GOVERNMENT OF THE DISTRICT OF COLUMBIA
WASHINGTON, DC

Municipal Separate Storm Sewer System
NPDES Permit No. DC0000221

DISCHARGE MONITORING REPORT

AUGUST 19, 2005

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WASHINGTON, D.C.

Municipal Separate Storm Sewer System
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DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY
Washington, D.C.

Municipal Separate Storm Sewer System
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1.0 INTRODUCTION

The National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) – Permit No. DC 0000221 (the Permit) requires monitoring of storm event discharges to characterize the quality of storm water discharges, monitoring of dry weather flows to detect illicit connections and improper discharges, and wet weather screening to further investigate excessive levels of pollutants.

This report describes the monitoring sites, sample collection, record keeping, monitoring results, and estimates of loadings from the Potomac River and Rock Creek watersheds that have occurred since January 2004.

The District's current MS4 Permit was issued by U.S. Environmental Protection Agency (EPA) on August 19, 2004. Section IV.A.1, states that the Potomac River stations are to be sampled within calendar year 2004. The results of laboratory analysis of the samples collected at the seven Potomac stations are the focus of this report. In addition, Rock Creek monitoring results were updated by incorporating the analytical results of the more recent 2004 sampling efforts with the previously reported 2003 analytical results.

2.0 MONITORING STATIONS

The permit specifies representative sampling locations for each of the three subwatersheds designated within the MS4 area of the District: Anacostia River, Rock Creek and Potomac River. One subwatershed is monitored in each calendar year on a rotating basis. Each of the sites is to be monitored for at least three wet weather events per year. At sites with dry weather flows, dry weather screening samples are collected two times per year as part of the District's dry weather screening program. Samples are collected in accordance with the Permit and monitoring requirements at 40 CFR 122.26 (d)(2)(iii), by Maryland Environmental Services (MES) and EA Engineering, Science, and Technology, Inc., contractors with DOH and WASA, respectively. The Potomac River and Rock Creek sampling stations are described in this section.

2.1 Potomac River

Seven stations from the Potomac River watershed are included in the Permit under Section IV.A.1. A listing of the seven sampling stations and the associated drainage area for each is provided in Table 2-1. Figure 2-1 shows the Potomac River MS4 sampling sites. In addition, large-scale location maps showing individual Potomac River MS4 sampling sites are provided in Appendix A. Land use types associated with each Potomac River MS4 monitoring sites are identified in Appendix B.

TABLE 2-1. POTOMAC RIVER MONITORING SITES

Site Number	Sampling Location	Estimated Acreage of Drainage Area
1	Battery Kemble Creek-49th and Hawthorne Streets, NW.[a]	12
2	Foundary Branch-at Van Ness and Upton Streets, NW in the park.	51
3	Dalecarlia Tributary-Van Ness Street and Dalecarlia Parkway.	33
4	Oxon Run-Mississippi Avenue and 15th Street, SE	44
5	Tidal Basin-17th Street and Constitution Avenue, NW [b]	120
6	Washington Ship Channel-Washington Marina parking lot, SW [c]	42
7	C and O Canal-Potomac Avenue and Foxhall Road, NW	627

[a] Sample location shifted one block south due to access issues.
[b] Original location subject to tidal influence. Location shifted up-pipe to 12th & Constitution.
[c] Original location subject to tidal influence. Location shifted up-pipe to 14th and Main.

To date, 11 wet-weather and four dry-weather screening samples have been collected from the Potomac MS4 sampling sites. Table 2-2 lists the dates and location of each sample collected.

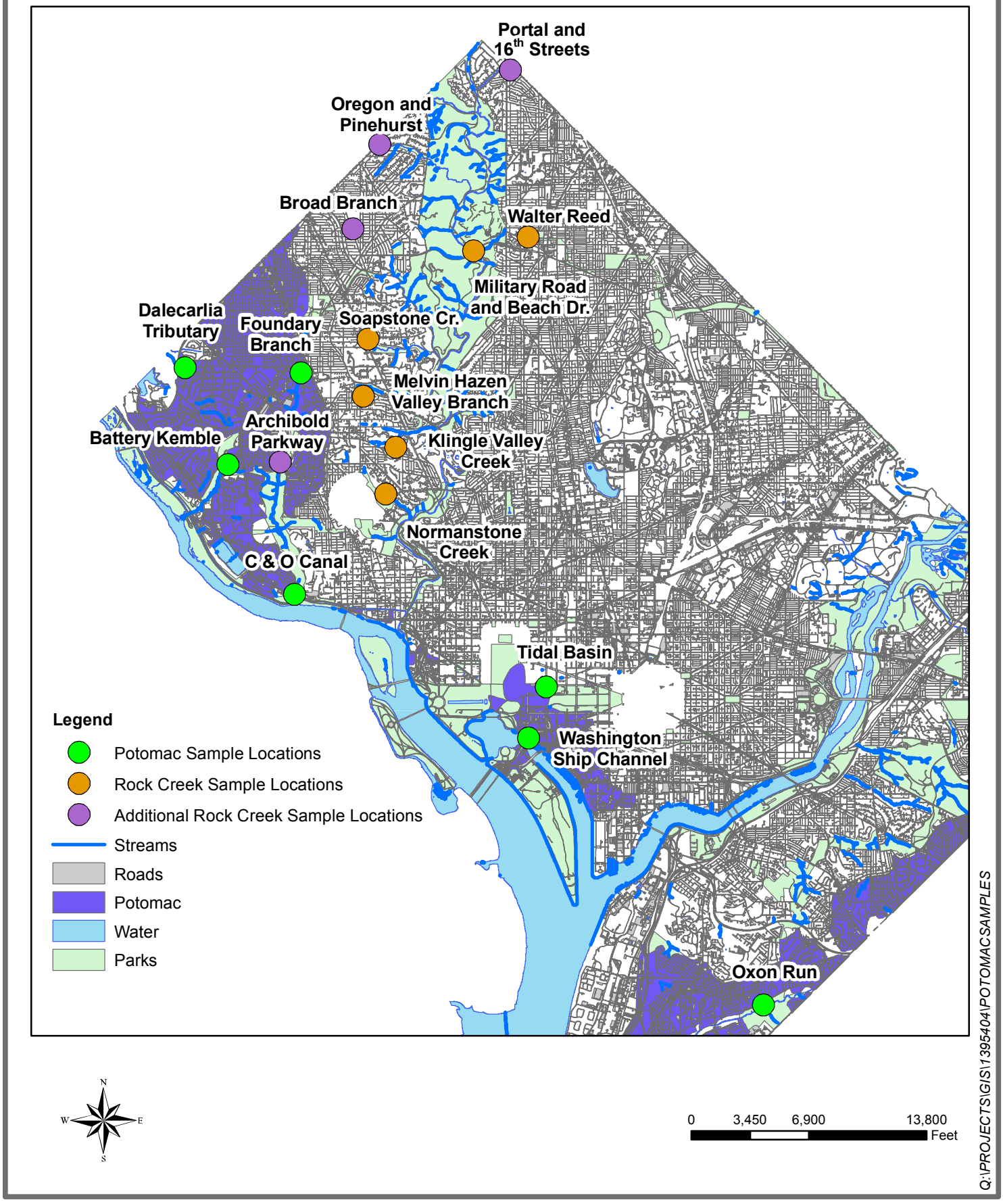

Figure 2-1. Potomac River and Rock Creek MS4 Monitoring Sites

TABLE 2-2. SUMMARY OF WET AND DRY WEATHER SAMPLING FOR SEVEN POTOMAC STATIONS

Site Number	Location	Wet Weather	Dry Weather
1	Battery Kemble Creek	20 May 2005 6 June 2005 29 June 2005	N/A
2	Foundary Branch	20 May 2005 6 June 2005	4 August 2005 *
3	Dalecarlia Tributary	20 May 2005 6 June 2005 29 June 2005	N/A
4	Oxon Run	---	3 August 2005 *
5	Tidal Basin	27 July 2005 *	N/A
6	Washington Ship Channel	6 June 2005	3 August 2005 *
7	C and O Canal	22 June 2005	4 August 2005 *

-- No sampling or analysis from these stations.
* Analyses are not included in this report, 2005 DMR.
N/A: Not applicable due to no dry-weather flows.

2.2 Rock Creek

A total of ten stations have been monitored for the Rock Creek watershed. Six of these were approved by EPA Region III Director in a letter dated, March 19, 2003 and have been incorporated in the permit in section IV.A.1, four additional sites were added to better characterize discharges from MS4 to Rock Creek.

A listing of the ten sampling stations and the associated drainage area of each is provided in Table 2-3. The Rock Creek MS4 sampling stations are also shown in Figure 2-1. Large-scale location maps of the ten permit-required monitoring stations representing Rock Creek are provided in Appendix C. The land use types associated with each Rock Creek MS4 monitoring site are provided in Appendix D.

TABLE 2-3. ROCK CREEK MONITORING SITES

Site Number	Sampling Location	Estimated Acreage of Drainage Area
1	Walter Reed - Fort Stevens Dr.	25
2	Military Rd and Beach Dr.	37
3	Soapstone Cr. – Connecticut Ave. and Ablemarle St.	330
4	Melvin Hazen Valley Branch – Melvin Hazen Park and Quebec St.	146
5	Klingle Valley Creek – Devonshire Place and 30th St.	52
6	Normanstone Creek – Normanstone Dr. and Normanstone Pkwy.	45
7*	Portal and 16th Streets	N/A
8*	Broad Branch- Broad Branch and 30th St., NW near the Ivory Coast Embassy.	540
9*	Oregon and Pinehurst	---
10*	Archibold Parkway – Intersection of New Mexico Ave. and Garfield St., NW	---

*Additional monitoring stations not listed in the 2004 Permit.
N/A: No acreage of drainage area has been estimated because much of the drainage area is in MD.
---Unknown drainage area

One dry weather sample was collected at each of Sites 1 through 6 during the fall of 2003 (November 4, 2003). The 2003 dry-weather data and results were reported in the 2004 DMR. A second dry-weather sample was collected for Sites 1 through 6 in the summer of 2004 (June 30, 2004). This report, 2005 DMR, lists the 2004 dry-weather data and results. Wet weather samples were collected at Sites 1, 2, 5, and 8 during the fall of 2003. The dates that samples were collected are provided in Table 2-3. Laboratory analysis data from these samples were presented in the 2004 Discharge Monitoring Report. Technical issues inhibited the completion of sampling for selected Rock Creek stations during 2003. A letter from EPA Region III, January 19, 2005 instructed the District to complete the wet weather sampling and report the data in the 2005 DMR report.

This report includes a summary of data for sample events from summer of 2004 to the present. Sixteen wet weather samples were collected from nine stations for the period between July 22, 2004 through July 27, 2005. Dry weather samples were collected from each of the six stations between November 2003 and June 2004. Table 2-4 summarizes sampling locations with associated number of samples collected, dates, and weather types.

TABLE 2-4. SUMMARY OF WET AND DRY WEATHER SAMPLING FOR TEN ROCK CREEK STATIONS

Site Number	Location	Wet Weather	Dry Weather
1	Ft. Stevens	12 Sept 2003 [b] 4 Nov 2004 7 Apr 2005	4 Nov 2003 [b] 30 Jun 2004
2	Military Rd.	12 Sept 2003 [b] 4 Nov 2004 7 Apr 2005	4 Nov 2003 [b] 30 Jun 2004
3	Soapstone Cr.	22 Jul 2004 7 Apr 2005 27 July 2005 [a]	4 Nov 2003 [b] 30 Jun 2004
4	Melvin Hazen Valley Br.	27 July 2005 [a]	4 Nov 2003 [b] 30 Jun 2004
5	Klingle Valley Cr.	14 Oct 2003 [2]	4 Nov 2003 [b] 30 Jun 2004
6	Normanstone Cr.	27 July 2005 [a]	4 Nov 2003 [b] 30 Jun 2004
7	Portal and 16th Streets	14 Oct 2003 [b] 4 Nov 2004 7 Apr 2005	---
8	Broad Branch	14 Oct 2003 [b] 7 Apr 2005 27 July 2005 [a]	---
9	Oregon and Pinehurst	22 Jul 2004 27 July 2005 [a]	---
10	Archibold Pky.	7 Apr. 2005	---

Additional monitoring stations not listed in the 2004 Permit.

--- No sampling or analysis from these stations.

[a] Analyses are not included in this report, 2005 Discharge Monitoring Report.

[b] Sample analysis data presented in 2004 DMR.

3.0 WEATHER INFORMATION

Table 3-1 lists the actual and normal precipitation for Washington, D.C. for the period of January 2004 through July 2005. Table 3-2 provides historic, monthly rain data for the Washington, D.C. area.

TABLE 3-1. PRECIPITATION RECORD FOR WASHINGTON, DC

Precipitation[a]		
Month	**Actual (in.)**	**Normal (in.)**
2004		
January	3.94[b]	3.21
February	2.15[b]	2.63
March	4.54[b]	3.60
April	3.84	2.77
May	2.98	3.82
June	4.60	3.13
July	6.98	3.66
August	5.09	3.44
September	3.99	3.79
October	1.74	3.22
November	4.50	3.03
December	3.06[b]	3.05
2005		
January	3.94[b]	3.21
February	2.15[b]	2.63
March	4.54[b]	3.60
April	3.84	2.77
May	4.61	3.82
June	2.87	3.13
July	6.06	3.66

[a]Precipitation data from Ronald Reagan National Airport; Source: www.accuweather.com
[b]During months with rainfall and snowfall, a conversion factor (10 in. snow = 1 in. rain) was used to calculate Actual Precipitation amount.

TABLE 3-2. MONTHLY RAIN DATA SUMMARY FROM THE NATIONAL AIRPORT DATABASE, 1949-1996

	Monthly Average	
Month	**Precipitation (in.)**	**Intensity (in./hr)**
January	2.81	0.04
February	2.61	0.04
March	3.52	0.05
April	2.84	0.05
May	3.73	0.06
June	3.19	0.09
July	3.88	0.11
August	3.97	0.11
September	3.38	0.08
October	3.06	0.07
November	2.99	0.06
December	3.13	0.05
Avg.	**3.26**	**0.07**

3.1 Potomac River

The National Weather Service rain gauge, located at Reagan National Airport, was used to represent rainfall at the Potomac River stations. Rain events sampled are provided in Table 3-3. Narrative descriptions for storm events are provided below:

May 20, 2005: A sample set was collected during this storm event at Site #1 (Battery Kemble), Site #2 (Foundary Branch), and Site #3 (Dalecarlia Tributary). Rain data were taken from Reagan National Airport. Rain began to fall at about 3:00 AM and continued to about 2:00 PM, giving duration of 11 hours. A total of 2.63 inches of rain fell during this interval. The last previous rainfall occurred approximately six days prior to the measured rain event.

June 6, 2005: A sample set was collected during this storm event at Site #1 (Battery Kemble), Site #2 (Foundary Branch), Site #3 (Dalecarlia Tributary), and Site #6 (Washington Ship Channel). Rain data were taken from Reagan National Airport. Rain began to fall at about 6:40 PM and continued to about 7:10 PM, giving duration of 1 hour. A total of 1.00 inch of rain fell during this interval. The last previous rainfall occurred approximately 74 hours prior to the measured rain event.

June 22, 2005: A sample was collected during this storm event at Site #7 (C&O Canal). Rain data were taken from Reagan National Airport. Rain began to fall at about 10:00 AM and continued to about 10:30 AM, giving duration of 0.5 hours. A total of 0.03 inches of rain fell during this interval. The last previous storm event occurred approximately 16 days prior to the measured rain event.

June 29, 2005: A sample set was collected during this storm event at Site #1 (Battery Kemble) and Site #3 (Dalecarlia Tributary). Rain data were taken from Reagan National Airport. Rain began to fall at about 7:00 PM and continued to about 11:00 PM, giving duration of 4 hours. A total of 1.03 inches of rain fell during this interval. The last previous rainfall occurred approximately 23 days prior to the measured rain event.

July 27, 2005: A sample set was collected during this storm event at Site #5 (Tidal Basin). Rainfall recorded at the Reagan National Airport for this day was 0.11 inches. Rain began to fall at about 6:40 PM and continued to about 7:20 PM, giving duration of 0.67 hours. The last previous rainfall occurred approximately three complete days (72 hrs) prior to the measured rain event.

TABLE 3-3. STORM SAMPLING CHARACTERISTICS FOR POTOMAC RIVER EVENTS

Date	Precipitation (in.)	Duration (hr)	Time to Previous (hr)	Gauge Location	Sites Sampled
5-20-05	2.63	11	144	RNA	1,2,3
6-6-05	1.0	1	74	RNA	1,2,3,6
6-22-05	0.03	0.5	384	RNA	7
6-29-05	1.03	4	552	RNA	1,3
7-27-05	0.11	0.67	72	RNA	5

RNA: Reagan National Airport

As part of the dry weather program requirement, four Potomac River stations with dry weather flow were sampled during the year. The first dry weather monitoring event occurred on August 3, 2005 and the second occurred on August 3 and 4, 2005. A narrative description for these sampling events is provided below:

August 3, 2005: A sample set was collected at Site #4 (Oxon Run) and Site #6 (Washington Ship Channel). The last previous rainfall occurred approximately 120 hours prior to this dry weather monitoring event. On this same day, two other sites (Site #1

Battery Kemble and site #3 Dalecarlia Tributary) were also checked for sample collection, however both were dry and no water was available for analysis.

August 4, 2005: A sample set was collected at Site #2 (Foundary Branch) and Site #7 (C&O Canal). The last previous rainfall occurred approximately 144 hours prior to this dry weather monitoring event. On this same day, Site #5 (Tidal Basin) was checked for sample collection, however it was dry and no water was available for analysis.

3.2 Rock Creek

Two data logging rain gauges within the Rock Creek watershed were used to represent the District of Columbia's wet weather sampling stations for 2003 and 2004. Rain gauge site locations and the monitoring stations they represent are presented in Table 3-4. Rain events for which samples were collected are provided in Table 3-5. Narrative descriptions for storm events are provided below:

July 22, 2004: A sample set was collected during this storm event at Site No. 3 (Soapstone Creek) and Site No. 9 (Oregon and Pinehurst). Rain data were taken at a rain gauge placed at Site No. 3. Rain began to fall at about 6:30 PM and continued to about 8:10 PM, this rain event lasted approximately two hours. A total of 0.53 inches of rain fell during this interval. The last previous rainfall occurred approximately 96 hours prior to the measured rain event.

November 4, 2004: A sample set was collected during this storm event at Site #1 (Fort Stevens Drive), Site #2 (Military and Beach), and Site #7 (Portal & 16th). Rain data were taken at a rain gauge placed at Site #1. Rain began to fall at about 7:15 AM and continued to about 7:00 PM, this rain event lasted approximately 11 hours. A total of 1.71 inches of rain fell during this interval. The last previous rainfall occurred approximately 13 days prior to the measured rain event.

April 7, 2005: A sample set was collected during this storm event at Site No.1 (Fort Stevens Drive), Site No. 2 (Military and Beach), Site No. 3 (Soapstone Creek), Site No. 7 (Portal and 16th), Site No. 8 (Broad Branch), and Site No. 10 (Archibold Pky). Rain data were taken at a rain gauge placed at Site No. 2. Rain began to fall on April 7th at 5:15 PM and continued to about 9:00 AM on April 8th; this rain event lasted approximately 16 hours. A total of 0.33 inches of rain fell during this interval. The last previous rainfall occurred approximately four days prior to the measured rain event.

TABLE 3-4. LOCATION OF RAIN GAGES REPRESENTING THE ROCK CREEK MONITORING STATIONS

Site No.	Location Description	Rain Gauge No.
1	Ft. Stevens Dr.	#1,#2
2	Military & Beach	#1,#2
3	Soapstone Cr.	#3,#2
7	Portal and 16th	#1,#2
8	Broad Branch	#2
9	Oregon and Pinehurst	#3

TABLE 3-5. STORM CHARACTERISTICS FOR ROCK CREEK SAMPLING EVENTS

Date	Precipitation (in.)	Duration (hr)	Time to Previous (hr)	Gauge Location	Sites Sampled
7/22/04	0.53	1.67	96	#3	3,9
11/4/04	1.71	11	310	#1	1,2,7
4/7/05	0.33	16	100	#2	1,2,3,7,8,10

4.0 SAMPLE COLLECTION

The list of sampled parameters, the detection limits, and EPA-approved methods utilized for monitoring activities are included in Table 4-1. A Quality Assurance Project Plan (QAPP) for the wet and dry weather monitoring is provided in Appendix E.

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_2SO_4	Composite	Ammonia Nitrogen	SM4500-NH3-E	mg/L	<1.0
		Phosphorus, Total	EPA 365.3	mg/L	<0.05
		Nitrite + Nitrate	EPA 353.2	mg/L	<0.05
		Chemical Oxygen Demand	EPA 410.4	mg/L	<10.0
		Total Kjeldahl Nitrogen	EPA 351.3	mg/L	<0.5
250 mL Plastic, Filtered, H_2SO_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	
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_2SO_4 Teflon Lids	Grab	Phenols, Total	EPA 420.2	mg/L	1.9
1-L Glass Amber H_2SO_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_2SO_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_2SO_4	Composite	Organic Nitrogen	TKN – NH3	mg/L	N/A
500 mL Plastic H_2SO_4	Composite	Total Nitrogen	NO2 + NO3 + TKN	mg/L	N/A

5.0 RECORDKEEPING

DOH maintains the records of monitoring information including:

- Description of Sampling
    - Location/Collection Time
    - Sampling Collection
    - Field Test
    - Maryland Environmental Services and EA Engineering personnel who collected samples
- Storm Event Data
    - Date and duration of the storm events samples
    - 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
- Sampling Difficulties/Field Notes
- QA/QC Review and Clarification
    - Field Test Results
    - Laboratory Results Tables

6.0 MONITORING RESULTS

6.1 Potomac River

Monitoring results for the wet weather sampling events are reported on discharge monitoring report (DMR) forms. Copies of the completed DMR forms for the Potomac River stations are provided in Appendix F. Complete analytical results are included in Appendix G. Ambient water quality data collected during the wet and dry weather sampling events are summarized in Table 6-1.

TABLE 6-1. AMBIENT WATER QUALITY DATA FOR SEVEN POTOMAC RIVER STATIONS DURING WET AND DRY WEATHER SAMPLING EVENTS

Station	Date	pH (s.u.)	Temp (^{o}F)
WET			
Tidal Basin	7/27/05	---	---
Battery Kemble	6/29/05	---	---
Foundary Branch	6/29/05	---	---
C&O Canal	6/22/05	---	---
Battery Kemble	6/6/05	7.3	63.3
Foundary Branch	6/6/05	7.1	62.2
Dalecarlia Tributary	6/6/05	6.0	68.8
Battery Kemble	5/20/05	7.5	58.1
Foundary Branch	5/20/05	---[(a)]	60.1
Dalecarlia Tributary	5/20/05	6.8	57.8
DRY			
Oxon Run	8/3/05	---	---
Washington Ship Channel	8/3/05	---	---
Foundary Branch	8/4/05	---	---
C&O Canal	8/4/05	---	---

[(a)] Probe for the pH meter malfunctioned during data collection.

---No ambient water quality data collected for these storm events.

Analytical results of twelve priority pollutants that were collected during wet weather monitoring events are provided in Table 6-2. Complete analytical results are included in Appendix H.

On August 3 and 4, 2005, seven MS4 sites were sampled during dry weather (the dry weather data and results are not available for presentation in this report, 2005 DMR).

It should be noted that a better characterization of the storm water quality can be made once all of the annual wet and dry weather samples have been analyzed and average values for each parameter are calculated as required by the permit. The dry and wet weather monitoring at for the Potomac River subwatershed is on-going and results of sample analyses will be reported in subsequent DMRs.

TABLE 6-2. WET WEATHER RESULTS OF PRIORITY POLLUTANT ANALYSES FOR THE DISTRICT OF COLUMBIA'S POTOMAC RIVER MS4 MONITORING STATIONS (MG/L)

Parameter	Sample Stations									
	1[a]	1[b]	1[d]	2[a]	2[b]	3[a]	3[b]	3[d]	6[b]	7[c]
TSS	24	558	19	ND	58	ND	35	11	26	35
BOD	NRR	16	9	NRR	17	NRR	9	9	10	44
COD	62	126	112	27	41	53	65	51	NRR	204
TDS	124	146	250	ND	114	132	174	130	62	506
Total Nitrogen	NRR	NRR	NRR	NRR	NRR	NRR	NRR	NRR	NRR	NRR
Total Kjeldhal Nitrogen	1.2	2.86	0.84	1.2	1.21	1.00	1.42	2.73	NRR	5.16
Total Phosphorus	0.26	1.06	0.52	0.51	0.7	0.19	0.46	0.32	NRR	0.7
Dissolved Phosphorus	0.3*	0.3	0.55*	ND	0.71*	0.21*	0.46	0.22	NRR	0.54
Cadmium	NRR	0.00044	ND	ND	0.00022	ND	ND	ND	0.00033	ND
Copper	0.29	0.12	ND	ND	0.034	0.068	0.053	ND	0.14	0.12
Lead	0.0069	0.031	ND	ND	0.015	0.0058	0.0036	ND	0.16	0.024
Zinc	0.047	0.16	NRR	ND	0.13	0.031	ND	ND	0.16	0.14

[a] Wet weather collection – May 20, 2005
[b] Wet weather collection – June 6, 2005
[c] Wet weather collection – June 22, 2005
[d] Wet weather collection – June 29, 2005
ND: No Detection
NRR: No results reported
* Dissolved Phosphorus analysis was greater than Total Phosphorus for the same sampling event.

6.2 Rock Creek

Monitoring results for the wet weather sampling events are reported on DMR forms. Copies of the completed DMR forms for the monitoring results are provided in Appendix I.

Ambient water quality data collected during the wet and dry weather sampling events are summarized in Table 6-3.

TABLE 6-3. – AMBIENT WATER QUALITY DATA FOR SIX ROCK CREEK STATIONS DURING WET WEATHER AND DRY WEATHER SAMPLING EVENTS

Station	Time	Date	pH (s.u.)	Temp (^{o}C)	TRC* (mg/L)	DO (mg/L)
WET						
Ft. Stevens	2010	4/7/05	6.95	14.9	0.10	11.01
Military	2000	4/7/05	7.43	13.9	0.41	10.4
Soapstone	2037	4/7/05	6.23	15.3	0.23	7.44
Portal Dr.	2041	4/7/05	7.12	16.4	0.22	10.76
Broad Branch	2016	4/7/05	6.21	14.3	0.02	8.00
Ft. Stevens	0950	11/4/04	6.72	12.1	---	7.10
Military	0935	11/4/04	5.27	11.8	---	8.54
Portal Dr.	0900	11/4/04	5.89	12.3	---	8.04
Soapstone	1940	7/22/04	5.99	24.7	0.03	5.08
Oregon and Pinehurst	2020	7/22/04	6.52	25.1	0.00	5.00
DRY						
Ft. Stevens	1130	6/30/04	5.20	20.1	0.09	6.64
Military	1150	6/30/04	5.5	18.2	0.89	6.74
Soapstone	1232	6/30/04	7.11	19.7	1.03	6.48
Hazen	1045	6/30/04	6.9	20.7	1.28	7.26
Klingle Valley	1151	6/30/04	6.95	21.9	0.16	2.83
Normanstone	1220	6/30/04	6.32	18.0	0.04	2.66

*TRC: Total Residual Chlorine

Analytical results of twelve priority pollutants that were collected during wet and dryweather monitoring events are provided in Tables 6-4a and 6-4b. Complete analytical results are included in Appendix J. Complete analytical results for Rock Creek are included in Appendix K.

TABLE 6-4a. WET WEATHER RESULTS OF PRIORITY POLLUTANT ANALYSES FOR THE DISTRICT OF COLUMBIA'S

ROCK CREEK MS4 MONITORING STATIONS
(MG/L)

Parameter	Sample Stations										
	1[a]	1[b]	2[a]	2[b]	3[b]	3[c]	7[a]	7[b]	8[b]	9[c]	10[c]
TSS	24	28	149	57	20	41	162	48	36	73	21
BOD	NRR	NRR	NRR	NRR	NRR	NRR	NRR	NRR	NRR	NRR	NRR
COD	145	59	328	114	39	26	155	92	21	111	82
TDS	123	438	91	442	87	327	234	410	404	92	346
Total Nitrogen	4.5	4.63	5.08	4.14	2.22	3.88	3	4.84	3.3	3.23	4.3
Total Kjeldhal Nitrogen	3.24	1.36	4.06	1.88	0.98	0.98	1.65	1.47	0.91	1.89	1.92
Total Phosphorus	0.41	0.37	1.05	0.16	0.22	0.18	0.39	0.31	0.14	0.35	0.37
Dissolved Phosphorus	NRR	NRR	NRR	NRR	NRR	NRR	NRR	NRR	NRR	NRR	NRR
Cadmium	ND	ND	ND	0.0019	ND	0.0008	ND	ND	0.0006	ND	ND
Copper	0.072	0.038	0.04	0.031	0.033	0.038	0.051	0.034	0.043	0.025	0.066
Lead	0.021	0.006	0.016	0.011	0.014	0.013	0.018	0.007	0.013	0.008	0.031
Zinc	0.166	0.088	0.15	0.075	0.12	0.109	0.221	0.144	0.066	0.05	0.092

[a] Wet weather collection – November 4, 2004
[b] Wet weather collection – April 7, 2005
[c] Wet weather collection – July 22, 2004
ND: No detection
NRR: No results reported

TABLE 6-4b. DRY WEATHER RESULTS OF PRIORITY POLLUTANT ANALYSES FOR THE DISTRICT OF COLUMBIA'S ROCK CREEK MS4 MONITORING STATIONS (MG/L)

Parameter	Sample Stations											
	1[a]	1[b]	2[a]	2[b]	3[a]	3[b]	4[a]	4[b]	5[a]	5[b]	6[a]	6[b]
TSS	ND	N/A	ND	N/A	N/A	ND	N/A	N/A	N/A	N/A	N/A	N/A
BOD	NRR	N/A	NRR	N/A	N/A	NRR	N/A	N/A	N/A	N/A	N/A	N/A
COD	ND	N/A	ND	N/A	N/A	ND	N/A	N/A	N/A	N/A	N/A	N/A
TDS	772	N/A	266	N/A	N/A	438	N/A	N/A	N/A	N/A	N/A	N/A
Total Nitrogen	4.17	N/A	2.4	N/A	N/A	3.31	N/A	N/A	N/A	N/A	N/A	N/A
Total Kjeldhal Nitrogen	ND	N/A	ND	N/A	N/A	0.56	N/A	N/A	N/A	N/A	N/A	N/A
Total Phosphorus	0.04	N/A	0.05	N/A	N/A	0.15	N/A	N/A	N/A	N/A	N/A	N/A
Dissolved Phosphorus	NRR	N/A	NRR	N/A	N/A	NRR	N/A	N/A	N/A	N/A	N/A	N/A
Cadmium	ND	N/A	ND	N/A	N/A	ND	N/A	N/A	N/A	N/A	N/A	N/A
Copper	ND	N/A	.003	N/A	N/A	.007	N/A	N/A	N/A	N/A	N/A	N/A
Lead	ND	N/A	ND	N/A	N/A	ND	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	.018	N/A	.010	N/A	N/A	.025	N/A	N/A	N/A	N/A	N/A	N/A

[a] Dry weather collection – November 4, 2003
[b] Dry weather collection – June 30, 2004
N/A: Not applicable, no dryweather flows
ND: No detection
NRR: No results reported

It should be noted that a better characterization of the storm water quality can be made once all of the annual wet and dry weather samples have been analyzed and average values for each parameter are calculated as required by the permit. The dry and wet weather monitoring at Rock Creek subwatershed is on-going and results of sample analyses will be reported in subsequent DMRs.

7.0 ESTIMATES OF CUMULATIVE LOADINGS

The MS4 system-wide annual pollutant loads for wet and dry weather events were calculated by the Simple Method (EPA 1992) utilizing the system-wide event mean concentrations and the total area and land use distribution within the MS4 area of the District of Columbia. 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:

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

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)

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)

The average EMCs (C_i)for each monitoring station was calculated as the geomean of the measured EMCs in accordance with EPA's *Urban Stormwater BMP Performance Monitoring: Guidance Manual* (ASCE/EPA, 2002).

$$\text{Geomean of EMCs} = \left[\prod_{j=1}^{m} \text{EMC}_j \right]^{\frac{1}{m}}$$

Where:

EMC_j = Event Mean Concentration of storm *j*

m = Number of storms at monitoring location

Annual precipitation for 2004 within the District of Columbia was 42.5 inches as reported by the 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 (Rvi), 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 L.

7.1 Potomac River

A review of the estimated loadings of wet weather data for five representative stations (Battery Kemble, Foundary Branch, Dalecarlia Tributary, Washington Ship Channel, and C&O Canal) indicates that some metals are contributed in minor amounts, and among these, copper, lead, and zinc are the highest on average (Table 7-1). Moderate loads of nitrogen, phosphorus, and metals were contributed from all stations, while significant loads of total dissolved solids (8,090 – 1,430,000 pounds per year), are contributed from all stations. Total suspended solids are contributed in moderate loads for all stations (1,380 – 3,100) with the exception of C&O Canal, where the loads are more significant (98,900 ppy). Additionally for this same station BOD and COD loadings (98,900 and 124,000, respectively) are much higher than other representative stations in the Potomac River.

7.2 Rock Creek

A review of the estimated loadings of wet weather data for three representative stations (Ft. Stevens, Military Road, and Soapstone) indicates that some metals are contributed minor amounts, and among these, copper, lead, and zinc are the highest on average (Table 7-2). Moderate loads of nitrogen, phosphorus, and metals were contributed from all stations, however the highest calculated loads for these pollutants are coming from the Soapstone station. More significant loads of total dissolved solids, total suspended solids, BOD, and COD are contributed from all representative stations in Rock Creek.

TABLE 7-1. 2005 ANNUAL POLLUTANT LOADING FOR PRIORITY POLLUTANTS FOR POTOMAC RIVER STATIONS DURING WET WEATHER EVENTS

PARAMETER	POUNDS/YEAR
Battery Kemble Creek (1)	
TSS	3100
BOD	587
COD	4680
TDS	8090
TN	no data
TKN	69.4
TP	25.6
DP	17.9
Cadmium	0.00854
Copper	1.45
Lead	0.142
Zinc	4.24
Foundary Branch (2)	
TSS	1380
BOD	4360
COD	8530
TDS	29200
TN	no data
TKN	309.0
TP	153
DP	34.2
Cadmium	0.0399
Copper	1.29
Lead	0.337
Zinc	2.53

TABLE 7-1. 2005 ANNUAL POLLUTANT LOADING FOR PRIORITY POLLUTANTS FOR POTOMAC RIVER STATIONS DURING WET WEATHER EVENTS (Continued)

PARAMETER	POUNDS/YEAR
Dalecarlia Tributary (3)	
TSS	2630
BOD	1180
COD	7370
TDS	18900
TN	no data
TKN	206.7
TP	39.9
DP	36.4
Cadmium	0.0145
Copper	1.83
Lead	0.176
Zinc	0.158
Washington Ship Channel (6)	
TSS	6060
BOD	2330
COD	no data
TDS	14400
TN	no data
TKN	no data
TP	no data
DP	no data
Cadmium	0.0769
Copper	32.6
Lead	37.3
Zinc	37.3
C&O Canal (7)	
TSS	98900
BOD	124000
COD	577000
TDS	1430000
TN	no data
TKN	14583
TP	1980
DP	1530
Cadmium	0.311
Copper	339
Lead	67.8
Zinc	396

TABLE 7-2. 2004 ANNUAL POLLUTANT LOADING FOR PRIORITY POLLUTANTS FOR ROCK CREEK STATIONS DURING WET WEATHER EVENTS

PARAMETER	POUNDS/YEAR
Walter Reed-Ft. Stevens (1)	
TSS	3260
BOD	no data
COD	11600
TDS	29200
TN	574
TKN	264
TP	49
DP	no data
Cadmium	0.0314
Copper	6.57
Lead	1.41
Zinc	15.2
Military Road & Beach Dr. (2)	
TSS	15700
BOD	no data
COD	32900
TDS	34100
TN	780
TKN	470
TP	69.7
DP	no data
Cadmium	0.117
Copper	5.99
Lead	2.26
Zinc	18
Soapstone (3)	
TSS	42600
BOD	no data
COD	47400
TDS	251000
TN	4370
TKN	1460
TP	296
DP	no data
Cadmium	0.665
Copper	52.7
Lead	20.1
Zinc	170