Appendix C

Revised Metals Allocations and Daily Loads for Rock Creek

***Draft* - May 2016**

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1. Introduction

The purpose of this document is to revise the original 2004 *Final Total Maximum Daily Loads for Metals in Rock Creek* (DDOH 2004). The revision incorporates revised water quality standards (WQS) for copper, zinc, and mercury. The current WQS were adopted by the District of Columbia (District) on November 1, 2013 and approved by EPA on February 4, 2014.

In addition, daily loading expressions for copper, zinc, lead, and mercury allocations are also provided. The daily loads have been established to comply with *Friends of the Earth vs. the Environmental Protection Agency, 446 F.3d 140, 144* (D.C. Cir. 2006), which requires establishment of a daily loading expression in TMDLs in addition to any annual or seasonal loading expressions previously established in the TMDL.

Anacostia Riverkeepers, Friends of the Earth, and Potomac Riverkeepers filed a complaint (Case No.: 1:09-cv-00098-JDB) on January 15, 2009, because certain District TMDLs did not include a daily load expression. The District Court ultimately vacated the subject TMDLs, but delayed vacatur in order to allow the District of Columbia and the U.S. Environmental Protection Agency, Region III (EPA) sufficient time to establish and approve replacement TMDLs. For purposes of these TMDLs (identified in Paragraph 24f of the above-referenced complaint), vacatur is stayed until January 1, 2017.

2. Applicable Water Quality Standards

Rock Creek (Upper Rock Creek segment DCRCR00R_02 and Lower Rock Creek segment DCRCR00R_01) was listed on the District's 1998 section 303(d) list for metals impairments. The specific metals impairing Rock Creek's water quality were identified through analysis of available water quality data for pollutants of concern, and TMDLs were developed for lead, zinc, mercury, and copper. The District WQS, Title 21 of the District of Columbia Municipal Regulations (DCMR), Chapter 11 specifies the categories of beneficial uses. They are listed in Table 2.1.

Table 2.1: Categories of beneficial uses for surface waters

Categories of Uses that Determine WQS	Classes of Water
Primary contact recreation	A
Secondary contact recreation	B
Protection and propagation of fish, shellfish, and wildlife	C
Protection of human health related to consumption of fish and shellfish	D
Navigation	E

Source: DCMR 21-1101.1

The classification of Rock Creek is listed in Table 2.2.

Table 2.2: Classification of the Rock Creek Uses

Surface waters of the District	Use classes	
	Current use	**Designated use**
Rock Creek	B, C, D, E	A, B, C, D, E
Rock Creek tributaries	B, C, D, E	A, B, C, D, E

Source: DCMR 21-1101.2

This TMDL revision is set at a level that will protect all of Rock Creek's designated uses with respect to the specific pollutants addressed. The waterbodies addressed by this revision are the same ones that received allocations under the original TMDL, Upper Rock Creek and Lower Rock Creek.

Class C criteria apply to all the metals and include two numeric criteria. The Criteria Maximum Concentration (CMC) is the highest concentration of a pollutant to which aquatic life can be exposed for a short period of time (one-hour (1-hour) average) without deleterious effects at a frequency that does not exceed more than once every three (3) years. The Criterion Continuous Concentration (CCC) is the highest concentration of a pollutant to which aquatic life can be exposed for an extended period of time (four-day (4-day) average) without deleterious effects at a frequency that does not exceed more than once every three (3) years. In freshwater, it is important to note that Class C criteria for copper, lead, and zinc are hardness dependent. Class D criterion protects human health related to consumption of fish and shellfish, and is based on a 30-day average concentration not to be exceeded in the water column. There are Class D criteria applicable to mercury and zinc.

Current and applicable WQS for copper, zinc, lead and mercury were most recently adopted by the District on November 1, 2013, and approved by EPA on February 4, 2014. The current Class C and Class D numeric water quality criteria for metals (bold) applicable to Rock Creek, and the criteria used to develop the original TMDLs (strike-out), are presented in Table 2.3. These bolded criteria represent the TMDL endpoints.

Table 2.3: Water Quality Criteria for Metal in the District of Columbia

Metals	Criteria for Classes		
	Class C		Class D[2]
	Criteria Continuous Concentration (CCC) Four-Day Average µg/L	Criteria Maximum Concentration (CMC) One-Hour Average - µg/L	30-Day Average – µg/L
Copper[1], dissolved	**9.72** ~~12.3~~	**14.7** ~~18.6~~	**N/A**
Lead[1], dissolved	**2.79**	**71.63**	**N/A**
Zinc[1], dissolved	**128.07** ~~113.3~~	**127.04** ~~124.1~~	**26,000** ~~N/A~~
Mercury, total recoverable	**0.77** ~~0.012~~	**1.4** ~~2.4~~	**0.15**

Source: DCMR 21-1104.8

[1]The water quality criteria for copper, lead, and zinc are hardness dependent. The Rock Creek criteria shown are based on a hardness of 110 mg/L $CaCO_3$, which was calculated using the 50th percentile hardness value from data collected in Rock Creek from 1984 to 2000.

[2]The Class D human health criteria for metals is based on total recoverable metals.

3. Technical Approach

All information and input files to the Rock Creek Storm Water Management Model (SWMM), as applied to the original TMDLs, were used to develop the revised metals allocations and daily load expressions, except for necessary revisions noted below. The representative three-year period used to model existing and TMDL conditions was 1988 to 1990. The use of this three-year period estimates a wide variety of seasonal variations and critical conditions. For example, the modeling period represents a combination of dry (1988), wet (1989), and average rainfall (1990) conditions. During development of this revision, flow and precipitation data from the 1988-1990 period were compared to more recent flow and precipitation data from the 10-year period 2005-2015 and 3-year period 2012-2015. The comparison showed that the 1988-1990 data remain representative of flow and precipitation conditions in Rock Creek. A more detailed description of the modeling, as applied to the copper, lead, and zinc TMDLs, can be found in Appendix A to the original 2004 TMDL. A more detailed description of the modeling approach along with the equations and specific values used in the Rock Creek mercury model can be found in Appendix B to the original 2004 TMDL.

Flow for the upstream dataset input to the Rock Creek model is based on the USGS gage at Sherrill Drive (USGS 01648000). During the re-creation of the original Rock Creek model, it was noted that the flow in Rock Creek used to assign pollutant loads was under-represented on two high flow days in the original 2004 TMDLs. As shown in table 3.1, flow values used for the 2004 TMDLs on May 6, 1989, and October 23, 1990, were much lower than the recorded flow at the USGS gage.

Table 3.1: Flow comparison between 2004 TMDL values and recorded USGS gage values

Date	Flow used for 2004 TMDL (cfs)	Recorded USGS Flow at Sherrill Drive (cfs)
May 6, 1989	380	2,380
October 23, 1990	460	1,460

To better represent all flows and associated loadings from 1988 to 1990, the 2 recorded USGS high-flow values are included in this revision.

In addition, the original TMDL indicated that hourly flow from the USGS gage at Sherrill Drive was adjusted by using areal weighting. Since the Sherrill Drive flow gage is not directly at the DC/MD border, areal weighting better represents flow from Maryland entering the District (See Figure 3.1). Upon reproducing the model runs, it became apparent that the areal weighting was omitted in the 2004 existing loads – providing existing loads within the District that were slightly overestimated. To better represent pollutant loadings entering the District from the Maryland portion of Rock Creek, daily flows were adjusted 2.25% in this revision. The revised existing, annual and daily loads for each metal were calculated to include the current water quality standards as well as the refinements outlined in this section.

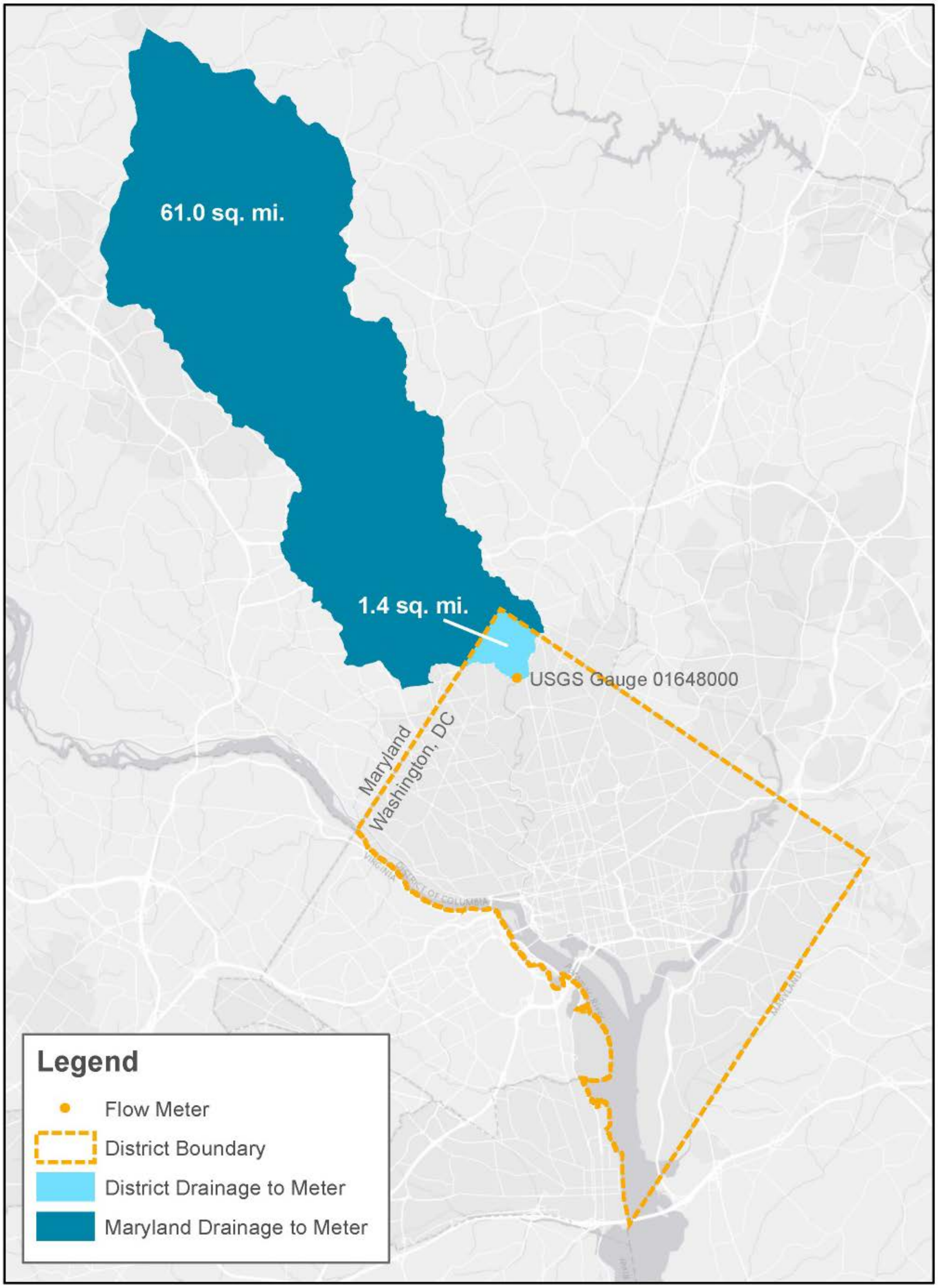

Figure 3.1: Map of Rock Creek Drainage Area in Maryland and DC above Sherrill Drive USGS Gage

Allocation Methodology

The original TMDLs provided wasteload allocations (WLAs) and load allocations (LAs) for the following pollutant sources: upstream, combined sewer overflows (CSOs), separate storm water (MS4) including tributary loads, and direct stormwater runoff or lateral flow (nonpoint). In order to avoid confusion, separate storm water loads and nearly all of the tributary loads documented in the original 2004 TMDL are referred to as "MS4 loads" in this revision. This consolidation is consistent with the separate storm water and tributary WLAs contained in the original 2004 TMDL. It reflects the assumption that all of the loadings from the tributaries originate from the municipal separate storm sewer system operated by the District. Direct nonpoint loads originate outside of the MS4 and combined sewer systems and, for the most part, represent parkland that drains directly to Rock Creek and its tributaries. The pollutant source categories in this revision are: upstream, CSO, MS4, and direct nonpoint.

Daily Loads Calculation Methodology

In November 2006, EPA issued the memorandum *Establishing TMDL Daily Loads in Light of the Decision by the U.S. Court of Appeals for the D.C. Circuit in Friends of the Earth, Inc. v. EPA et. al., No. 05-5015 (April 25, 2006) and Implications for NPDES permits*, which recommends that all TMDLs and associated load allocations and wasteload allocations include a daily time increment in conjunction with other appropriate temporal expressions that might be necessary to implement the relevant WQS. In compliance with that recommendation, this appendix presents corresponding daily load expressions for the long-term load allocations for Rock Creek. These daily loads were developed in a manner consistent with the following assumptions in EPA's Draft Options for Expressions of Daily Loads in TMDLs (USEPA 2007):

1. Methods and information used to develop the daily load should be consistent with the approach used to develop the loading analysis.
2. The analysis should avoid added analytical burden without providing added benefit.
3. The daily load expression should incorporate terms that address acceptable variability in loading under the long-term loading allocation. Because many TMDLs are developed for precipitation-driven parameters, one number will often not represent an adequate daily load value. Rather, a range of values might need to be presented to account for allowable differences in loading due to seasonal or flow-related conditions (e.g., daily maximum and daily median).
4. The methodologies are applicable to a wide variety of TMDL situations; however, the specific application (e.g., data used, values selected) should be based on knowledge and consideration of site-specific characteristics and priorities.
5. The TMDL analysis on which the daily load expression is based fully meets the EPA requirements for approval, is appropriate for the specific pollutant and waterbody type, and results in attainment of water quality criteria in a manner that is consistent with the underlying analysis that was used to develop the original TMDLs.

Annual and Daily Load Calculation Approach for Rock Creek Sources

The original information and input files to the Rock Creek model for the simulation period (1988-1990), with the changes noted in the paragraphs above, were used to develop the revised annual metals allocations necessary to achieve the applicable WQS. From the same time series, EPA identified the average and maximum daily load values for each source. The step-wise process is summarized below:

1. Hourly time series loading files for TSS and metals were developed for the three-year period 1988 to 1990 for each loading source using the quantification methods outlined in the original 2004 TMDL report and technical appendices.

2. The previously calibrated SWMM model of Rock Creek was applied to simulate water and pollutants being conveyed through Rock Creek for the period 1988 to 1990. Figure 3.1 shows a map of Lower Rock Creek model segments 1-18, and Upper Rock Creek model segments 19-40. All Rock Creek segments are modeled to ensure compliance with applicable criteria at all times. Shaded areas on Figure 3.1 represent model segments selected because of their location and represent the critical segments from both a load and water quality standpoint.

3. The SWMM model predicts hourly concentrations of TSS and total copper, zinc and lead The model predictions for total copper, lead and zinc were converted to instream dissolved metal concentrations using the TSS-based partition coefficient for copper and zinc, and a data-based fixed fraction for lead to separate the dissolved and particulate forms of the metals. Additional detail for the conversion of total metals to dissolved concentrations can be found in Appendix A of the original TMDL. Total mercury was used directly, since the applicable criteria are not based on dissolved mercury.

4. The model-predicted hourly dissolved metal concentrations for each metal, were evaluated with regard to the water quality criterion with graphical and tabular analysis:

   a. Four-day average values were compared to the CCC.
   b. One-hour maximum values were compared to the CMC.
   c. Calendar month and rolling thirty-day average values were compared to the Class D criterion when applicable for a given metal.

5. Periods where the model simulated values exceeded the water quality criterion were identified. The pollutant loads, which are inputs to the model in terms of total load, were reduced to the extent needed to ensure compliance with the water quality criteria during all appropriate corresponding periods (e.g., hourly, 4-day average, 30-day average) throughout the 3-year simulation period as described above in step 3. For copper, lead and zinc this meant reducing the total pollutant load to the point where the converted model predictions of instream dissolved concentration for each metal met the criteria.

6. A Margin of Safety (MOS) of 5% was applied to the water quality compliant-daily pollutant load time series for individual sources other than CSO.

7. The annual average, daily maximum load, and the average daily load were quantified and tabulated. Further details are provided below for the individual sources.

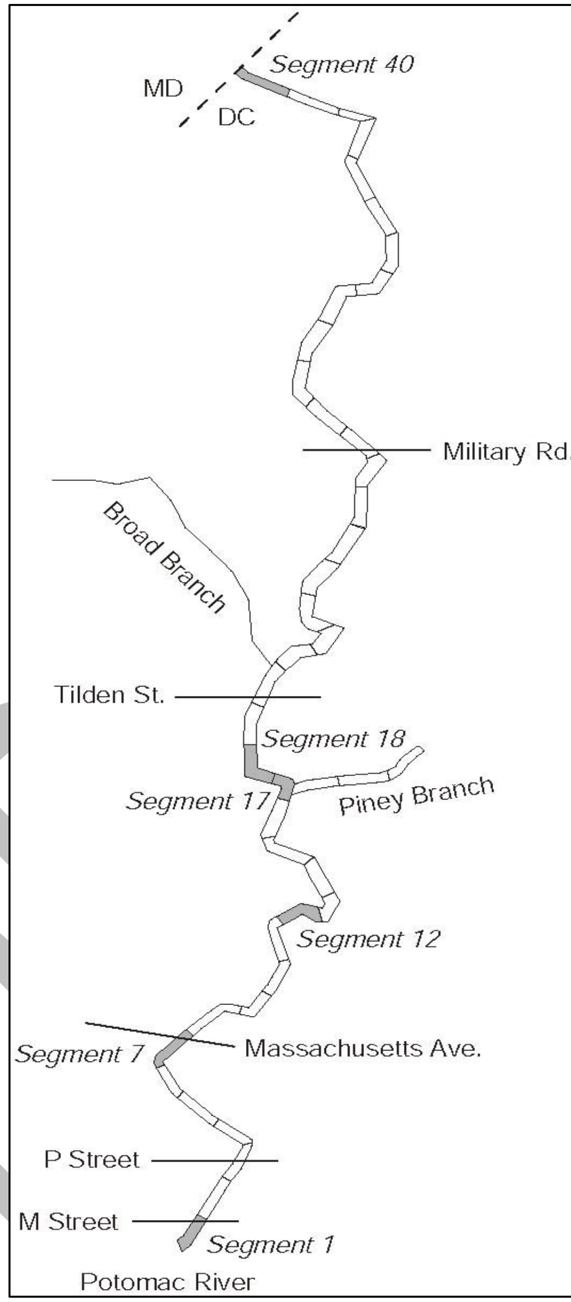

Figure 3.2 Map of Model Segments - SWMM Rock Creek Model

Pollution reductions for upstream loads, separate storm water (MS4) loads, and direct storm runoff (nonpoint source) loads were accomplished by applying proportional percent reductions to the daily time series loading files in step 5 to achieve applicable WQS. The maximum daily loads were identified as the highest daily load for a 24-hour period in the TMDL load time series that will not cause or contribute to an exceedance of the water quality criteria. The average daily loads for the upstream, MS4 and, direct nonpoint sources were calculated by dividing the average annual allocated loads (lbs/yr) by 365.

Consistent with the original TMDL, an explicit 5% MOS was applied to individual sources other than CSO to account for any potential differences between modeled and monitored data.

Pollution reduction for the combined sewer system was based on DC Water's approved CSO Long-Term Control Plan (LTCP). The LTCP is designed to limit CSOs in Rock Creek to four events per year, on average. Based upon flows that occurred during the 1988 to 1990 period, the 12 CSO events that are projected to occur under the level of control provided in the LTCP are presented and ranked according to volume in Table 3.2. There are two events that span midnight and have CSO discharge on successive days. All of the CSO discharges occur within Lower Rock Creek, either directly into the mainstem Rock Creek or Piney Branch. The average daily loads for the CSO were calculated as the average CSO load over the 14 days in which CSO discharges predicted during the 1988-1990 period.

Table 3.2: CSO LTCP Volume Projections

CSO Event	Date	Volume (MG)	Comment
1	5/5/1989	0.005	Single overnight CSO event
	5/6/1989	6.303	
2	10/18/1990	1.952	
3	11/16/1989	1.557	
4	8/6/1990	1.189	
5	7/4/1989	0.298	
6	6/23/1989	0.060	
7	9/26/1989	0.034	
8	10/2/1989	0.033	
9	7/13/1990	0.026	
10	5/2/1989	0.010	
11	5/24/1989	0.002	
12	8/9/1990	0.001	Single overnight CSO event
	8/10/1990	0.001	

Hourly CSO volumes were converted to pollutant load using average total metals monitoring data collected from the Piney Branch CSO during development of the DC WASA LTCP. The total metals concentrations were determined by averaging all of the data collected for the LTCP at the Piney Branch CSO outfall. The data were collected during four separate CSO events for a total of 13 data points. The methods for calculating CSO concentrations for each metal are documented in the 2004 TMDL report and appendices, and the monitoring data is outlined in the 2002 DC WASA LTCP. A summary of the average concentrations for CSO sources are provided in Table 3.3. The CSO pollutant loads calculated through this process were included in the final TMDL scenarios.

Table 3.3: Summary of CSO concentrations

Source	Total Copper	Total Lead	Total Zinc	Total Mercury
CSO	26 µg/L	35 µg/L	110 µg/L	0.4 µg/L

4. Copper TMDLs

Under previous copper WQS used to develop the TMDLs in 2004, Rock Creek did not exceed the copper CCC or the CMC during the three-year modeled period under existing conditions. Therefore, the original TMDL allocations were based on the existing loads, minus an explicit 5% margin of safety (MOS). For this revision, the model was applied using the enhanced input files as described in Section 3 to meet current Class C CCC and CMC water quality criteria for copper (Table 2.3).

Model Results and Allocations

Under existing conditions, with the more stringent current copper CCC and CMC, the CMC criterion is exceeded in Rock Creek. The TMDL load reductions were needed to reduce the hourly concentrations of dissolved copper to a level that did not exceed the CMC criterion for acute exposure. Load reductions were performed in the following manner:

- CSO load reductions provided by implementation of the CSO LTCP produce a CSO load reduction of 93%
- Reductions were made to sources other than CSO until no exceedances of the CCC or CMC in the 3 year period occurred in Upper and Lower Rock Creek
- Upstream, MS4 and direct nonpoint source loads require equal reductions of 19% minus a 5% MOS, for an overall reduction of 23%.

Consistent with the original TMDL, the five percent explicit MOS was applied to upstream, MS4, and direct stormwater runoff loads to account for any potential differences between modeled and monitored data.

Figure 4.1 shows a time plot of dissolved copper concentrations for the three-year period compared to the applicable criteria, *i.e.*, CCC = 9.72 µg/L and CMC = 14.7 µg/L, in model segment 1 at the mouth of Rock Creek, which was the controlling segment that required the greatest reductions. As shown, the CMC of 14.7 µg/L was the limiting criterion.

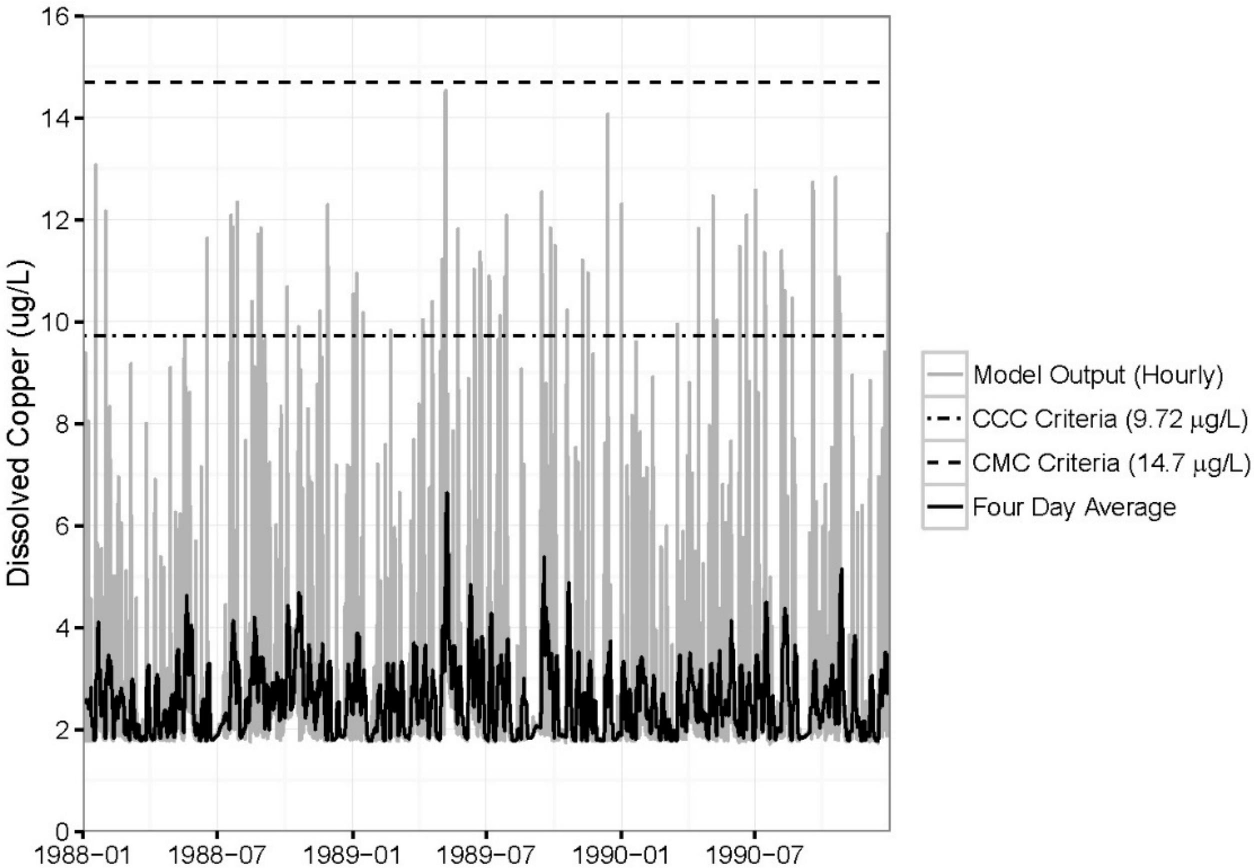

Figure 4.1: Time Series Plot of Simulated Dissolved Copper Concentrations with TMDL Loads in SWMM Model Segment 1

The existing load and TMDL allocations made for Rock Creek are shown in Table 4.1 and are separated by sources such as upstream, CSO, MS4 (separate storm water), direct nonpoint loads and the MOS. To clearly allocate and assign the full load to the MS4, all tributary loads in the original TMDL were aggregated under the current MS4 WLA. Table 4.1 supersedes Table 5-5 in the original 2004 TMDL report. It is important to notice that the TMDL is given as a loading of total copper and not dissolved copper, as described in Section 3 above. Table 4.1 provides total copper TMDLs that are protective of the dissolved copper criteria.

Table 4.1- TMDL for Total Copper					
Source	**Existing Load (lbs/year)**	**TMDL WLA/LA (lbs/year)**	**Percent Reduction**	**Maximum Daily Load (lbs/day)**	**Average Daily Load (lbs/day)**
Upper Rock Creek					
Upstream	2,485.87	1,912.88	23%	1,211.50	5.24
CSO	0.00	0.00	N/A	0.00	0.00
MS4	769.33	592.67[a]	23%	56.21	1.62
Direct Nonpoint	1.74	1.34	23%	0.02	<0.01
5% MOS	N/A	131.94	N/A	66.72	0.36
Upper RC Total	**3,256.94**	**2,638.83**	**19%**	**1334.45**	**7.22**
Lower Rock Creek					
Upstream	3,256.94	2,506.89	23%	1267.73	6.86
CSO	11.35	0.83	93%[b]	0.34	0.18
MS4	271.14	208.64	23%	18.56	0.57
Direct Nonpoint	1.36	1.05	23%	0.01	<0.01
5% MOS	N/A	142.98	N/A	67.72	0.40
Lower RC Total	**3,504.79**	**2,860.39**	**19%**	**1354.36**	**8.01**

[a]There is a minor difference (increase) in the WLA analysis for Luzon Valley from the original 2004 TMDL that stems from the use of different methods to calculate a small area in Luzon Valley that had at one time been part of the combined sewer system but is now separated and part of the MS4.
[b]Implementation of the CSO LTCP produces a CSO load reduction of 93 percent.

5. Zinc TMDLs

Under previous zinc WQS used to develop the TMDLs in 2004, Rock Creek did not exceed the zinc CCC or the CMC during the three-year modeled period under existing conditions. Therefore, the original TMDL allocations were based on the existing conditions, minus an explicit 5% margin of safety (MOS). For this revision, the model was applied using the enhanced input files as described in Section 3 to meet current Class C CCC and CMC, and Class D human health water quality criteria for zinc (Table 2.3).

Model Results and Allocations

Under existing conditions, and with the current zinc CCC, CMC, and human health criteria, criteria are not exceeded in Rock Creek. Implementation of the CSO LTCP is included in the TMDL scenario and produces a CSO load reduction of 93 percent. The upstream, MS4 and direct nonpoint source loads require no reductions.

Consistent with the original TMDL, a five percent explicit MOS was applied to upstream, MS4, and direct stormwater runoff loads to account for any potential differences between modeled and monitored data. The existing loads minus the five percent MOS, along with load reductions provided by implementation of the CSO LTCP, represent the total zinc TMDLs.

Figure 4.1 shows a time plot of dissolved zinc concentrations for the three-year period compared to the criteria, *i.e.*, CCC = 128.07 µg/L, CMC = 127.04 µg/L and Class D human health criterion = 26,000 µg/L, in model segment 40 of Rock Creek at the Maryland/DC line. Rolling 30-day average values (not shown) were also well below the human health criterion of 26,000 µg/L.

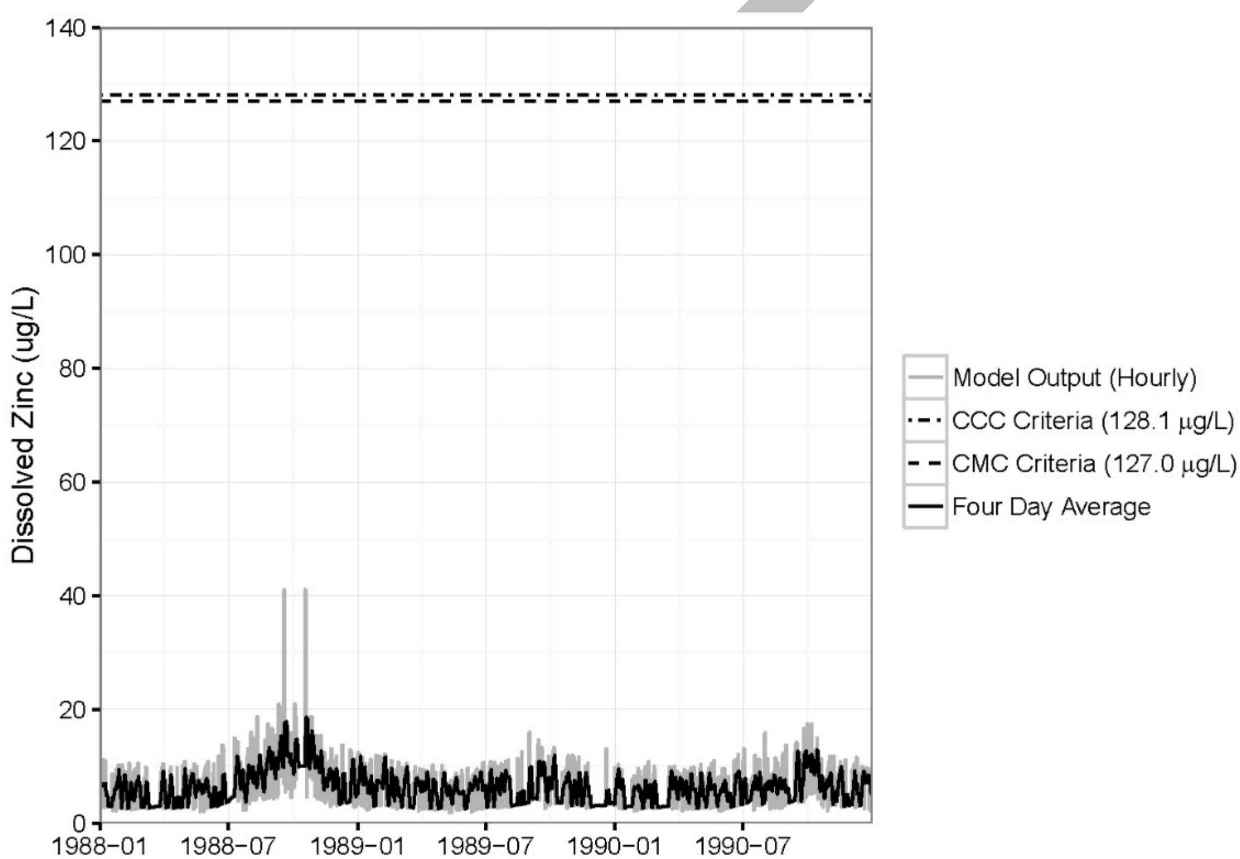

Figure 5.1: Time Series Plot of Simulated Dissolved Zinc Concentrations with TMDL Loads in SWMM Model Segment 40

The existing load and TMDL allocations made for Rock Creek are shown in Table 5.1 and are separated by sources such as upstream, CSO, MS4 (separate storm water), direct nonpoint loads and the MOS. To clearly allocate and assign the full load to the MS4 all tributary loads in the original TMDL were aggregated under the current MS4 WLA. Table 5.1 supersedes Table 6-3 in the original 2004 TMDL report. It is important to notice that the TMDL is given as a loading of total zinc and not dissolved zinc, as described in Section 3 above. Table 5.1 provides total zinc TMDLs that are protective of the dissolved zinc criteria.

Table 5.1 - TMDL for Total Zinc					
Source	**Existing Load (lbs/year)**	**TMDL WLA/LA (lbs/year)**	**Percent Reduction**	**Maximum Daily Load (lbs/day)**	**Average Daily Load (lbs/day)**
Upper Rock Creek					
Upstream	4,556.56	4,328.73	5%	488.76	11.85
CSO	0.00	0.00	N/A	0.00	0.00
MS4	1,804.96	1,716.67[a]	5%	162.81	4.70
Direct Nonpoint	4.09	3.88	5%	0.05	0.01
MOS	N/A	318.38	N/A	34.30	0.87
Upper RC Total	**6,365.61**	**6,367.67**	**0%**	**685.91**	**17.43**
Lower Rock Creek					
Upstream	6,365.61	6,049.29	5%	651.62	16.56
CSO	48.02	3.51	93%[b]	1.43	0.75
MS4	636.13	604.32	5%	53.76	1.65
Direct Nonpoint	3.19	3.03	5%	0.04	0.01
MOS	N/A	350.53	N/A	37.20	1.00
Lower RC Total	**7,052.96**	**7,010.50**	**1%**	**744.05**	**19.97**

[a]There is a minor difference (increase) in the WLA analysis for Luzon Valley from the original 2004 TMDL that stems from the use of different methods to calculate a small area in Luzon Valley that had at one time been part of the combined sewer system but is now separated and part of the MS4.
[b]Implementation of the CSO LTCP produces a CSO load reduction of 93 percent.

6. Lead TMDLs

Under previous lead WQS used to develop the TMDLs in 2004, Rock Creek exceeded the lead CCC during the three-year modeled period under existing conditions. The original TMDL allocations were driven by the CCC criterion and were based on the CSO load reductions specified in the LTCP, an 86% reduction to all other loads, and an explicit 5% margin of safety (MOS). For this revision, the model was applied using the enhanced input files as described in Section 3 to meet current Class C CCC and CMC water quality criteria for lead (Table 2.3).

Model Results and Allocations

Under existing conditions, the CCC criterion for lead are exceeded in Rock Creek. In order to meet the WQS for lead, TMDL reductions were performed in the following manner:

- CSO load reductions provided by implementation of the CSO LTCP produce a CSO load reduction of 93%

- Reductions were made to sources other than CSO until no exceedances of the CCC or CMC in the 3 year period occurred in Upper and Lower Rock Creek
- Upstream, MS4 and direct nonpoint source loads require equal reductions of 87% minus a 5% MOS, for an overall reduction of 88%.

Consistent with the original TMDL, the five percent explicit MOS was applied to upstream, MS4, and direct stormwater runoff loads to account for any potential differences between modeled and monitored data.

Figure 6.1 shows a time plot of dissolved lead concentrations for the three-year period compared to the criteria, *i.e.*, CCC = 2.79 µg/L and CMC = 71.63 µg/L, in model segment 1 at the mouth of Rock Creek (the controlling segment that required the greatest reductions). The CMC of 71.63 µg/L is not shown on Figure 6.1, but all of the four-day average values within the simulation period were well below this criterion.

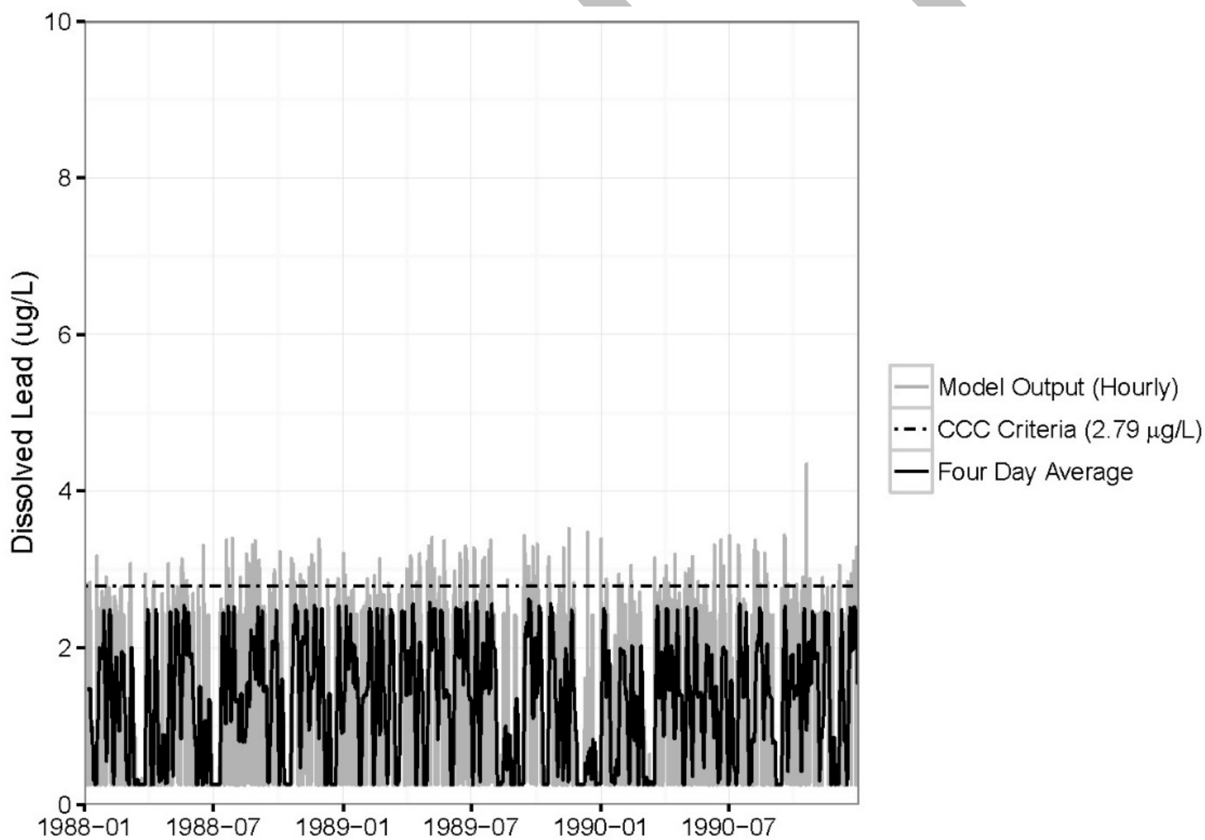

Figure 6.1: Time Series Plot of Simulated Dissolved Lead Concentrations with TMDL Loads in SWMM Model Segment 1

The existing load and TMDL allocations made for Rock Creek are shown in Table 6.1 and are separated by sources such as upstream, CSO, MS4 (separate storm water), direct nonpoint loads and the MOS. To clearly allocate and assign the full load to the MS4, all tributary loads in the original TMDL were aggregated under the current MS4 WLA. Table 6.1 supersedes Table 7-3 in the original 2004 TMDL report. It is important to notice that the TMDL is given as a loading of total lead and not dissolved lead, as described in Section 3 above. Table 6.1 provides total lead TMDLs that are protective of the dissolved lead criteria.

Table 6.1 - TMDL for Total Lead					
Source	**Existing Load (lbs/year)**	**TMDL WLA/LA (lbs/year)**	**Percent Reduction**	**Maximum Daily Load (lbs/day)**	**Average Daily Load (lbs/day)**
Upper Rock Creek					
Upstream	2,544.25	314.22	88%	37.19	0.86
CSO	0.00	0.00	N/A	0.00	0.00
MS4	355.08	43.90[a]	88%	4.16	0.12
Direct Nonpoint	0.78	0.10	88%	<0.01	<0.01
MOS	N/A	18.85	N/A	2.18	0.05
Upper RC Total	**2,900.11**	**377.07**	**87%**	**43.53**	**1.03**
Lower Rock Creek					
Upstream	2,900.11	358.21		41.36	0.98
CSO	15.28	1.12	93%[b]	0.45	0.24
MS4	125.14	15.45		1.37	0.04
Direct Nonpoint	0.61	0.08		<0.01	<0.01
MOS	N/A	19.67	N/A	2.27	0.07
Lower RC Total	**3,041.14**	**394.53**	**87%**	**45.46**	**1.34**

[a]There is a minor difference (increase) in the WLA analysis for Luzon Valley from the original 2004 TMDL that stems from the use of different methods to calculate a small area in Luzon Valley that had at one time been part of the combined sewer system but is now separated and part of the MS4.
[b]Implementation of the CSO LTCP produces a CSO load reduction of 93 percent.

7. Mercury TMDLs

Under previous mercury WQS used to develop the TMDLs in 2004, Rock Creek exceeded the mercury CCC during the three-year modeled period under existing conditions. The original TMDL allocations were driven by the CCC and were based on the CSO load reductions specified in the LTCP, a 97% reduction to upstream loads, an 85% reduction to all stormwater loads (MS4 including tributaries and nonpoint) loads, and an explicit 5% margin of safety (MOS). For this revision, the model was applied using the enhanced input files as described in Section 3 to meet current Class C CCC and CMC, and Class D human health water quality criteria for mercury (Table 2.3).

Model Results and Allocations

Under existing conditions, and with the current mercury CCC, CMC, and human health criteria, criteria are not exceeded in Rock Creek. Implementation of the CSO LTCP is included in the TMDL scenario and produces a CSO load reduction of 93 percent. The upstream, MS4 and direct nonpoint source loads require no reductions.

Consistent with the original TMDL, a five percent explicit MOS was applied to upstream, MS4, and direct stormwater runoff loads to account for any potential differences between modeled and monitored data. The existing loads minus the five percent MOS, along with load reductions provided by implementation of the CSO LTCP, represent the total mercury TMDLs.

Figure 7.1 shows a time plot of total mercury concentrations for the three-year period compared to the criteria, *i.e.*, CCC = 0.77 µg/L and CMC = 1.40 µg/L, in model segment 1 at the mouth of Rock Creek. Figure 7.2 shows the 30-day rolling average values compared to the Class D human health criteria of 0.15 µg/L, also in model segment 1 at the mouth of Rock Creek.

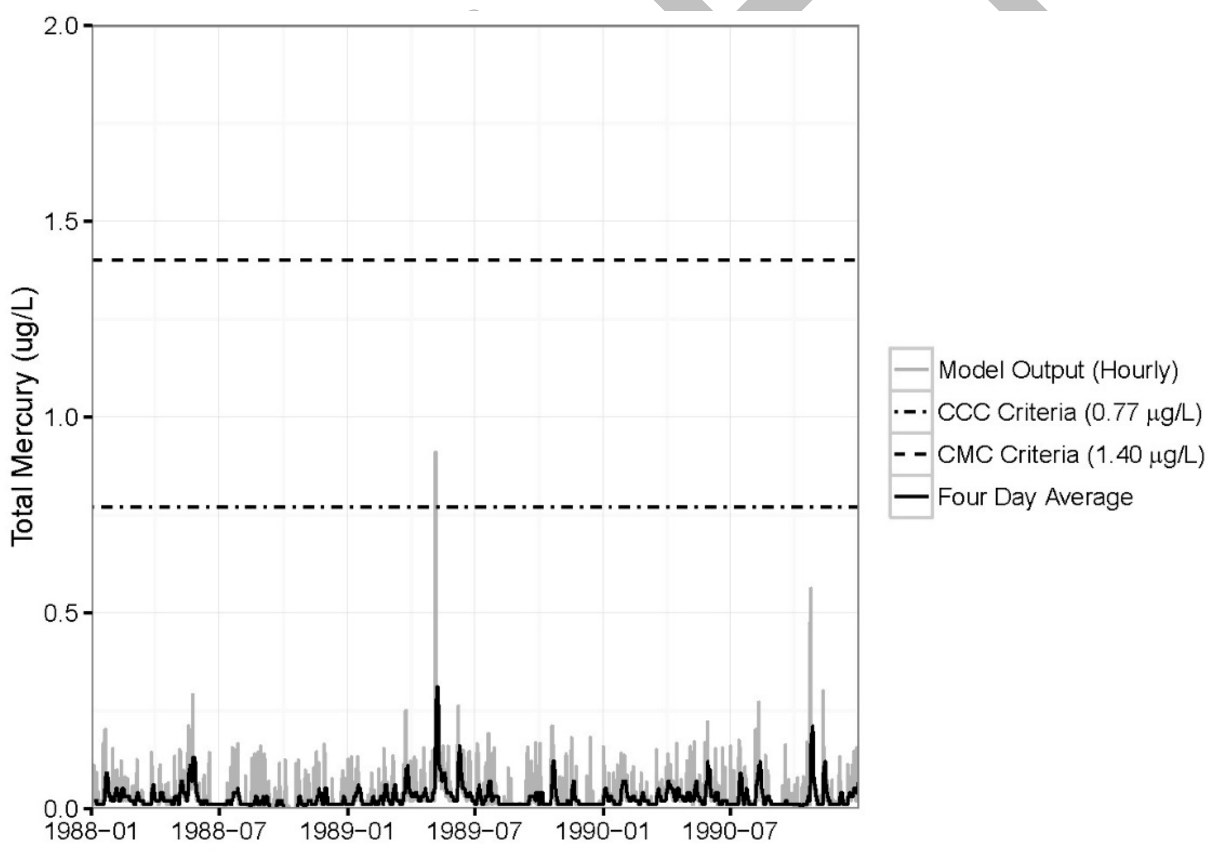

Figure 7.1: Time Series Plot of Simulated Total Mercury Concentrations with TMDL Loads in SWMM Model Segment 1

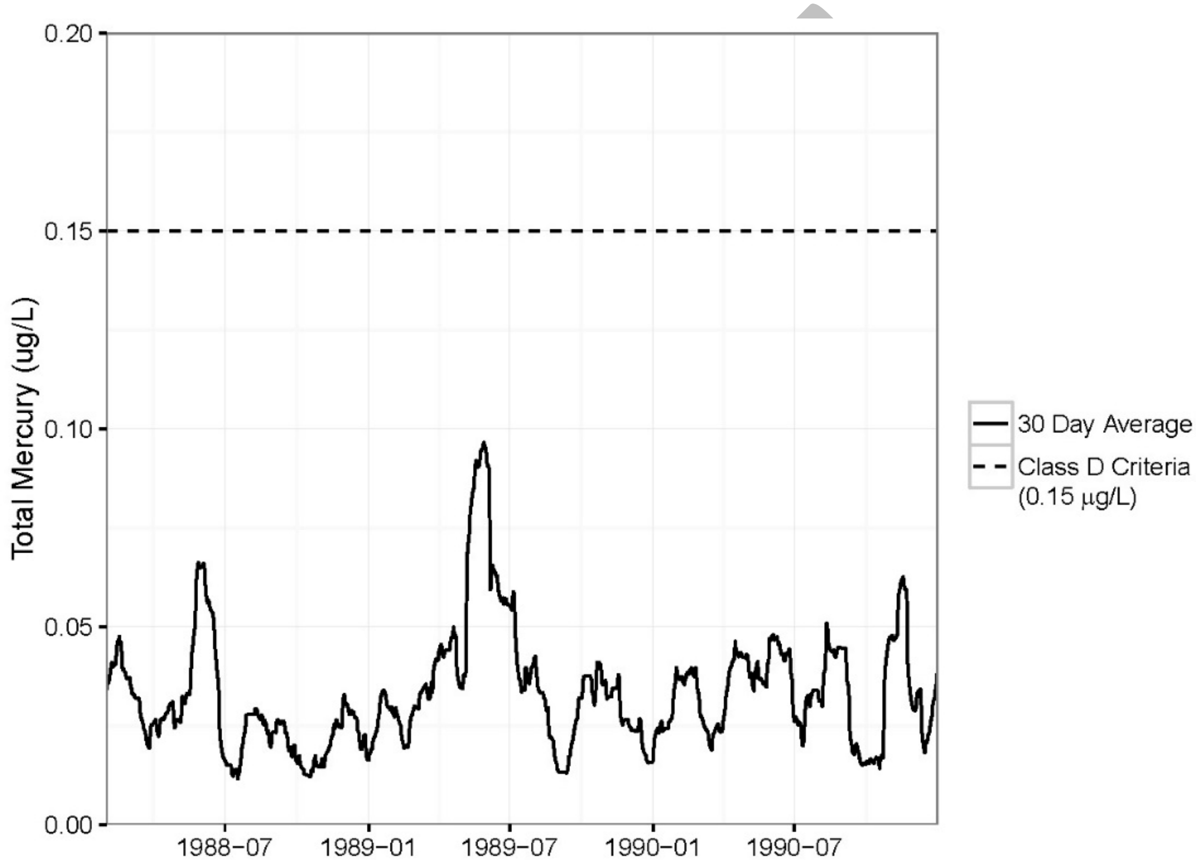

Figure 7.2: Time Series Plot of Simulated 30-day average Total Mercury Concentrations with TMDL Loads in SWMM Model Segment 1

The existing load and TMDL allocations made for Rock Creek are shown in Table 7.1 and are separated by sources such as upstream, CSO, MS4 (separate storm water), direct nonpoint loads and the MOS. To clearly allocate and assign the full load to the MS4 all tributary loads in the original TMDL were aggregated under the current MS4 WLA. Table 7.1 supersedes Table 8-3 in the original 2004 TMDL report.

	Table 7.1 - TMDL for Total Mercury				
Source	**Existing Load (lbs/year)**	**TMDL WLA/LA (lbs/year)**	**Percent Reduction**	**Maximum Daily Load (lbs/day)**	**Average Daily Load (lbs/day)**
	Upper Rock Creek				
Upstream	14.37	13.65	5%	11.13	0.04
CSO	0.00	0.00	N/A	0.00	0.00
MS4	1.87	1.78[a]	5%	0.17	<0.01
Direct Nonpoint	<0.01	<0.01	5%	<0.01	<0.01
MOS	N/A	0.81	N/A	0.59	<0.01
Upper RC Total	**16.25**	**16.25**	**0%**	**11.89**	**0.04**
	Lower Rock Creek				
Upstream	16.25	15.44	5%	11.30	0.04
CSO	0.17	0.01	93%[b]	<0.01	<0.01
MS4	0.66	0.63	5%	0.06	<0.01
Direct Nonpoint	<0.01	<0.01	5%	<0.01	<0.01
MOS	N/A	0.85	N/A	0.60	<0.01
Lower RC Total	**17.09**	**16.93**	**1%**	**11.96**	**0.05**

[a]There is a minor difference (increase) in the WLA analysis for Luzon Valley from the original 2004 TMDL that stems from the use of different methods to calculate a small area in Luzon Valley that had at one time been part of the combined sewer system but is now separated and part of the MS4.
[b]Implementation of the CSO LTCP produces a CSO load reduction of 93 percent.

8. Public Participation

The availability of draft revisions to the Rock Creek metals TMDLs was advertised in the DC Register beginning on July 8, 2016. Interested parties are invited to submit comments during the public comment period, which began on July 8, 2016, and will end on August 8, 2016. The electronic documents are also posted on the DOEE's internet site at http://doee.dc.gov/publication/rock-creek-metals-tmdls.

Response Summary

If written comments are received on the draft revisions to the TMDLs, comments will be compiled and responded to in a response summary.

9. Assurance of Implementation – Daily Loads

The approach used to calculate daily loads in this TMDL identifies a representative maximum daily and average daily load for the annual TMDL for each source identified in the original report. The approach does not presume that the maximum daily load provided could be discharged every day and still meet the in-stream WQS. While expressions of daily loading values are useful in illustrating the variability in loading that can occur under a TMDL scenario, the annual load must also be met to comply with the TMDL.

Note that federal regulations at Title 40 of the *Code of Federal Regulations* section 122.44(d)(1)(vii)(B) require that, for a National Pollutant Discharge Elimination System permit for an individual point source, the effluent limitations must be consistent with the assumptions and requirements of any available wasteload allocation for the discharge prepared by the jurisdiction and approved by EPA. There is no express or implied statutory requirement that effluent limitations in National Pollutant Discharge Elimination System permits be expressed in daily terms. The Clean Water Act definition of *effluent limitation* is quite broad (effluent limitation is "any restriction on quantities, rates, and concentrations of chemical, physical, biological, and other constituents which are discharged from point sources …"), see Clean Water Act section 502(11). Unlike the Clean Water Act's definition of TMDL, the Clean Water Act definition of *effluent limitation* does not contain a *daily* temporal restriction. National Pollutant Discharge Elimination System permit regulations do not require that effluent limits in permits be expressed as maximum daily limits or even as numeric limitations in all circumstances, and such discretion exists regardless of the time increment chosen to express the TMDL. For further guidance, see Benjamin H. Grumbles' memo of November 15, 2006, titled *Establishing TMDL Daily Loads in Light of the Decision by the U.S. Court of Appeals for the D.C. Circuit in Friends of the Earth, Inc. v. EPA, et al., No. 05-5015 (April 25, 2006) and implications for NPDES Permits*.

10. References

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