

**GOVERNMENT OF THE DISTRICT OF COLUMBIA
WASHINGTON, DC**



**Adrian M. Fenty
Mayor**

**Anacostia River
Discharge Monitoring Report**

**Municipal Separate Storm Sewer System
NPDES Permit No. DC0000221**

August 19, 2009

Prepared by:

**District Department of the Environment
George S. Hawkins, Director**

Submitted on behalf of:

District Department of the Environment
51 N Street, NE
Washington, DC 20002

District Department of Transportation
2000 14th Street, NW
Washington, DC 20009

DC Department of Public Works
2000 14th Street, NW
Washington, DC 20009

DC Water and Sewer Authority
5000 Overlook Avenue, SE
Washington, DC 20032

District Department of Real Estate Services
441 4th St. NW, Suite 1100 South
Washington, DC 20001



Property Management
Government of the District of Columbia

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I. INTRODUCTION

The current District of Columbia Municipal Separate Storm Sewer System (DC MS4) Permit No. DC0000221 (Permit) was issued by the U.S. Environmental Protection Agency (EPA) on August 19, 2004. This report is prepared in partial fulfillment of the monitoring and reporting requirements set forth in Part IV of the Permit.

The Permit requires that three wet weather and two dry weather sampling and analyses be conducted as part of the characterization of the storm water discharges. The sampling schedule followed a watershed based monitoring approach whereby the representative sites within one of the three watersheds are to be sampled within a given calendar year. Table 1-1 below shows the schedule for the most recent cycle of monitoring and reporting for each of the three DC MS4 watersheds.

The monitoring for all watersheds did not take place as scheduled. Several factors contributed to limit the number of sampled events within the scheduled calendar year. Rainfall conditions that produce qualifying storm events have been fewer than needed. In other instances the nature of rainfall (intensity or duration) did not allow the collection of sample volume required for the full suite of laboratory analysis. Also, irregularities in contractor's sampling protocols, discovered in the process, necessitated the re-sampling of a number of sites. A Corrective Action Plan (CAP) was developed by the DDOE in July of 2008. The CAP was approved by the EPA. The ongoing implementation of the CAP required that sampling be carried out at all three watersheds concurrently under an accelerated schedule. All three wet weather and two dry weather samples have been collected and analyzed at the nine sites in the Anacostia River watershed.

This report constitutes the Anacostia River watershed discharge monitoring report scheduled to be submitted to the EPA by August 19, 2009, as required by Part IV of the Permit. The report contains a description of the monitoring sites, the sampled storm characteristics, the sampling activities, the analytical results at the nine sites, and the estimated annual loads for selected parameters. A comparison of the results with the prior monitoring rotation is also presented.

Table 1-1 DC MS4 MONITORING SCHEDULE

Watershed	Monitoring Year	No. of Stations	DMR Due Date
Rock Creek	Calendar year 2006	10 (6 in MS4 permit, 4 not in permit)	August 19, 2007
Potomac River	Calendar year 2007	7	August 19, 2008
Anacostia River	Calendar year 2008	9	August 19, 2009

II. MONITORING STATIONS

Part IV.A.1 of the Permit lists the sampling locations for the Anacostia River watershed. The nine representative monitoring sites and the associated drainage areas are provided in Table 2-1. Figure 2-1 shows the locations of the monitoring sites.

The drainage areas and land use types for each representative monitoring site were revised based on most recent available Geographic Information System (GIS) data. The monitoring site point-layer and existing GIS dataset of the storm water sewer system supplied by the DC Water and Sewer Authority (DCWASA) were used to digitize the drainage area.

The areas drained by all contributing secondary and higher order storm water drains upstream from the monitoring manhole/outfall were delineated. In addition, the 2008 orthophoto and the ground surface elevation GIS data was used to locate the storm water runoff divide to take into account curbs and unsewered areas. The acreage within the perimeter was automatically computed by the geodatabase file system.

The 2004 land use delineation prepared by the DC Office of Planning was used to represent the land use type within each catchment area. The coverage by each land use type within

each drainage area was calculated by GIS analysis by intersecting the drainage area polygons with the Existing Land use polygon layer and then field calculations were performed.

Detailed maps of each of the monitoring site, the associated drainage area and land use types are included in Appendix A.

TABLE 2-1 ANACOSTIA RIVER MONITORING SITES

Site Number	Sampling Location	Drainage Area (Acres)
1	Stickfoot Sewer- 2400 block of Martin Luther King, Jr. Ave., SE, near Metro bus entrance	616.3
2	O St. Storm Water Pump Station- 125 O. St., 125 O SE – just outside front gate at O St. Pump Station	25.4
3	Anacostia High School/Anacostia Recreation Center – corner of 17 th St. and Minnesota Ave., SE	251.8
4	Gallatin & 14th St., NE – across from the intersection of 14 th St. and Gallatin St. in a large outfall	662.4
5	Varnum & 19th Place, NE – 2100 Block of Varnum St.	517.4
6	Nash Run – intersection of Anacostia Dr. and Polk St., NE	13.4
7	East Capitol St. – 200 Block of Oklahoma Ave., NE	16.7
8	Ft. Lincoln – Newton BMP- in the brush along the side of New York Ave. West after the bridge	5.7
9	Hickey Run -33 rd and V Streets, NE, across road from post office access	8.5

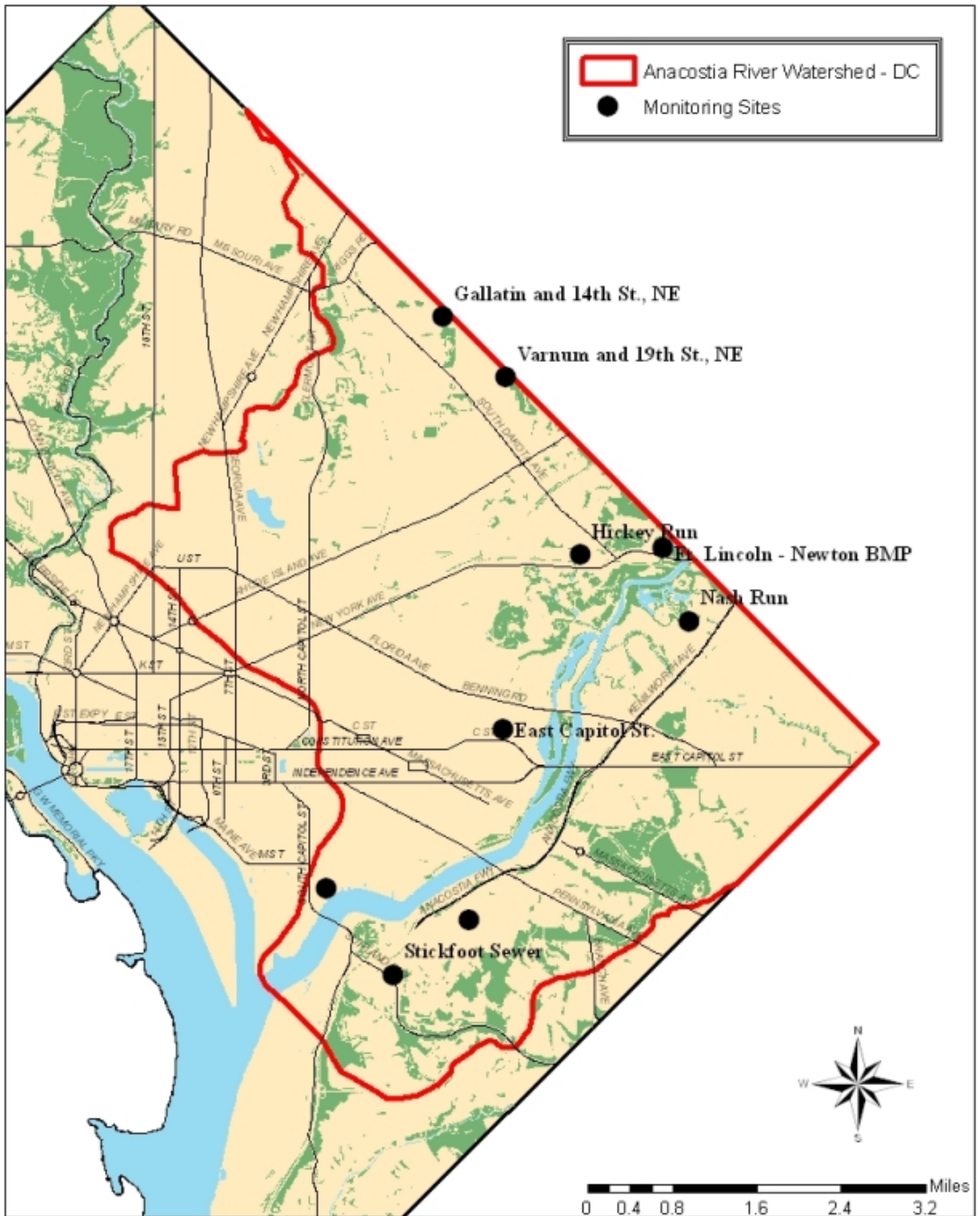


Figure 2-1: Anacostia River Watershed - DC MS4 Monitoring Sites

Samples were collected and analyzed in accordance with the Permit and monitoring requirements at 40 CFR 122.26(d)(2)(iii), by the Environmental Design and Construction, Inc, contractors for the DDOE. At each of the nine Anacostia River sites, at least three wet weather and two dry weather sampling were planned in this monitoring rotation. Table 2-2 below lists the sampling event dates for each site. Site 8, Ft. Lincoln- Newton BMP monitoring site did not produce sufficient flow necessary for the full suite of laboratory analysis during three qualifying storm events.

TABLE 2-2 SUMMARY EVENTS OF WET AND DRY WEATHER SAMPLING AT NINE ANACOSTIA RIVER SITES

Site Number	Sampling Location	Wet Weather	Dry Weather
1	Stickfoot Sewer	9/25/08 11/24/08 2/18/09	3/25/08 1/23/09
2	O St. Storm Water Pump Station	11/4/08 12/10/08 3/26/09	NDF 6/16/09
3	Anacostia High School	9/25/08 11/24/08 1/6/09	3/24/08 6/26/09
4	Gallatin & 14 th St, NE	11/04/08 12/10/08 2/18/09	3/24/08 1/16/09
5	Varnum and 19 th Pl, NE	11/13/08 2/18/09 4/11/09	NDF NDF
6	Nash Run	11/13/08 2/18/09 4/11/09	3/25/08 NDF
7	East Capitol St.	11/13/09 2/18/09 4/11/09	3/26/08 1/16/09
8	Ft. Lincoln – Newton BMP	NSF NSF NSF	NDF NDF
9	Hickey Run	11/4/08 1/6/09 3/6/08	NDF NDF

NSF: No sufficient flow for analyses
 NDF: there are no dry flows at that monitoring site

III. WEATHER INFORMATION

During the monitoring period September 2008 to July 2009, the rainfall patterns have been unpredictable, with accumulations well below or above the monthly averages on record. Table 3-1 lists the actual and average precipitation at the Ronald Reagan National Airport. A number of the rainfall events were in the form of short duration thunderstorms followed by a lengthy dry period. The spatial distribution of the rainfall through the region and the city also presented special challenges in the collection of samples for analysis.

TABLE 3-1 PRECIPITATION RECORD FOR WASHINGTON D.C.

Precipitation			
Month	Actual (in.)^a	Number of Days in Month with Storms >0.10 in.	Monthly Average (in.)
2008			
September	6.41	7	3.79
October	1.13	1	3.22
November	2.43	3	3.03
December	2.97	4	3.05
2009			
January	2.68	4	3.21
February	0.35	1	2.63
March	1.97	1	3.60
April	4.22	7	2.77
May	8.05	12	3.82
June	5.86	8	3.13
July	0.94	3	3.66

a – gage at Ronald Reagan National Airport

A narrative description of the sampled rainfall events including the site sampled, the duration of the rainfall, and the elapsed time between the sampled rainfall and the prior measurable rainfall event is presented below. Table 3-2 lists a summary of the wet weather events.

September 25, 2008

Samples were collected at Site #1 (Stickfoot Sewer) and Site #3 (Anacostia High School). The rainfall event lasted approximately 19 hours and produced 0.36 inches. The last measurable rainfall occurred about 16 days prior to this event.

November 4, 2008

Samples were collected at Site #2 (O Street Storm Water Pump Station), site #4 (Gallatin & 14th St.), and site #9 (Hickey Run). Site #8 (Ft. Lincoln-Newton BMP) did not produce sufficient flow for analysis. Rain begun to fall at approximately 2:00 O'clock in the afternoon. The rainfall event lasted for about 7.5 hours. A total of 0.12 inches of rain fell during the sampling event. The last measurable rainfall occurred about 7 days prior to this event.

November 13, 2008

During this event, samples were collected at Site #5 (Varnum and 19th Pl.), Site #6 (Polk/Nash Run), and Site #7 (East Capitol St.). Site #8 (Ft. Lincoln-Newton BMP) did not produce sufficient flow for sampling. A total of 0.64 inches of rain fell over a duration of 5.5 hours. The last measurable rainfall occurred about 8.5 days prior to this event.

November 24, 2008

The sites sampled during this rainfall event were Site #1 (Stickfoot Sewer) and Site #3 (Anacostia High School). A total of 0.08 inches of rainfall occurred over a total of 3 hours duration. The last measurable rainfall occurred about 9 days prior to this event.

December 10, 2008

Samples were collected at Site #2 (O St. Storm Water Pump Station) and Site #4 (Gallatin & 14th St.).

The rainfall event lasted for about 9 hours. A total of .09 inches of rain fell during that period. The last measurable rainfall occurred about 9 days prior to this event.

January 6, 2009

Site #3 (Anacostia High School), Site #6 (Nash Run), Site #7 (Oklahoma and D Streets NE), and Site #9 (Hickey Run) were sampled during this storm event. Site #5 (Varnum and 19th Pl.) did not produce enough flow for sampling. A total of 0.67 inches of rain fell over approximately 31.5 hours. The last measurable rainfall occurred about 17 days prior to this event.

February 18, 2009

Samples were collected at Site #1 (Stickfoot Sewer), Site #4 (Gallatin & 14th Street NE) and Site #5 (Varnum and 19th Pl.). 0.15 inches of rain fell over a 5 hours period. The last measurable rainfall occurred about 20 days prior to this event.

March 26, 2009

The sites sampled during this storm event were Site #2 (O St. Storm Water Pump Station) and Site #9 (Hickey Run). A total of 0.28 inches of rain fell over a period of approximately 13.0 hours. The last measurable rainfall occurred about 24 days prior to this event.

April 11, 2009

Site #5 (Varnum and 19th Pl.) and Site #6 (Nash Run) were sampled during this storm event. The storm event produced a total of 0.31 inches of rain. The rainfall lasted for approximately 9.0 hours. The last measurable rainfall occurred about 5.5 days prior to this event.

April 20, 2009

Site #7 (East Capitol St.) was sampled during this event. A total of 0.72 inches of rain fell. The storm event lasted for approximately 7.5 hours. The last measurable rainfall occurred about 4.5 days.

**TABLE 3-2. STORM CHARACTERISTICS FOR ANACOSTIA RIVER
 WATERSHED WET WEATHER SAMPLING EVENTS**

Date	Precipitation (in.)	Duration (hours)	Time to Previous Measurable Rainfall (days)	Sites Sampled
9-25-08	0.36	19	16	1, 3
11-4-08	0.12	7.5	7	2, 4, 9
11-13-08	0.64	5.5	8.5	5, 6, 7
11-24-08	0.08	3	9	1, 3
12-10-08	0.09	9	9	2, 4
1-6-09	0.67	31.5	17	3, 6, 7, 9
2-18-09	0.15	5	20	1, 4, 5
3-26-09	0.28	13	24	2, 9
4-11-09	0.31	9	5.5	5, 6
4-20-09	0.72	7.5	4.5	7

IV. SAMPLE COLLECTION AND ANALYSIS

The storm water samples were collected based on the requirement to collect one subset of samples by using grab samples collected during the first 2 hours of the storm event and a separate subset to be collected using time-weighted-average composite technique.

The list of sampled parameters, the detection limits, and EPA-approved methods utilized for monitoring activities are included in Table 4-1.

TABLE 4-1. SAMPLE ANALYSIS REQUIREMENTS FOR WET AND DRY WEATHER SAMPLING

Bottle Type	Sample Type	Parameter	Method	Units	MDL
1-L Plastic Unpreserved	Composite	Biochemical Oxygen Demand (5d)	SM5210B	mg/L	<5.0
		Total Dissolved Solids	SM2540C	mg/L	<1.0
		Total Suspended Solids	SM2540D	mg/L	<1.0
500 mL Plastic H ₂ SO ₄	Composite	Ammonia Nitrogen	SM4500-NH3-	mg/L	<1.0
		Phosphorus, Total	E	mg/L	<0.05
		Nitrite + Nitrate	EPA 365.3	mg/L	<0.05
		Chemical Oxygen Demand	EPA 353.2	mg/L	<10.0
		Total Kjeldahl Nitrogen	EPA 410.4 EPA 351.3	mg/L	<0.5
250 mL Plastic, Filtered, H ₂ SO ₄	Composite	Phosphorus, Dissolved	EPA 365.3	mg/L	<0.5
1000 mL Plastic HNO ₃	Composite	Hardness, Total	EPA 130.2	mg/L	
		Antimony, Total	EPA 200.8	µg/L	0.21
		Arsenic, Total	EPA 200.8	µg/L	0.25
		Beryllium, Total	EPA 200.8	µg/L	0.22
		Cadmium, Total	EPA 200.8	µg/L	0.22
		Chromium, Total	EPA 200.8	µg/L	0.18
		Copper, Total	EPA 200.8	µg/L	1.52
		Lead, Total	EPA 200.8	µg/L	0.23
		Mercury, Total (by cold vapor)	EPA 245.1	µg/L	0.20
		Nickel, Total	EPA 200.8	µg/L	0.46
		Selenium, Total	EPA 200.8	µg/L	0.31
		Silver, Total	EPA 200.8	µg/L	0.35
		Thallium, Total	EPA 200.8	µg/L	0.21
		Zinc, Total	EPA 200.8	µg/L	1.52
(2) 1-L Glass Amber	Grab	Dioxin (2,3,7,8) TCDD	EPA 1613	pg/L	4.4
1000 mL Plastic, Sterile	Grab	Fecal Coliform	SM9221E	MPN	
		Fecal Streptococcus	SM9230B	MPN	

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Bottle Type	Sample Type	Parameter	Method	Units	MDL
250 mL Plastic, NaOH	Grab	Cyanide, Total	EPA 335.2	mg/L	<0.01
(2) 1-L Glass Amber Unpreserved	Composite	BNA Compounds	EPA 625	µg/L	Various
(2) 40 mL Glass Vials Teflon Lids	Grab	Volatile Organic Compound	EPA 624	µg/L	0.5
1-L Glass Amber H ₂ SO ₄ Teflon Lids	Grab	Phenols, Total	EPA 420.2	mg/L	1.9
1-L Glass Amber H ₂ SO ₄ Teflon Lids	Composite	PCBs / Pesticides	EPA 608	µg/L	0.01-1.7
1-L Glass Amber Teflon Lids	Composite	PCBs	EPA 8082 modified	ng/L	0.25-5.0
1-L Glass Amber 1:1 HCl	Grab	Fats (oil and grease)	EPA 1664	mg/L	1.6
100 mL Plastic	Composite	Chlorophyll-a	SM 10020H2	mg/m ³	2
500 mL Plastic H ₂ SO ₄	Composite	Total Ammonia + Organic Nitrogen (TKN)	EPA 351.3	mg/L	0.2
	Field Test	Dissolved Oxygen	EPA 360.1	mg/L	N/A
500 mL Plastic H ₂ SO ₄	Composite	Organic Nitrogen	TKN – NH ₃	mg/L	N/A
500 mL Plastic H ₂ SO ₄	Composite	Total Nitrogen	NO ₂ + NO ₃ + TKN	mg/L	N/A

V. RECORD KEEPING

DDOE WQD maintains the records of monitoring information including:

- Description of Sampling
 - Sampling protocols
 - Location/Collection time
 - Sample collection procedures
 - Field notes
 - Environmental Design & Construction, DC MS4 sampling personnel

- Storm Event Data
 - Date and duration of storm events sampled
 - Rainfall measurements
 - Duration between storm event sampled and the end of the previous measurable storm event
 - Estimate of the total volume of the discharge sampled

- Storm Water Analysis Data
 - Field test results
 - Laboratory results

VI. MONITORING RESULTS

Monitoring results for the wet weather sampling events are reported on EPA Form 3320-1 Discharge Monitoring Report included in Appendix B. Table 6-1 and Table 6-2 show the ambient water quality results for the wet weather and dry weather sampling, respectively. Additional sampling and analysis results are contained in Appendix C.

Table 6-1 Ambient Water Quality Data for Anacostia River Stations During Wet Weather Sampling Event

Wet Events							
Site ID	Location	Date	Water Temp (°C)	pH	DO (mg/l)*	TRC (mg/L)	Cond (µS)
1	Stickfoot Sewer	9/25/2008	18.1	7.8	3.29		655
		11/24/2008	13.7	8.34	2.9	0.05	839
		2/18/2009	7.4	6.45	4.1	0	2900
2	O St. Storm Water Pump Station	11/4/2008	19	7.98	4.12	0	877
		12/10/2008	16	8.1		0.08	
		3/26/2009	8.3	8.12	4	0	697
3	Anacostia High School	9/25/2008	19.4	7.67	3.76		515
		11/24/2008	10.5	7.48	3	0.03	463
		1/6/2009	7.4	7.2	6.8	<.03	464
4	Gallatin & 14 th St., NE	11/4/2008	16.8	7.5	8.8	0.08	
		12/10/2008	13.7	7.4		0.33	
		2/18/2009	6.96	6.9	12	<.03	
5	Varnum and 19 th Pl., NE	11/13/2008	13.1	6			
		2/18/2009	7.2	7.11	9.5	<.03	
		4/11/2009	13.1	6.6	9.9	<.03	
6	Nash Run	11/13/2008	11	6.6	11.1	0.04	
		1/6/2009	7.6	6.66	11.6	0.04	
		4/11/2009	14.3	6.4	9.2	<.03	
7	East Capitol St.	11/13/2008	11.9	6.8	10.3	<.03	
		1/6/2009	8.1	6.41	10.1	0.04	
		4/20/2009	13.9	6.63	8.8	<.03	
8	Ft. Lincoln-Newton BMP	NSF					
		NSF					
		NSF					
9	Hickey Run	11/4/2008	19.7	7.3	7.3	<.03	
		1/6/2009	7.1	6.1	12.8	<.03	
		3/26/2009	11.9	6.6	10.2	<.03	220

* Field measurements were taken as % saturation.

Table 6-2 Ambient Water Quality Data for Anacostia River Stations During Dry Weather Sampling Event

Dry Events							
Site No.	Location	Date	Water Temp (°C)	pH	DO*	TRC (mg/L)	Cond (µS)
1	Stickfoot Sewer	3-25-08					
		1/23/2009	4.4	8.5	3.6	0	789
2	O St. Storm Water Pump Station	NDF					
		6/16/09	23.3	7.61	5.2		
3	Anacostia High School	3/24/2008	12	7.92	7.5		507
		6/26/09	24.3	7.3	8.8	.03	502
4	Gallatin & 14 th St., NE	3/24/2008	15.1	7.1	6.9		329
		1/16/2009	6.4	6.44	12		
5	Varnum and 19 th Pl., NE	NDF					
		NDF					
6	Nash Run						
		NDF					
7	East Capitol St.	3/27/2008	18.9	6.37	5.5		783
		1/16/2009	12.7	6.13	3.3		
8	Ft. Lincoln-Newton BMP	NDF	9.2	7.65	6.7		229
9	Hickey Run	NDF					
		NDF					

* Field measurements were taken as % saturation.

For EMCs calculated in this report, the geometric mean of each parameter was calculated as an estimate of the average EMC for each station. These data are presented in the following paragraphs for Anacostia River.

Wet Weather Events

Anacostia River watershed sites 1 through 9 were sampled during wet weather flows from September 2008 to July 2009. The geometric mean of the analytical results for each sample station is provided for twenty priority pollutants in Table 6-3. The highest mean concentration of total suspended solids (TSS) was reported at Varnum and 19th Pl (66.9 mg/L), and the lowest was reported at Hickey Run (5.00 mg/L). All other stations had TSS concentrations between 8.71 and 60.7 mg/L. Varnum and 19th Pl. had the highest biochemical oxygen demand (BOD) concentrations (42.8 mg/L) among all stations, while all other stations ranged from 5.65 (O St. Storm Water Pump Station) to 28.4 mg/L (Nash Run). Total nitrogen (TN) concentrations from Anacostia River stations ranged from 3.25 (Anacostia High School) to 5.66 mg/L (Varnum and 19th Pl.) and total phosphorus (TP) concentrations ranged from 0.02 (Hickey Run) to 0.57 mg/L (O St. Storm Water Pump Station). Most of the Anacostia stations had high fecal coliform (FC) concentrations ranging from 9,790 (Varnum and 19th Pl., NE) to 184,103 MPN/100 mls (Stickfoot Sewer). Two Anacostia stations had relatively low FC concentrations including O St. Storm Water Pump Station (2,759 MPN/100 mls) and Nash Run (4,191 MPN/100 ml). Oil and grease (O&G) concentrations ranged from non-detect (ND) to 3.76 mg/L (Varnum and 19th Pl). Relatively high concentrations of zinc (18.3 to 122.3 µg/L) and copper (11.3 to 63.0 µg/L) were measured from all Anacostia stations. Lead concentration were measured for Gallatin & 14th St. (4.98 µg/L) and Varnum and 19th Pl. (4.52 µg/L) stations, while remaining six stations had non detectable concentrations of lead. None of the stations had detectable concentrations for arsenic, PAHs, chlordane, heptachlor, dieldrin, DDT, DDE, DDD, or PCBs. Complete analytical results are included in Appendix C.

Dry Weather Events

Six stations were sampled for dry weather flows from March 2008 to June 2009. Grab samples were used to calculate the concentrations of 20 pollutants for these six stations and the geometric mean of the dry weather sample analysis results for each station are presented

in Table 6-4. The relatively high mean concentrations of TSS and BOD were reported at Nash Run (88.0 mg/L for TSS and 59.0 for BOD), while other stations had much lower, with concentrations ranging from 6.0 to 23.9 mg/L and from 5.11 to 10.0 mg/L, respectively. The highest mean concentration of TN was reported at O St. Storm Water Pump Station (13.0 mg/L), and the lowest was reported at Gallatin & 14th St (1.70 mg/L). Nash Run had the highest TP, and O&G concentrations (2.50 and 24.0 mg/L, respectively) compared to other stations, which ranged from 0.09 to 0.38 mg/L and ND to 2.83 mg/L, respectively). Fecal coliform bacteria concentrations were highest at Stickfoot Sewer and East Capitol St. (4,195 and 3,578 MPN/100 mls, respectively) and lowest at Anacostia High School (226 MPN/100 mls). Fecal coliform concentrations for all stations were noticeably lower during dry weather event (226 to 4,195 MPN/100 mls) than wet weather event (2,759 to 184,103 MPN/100 mls). The highest mean concentration of zinc was reported at O St. Storm Water Pump Station (250 µg/L), and the lowest was reported at Stickfoot Sewer (2.4 µg/L). All other stations had zinc concentrations between 22.2 and 110 µg/L. Copper concentrations ranged from 5.1 (Stickfoot Sewer) to 34.0 µg/L (Nash Run) during dry weather events. Two Anacostia stations had relatively high lead concentrations including East Capitol St. (10.7 mg/L) and O St. Storm Water Pump Station (12.0 mg/L), while all other stations had lead concentrations below 4.4 µg/L. Anacostia High School was the only station that had detectable concentrations (3.0 µg/L) of arsenic during the two sample collections.

During the dry weather events, Nash Run had highest concentrations for TSS, BOD, TP, O&G, and copper, and O St. Storm Water Pump Station had highest concentrations for TN, zinc, and lead.

None of the stations had detectable concentrations for PAHs, chlordane, heptachlor, dieldrin, DDT, DDE, or DDD, and PCBs. Complete analytical results are included in Appendix C.

TABLE 6-3 SUMMARY DATA OF WET WEATHER EVENTS (2008-2009) FROM NINE ANACOSTIA MONITORING STATIONS.
 VALUES REPRESENT GEOMETRIC MEAN FOR EACH STATION.

Parameters (mg/L, unless otherwise noted)																				
Station	TSS	BOD	TN	TP	FC ^a	O&G	Zn ^{bc}	Pb ^{bc}	Cu ^{bc}	As ^{bc}	PAH 1 ^c	PAH 2 ^c	PAH 3 ^c	Chlordane ^c	Heptachlor ^c	Dieldrin ^c	DDT ^c	DDE ^c	DDD ^c	PCBs ^d
Stickfoot Sewer	32.0 (n=3)	25.3 (n=3)	5.49 (n=3)	0.23 (n=3)	184,103 (n=3)	ND (n=3)	53.7 (n=3)	ND (n=3)	31.7 (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)
O St. Storm Water Pump Station	60.7 (n=3)	5.65 ^e (n=3)	5.34 (n=3)	0.57 (n=3)	2,759 ^e (n=3)	ND (n=3)	18.3 ^e (n=3)	ND (n=3)	63.0 (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)
Anacostia High School	26.8 (n=3)	21.3 (n=3)	3.25 (n=3)	0.17 (n=3)	49,461 (n=3)	ND (n=3)	57.6 (n=3)	ND (n=3)	11.3 (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)
Gallatin & 14 th St., NE	8.71 ^e (n=3)	21.8 (n=3)	4.33 (n=3)	0.42 (n=3)	36,342 (n=3)	3.74 ^e (n=3)	68.0 (n=3)	4.98 ^e (n=3)	23.3 (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)
Varnum and 19 th Pl., NE	66.9 (n=3)	42.8 (n=3)	5.66 (n=3)	0.44 (n=3)	9,790 (n=3)	3.76 (n=3)	48.4 (n=3)	4.52 ^e (n=3)	29.4 (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)
Nash Run	20.3 (n=3)	28.4 (n=3)	3.81 (n=3)	0.20 (n=3)	4,191 (n=3)	ND (n=3)	74.4 (n=3)	ND (n=3)	54.4 (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)
East Capitol St.	39.4 (n=3)	16.2 (n=3)	3.58 (n=3)	0.28 (n=3)	12,927 (n=3)	2.92 ^e (n=3)	88.8 (n=3)	ND (n=3)	13.5 (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)
Ft. Lincoln-Newton BMP	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Hickey Run	5.00 ^e (n=3)	10.1 (n=3)	3.65 (n=3)	0.02 (n=3)	15,326 (n=3)	ND (n=3)	122.3 (n=3)	ND (n=3)	11.7 (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)	ND (n=3)

TSS: total suspended solids; BOD: biological oxygen demand; TN: total nitrogen; TP: total phosphorus; FC: fecal coliform bacteria; O&G: oil and grease; PCB: total PCBs

ND: none-detected

^aUnits are in MPN/100ml

^bTotal recoverable metals

^cUnits are in ug/L

^dUnits are in ng/L

^egeometric mean was calculated using half of detection limit or reporting limit if the analysis results show “none detected” or “below reporting limit”

--- No data available due to non sufficient flow

TABLE 6-4 SUMMARY DATA OF DRY WEATHER EVENTS (2008-2009) FROM NINE ANACOSTIA MONITORING STATIONS.
VALUES REPRESENT GEOMETRIC MEAN FOR EACH STATION.

Parameters (mg/L, unless otherwise noted)																				
Station	TSS	BOD	TN	TP	FC ^a	O&G	Zn ^{bc}	Pb ^{bc}	Cu ^{bc}	As ^{bc}	PAH 1 ^c	PAH 2 ^c	PAH 3 ^c	Chlordane ^d	Heptachlor ^c	Dieldrin ^c	DDT ^c	DDE ^c	DDD ^c	PCBs ^d
Stickfoot Sewer	10.2 (n=2)	7.43 (n=2)	3.11 (n=2)	0.38 (n=2)	4,195 (n=2)	ND (n=2)	2.4 ^e (n=2)	ND (n=2)	5.1 (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)
O St. Storm Water Pump Station	20.0 (n=1)	10.0 (n=1)	13.0 (n=1)	0.12 (n=1)	1600 (n=1)	ND (n=1)	250 (n=1)	12.0 (n=1)	9.1 (n=1)	ND (n=1)	ND (n=1)	ND (n=1)	ND (n=1)	ND (n=1)	ND (n=1)	ND (n=1)	ND (n=1)	ND (n=1)	ND (n=1)	ND (n=1)
Anacostia High School	9.90 (n=2)	5.11 (n=2)	2.60 (n=1)	0.13 (n=2)	226 (n=2)	ND (n=2)	22.2 (n=2)	ND (n=2)	2.2 (n=2)	3.0 ^e (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)
Gallatin & 14 th St., NE	6.00 (n=2)	8.06 (n=2)	1.70 (n=1)	0.26 (n=2)	245 (n=2)	ND (n=2)	85.8 (n=2)	ND (n=2)	7.1 (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)
Varnum and 19 th Pl., NE	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Nash Run	88.0 (n=1)	59.0 (n=1)	n/a	2.50 (n=1)	1,600 (n=1)	24.0 (n=1)	79.0 (n=1)	4.4 (n=1)	34.0 (n=1)	ND (n=1)	ND (n=1)	ND (n=1)	ND (n=1)	ND (n=1)	ND (n=1)	ND (n=1)	ND (n=1)	ND (n=1)	ND (n=1)	ND (n=1)
East Capitol St.	23.9 (n=2)	9.61 (n=2)	2.90 (n=1)	0.09 (n=2)	3,578 (n=2)	2.83 ^e (n=2)	110 (n=2)	10.7 ^e (n=2)	17.3 (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)	ND (n=2)
Ft. Lincoln-Newton BMP	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Hickey Run	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

TSS: total suspended solids; BOD: biological oxygen demand; TN: total nitrogen; TP: total phosphorus; FC: fecal coliform bacteria; O&G: oil and grease; PCB: total PCBs

ND: none-detected

n/a: not available

^aUnits are in MPN/100ml

^bTotal recoverable metals

^cUnits are in ug/L

^dUnits are in ng/L

^egeometric mean was calculated using half of detection limit or reporting limit if the analysis results show "none detected" or "below reporting limit"

--- No data available due to no dry weather flow

VII. ESTIMATES OF CUMMULATIVE POLLUTANT LOADINGS

The annual pollutant loads for each sewershed sampled were calculated by the Simple Method (EPA 1992) utilizing the wet weather event mean concentrations, the total drainage area, and land use distribution within each sewershed. The Simple Method can estimate pollutant loads without extensive rainfall-runoff volume data using the sample analysis results available. Generally, the Simple Method is expected to overestimate pollutant loads as compared to more dynamic models that incorporate pollutant concentration and runoff coefficients as functions of initial conditions and rainfall intensity and duration in estimating total pollutant loads.

The Simple Method is given by the following equation:

$$L = \sum_{i=1}^{\text{No. of landuse types}} \left(\frac{P}{12} \times CF \times Rv_i \times C_i \times A_i \times 2.72 \right) \quad \text{(Equation 1)}$$

where

- L = pollutant loading (lb/year for chemical constituents, MPN/yr for bacteria)
- P = average annual rainfall (inches)
- CF = Correction factor (0.9) to adjust for storms where no runoff occurs (dimensionless) (EPA 1992)
- Rv_i = runoff coefficient for the land use type (dimensionless)
- C_i = average event mean concentration (mg/L for chemical constituents)
- A_i = land use area (acres)
- 2.72 = unit conversion factor for chemical constituents in concentration units of mg/L; 12,334,885 for bacteria in units of MPN/100 mL.

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The average event mean concentration (EMCs) for each monitoring station was calculated as the geomean of the measured EMCs (*Urban Stormwater BMP Performance Monitoring: Guidance Manual*, ASCE/EPA, 2002).

$$C = \text{Geomean of EMCs} = \left[\prod_{j=1}^m \text{EMC}_j \right]^{\frac{1}{m}} \quad \text{(Equation 2)}$$

Where:

EMC_j = Event Mean Concentration of storm j

m = Number of storms at monitoring location

Annual precipitation within the District of Columbia for the September 2008 through August 2009 monitoring period was 40.44 inches as reported by the National Weather Service (NWS) weather station at Washington National Airport (COOP ID: 448906). The sewershed area was obtained from the sewershed coverage. A key parameter in Equation 1 is the runoff coefficient (R_{vi}), which is directly related to imperviousness and land use. Land use categories, impervious surfaces, and runoff coefficients were calculated for each sewershed and presented in Appendix D. Table 7-1 presents the annual loads for pollutants specified in 40 CFR 122.21(g)(7). Also included are the annual loads for Fecal Coliform Bacteria and Oil and Grease.

Based upon the pollutant loadings calculated for eight District of Columbia Anacostia River monitoring sites, a cumulative load for the entire District of Columbia portion of the Anacostia River watershed was estimated (Table 7-1). This cumulative load assumes that the eight sample stations are representative of the watershed. Given this assumption, a simple ratio may be used to discover a cumulative load for the Anacostia River watershed in its entirety:

$$L_A = \left(\frac{\sum L_i}{\sum A_i} \right) (A_t) \quad \text{(Equation 3)}$$

L_A = Anacostia watershed cumulative pollutant load (lb/year)

A_t = Anacostia watershed total area (acres)

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L_i = Pollutant loading for each monitoring site (lb/year)

A_i = Acreage for each monitoring site (acres)

Table 7-2 indicates that cadmium and lead are entering the Anacostia River in relatively small amounts at 226 lbs/year and 285 lbs/year respectively. Total Dissolved Solids loads are significant at 49,886,798 lbs/year. Total Nitrogen and Total Phosphorous loads to the Anacostia River are estimated at 516,908 lbs/year and 36.037 lbs/year, respectively.

Monitoring sites contributing the highest loads to the Anacostia River include Gallatin & 14th St., Varnum and 19th Pl., and Stickfoot Sewer. This is due in large part to the total catchment area of each of these monitoring sites with the catchment area for each site being greater than 500 acres. The next largest catchment area is represented by the Anacostia High School monitoring site at roughly 250 acres.

Table 7-1 2008-2009 Anacostia River Watershed Pollutant Event Mean Concentration

Event Mean Concentrations for Designated Parameters (mg/L unless otherwise noted)														
Station	BOD	COD	TDS	TSS	TN	TKN	TP	DP	FC ^b	O&G	Cd ^a	Cu ^a	Pb ^a	Zn ^a
Stickfoot Sewer	25.30	69.15	257.38	32.00	5.49	3.93	0.23	0.1199	184,103	ND	0.0022	0.0317	ND	0.0537
O St. Stormwater Pump Station	5.65	53.34	853.16	60.70	5.34	5.11	0.57	0.2713	2,759	ND	0.0027	0.0630	ND	0.0183
Anacostia High School	21.30	62.03	224.33	26.80	3.25	2.82	0.17	0.1151	49,461	ND	0.0013	0.0113	ND	0.0576
Gallatin & 14th St., NE	21.80	54.05	816.42	8.71	4.33	4.27	0.42	0.1018	36,342	3.74	0.0033	0.0233	0.005	0.0680
Varnum and 19th Pl., NE	42.80	96.41	362.21	66.90	5.66	5.59	0.44	0.3137	9,790	3.76	0.0009	0.0294	0.0045	0.0484
Nash Run	28.40	53.96	143.14	20.30	3.81	3.81	0.20	0.1432	4,191	ND	0.0006	0.0544	ND	0.0744
East Capitol St.	16.20	42.51	178.90	39.40	3.58	3.58	0.28	0.1999	12,927	2.92	0.0003	0.0135	ND	0.0888
Hickey Run	10.10	35.36	194.80	5.00	3.65	3.65	0.02	0.0537	15,326	ND	0.0002	0.0117	ND	0.1223

^aTotal Recoverable Metals

^bUnits are in MPN/100mls

ND: none –detected

Table 7-2 2008-2009 Anacostia River Watershed Annual Pollutant Loading

Loadings for Designated Parameters (Lbs./year unless otherwise noted)														
Station	BOD	COD	TDS	TSS	TN	TKN	TP	DP	Cd ^a	Cu ^a	Pb ^a	Zn ^a	O&G	FC ^b
Stickfoot Sewer	90,160	246,441	917,201	114,036	19,564	13,988	819.6	427.4	7.90	113.00	ND	191.00	ND	3.0E+15
O St. Stormwater Pump Station	1,084	10,234	163,681	11,645	1,024	981	109.4	52.0	0.53	12.10	ND	3.51	ND	2.4E+12
Anacostia High School	29,696	86,477	312,756	37,363	4,531	3,937	237.0	160.4	1.83	15.80	ND	80.30	ND	3.1E+14
Gallatin & 14th St., NE	87,353	216,589	3,271,426	34,901	17,350	17,129	1683.0	408.0	13.20	93.40	20.0	272.00	14,986	6.6E+14
Varnum and 19th Pl., NE	121,596	273,891	1,029,046	190,065	16,080	15,895	1250.1	891.1	2.44	83.50	12.8	138.00	10,682	1.3E+14
Nash Run	1,972	3,747	9,940	1,410	265	265	13.9	9.9	0.04	3.78	ND	5.17	ND	1.3E+12
East Capitol St.	1,687	4,426	18,628	4,103	373	372	29.2	20.8	0.03	1.41	ND	9.25	304	6.1E+12
Fort Lincoln	NSF	NSF	NSF	NSF	NSF	NSF	NSF	NSF	NSF	NSF	NSF	NSF	NSF	NSF
Hickey Run	670	2,346	12,926	332	242	242	1.3	3.6	0.02	0.78	ND	8.12	ND	4.6E+12
Cumulative Load for all monitoring sites (lbs/yr)	334,218	844,151	5,735,604	393,855	59,430	52,810	4143.3	1973.3	25.99	323.77	32.8	707.35	25,973	4.1E+15
Anacostia Watershed Load Estimates (lbs/yr)	2,906,942	7,342,206	49,886,798	3,425,652	516,908	459,324	36037.4	17163.6	226.05	2816.03	285.3	6152.35	225,903	3.6E+16

^aTotal Recoverable Metals
^bUnits are in MPN/yr
 ND: none –detected

VIII. ANACOSTIA RIVER WATER QUALITY TREND ANALYSIS¹

To date the Anacostia River monitoring stations have been sampled on three separate rotations during the periods of 2001-2002, 2005-2006, and 2008-2009. Table 8-1 below shows the mean concentrations from the sampling and analysis performed during the three rotations. The data set for the 2001-2002 and 2005-2006 rotations in the table are those reported in previous discharge monitoring reports.

Table 8-2 presents a direct comparison of the average pollutant concentrations between the previous and current sampling rotations for the Anacostia River Watershed. The data shown represents a broad overview of water quality trends in the Anacostia River watershed for select parameters during wet weather events.

Average concentrations of Cadmium, Fecal Coliform bacteria, Total Nitrogen, and Total Dissolved Solids have increased this monitoring cycle, the Anacostia River monitoring sites have seen a decrease in the concentrations of all other specified pollutants. Furthermore, Arsenic, Lead and PAH's which have previously been detected in Anacostia monitoring site samples, were not found in levels sufficient for detection during rotation 3.

Future rotations of wet weather sampling will produce a more precise evaluation of the historic trends for the selected parameters, and indicate the effectiveness of pollution reduction measures being undertaken within the Anacostia River watershed.

**Table 8-1 Mean Pollutant Concentrations for the Anacostia River Sites
 Over Three Sampling Rotations**

Parameter	Rotation 1 (2001-2002)	Rotation 2^a (2005-2006)	Rotation 3 (2008-2009)
Arsenic (µg/L)	1.38	1.80	ND
BOD (mg/L)	44.4	124	21.44
Cadmium, total (µg/L)	0.35	0.34	1.36
Chlordane (µg/L)	ND	ND	ND
COD (mg/L)	110	305	58.4
Copper (µg/L)	41.2	64.9	29.8
DDD (µg/L)	ND	ND	ND
DDE (µg/L)	0.00036	ND	ND
DDT (µg/L)	0.00068	ND	ND
Dieldrin (µg/L)	0.00014	ND	ND
Fecal Coliform (mpn)	2,090	24,500	39,362
Heptachlor epoxide (µg/L)	ND	ND	ND
Lead (µg/L)	19.0	28.5	ND
Nitrogen, total (mg/L)	3.56	3.42	4.39
Oil & Grease (mg/)	6.25	3.45	2.49
PAHs (µg/L)	5.38	67.6	ND
PCBs, total (mg/L)	ND	ND	ND
Phosphorus, dissolved (mg/L)	0.233	0.244	0.161
Phosphorus, total (mg/L)	0.353	0.673	0.291
Total Dissolved Solids (mg/L)	172	120	379
Total Suspended Solids (mg/L)	65.6	121	32.49
Zinc (µg/L)	142	169	66.5

^a Partial Dataset

Table 8-2 Comparison of Mean Pollutant Concentrations to 2005-2006 Rotation

Parameter	Roation 2 ^a	Rotation 3	Percent Change
	(2005-2006)	(2008-2009)	
Arsenic (µg/L)	1.8	ND	
BOD (mg/L)	124	21.44	-83%
Cadmium, total (µg/L)	0.34	1.36	300%
Chlordane (µg/L)	ND	ND	
COD (mg/L)	305	58.4	-81%
Copper (µg/L)	64.9	29.8	-54%
DDD (µg/L)	ND	ND	
DDE (µg/L)	ND	ND	
DDT (µg/L)	ND	ND	
Dieldrin (µg/L)	ND	ND	
Fecal Coliform (mpn)	24,500	39,362	61%
Heptachlor epoxide (µg/L)	ND	ND	
Lead (µg/L)	28.5	ND	
Nitrogen, total (mg/L)	3.42	4.39	28%
Oil & Grease (mg/	3.45	2.49	-28%
PAHs (µg/L)	67.6	ND	
PCBs, total (mg/L)	ND	ND	
Phosphorus, dissolved (mg/L)	0.244	0.161	-34%
Phosphorus, total (mg/L)	0.673	0.291	-57%
Total Dissolved Solids (mg/L)	120	379	216%
Total Suspended Solids (mg/L)	121	32.49	-73%
Zinc (µg/L)	169	66.5	-61%

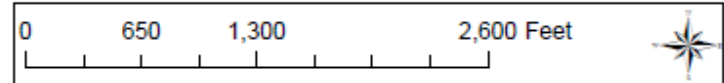
APPENDIX A

ANACOSTIA RIVER WATERSHED MONITORING SITES

Stickfoot Sewer

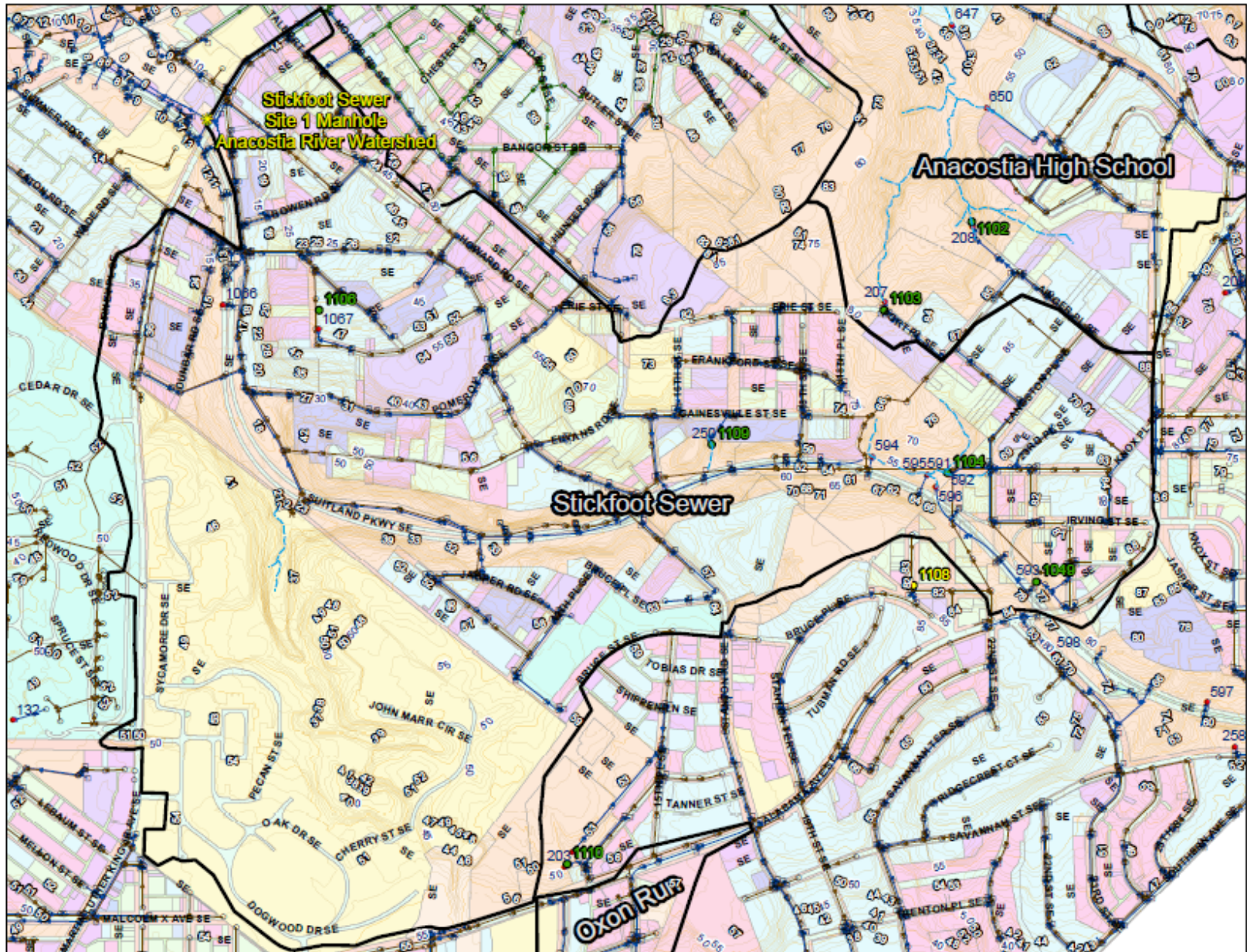
Site# 1

Anacostia River Watershed



Legend

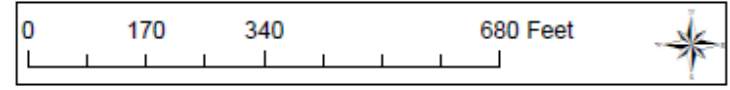
- Monitoring Sites (WQMS)
- MS4 Outfall**
- Watershed**
- Anacostia
- Potomac
- Rock Creek
- Sewer Outfall
- Sewer Catch Basin
- Sewer Manhole
- Sewer Gravity Main**
- FlowType**
- Storm
- Combined Storm/Wastewater
- Sanitary
- DOGIS.ExistingLandUse**
- all other values-
- LU_CODE**
- Nut-
- ALLEYS
- Alleys
- C
- CANAL
- FP
- HDR
- I
- LAKE
- LDR
- LMDR
- LP
- MDR
- MEDIAN
- MU
- O
- PARKING
- PGP4
- R
- RIVER
- ROADS
- S
- TCU
- TRAFFICIS
- TROW



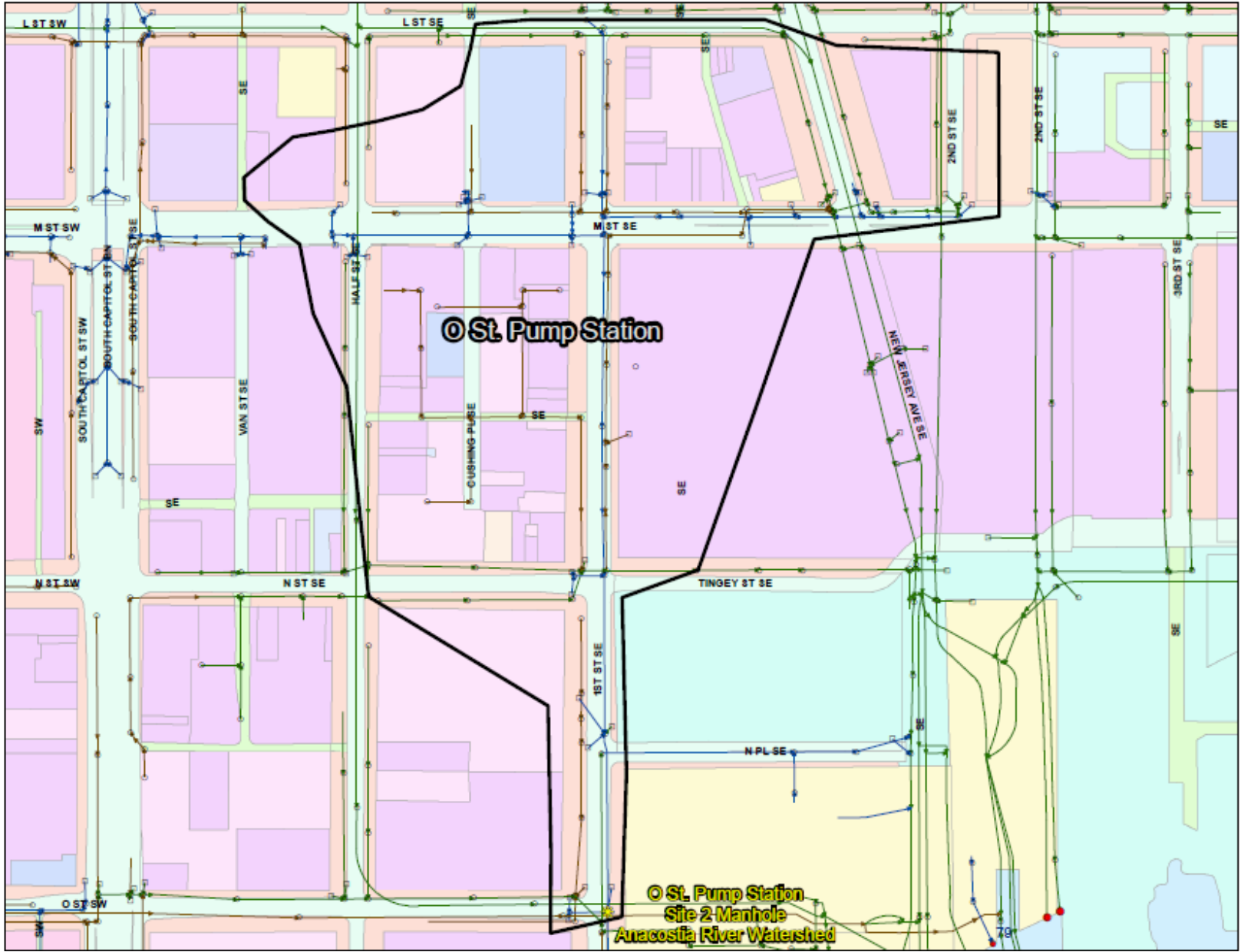
O St. Pump Station

Site# 2

Anacostia River Watershed



- Legend**
- Monitoring Sites (WQMS)
 - MS4 Outfall**
 - Watershed**
 - Anacostia
 - Potomac
 - Rock Creek
 - Sewer Outfall
 - Sewer Catch Basin
 - Sewer Manhole
 - Sewer Gravity Main**
 - FlowType**
 - Storm
 - Combined Storm/Wastewater
 - Sanitary
 - DCGIS Existing Land Use**
 - all other values-
 - LU_CODE**
 - NUL
 - ALLEYS
 - Alleys
 - C
 - CANAL
 - FP
 - HDR
 - I
 - LAKE
 - LDR
 - LMDR
 - LP
 - MDR
 - MEDIAN
 - MU
 - O
 - PARKING
 - PQ14
 - R
 - RIVER
 - ROADS
 - S
 - TCU
 - TRAFFICS
 - TROW



O St. Pump Station
Site 2 Manhole
Anacostia River Watershed

Gallatin and 14th St., NE

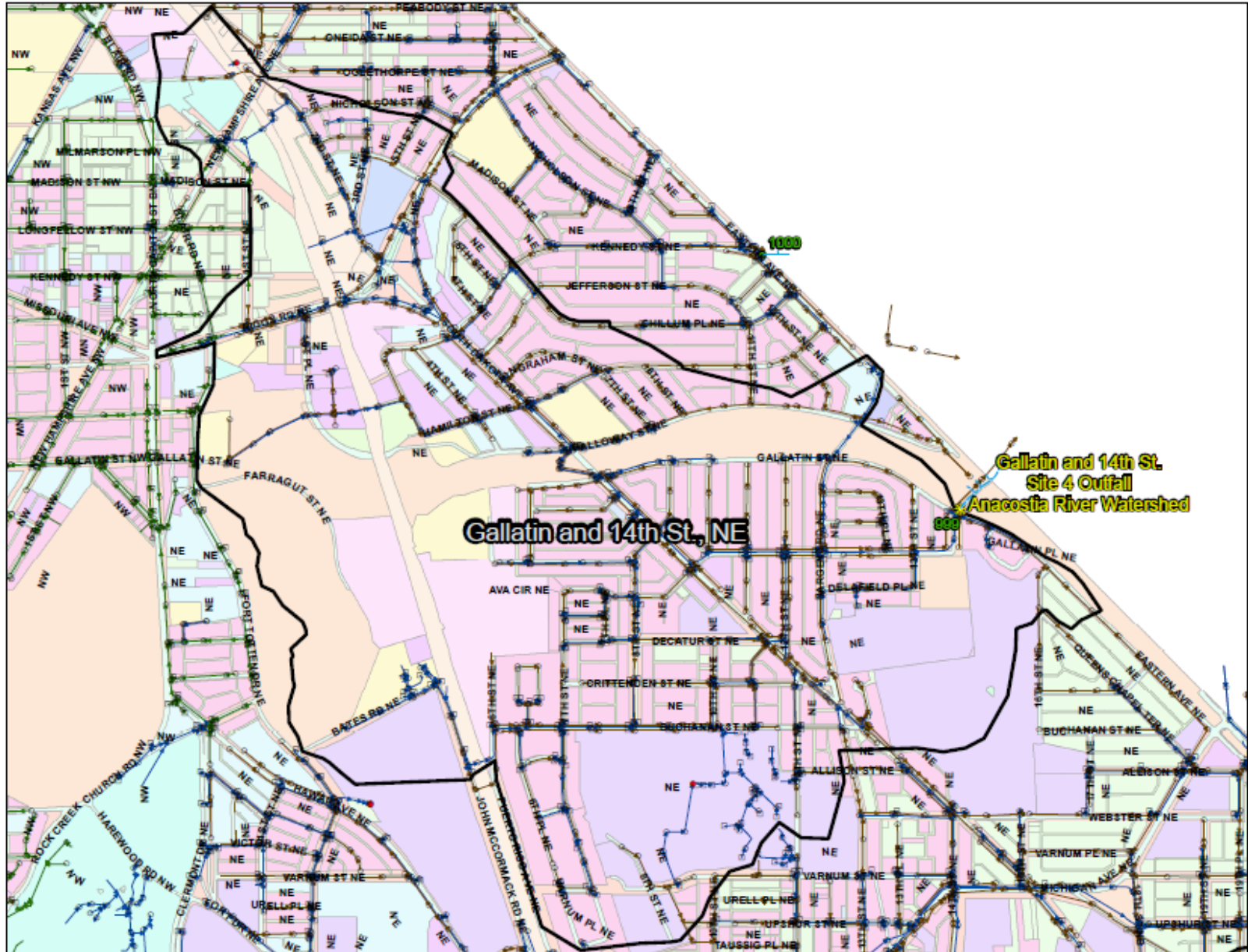
Site# 4

Anacostia River Watershed



Legend

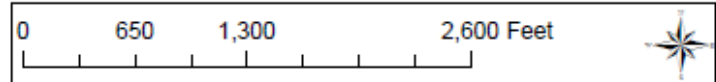
- Monitoring Sites (WQMS)
- MS4 Outfall**
- Anacostia
- Potomac
- Rock Creek
- Sewer Outfall
- Sewer Catch Basin
- Sewer Manhole
- Sewer Gravity Main**
- FlowType**
- Storm
- Combined Storm/Wastewater
- Sanitary
- DCGIS_ExistingLandUse**
- all other values
- LU_CODE**
- <Null>
- ALLEYS
- Alleys
- C
- CANAL
- FP
- HDR
- I
- LAKE
- LDR
- LMDR
- LP
- MDR
- MEDIAN
- MU
- O
- PARKING
- PGM
- R
- RIVER
- ROADS
- S
- TCU
- TRAFFICIS
- TROW



Varnum and 19th St., NE

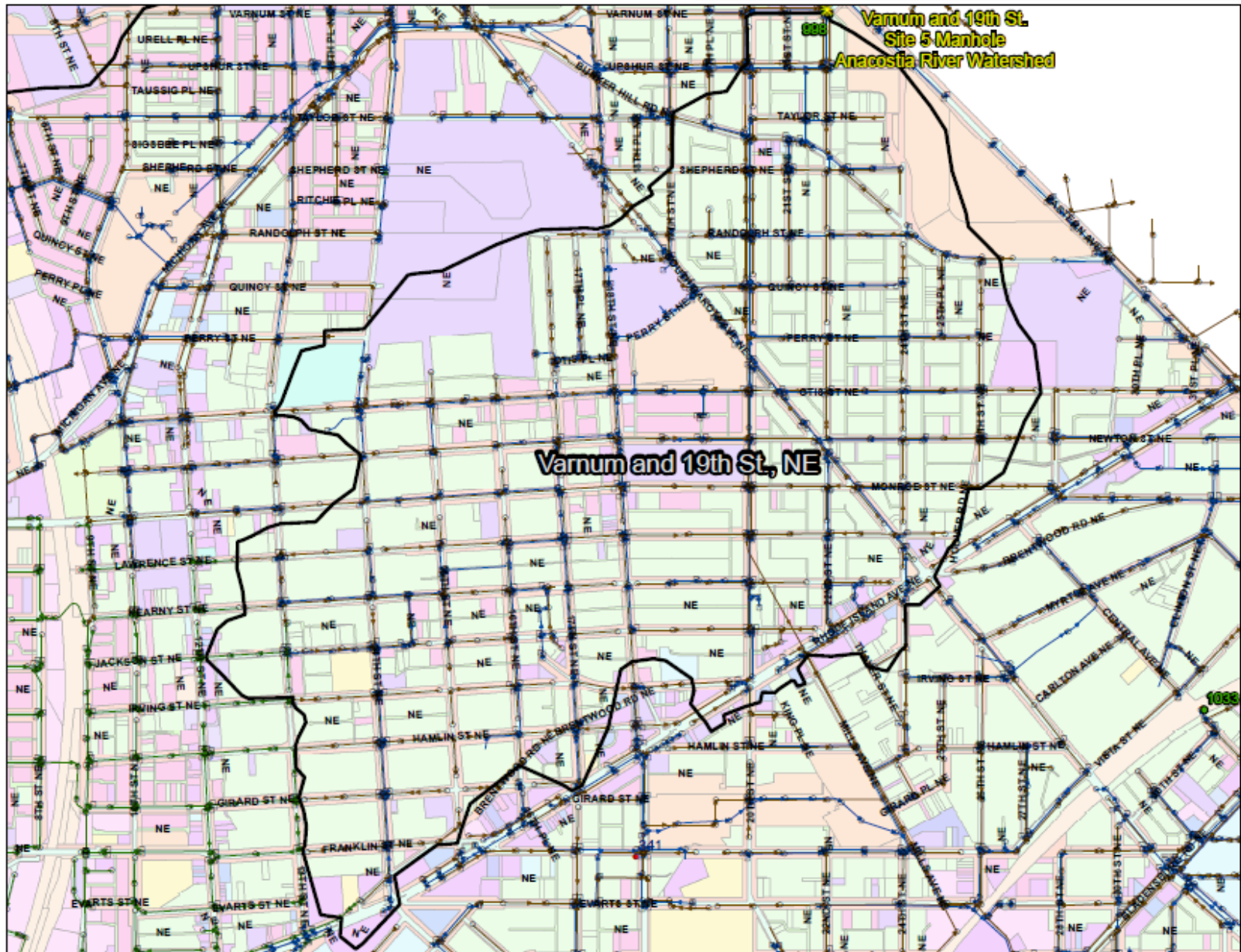
Site# 5

Anacostia River Watershed



Legend

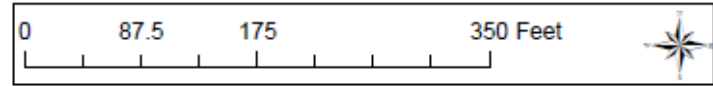
- Monitoring Sites (WQMS)
- MS4 Outfall**
- Watershed**
- Anacostia
- Potomac
- Rock Creek
- Sewer Outfall
- Sewer Catch Basin
- Sewer Manhole
- Sewer Gravity Main**
- FlowType**
- Storm
- Combined Storm/Wastewater
- Sanitary
- DCGIS_ExistingLandUse**
- All other values
- LU_CODE**
- <Null>
- ALLEYS
- Alleys
- C
- CANAL
- FP
- HDR
- I
- LAKE
- LDR
- LMDR
- LP
- MOR
- MEDIAN
- MU
- O
- PARKING
- POPN
- R
- RIVER
- ROADS
- S
- TCU
- TRAFFICIS
- TROW



Nash Run

Site# 6

Anacostia River Watershed



Legend

Monitoring Sites (WQMS)

MS4 Outfall

Watershed

Anacostia

Potomac

Rock Creek

Sewer Outfall

Sewer Catch Basin

Sewer Manhole

Sewer Gravity Main

FlowType

Storm

Combined Storm/Wastewater

Sanitary

DCGIS Existing Land Use

<all other values>

LU_CODE

<Null>

ALLEYS

ALLEYS

C

CANAL

PP

HCR

I

LAKE

LDR

LMDR

LP

MOR

MEDIAN

MU

O

PARKING

PQIN

R

RIVER

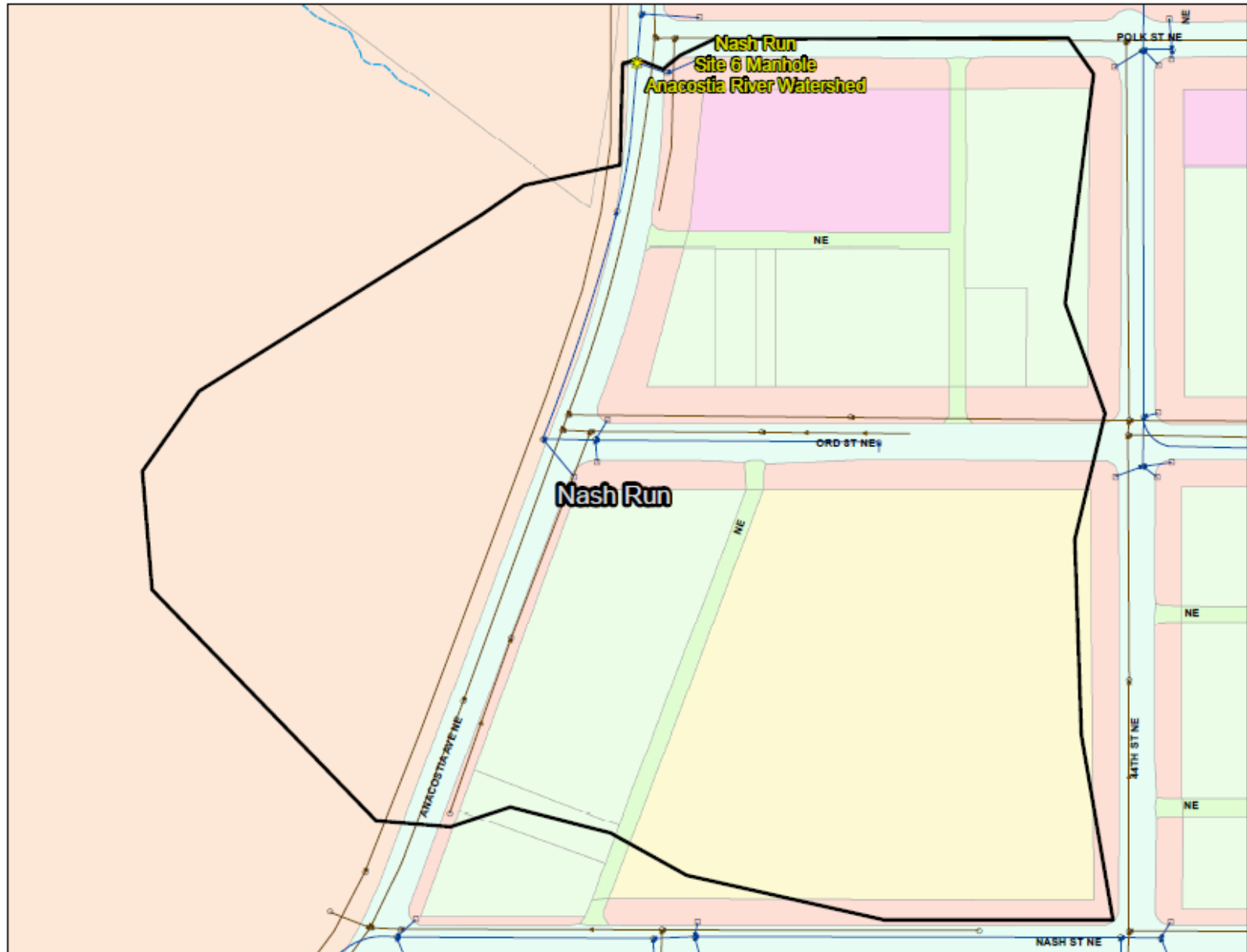
ROADS

S

TCU

TRAFFICIS

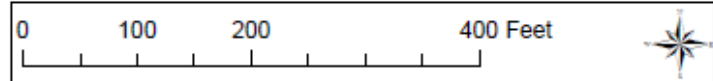
TROW



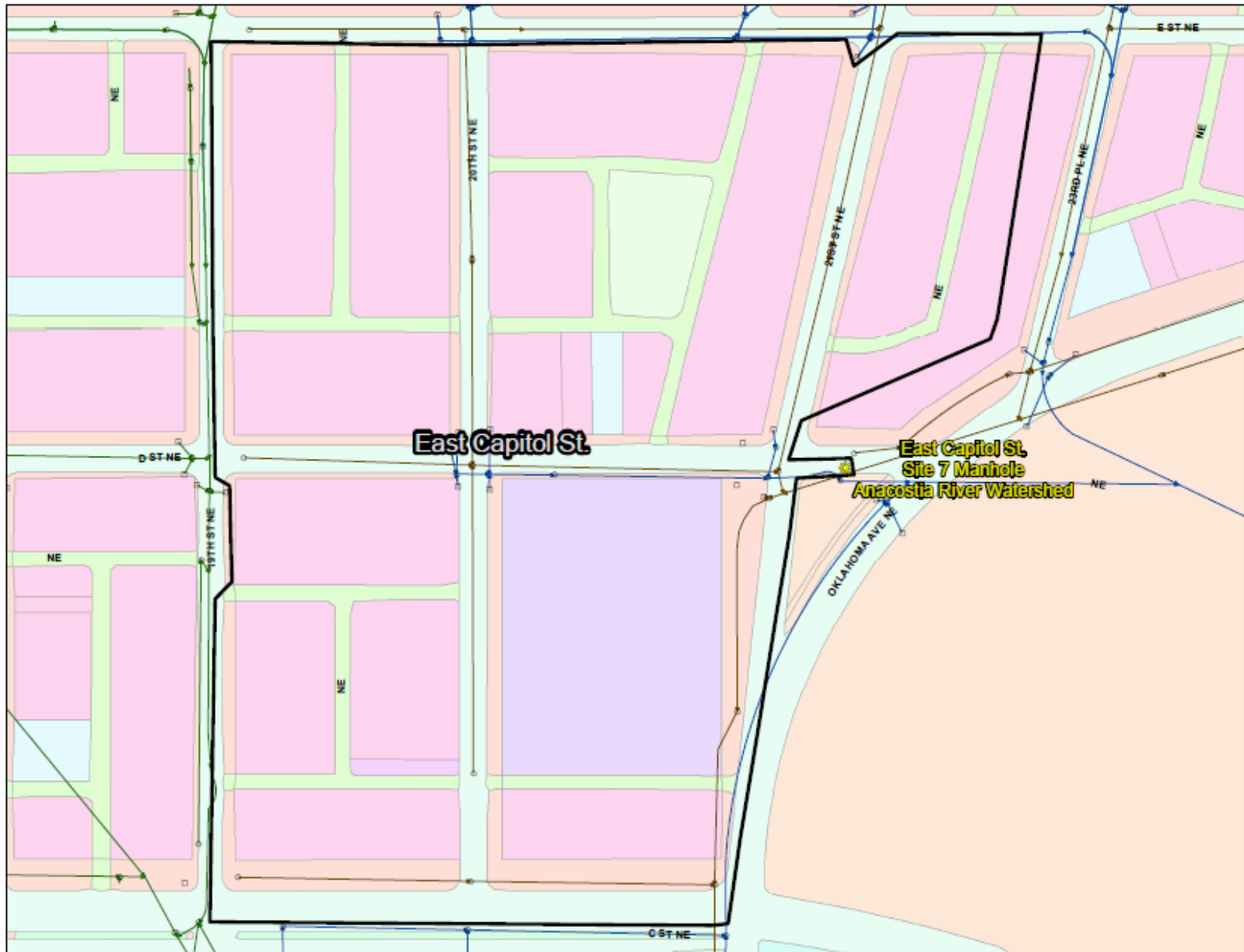
Jul 06, 2009

East Capitol St. Site# 7

Anacostia River Watershed



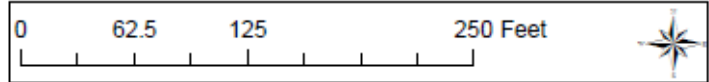
- Legend**
- Monitoring Sites (WQMS)
 - MS4 Outfall**
 - Watershed**
 - Anacostia
 - Potomac
 - Rock Creek
 - Sewer Outfall
 - Sewer Catch Basin
 - Sewer Manhole
 - Sewer Gravity Main**
 - Flow Type**
 - Storm
 - Combined Storm/Wastewater
 - Sanitary
 - DCGIS_ExistingLandUse**
 - all other values-
 - LU_CODE**
 - <Null>
 - ALLEYS
 - ALLEYS
 - ALLEYS
 - C
 - CANAL
 - FP
 - HDR
 - I
 - LAKE
 - LDR
 - LMOR
 - LP
 - MOR
 - MEDIAN
 - MU
 - O
 - PARKING
 - PGF4
 - R
 - RIVER
 - ROADS
 - S
 - TCU
 - TRAFFICIS
 - TROW



Ft. Lincoln - Newton BMP

Site# 8

Anacostia River Watershed



Legend

- Monitoring Sites (WQMS)
- MS4 Outfall**
- Watershed**
- Anacostia
- Potomac
- Rock Creek
- Sewer Outfall
- Sewer Catch Basin
- Sewer Manhole
- Sewer Gravity Main**
- FlowType**
- Storm
- Combined Storm/Wastewater
- Sanitary
- DOGIS_ExistingLandUse**
- "all other values"
- LU_CODE**
- Null
- ALLEYS
- Alleys
- C
- CANAL
- FP
- HDR
- I
- LAKE
- LDR
- LMDR
- LP
- MOR
- MEDIAN
- MU
- O
- PARKING
- PQPI
- R
- RIVER
- ROADS
- S
- TCU
- TRAFFICIS
- TROW



Jul 06, 2009

APPENDIX B

Anacostia River Watershed Discharge Monitoring Report

APPENDIX C

Anacostia River Watershed Sampling Analytical Data

**ANACOSTIA SUBWATERSHED
DRY WEATHER SAMPLING
(ROTATION 3- RAW DATA)**

Parameter	Units	RL	DL	Stickfoot Sewer		O St. Storm Water Pump Station		Anacostia High School		Gallatin & 14th St., NE		Varnum and 19th Pl., NE		Nash Run		East Capitol St.		Ft. Lincoln- Newton BMP		Hickey Run	
				Dry 1	Dry2	Dry 1 (NDF)	Dry2	Dry 1	Dry2	Dry 1 (NDF)	Dry2 (NDF)	Dry 1	Dry2	Dry 1 (NDF)	Dry2 (NDF)	Dry 1	Dry2	Dry 1 (NDF)	Dry2 (NDF)	Dry 1 (NDF)	Dry2 (NDF)
1,1,1-Trichloroethane	ug/L	1.0	0.25	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
1,1,2,2-Tetrachloroethane	ug/L	1.0	0.57	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
1,1,2,2-Tetrachloroethylene	ug/L	1.0	0.43	n/a	ND		ND	n/a	ND	n/a	ND			n/a		n/a	270				
1,1,2-Trichloroethane	ug/L	1.0	0.46	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
1,1,2-Trichloroethylene	ug/L	1.0	0.33	n/a	ND		ND	n/a	ND	n/a	ND			BRL		n/a	1.9				
1,1-Dichloroethane	ug/L	1.0	0.30	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
1,1-Dichloroethylene	ug/L	1.0	0.30	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
1,2,4-Trichlorobenzene	ug/L	10	3.4	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
1,2-Dichlorobenzene	ug/L	1.0	0.44	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
1,2-Dichloroethane	ug/L	1.0	0.34	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
1,2-Dichloropropane	ug/L	1.0	0.36	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
1,2-Diphenylhydrazine	ug/L	10	1.4	n/a	ND		ND	n/a	ND	n/a	ND			n/a		n/a	ND				
1,3-Dichlorobenzene	ug/L	1.0	0.48	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
1,4-Dichlorobenzene	ug/L	1.0	0.48	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
2,3,7,8-TCDD	mg/L	0.38		BRL	BRL		BRL	n/a	ND	n/a	BRL			n/a		BRL	BRL				
2,4,6-Trichlorophenol	ug/L	10	2.2	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
2,4-Dichlorophenol	ug/L	10	3.2	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
2,4-Dimethylphenol	ug/L	10	4.0	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
2,4-Dinitrophenol	ug/L	50	9.1	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
2,4-Dinitrotoluene	ug/L	10	1.9	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
2,6-Dinitrotoluene	ug/L	10	2.4	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
2-Chloroethyl Vinyl Ether	ug/L	1.0	0.37	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
2-Chloronaphthalene	ug/L	10	3.6	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
2-Chlorophenol	ug/L	10	2.6	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
2-Nitrophenol	ug/L	10	2.9	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
3,3'-Dichlorobenzidine	ug/L	20	7.1	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
4,6-Dinitro-2-methylphenol	ug/L	50	14	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
4-Bromophenyl-phenylether	ug/L	10	3.3	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
4-Chloro-3-methylphenol	ug/L	20	6.8	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
4-Chlorophenyl-phenylether	ug/L	10	3.4	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
4-Nitrophenol	ug/L	50	5.8	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Acenaphthene	ug/L	10	3.2	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Acenaphthylene	ug/L	10	3.2	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Acrolein	ug/L	5.0	3.0	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Acrylonitrile	ug/L	5.0	2.2	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Aldrin	ug/L	0.050	0.027	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
alpha-BHC	ug/L	0.050	0.010	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Anthracene	ug/L	10	2.4	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Antimony	mg/L	0.040	0.0063	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Aroclor 1016	ug/L	1.0	0.20	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Aroclor 1221	ug/L	1.0	0.38	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Aroclor 1232	ug/L	1.0	0.29	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Aroclor 1242	ug/L	1.0	0.25	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Aroclor 1248	ug/L	1.0	0.20	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Aroclor 1254	ug/L	1.0	0.28	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Aroclor 1260	ug/L	1.0	0.18	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Arsenic	mg/L	0.0050	0.0030	BRL	ND		ND	BRL	0.0062	BRL	ND			BRL		BRL	0.0047				
Azobenzene(1,2-Diphenylhydrazine)	ug/L	11		BRL	n/a		n/a	BRL	n/a	BRL	n/a			BRL		BRL	n/a				
Benz(a)anthracene	ug/L	10	1.6	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Benzene	ug/L	1.0	0.30	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Benzidine	ug/L	50	50	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Benzo[a]pyrene	ug/L	10	1.6	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Benzo[b]fluoranthene	ug/L	10	1.7	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Benzo[g,h,i]perylene	ug/L	10	1.6	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Benzo[k]fluoranthene	ug/L	10	2.1	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Beryllium	mg/L	0.0010	0.000080	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
beta-BHC	ug/L	0.050	0.039	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
bis(2-Chloroethoxy)methane	ug/L	10	1.8	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Bis(2-Chloroethyl)ether	ug/L	10	1.6	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Bis(2-chloroisopropyl)ether	ug/L	10	8.2	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Bis(2-Ethylhexyl)phthalate	ug/L	10	2.6	BRL	ND		ND	BRL	ND	BRL	ND			16		BRL	ND				
BOD	mg/L	5.0	2.0	6.5	8.5		10	3.9	6.7	5.9	11			59		8.4	11				
Bromodichloromethane	ug/L	1.0	0.20	BRL	ND		ND	BRL	ND	n/a	ND			BRL		BRL	ND				
Bromoform	ug/L	1.0	0.43	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Bromomethane	ug/L	1.0	0.83	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Butylbenzylphthalate	ug/L	10	1.7	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Cadmium	mg/L	0.00050	0.00021	BRL	0.0013		0.0011	BRL	0.0011	BRL	0.0017			BRL		BRL	0.0050				
Carbon Tetrachloride	ug/L	1.0	0.21	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Chlordane	ug/L	1.0		BRL	n/a		n/a	BRL	n/a	BRL	n/a			BRL		BRL	n/a				
Chlorobenzene	ug/L	1.0	0.43	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Chloroethane	ug/L	1.0	0.29	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Chloroform	ug/L	1.0	0.35	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	1.2				
Chloromethane	ug/L	1.0	0.36	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Chlorophyll a	mg/m³	0.5		n/a	ND		10.3	n/a	1.6	n/a	0.76			n/a		n/a	4.22				

Parameter	Units	RL	DL	Stickfoot Sewer		O St. Storm Water Pump Station		Anacostia High School		Gallatin & 14th St., NE		Varnum and 19th Pl., NE		Nash Run		East Capitol St.		Ft. Lincoln- Newton BMP		Hickey Run	
				Dry 1	Dry2	Dry 1 (NDF)	Dry2	Dry 1	Dry2	Dry 1	Dry2	Dry 1 (NDF)	Dry2 (NDF)	Dry 1	Dry2 (NDF)	Dry 1	Dry2	Dry 1 (NDF)	Dry2 (NDF)	Dry 1 (NDF)	Dry2 (NDF)
Chromium	mg/L	0.0010	0.00051	BRL	ND		0.0014	BRL	0.0016	BRL	0.0017			BRL		0.0064	0.0042				
Chrysene	ug/L	10	1.5	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
cis-1,3-Dichloropropylene	ug/L	1.0	0.36	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
COD, Total	mg/L	10	3.8	29	ND		20	28	ND	23	ND			230		60	ND				
Copper	mg/L	0.0010	0.00036	0.0068	0.0038		0.0091	BRL	0.010	0.0022	0.023			0.034		0.020	0.015				
Cyanide, Total	mg/L	0.010	0.0030	0.012	ND		ND	BRL	ND	0.055	0.092			BRL		BRL	ND				
delta-BHC	ug/L	0.050	0.045	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Dibenz[a,h]anthracene	ug/L	10	1.2	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Dibromochloromethane	ug/L	1.0	0.35	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Dieldrin	ug/L	0.10	0.057	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Diethylphthalate	ug/L	10	2.4	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Dimethylphthalate	ug/L	10	2.1	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Di-n-butylphthalate	ug/L	10	1.9	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Di-n-octylphthalate	ug/L	10	2.2	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
E. Coli	MPN/100 mL	2000	2000	n/a	11000		n/a	n/a	n/a	n/a	2000			n/a		n/a	400				
Endosulfan I	ug/L	0.10	0.014	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Endosulfan II	ug/L	0.30	0.11	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Endosulfan Sulfate	ug/L	0.30	0.056	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Endrin	ug/L	0.10	0.044	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Endrin Aldehyde	ug/L	0.30	0.093	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Ethylbenzene	ug/L	1.0	0.49	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Fecal Coliforms	MPN/100 mL	200	200	BRL	11000		>1600	30	1700	300	200			1,600		1,600	8000				
Fecal Streptococcus	MPN/100 mL	2.0	2.0	23	800		170	30	30	23	ND			23		23	ND				
Fluoranthene	ug/L	10	2.2	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Fluorene	ug/L	10	2.8	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
gamma-BHC	ug/L	0.050	0.0090	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Hardness (As CaCO3)	mg CaCO3/L	1.0	1.0	260	160		160	220	170	48	140			190		180	180				
Heptachlor	ug/L	0.050	0.020	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Heptachlor epoxide	ug/L	0.050	0.014	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Hexachlorobenzene	ug/L	10	2.4	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Hexachlorobutadiene	ug/L	10	4.2	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Hexachlorocyclopentadiene	ug/L	10	4.7	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Hexachloroethane	ug/L	10	3.2	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Indeno[1,2,3-cd]pyrene	ug/L	10	4.6	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Isophorone	ug/L	10	1.9	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Lead	mg/L	0.040	0.0028	0.0026	ND		0.012	0.0037	ND	0.0022	ND			0.0044		0.082	ND				
Mercury	mg/L	0.00040	0.000053	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Methylene Chloride	ug/L	3.0	0.29	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Naphthalene	ug/L	10	3.3	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Nickel	mg/L	0.010	0.0010	0.0086	ND		ND	0.0088	ND	0.015	0.024			0.012		0.037	0.030				
Nitrate/Nitrite as N	mg/L	0.050	0.0050	2.2	ND		ND	BRL	ND	2.6	0.32			0.92		2.9	2.9				
Nitrobenzene	ug/L	10	1.8	BRL	ND		ND	1.7	ND	BRL	ND			BRL		BRL	ND				
Nitrogen, Total	mg/L	1.0	0.0050	n/a	2.3		13	n/a	2.6	n/a	1.7			n/a		n/a	2.9				
N-Nitrosodimethylamine	ug/L	10	3.0	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
N-Nitroso-di-n-propylamine	ug/L	10	2.1	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
N-Nitrosodiphenylamine	ug/L	11	2.8	BRL	ND		n/a	BRL	n/a	BRL	ND			BRL		BRL	ND				
Oil & Grease	mg/L	5.0	2.5	BRL	2.5		ND	BRL	ND	BRL	ND			24		BRL	3.2				
p,p'-DDD	ug/L	0.30	0.021	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
p,p'-DDE	ug/L	0.10	0.022	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
p,p'-DDT	ug/L	0.30	0.022	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Pentachlorophenol	ug/L	50	12	BRL	ND		ND	BRL	ND	BRL	n/a			BRL		BRL	ND				
Phenanthrene	ug/L	10	2.4	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Phenol	ug/L	10	1.2	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Phenolics, Total Recoverable	mg/L	0.010	0.0057	0.054	0.049		0.018	0.066	0.013	0.12	ND			0.071		0.027	0.056				
Phosphorus, Dissolved (As P)	mg/L	0.010	0.0060	0.15	0.29		0.023	0.014	0.15	0.16	0.17			1.9		0.10	ND				
Phosphorus, Total (As P)	mg/L	0.010	0.0060	0.38	0.38		0.12	0.071	0.23	0.20	0.33			2.5		0.37	0.020				
Pyrene	ug/L	10	1.8	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Selenium	mg/L	0.040	0.0043	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Silver	mg/L	0.0040	0.00044	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Tetrachloroethene	ug/L	5.0		BRL	n/a		BRL	BRL	BRL	BRL	BRL			BRL		420	n/a				
Technical Chlordane	ug/L	1.0	0.13	n/a	ND		0.326	n/a	0.852	n/a	0.689			n/a		n/a	ND				
Thallium	mg/L	0.020	0.0042	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Toluene	ug/L	1.0	0.40	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Total Dissolved Solids	mg/L	10		400	590		380	230	360	240	290			310		290	350				
Total Kjeldahl Nitrogen	mg/L	1.0		2.0	2.3		13	n/a	2.6	1.1	1.4			25		2.0	ND				
Total Organic Carbon	mg/L	0.5		n/a	2.8		5.3	n/a	3.5	n/a	2.7			n/a		n/a	1.5				
Total PCBs	ug/L	1.0		BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Total Suspended Solids ^a	mg/L			11	9.5		20	7.0	14	<2.0 (RL 2.0)	18			88		52	11				
Toxaphene	ug/L	3.0	0.26	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
trans-1,2-Dichloroethylene	ug/L	1.0	0.27	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
trans-1,3-Dichloropropylene	ug/L	1.0	0.32	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Trichloroethene	ug/L	5.0		BRL	n/a		n/a	BRL	n/a	BRL	n/a			BRL		BRL	n/a				
Vinyl chloride	ug/L	1.0	0.25	BRL	ND		ND	BRL	ND	BRL	ND			BRL		BRL	ND				
Zinc	mg/L	0.0050	0.0014	BRL	0.0080		0.25	0.026	0.019	0.11	0.067			0.079		0.12	0.10				

RL - reporting limit
 DL - detection limit
 BRL - below reporting limit
 n/a - not available
 ND - non detect
 NSF - non sufficient flow
^a Reporting limit for TSS subject to change due to dilutions

APPENDIX D

Estimation of Runoff Coefficients

Estimation of Runoff Coefficients for Monitored Sewersheds

Runoff coefficients were estimated for each of the nine monitored sewersheds contributing flow to the Anacostia River monitoring sites. Land use and acreage calculations within each sewershed were completed using the 'Land Use-Existing' dataset provided by the District of Columbia Office of Planning. This layer is also available to the public at: <http://dcatlas.dcgis.dc.gov/catalog/>

Weighted average runoff coefficients were assigned to each sewershed using Equation 2 on page 5-16 of the US EPA "Guidance Manual for the Preparation of Part 2 of the NPDES Permit Applications for Discharges from Municipal Separate Storm Sewer Systems", 1992. The equation is expressed:

$$R_{v_i} = (\sum A_i R_v) / (\sum A_i) \quad \text{(Equation 2)}$$

Where:

- R_{v_i} = Weighted Average Runoff Coefficient
- R_v = Assigned Runoff Coefficient for each land use type
- A_i = Catchment area (acres) for corresponding land use type

Runoff coefficients (R_v) were estimated for each land use type in the District of Columbia by taking into consideration both the runoff coefficient ranges for various land use types presented in exhibit 3-12 on page 57 of the US EPA "NPDES Stormwater Sampling Guidance Document", and runoff coefficient values used associated with District of Columbia zoning categories used in previous DMR's. Where the US EPA suggested runoff coefficients from Exhibit 3-12 did not contain a corresponding runoff coefficient range for a District of Columbia land use category, the corresponding code from a previous DMR was used as a substitute. Final runoff coefficient values by land use type are given in Table 1.

Weighted average runoff coefficients for each site were estimated using Table A1.

**Table A1. Estimated Runoff Coefficients for District of Columbia
Existing Land Use Categories**

Land Use Code	Description	Rv
C, O	Commercial (ac)	0.85
LDR	Low Density Residential	0.5
LMDR	Low Medium Density Residential	0.65
MDR	Medium Density Residential	0.77
HDR	High Density Residential	0.85
FP	Federal Public Land	0.77
I	Industrial	0.95
TCU	Transport/Communications/Utilities	0.95
LP	Local Public	0.77
MU	Mixed Use	0.905
PQP-I	Public-Quasi Public Institutional	0.8
R	Parks and Open Space	0.35
S	Institutional	0.8
TROW	Transportation Right of Way	0.85
ALLEYS	alleys	0.95
MEDIAN	Median	0.3
PARKING	Parking	0.95
ROADS	Roads	0.95
TRAFFICS	TRAFFIC	0.95

Table A2. Anacostia Watershed Monitoring Sites - Weighted Runoff Coefficients

SITE_NAME	Runoff Coefficient (R_v)	Land Use Code	Acreage	Weighted Average Runoff Coefficient (R_{v_i})
Stickfoot Sewer	0.95	ALLEYS	2.149	
	0.85	C	26.085	
	0.77	FP	15.605	
	0.85	HDR	19.749	
	0.5	LDR	43.618	
	0.65	LMDR	29.744	
	0.77	LP	165.293	
	0.77	MDR	83.238	
	0.3	MEDIAN	1.312	
	0.8	PQP-I	1.735	
	0.35	R	107.785	
	0.95	ROADS	59.912	
	0.8	S	22.811	
	0.95	TCU	4.700	
	0.85	TROW	32.122	
	*	0.456		0.70
O St. Pump Station	0.95	ALLEYS	0.261	
	0.95	C	8.789	
	0.77	FP	0.105	
	0.95	I	3.344	
	0.5	LDR	0.016	
	0.77	LP	0.071	
	0.3	MEDIAN	0.025	
	0.85	O	1.270	
	0.35	R	0.271	
	0.95	ROADS	5.800	
	0.8	S	0.183	
	0.95	TCU	0.113	
	0.85	TROW	5.168	
		*	0.005	

* no land use code assigned for acreage

Table A2(cont'd). Anacostia Watershed Monitoring Sites - Weighted Runoff Coefficients

SITE_NAME	Runoff Coefficient (R_v)	Land Use Code	Acreage	Weighted Average Runoff Coefficient (R_{v_i})
Anacostia High School	0.95	ALLEYS	3.671	
	0.85	C	20.310	
	0.85	HDR	12.807	
	0.5	LDR	9.995	
	0.65	LMDR	26.268	
	0.77	LP	5.559	
	0.77	MDR	46.758	
	0.3	MEDIAN	0.035	
	0.85	O	2.234	
	0.8	PQP-I	0.124	
	0.35	R	68.663	
	0.95	ROADS	23.249	
	0.8	S	9.198	
	0.95	TCU	0.300	
	0.85	TROW	22.624	0.68
Gallatin and 14th St., NE	0.95	ALLEYS	15.866	
	0.85	C	21.335	
	0.77	FP	5.059	
	0.85	HDR	0.021	
	0.95	I	43.590	
	0.5	LDR	20.307	
	0.65	LMDR	149.553	
	0.77	LP	23.492	
	0.77	MDR	12.116	
	0.3	MEDIAN	0.757	
	0.85	O	4.647	
	0.95	PARKING	3.259	
	0.35	R	95.603	
	0	RIVER	0.001	
	0.95	ROADS	71.765	
	0.8	S	108.198	
	0.95	TCU	32.918	
	0.85	TROW	53.719	
	*	0.248	0.73	

* no land use code assigned for acreage

Table A2(cont'd). Anacostia Watershed Monitoring Sites - Weighted Runoff Coefficients

SITE_NAME	Runoff Coefficient (R_v)	Land Use Code	Acreage	Weighted Average Runoff Coefficient (R_{v,i})
Varnum and 19th St., NE	0.95	ALLEYS	17.283	
	0.85	C	11.836	
	0.77	FP	5.146	
	0.5	LDR	248.551	
	0.65	LMDR	15.504	
	0.77	LP	2.879	
	0.77	MDR	1.492	
	0.3	MEDIAN	0.112	
	0.85	O	0.992	
	0.8	PQP-I	0.172	
	0.35	R	23.197	
	0.95	ROADS	71.650	
	0.8	S	36.361	
	0.85	TROW	82.266	
	*	0.021	0.67	
Nash Run	0.95	ALLEYS	0.374	
	0.5	LDR	2.748	
	0.65	LMDR	0.777	
	0.77	LP	3.400	
	0.35	R	3.548	
	0.95	ROADS	1.156	
	0.85	TROW	1.442	0.63
East Capitol St.	0.95	ALLEYS	1.211	
	0.85	C	0.050	
	0.5	LDR	0.371	
	0.54	LMDR	8.663	
	0.77	MDR	0.092	
	0.35	R	0.006	
	0.95	ROADS	2.513	
	0.8	S	1.905	
	0.85	TROW	1.915	0.75
Hickey Run	0.95	I	4.642	
	0.95	ROADS	1.546	
	0.95	TCU	1.277	
	0.85	TROW	1.119	0.94

* no land use code assigned for acreage