	2018		Postponed due to increase of A05 scope
												Removed	
A16	Stream Restoration	Jones Falls	Druid Hill Park Stream Project	1,875 LF	19	141	128	56,250	$2,702,000	2015	2018		Postponed due to increased scope of A10.
												Removed	
A17	Stream Restoration	Gwynns Falls	Dead Run (Huntington Ridge)	2,600 LF	26	195	177	78,000	$2,702,000	2015	2018		Protests from community groups related to tree removal. Alternatives analysis postponed project.
				600 LF	6	45	41	18,000	$2,589,956	2017	2023	Under design	
A18	Stream Restoration	Gwynns Falls	Maiden's Choice	2,600 LF	26	195	177	78,000	$2,702,000	2015	2018		Access problems. Project deemed not practicable.
												Removed	
A19	Stream Restoration	Gwynns Falls	Maiden's Choice Tributary (Upland)	2,300 LF	23	173	156	69,000	$2,702,000	2015	2018		Delays due to forest mitigation approvals. Anticipate advertising in 2021.
				2,700 LF	27	203	184	81,000	$3,112,295	2017	2022	Under design	
A20	Stream Restoration	Gwynns Falls	Dead Run	2,200 LF	22	165	150	66,000	$2,702,000	2016	2019		Advertised with A19.
				2,700 LF	27	203	184	81,000	$3,493,124	2017	2022	Under design	
A21	Stream Restoration	Back River	Herring Run Western Branch	2,675 LF	27	201	182	80,250	$2,702,000	2016	2019		Advertised with A19.
				3,800 LF	38	285	258	114,000	$4,900,000	2017	2022	Under design	
			Subtotal Alternative BMPs (Stream Restoration) (WIP):	**52,215 LF**	**522**	**3,916**	**3,551**	**1,566,450**	**$49,403,600**				
			Subtotal Alternative BMPs (Stream Restoration) (Current):	**52,790 LF**	**528**	**3,959**	**3,590**	**1,583,700**	**$67,207,319**				
Alternative BMPs (Other)													
A22	Regenerative Step Pool Storm Conveyance	Gwynns Falls	Seamon Avenue	20	6	139	11	5,068	$1,168,000	2015	2017		Pending right-of-entry agreements.
				20	6	139	11	5,120	$1,403,750	2015	2022	Under design	
A23	IA Removal, afforestation, bioretention	Baltimore Harbor	CARE Communities / McElderry Park / Milton-Montford	3.1	3.75	19.2	4.34	2,852	$496,000	2016	2018		Delays due to design contract procurement and financing (EIB).
				0.3	0.25	1.8	0.42	274	$48,800	2016	2022	Under Design	
A24	IA Removal, afforestation	Baltimore Harbor	Harford Hts ES (HA-R19)	0.9	0.60	3.3	0.92	523	$110,000	2016	2018		INSPIRE School- construction conflict
												Removed	

MS4 WIP Project ID	BMP Type	Watershed	Location	Drainage Area (ac)	Eq. Imp Area Restored (ac)	Estimated Pollutant Removal (lbs / yr)			Estimated Capital Cost	Schedule to Start (FY)		Status as of 6/30/2019	NOTES
						TN	TP	TSS		Design	Construction		
A25	IA Removal, afforestation, bioretention	Back River	Northwood ES and Rec Center (CH-R2A)	2.4	2.85	14.6	3.30	2,167	$565,000	2016	2018		INSPIRE School- construction conflict
												Removed	
A26	IA Removal, afforestation	Back River	Sinclair Lane ES (HR-R18)	1.9	1.31	7.3	2.03	1,154	$260,400	2016	2018		Construction schedule constrained by school year calendar.
				1.4	1.00	5.6	1.54	877	$484,417	2016	2020	Under Construction	
A27	IA Removal, afforestation	Back River	WEB DuBois (HR-R29A)	0.8	0.53	2.9	0.81	461	$104,200	2016	2018		Postponed to next permit.
												Removed	
A28	IA Removal, afforestation, bioretention	Back River	Various Schools	0.5	0.6	3.1	0.70	456	$120,000	2016	2018		Same contract as A26.
				1.0	0.54	6.2	1.39	913	$266,985	2016	2020	Under Construction	
A29	IA Removal, afforestation, bioretention	Gwynns Falls	Mt. Winans	3.1	3.75	19.2	4.34	2,852	$496,000	2016	2018		Same contract as A23.
				3.8	3	23.1	5.21	3,422	$585,554	2016	2022	Under Design	
A30	IA Removal, afforestation, bioretention	Back River	Montebello ES (HR-R41A)	0.9	1.05	5.4	1.22	799	$208,000	2016	2018		INSPIRE School- construction conflict
												Removed	
A31	IA Removal, afforestation, bioretention	City-wide	Various Schools	1.5	1.76	9.0	2.03	1,335	$350,000	2016	2018		Same contract as A23.
				7.5	6.25	46.1	10.43	6,845	$199,697	2016	2022	Under Design	
A32	IA Removal, afforestation, bioretention	Jones Falls	Pimlico ES (LJ-R6)	1.1	1.35	6.9	1.56	1,027	$268,000	2016	2018		INSPIRE School- construction conflict
												Removed	
A33	IA Removal, afforestation, bioretention	Jones Falls	Poly Western HS (LJ-R8C)	1.4	1.65	8.5	1.91	1,255	$328,000	2016	2018		Same contract as A23.
				0.9	0.74	5.7	1.29	844	$1,060,164	2016	2022	Under Design	
A34	IA Removal, afforestation, bioretention	Baltimore Harbor	Duane Avenue Park - parking lot (MC-21)	0.3	0.35	1.8	0.40	262	$42,000	2016	2018		Current demand for parking lot.
												Removed	
A35	IA Removal, afforestation	Baltimore Harbor	Oliver / Broadway East	4.0	2.8	15.6	4.32	2,461	$496,000	2017	2019		Locations were not practicable.
												Removed	
A36	IA Removal, afforestation	Gwynns Falls	Carrollton Ridge / Shipley Hill / Mill Hill / Pigtown / New Southwest / Union	4.0	2.8	15.6	4.32	2,461	$496,000	2017	2019		Same contract as A23.
				0.2	0.2	0.8	0.22	123	$149,788	2016	2022	Under Design	
A37	IA Removal, afforestation	Baltimore Harbor	Harlem Park / Sandtown-Winchester / Uplands	2.0	1.40	7.8	2.16	1,230	$248,000	2017	2019		Same contract as A23.
				4.9	4.88	19.0	5.27	3,002	$3,609,904	2016	2022	Under Design	
A38	IA Removal, afforestation	Baltimore Harbor	Various Schools	2.0	1.40	7.8	2.16	1,230	$248,000	2017	2019		Same contract as A23.
				2.6	2.56	10.0	2.76	1,575	$530,083	2016	2022	Under Design	

MS4 WIP Project ID	BMP Type	Watershed	Location	Drainage Area (ac)	Eq. Imp Area Restored (ac)	Estimated Pollutant Removal (lbs / yr)			Estimated Capital Cost	Schedule to Start (FY)		Status as of 6/30/2019	NOTES
						TN	TP	TSS		Design	Construction		
A39	Aforestation of IA	Gwynns Falls	TreeBaltimore Street Trees	2.0	1.40	19.3	2.29	1,121	$496,000	2017	2019		Shown as part of partnerships.
												Partnership	
A40	Aforestation of IA	Gwynns Falls	TreeBaltimore Street Trees	8.3	5.81	90.2	13.19	6,793	$496,000	NA	2017		Shown as part of partnerships.
												Partnership	
A41	Aforestation of IA	Jones Falls	TreeBaltimore Street Trees	8.3	5.81	90.2	13.19	6,793	$496,000	NA	2018		Shown as part of partnerships.
												Partnership	
A42	Aforestation of IA	City-Wide	TreeBaltimore Street Trees	4.2	2.91	45.1	6.59	3,396	$248,000	NA	2019		Shown as part of partnerships.
												Partnership	
A43	Regenerative Step Pool Storm Conveyance	Jones Falls	Lower Lower Stony Run	0	0	0	0	0	$0				Part of Project A02. Total costs shown in A02.
				5	5	44	6	3,080	$0	2015	2017	Completed	
			Subtotal Alternative BMPs (Other) (WIP):	**72**	**50**	**531**	**82**	**45,696**	**7,739,600**				
			Subtotal Alternative BMPs (Other) (Current):	**48**	**31**	**301**	**45**	**26,074**	**8,339,142**				
			Total Projects (WIP):		**941**	**6,230**	**3,927**	**1,827,491**	**$77,536,600**	**84**	**Projects**	**Proposed**	
			Total Projects (Current):		**613**	**4,568**	**3,684**	**1,640,837**	**$88,102,253**	**48**	**Projects**	**Proposed**	
					0	0	0	0	$0	0	Projects	Pending	
					383	2,887	2,285	1,019,422	$67,844,972	37	Projects	Under Design	
					129	964	867	382,789	$13,810,781	4	Projects	Under Construction	
					101	716	533	238,626	$6,446,500	7	Projects	Completed	

Project No. / Type	Equivalent Impervious Surface Restoration, ISR (ac)	Reference Metric		Estimated Pollutant Removal (lbs / yr)			NOTES
				TN	TP	TSS	
Street Sweeping							
Sub-total Street Sweeping at full expansion (WIP):	**5,347**	**19,097**	**tons**	**46,788**	**18,715**	**5,614,518**	Ref: WIP, which only listed tonnage as reference metric.
Sub-total Street sweeping (Current Annual Total):	**5,475**	**80,187**	**lane miles**	**24,639**	**1,718**	**3,790,658**	Equivalent ISR is based on lane miles swept min. 2x /month. See Section 6.3.2.
Street Sweeping (Annual, as of Dec. 2009)	**4,790**	**70,143**	**lane miles**	**21,553**	**1,503**	**3,315,851**	Ref: MS4 Annual Report for CY 2009. All operations assumed as min. 2 x / month.
Increased Street Sweeping (Planned)	**1,766**	***25,857***	**lane miles**	**7,945**	**554**	**1,222,331**	Only current increase of street sweeping is used for TMDL compliance.
Increased Street Sweeping (Current)	**686**	**10,044**	**lane miles**	**3,086**	**215**	**474,807**	
Inlet Cleaning & Debris Collection							
Collection within CY 2012	259	926	tons	2,269	907	272,244	Ref: MS4 Annual Report (Jan. 2011 to Dec. 2012). Inlet amount is total inlet cleaning.
Anticipated Increase after Asset Management (4% Inlets cleaned quarterly):	277	990	tons	2,426	970	291,060	Ref: Preliminary Asset Management Program and CIP Schedule for Inlet Screens.
Sub-total Preventive Inlet Cleaning (WIP):	**536**	**1,916**	**tons**	**4,694**	**1,878**	**563,304**	
Sub-total Inlet Cleaning (Current Annual Total):	**393.2**	**983**	**tons**	**2,408**	**963**	**289,002**	Tonnage reflects dry weight, due to procedure change in 2016. Does not include data for cleaning during ransomware (May 7 to June 30, 3019). Only portion of proactive cleaning is used for TMDL compliance, Appendices O and P.
Reactive Inlet Cleaning (daily operation):	*307.2*	*768*	*tons*	*1,882*	*753*	*225,792*	
Targeted preventive cleaning (quarterly):	*86.0*	*215*	*tons*	*527*	*211*	*63,210*	
Illicit Discharge Detection and Elimination Program							
Sanitary Direct Connection	**NA**	10	connections	100	18	**NA**	
Sanitary Direct Connection (current)	**160.0**	15	connections	1,608	292	**NA**	Nutrient reductions per CBP protocol N-5, default values, see Appendix L.
Sewage Exfiltration	**NA**	300	miles lined	5,000	909	**NA**	
Sewage Exfiltration (current)	**104.4**	72	locations	1,054	191		Nutrient reductions per CBP protocol N-6, default values, see Appendix L.
Drinking Water Transmission	**NA**	60	miles lined / replaced	1,500	273	**NA**	
Drinking Water Transmission (current)	**28.1**	14	locations	555	16		Nutrient reductions per CBP protocol N-7, default values, see Appendix L.
Dry Weather SSO	**NA**	30	SSOs / yr red	350	64	**NA**	Asset management / FOG program, education, enforcement, and enhanced IDDE

Project No. / Type	Equivalent Impervious Surface Restoration, ISR (ac)	Reference Metric	Estimated Pollutant Removal (lbs / yr)			NOTES
			TN	TP	TSS	
Sub-total IDDE (WIP):			**8,559**	**1,471**	**0**	
Sub-total IDDE (Current):	**292.5**		**3,217**	**500**	**0**	See Appendix L for watershed designation used in local TMDL compliance (Appendix P).
TOTAL Programs (WIP):	**5,883**		**60,041**	**22,064**	**6,177,822**	
TOTAL Programs (Current):	**6,161**		**30,265**	**3,181**	**4,079,660**	

Project No. / Type	Source ID	Watershed	Location	Eq. Imp Area Restored (ac)	Estimated Pollutant Removal (lbs / yr)		
					TN	TP	TSS
Development							
Impervious area to pervious	DPW-PRI	City-wide	City-wide	73.8	183	71	38,028
				3.1	4	1	365
Treatment by ESD	DPW-PRI	City-wide	City-wide	21.4	102	10	8,539
				278.3	751	42	25,327
Treatment by Traditional	DPW-PRI	City-wide	City-wide	54.7	260	26	21,805
				206.1	557	31	18,757
			Sub-total Development (WIP):	**150**	**545**	**107**	**68,372**
Sub-total Development (Actual Completed in Jan. 2010 to June 2019):				**488**	**1,312**	**74**	**44,449**
Voluntary - included in the estimate for Development							
Impervious Removal	BWB	Jones Falls	Guilford ES/MS	0.28	0.4	0.1	33
	BWB			0.22	1.1	0.1	52
Impervious Removal	BWB	Gwynns Falls	Calvin Rodwell ES	0.13	1.4	0.2	106.4
Micro-bioretention	BWB	Baltimore Harbor	Library Square	1.1	5.3	0.5	261
	BWB			0.6	2.8	0.3	139

Project No. / Type	Source ID	Watershed	Location	Eq. Imp Area Restored (ac)	Estimated Pollutant Removal (lbs / yr)		
					TN	TP	TSS
IA Removal, Rain Garden	DOT	Baltimore Harbor	200 N. Duncan Street	0.45	2.3	0.5	342
				0.08	1.0	0.1	59
IA Removal, afforestation	DOT	Baltimore Harbor	2300-2400 Eager St	1.5	7.7	1.7	1141
IA Removal, afforestation, bioretention	GGI Design Comp	Gwynns Falls	2306-8 Riggs Street	0.81	4.2	0.9	616
	CBF			0.18	2.2	0.3	133
IA Removal, afforestation, bioretention	GGI Design Comp	Back River	CHM Gateway 32nd & Harford	0.18	0.9	0.2	137
	Civicworks			0.09	1.1	0.1	67
IA Removal, afforestation, bioretention	GGI Design Comp	Baltimore Harbor	Day Spring Green Parking 1100 block N. Bradford	0.36	1.8	0.4	274
IA Removal, afforestation	GGI Design Comp	Baltimore Harbor	Druid Heights Peace Park Bloom & Druid Hill Ave	0.15	0.8	0.2	114
	Druid Hts CDC			0.04	0.5	0.1	30
IA Removal, afforestation	GGI Design Comp	Baltimore Harbor	Hollins Roundhouse Lots of Art1218-20 W. Lombard	0.06	0.3	0.1	46
	PPF			0.2	2.4	0.3	148
IA Removal, afforestation, and rainwater harvesting	GGI Design Comp	Baltimore Harbor	Janes House of Inspiration A-maze-N Lot728 North Avenue	0.20	1.0	0.2	148

Project No. / Type	Source ID	Watershed	Location	Eq. Imp Area Restored (ac)	Estimated Pollutant Removal (lbs / yr)		
					TN	TP	TSS
IA Removal, afforestation	GGI Design Comp	Baltimore Harbor	Flower Farm1400 block Gay Street	0.75	3.8	0.9	570
	Civicworks			0.16	1.9	0.2	118
Aforestation of IA	Tree Baltimore	Baltimore Harbor	TBD	25.2	273.7	40.0	20,623.7
			9,452 trees	47.6	807.2	52.2	20,038
Aforestation of IA	Tree Baltimore	Gwynns Falls	TBD	23.1	250.9	36.7	18,905.0
			8,542 trees	43.1	729.5	47.2	18,109
Aforestation of IA	Tree Baltimore	Jones Falls	TBD	19.6	212.9	31.1	16,040.6
			6,525 trees	32.9	557.2	36.0	13,833
Aforestation of IA	Tree Baltimore	Back River	TBD	21.0	228.1	33.4	17,186.4
			4,296 trees	21.7	366.9	23.7	9,108
Not included in WIP							
Aforestation of IA	Tree Baltimore	LNBP	1,330 trees	6.7	113.6	7.3	2,820
Mico-bioretention	BWB	Back River	Episcopal Church of the Holy Cove	0.16	0.8	0.1	38
Micro-bioretention, Filterra, IA Removal	PPF	Baltimore Harbor	Second Chance	0.29	1.4	0.1	69
Rain Gardens	Cylburn Arboretum	Jones Falls	Cylburn Arboretum Mansion Hous	0.09	0.8	0.1	59
Rain Garden, IA Removal	BWB	LNBP	St. Johns Rain Garden	0.12	0.6	0.1	29

Project No. / Type	Source ID	Watershed	Location	Eq. Imp Area Restored (ac)	Estimated Pollutant Removal (lbs / yr)		
					TN	TP	TSS
Micro-bioretention	Waterfront Partnership	Baltimore Harbor	Harris Creek Bioretention	0.15	0.7	0.1	36
Micro-bioretention	BWB	Gwynns Falls	Mt. Lebanon Stormwater Planter	0.03	0.1	0.0	7
IA Removal	PPF	Gwynns Falls	Harlem Park Inner Blocks	0.87	10.6	1.4	644
Bioretention	Green Street Academy	Gwynns Falls	Green Street Academy	0.37	1.8	0.2	88
Sidewalk planters	PPF	Jones Falls	Samuel Coleridge-Taylor	0.38	4.6	0.6	281
Micro-bioretention	PPF	Gwynns Falls	Mt. Winans Green Space	0.41	2.0	0.2	97
Micro-bioretention	BWB	Baltimore Harbor	Blue Alley - Bumpouts	0.63	3.0	0.3	150
Bioretention	PPF	Gwynns Falls	Baltimore Street Trolley Turnarou	0.44	2.1	0.2	105
Bioretention	BWB	Baltimore Harbor	Medstar Harbor Hospital	5.27	25.4	2.3	1,252
Bioretention	PPF	Baltimore Harbor	Ambrose Kennedy Park	0.60	2.9	0.3	143
Bioretention	Downtown Partnership	Baltimore Harbor	400 E. Pratt Street	0.13	0.6	0.1	31
Bioswales	BWB	Baltimore Harbor	Prince of Peace	0.26	1.3	0.1	62
Micro-bioretention	BWB	Baltimore Harbor	Gallery Church	0.13	0.6	0.1	31
Micro-bioretention	BWB	Back River	St. Anthony of Padua	0.41	2.0	0.2	97
Rain Garden	BWB	Baltimore Harbor	Amazing Gace / Port Street	0.22	1.1	0.1	52
Regenerative Stormwater Conveyance	PPF	Gwynns Falls	Gwynns Falls Millrace	0.70	10	1	500

Project No. / Type	Source ID	Watershed	Location	Eq. Imp Area Restored (ac)	Estimated Pollutant Removal (lbs / yr)		
					TN	TP	TSS
Rain Gardens	BWB	Baltimore Harbor	St. Helena Community Association	0.35	1.7	0.2	83
			Sub-total Volunteer (WIP):	**95**	**996**	**147**	**76,545**
		Sub-total Volunteer (Actual- Completed):		**165**	**2662**	**175**	**68,507**
SW Fee Credit program							
Treatment BMPs	SAIS	City-wide	City-wide	24.0	206.7	26.5	16,157
Private tree planting (Reforestation on pervious)	SAIS	City-wide	City-wide	7.6	142.6	6.6	1596
				6.1	114.0	5.3	1277
Rain gardens	SAIS	City-wide	City-wide	2.0	17.2	2.2	1,346
Rainwater harvesting	SAIS	City-wide	City-wide	0.5	12.4	1.0	485
			Subtotal SW Fee Credit (WIP):	**34.1**	**378.9**	**36.3**	**19,584**
			Subtotal SW Fee Credit (Actual):	**6.1**	**114.0**	**5.3**	**1,277**
			Total for Partnerships (WIP):	**279**	**1,919**	**290**	**164,500**
	Total for Partnerships (Actual Completed 1/2010 -6/2019):			**659**	**4,088**	**255**	**114,232**

Appendix O: Progress of Chesapeake Bay TMDL

Watershed	Area within City (sq. mi.)[1]	Area within City (acres)	Imp. Area[2]	Forest Area[3]	TN (lbs)	TP (lbs)	TSS (tons)
Back River	19.1	12,224	4,584	449	149,214	10,911	2,534
Baltimore Harbor	22.5	14,400	5,949	225	180,574	13,627	3,200
Gwynns Falls	20.7	13,248	5,605	742	162,636	12,559	2,972
Jones Falls	17.5	11,200	4,816	719	137,139	10,690	2,537
LNB Patapsco	1.8	1,152	502	112	13,842	1,098	262
Total	**81.6**	**52,224**	**21,456**	**2,247**	**643,404**	**48,884**	**11,505**
Urban Impervious Loading Rate (/ acre)[4]					15.3	1.69	0.44
Urban Pervious Loading Rate (/ acre)[4]					10.8	0.43	0.07
Forest Loading Rate (/ acre)[5]					3.16	0.16	0.03

Reference:

1 -Baltimore City MS4 and TMDL WIP, Table 1, August 2015.

2 - Baltimore City MS4 and TMDL WIP, Table 1, 2015, total = 21,456 ac uncontrolled IA.

3 - 2009 conditions, MAST Scenario, total forest = 2,247 ac.

4 - Table A.1, Appendix C from MS4 Accounting Guidelines, August 2014. CBWM version 5.3.2 loading rates.

5 - Table D.1, Appendix D from MS4 Accounting Guidelines, August 2014. CBWM version 5.3.0 loading rates.

Location	Estimated Pollutant Removal (lbs / yr)			Reference
	TN	TP	TSS	
Chesapeake Bay Loading for Baltimore City	418,243	32,870	22,025,806	Bay TMDL MAST Scenario 2010 for City
Reduction Goal for Urban Stormwater:	84,903	9,960	418,490	Maryland's Phase II WIP for Bay TMDL, Oct. 2012, Executive Summary
	20.3%	*30.3%*	*1.9%*	
Analysis based on MS4 Accounting Guidelines				
Total Loading	**643,404**	**48,884**	**23,009,040**	Table O-1
Reduction Goal:	*130,611*	*14,812*	*437,172*	Based on % reduction goals from Bay TMDL.
Projects related to current MS4 permit:				
Total Projects (WIP):	6,230	3,927	1,827,491	Table N-1. Current planned projects will be completed as shown.
Total Projects (Current Planned):	4,568	3,684	1,640,837	
Total Projects (Current Completed):	**716**	**533**	**238,626**	
Programs related to current MS4 permit:				
Total Programs (WIP)[1]:	36,220	19,653	2,589,727	Table N-2. Only accounts for increase after CY 2009.
Total Programs (Current Planned)[2]:	13,588	2,024	1,513,391	
Total Programs (Current)[3]:	**6,830**	**926**	**538,017**	
Partnerships related current MS4 permit:				
Total Partnerships (WIP):	1,919	290	164,500	Table N-3.
Total Parnerships (Current Planned)[4]	4,293	267	119,944	
Total Partnerships (Current):	**4,088**	**255**	**114,232**	
Total Reduction (WIP):	44,369	23,871	4,581,718	
% Reduction (WIP):	7%	49%	20%	
Total Reduction (Current):	**11,635**	**1,713**	**890,875**	
% Reduction (Current):	**2%**	**4%**	**4%**	

Location	Estimated Pollutant Removal (lbs / yr)			Reference
	TN	TP	TSS	
Total Reduction (Planned):	22,448	5,975	3,274,172	
% Reduction (Planned)	3%	12%	14%	
Remaining to meet local TMDL:	108,163	8,837	0	

NOTES:

1- Total WIP programs includes the increased street sweeping (WIP values less the CY 2009 values), ant. Increase of inlet cleaning, and WIP- IDDE estimates.

2- Total planned programs includes planned increased street sweeping, ant. increase of inlet cleaning, and current IDDE values.

3- Total current programs includes the current increased street sweeping, current proactive inlet cleaning, and current IDDE values.

4 - Planned partnerships assumes 5% increase by FY 2021.

Appendix P: Progress of Local TMDLs for Nutrients and Sediment

BMP Type	Estimated Pollutant Removal (lbs / yr) TN	TP	NOTES
TMDL Baseline Load:	**73,429**	**8,315**	TMDL for Back River (2005)
% Reduction Goal:	*15%*	*15%*	TMDL for Back River (2005)
Baseline Load using MDE-AG:	**149,214**	**10,911**	Table O-1.
Reduction Goal:	22,382	1,637	Based on % reduction goals.
BMPs installed between 2005 and 2010:			
Stream Restoration	113	102	Previous MS4 Annual Reports. 1,500 LF .
Private / Other City BMPs	24	3	Appendix B of WIP.
Total	136	105	
Projects related to current MS4 permit:			
Total Projects (WIP):	3,011	1,895	Table N-1. Current planned projects will be completed as shown.
Total Projects (Current Planned):	2,297	2,043	
Total Projects (Current Completed):	0	0	
Programs related current MS4 permit:			
Total Programs (WIP)[1]:	3,829	172	Table N-2.
Total Programs (Current Planned)[2]:	2,753	113	
Total Programs (Current)[3]:	219	38	
Partnerships related current MS4 permit:			
Total Partnerships (WIP):	410	62	Table N-3.
Total Parnerships (Current Planned)[4]	707	43	
Total Partnerships (Current):	674	41	
Total Reduction (WIP):	7,387	2,233	
% Reduction (WIP):	5%	20%	
Total Reduction (Current):	**1,028**	**184**	
% Reduction (Current):	**1%**	**2%**	
Total Reduction (Planned):	5,894	2,304	
% Reduction (Planned)	4%	21%	
Remaining to meet local TMDL:	16,489	0	Local TP TMDL will be met.

NOTES:

1- Total WIP programs includes the increased street sweeping (WIP values less the CY 2009 values), ant. Increase of inlet cleaning, and WIP- IDDE estimates.

2- Total planned programs includes planned increased street sweeping, ant. increase of inlet cleaning, and current IDDE values.

3- Total current programs includes the current increased street sweeping, current proactive inlet cleaning, and current IDDE values.

4 - Planned partnerships assumes 5% increase by FY 2021.

BMP Type	Estimated Pollutant Removal (lbs / yr)		NOTES
	TN	TP	
TMDL Baseline Load:	**260,323**	**28,177**	TMDL for Baltimore Harbor (2007), includes GF, JF, and LNBP
% Reduction Goal:	*15%*	*15%*	
Baseline Load using MDE AG:	**494,190**	**37,973**	Table O-1
Reduction Goal:	**74,129**	**5,696**	Based on % reduction goals.
BMPs installed between 2005 and 2010:			
ESD Practices -GF	20	3	Previous MS4 Annual Reports.
Stream Restoration -JF	139	126	Previous MS4 Annual Reports. 1,850 LF
Stream Restoration - GF	203	184	Previous MS4 Annual Reports. 2,700 LF
Private / Other City BMPs - GF	4	1	Appendix B of WIP.
Private / Other City BMPs -JF	84	10	Appendix B of WIP.
Private / Other City BMPs - BH	34	5	Appendix B of WIP.
Private / Other City BMPs - BR	24	3	Appendix B of WIP.
Total:	508	331	
Projects proposed related current MS4 permit:			
Total Projects (WIP):	3,219	2,032	Table N-1. Current planned projects will be completed as shown.
Total Projects (Current Planned):	2,271	1,640	
Total Projects (Current Completed):	716	533	
Programs proposed related to current MS4 permit:			
Total Programs (WIP)[1]:	26,038	2,802	Table N-2
Total Programs (Current Planned)[2]:	13,056	1,912	
Total Programs (Current)[3]:	6,612	888	
Partnerships related to current MS4 permit:			
Total Partnerships (WIP):	1,509	228	Table N-3.
Total Parnerships (Current Planned)[4]	**3,586**	**224**	
Total Partnerships (Current):	**3,416**	**213**	
Total Reduction (WIP):	31,273	5,393	
% Reduction (WIP):	6%	14%	
Total Reduction (Current):	**11,252**	**1,965**	
% Reduction (Current):	**2%**	**5%**	

BMP Type	Estimated Pollutant Removal (lbs / yr)		NOTES
	TN	TP	
Total Reduction (Planned):	19,422	4,107	
% Reduction (Planned)	4%	11%	
Remaining to meet local TMDL:	54,707	1,589	

NOTES:

1- Total WIP programs includes the increased street sweeping (WIP values less the CY 2009 values), ant. Increase of inlet cleaning, and WIP- IDDE estimates.

2- Total planned programs includes planned increased street sweeping, ant. increase of inlet cleaning, and current IDDE values.

3- Total current programs includes the current increased street sweeping, current proactive inlet cleaning, and current IDDE values.

4 - Planned partnerships assumes 5% increase by FY 2021.

Location	Estimated Pollutant TSS (lb/ year)	NOTES
MS4 Baseline Load (TMDL Report)	14,410,000	TMDL for Gwynns Falls (2010)
% Reduction Goal (TMDL Report)	*49%*	TMDL for Gwynns Falls (2010)
Baseline Load using MDE-AG:	**5,943,099**	See Table O-1
Reduction Goal:	**2,882,403**	Based on % reduction goals.
Projects proposed related to current MS4 permit:		
Total Projects (WIP):	608,562	Table N-1. Planned projects are scheduled for completion as shown.
Total Projects (Current Planned):	461,467	
Total Projects (Current Completed):	62,400	
Programs related to current MS4 permit:		
Total Programs (WIP)[1]:	1,362,000	Table N-2.
Total Programs (Current Planned)[2]:	575,017	
Total Programs (Current)[3]:	203,576	
Partnerships related current to MS4 permit:		
Total Partnerships (WIP):	42,967	Table N-3
Total Parnerships (Current Planned)[4]	33,208	
Total Partnerships (Current):	31,627	
Total Reduction (WIP):	2,013,529	
% Reduction (WIP):	34%	
Total Reduction (Current):	**297,602**	
% Reduction (Current):	**5%**	
Total Reduction (Planned):	1,069,691	
% Reduction (Planned)	18%	
Remaining to meet local TMDL:	1,812,712	

NOTES:

1- Total WIP programs includes the increased street sweeping (WIP values less the CY 2009 values) and ant. increase of inlet cleaning.

2- Total planned programs includes planned increased street sweepin and ant. increase of inlet cleaning.

3- Total current programs includes the current increased street sweeping and current proactive inlet cleaning.

4 - Planned partnerships assumes 5% increase by FY 2021.

Location	Estimated Pollutant TSS (lb/ year)	NOTES
MS4 Baseline Load (TMDL Report)	9,466,000	TMDL for Jones Falls (2011)
% Reduction Goal (TMDL Report)	*26.3%*	TMDL for Jones Falls (2011)
Baseline Load using MDE AG:	**5,074,317**	See Table O-1
Reduction Goal:	**1,334,545**	
Projects proposed within current MS4 permit:		
Total Projects (WIP):	302,799	Table N-1. Planned projects are scheduled for completion as shown.
Total Projects (Current Planned):	257,739	
Total Projects (Current Completed):	175,694	
Programs related to current MS4 permit:		
Total Programs (WIP)[1]:	719,096	Table N-2.
Total Programs (Current Planned)[2]:	294,969	
Total Programs (Current)[3]:	106,472	
Partnerships related current to MS4 permit:		
Total Partnerships (WIP):	36,930	Table N-3
Total Parnerships (Current Planned)[4]	11,191	
Total Partnerships (Current):	10,658	
Total Reduction (WIP):	1,013,766	
% Reduction (WIP):	76%	
Total Reduction (Current):	**292,824**	
% Reduction (Current):	**22%**	
Total Reduction (Planned):	481,855	
% Reduction (Planned)	36%	
Remaining to meet local TMDL:	0	
Alternate Evaluation		
Total Planned Stream Restoration (LF):	*8,000*	*MDE, Restoration Project Portfolio Acounting Principal (10/7/19). TSS = 248 lb / LF*
Total Reduction (Planned- Stream Rate):	*2,225,855*	
% Reduction (Planned - Stream Rate)	*44%*	*TMDL will be met with planned projects.*

NOTES

1- Total WIP programs includes the increased street sweeping (WIP values less the CY 2009 values) and ant. increase of inlet cleaning.

2- Total planned programs includes planned increased street sweepin and ant. increase of inlet cleaning.

3- Total current programs includes the current increased street sweeping and current proactive inlet cleaning.

4 - Planned partnerships assumes 5% increase by FY 2021.

Location	Estimated Pollutant TSS (lb/ year)	NOTES
MS4 Baseline Load (TMDL Report)	**1,220,000**	TMDL for Lower North Branch Patapsco (2011)
% Reduction Goal (TMDL Report)	*25.1%*	TMDL for Gwynns Falls (2010)
Baseline Load using MDE AG:	**523,772**	See Table S-1
Reduction Goal:	**131,467**	
Projects proposed related current MS4 permit:		
Total Projects (WIP):	1,510	Table N-1. Planned projects are scheduled for completion as shown.
Total Projects (Current Planned):	906	
Total Projects (Current Completed):	0	
Programs proposed related current MS4 permit:		
Total Programs (WIP)[1]:	63,826	Table N-2.
Total Programs (Current Planned)[2]:	39,394	
Total Programs (Current)[3]:	10,998	
Partnerships proposed related current MS4 permit:		
Total Partnerships (WIP):	3,849	Table N-3.
Total Parnerships (Current Planned)[4]	18,639	
Total Partnerships (Current):	17,752	
Total Reduction (WIP):	68,581	
% Reduction (WIP):	13%	
Total Reduction (Current):	**28,750**	
% Reduction (Current):	**5%**	
Total Reduction (Planned):	58,033	
% Reduction (Planned)	11%	
Remaining to meet local TMDL:	73,434	

NOTES:

1- Total WIP programs includes the increased street sweeping (WIP values less the CY 2009 values) and ant. increase of inlet cleaning.

2- Total planned programs includes planned increased street sweepin and ant. increase of inlet cleaning.

3- Total current programs includes the current increased street sweeping and current proactive inlet cleaning.

4 - Planned partnerships assumes 5% increase by FY 2021.