UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
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Decision Rationale
Total Maximum Daily Loads
For Organics
In Tidal Basin and Washington Ship Channel

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Date: _____

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District of Columbia
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December 15, 2004

I. Introduction

The Clean Water Act (CWA) requires that Total Maximum Daily Loads (TMDLs) be developed for those water bodies that will not attain water quality standards after application of technology-based and other required controls. A TMDL sets the quantity of a pollutant that may be introduced into a waterbody without exceeding the applicable water quality standard. EPA's regulations define a TMDL as the sum of the wasteload allocations (WLAs) assigned to point sources, the load allocations (LAs) assigned to nonpoint sources and natural background, and a margin of safety.

This document sets forth the United States Environmental Protection Agency's (EPA) rationale for approving the TMDLs for organics in Tidal Basin and Washington Ship Channel. These TMDLs were established to address impairment of water quality as identified in the District of Columbia's (DC) 1998 Section 303(d) list of impaired waters. The DC Department of Health, Environmental Health Administration, Bureau of Environmental Quality, Water Quality Division, submitted the *Final Total Maximum Daily Loads for Organics in Tidal Basin and Washington Ship Channel* dated December 2004 (TMDL Report) to EPA for final review which was received by EPA on December 10, 2004.

Based on this review, EPA determined that the following eight regulatory requirements have been met:

1. The TMDLs are designed to implement the applicable water quality standards,
2. The TMDLs include a total allowable load as well as individual waste load allocations and load allocations,
3. The TMDLs consider the impacts of background pollutant contributions,
4. The TMDLs consider critical environmental conditions,
5. The TMDLs consider seasonal environmental variations,
6. The TMDLs include a margin of safety,
7. There is reasonable assurance that the proposed TMDLs can be met, and
8. The TMDLs have been subject to public participation.

II. Summary

Table 1 presents the 1998 Section 303(d) listing information for the water quality-limited waters of the Potomac River tributaries in effect at the time the consent decree was filed. The District's 2002 Section 303(d) list added a pH impairment to the Tidal Basin.

Table 1 - Section 303(d) Listing Information

1998 Section 303(d) List					
Segment No.	Waterbody	Pollutants of Concern	Priority	Ranking	Action Needed
18.	Washington Ship Channel	Bacteria, organics, and pH	Low	18	Point and Nonpoint Source (NPS) pollution
32.	Tidal Basin	Bacteria and organics	Low	33	Nonpoint Source (NPS) pollution
2002 Section 303(d) List					
Listing Year	Waterbody	Pollutants of Concern	Priority Ranking	TMDL Establishment Date	
2002	Tidal Basin	pH	Medium	August 2008	

The TMDL is a written plan and analysis established to ensure that a waterbody will attain and maintain water quality standards. The TMDL is a scientifically-based strategy which considers current and foreseeable conditions, the best available data, and accounts for uncertainty with the inclusion of a margin of safety value. TMDLs may be revised in order to address new water quality data, better understanding of natural processes, refined modeling assumptions or analysis and/or reallocation.

III. Background

Tidal Basin and Washington Ship Channel Watershed

The Potomac River watershed covers 14,679 square miles in four states and the District of Columbia. The river is more than 380 miles long from its start in West Virginia to Point Lookout on the Chesapeake Bay.

The Potomac River provides 75 percent of the metropolitan Washington drinking water and all of the District's drinking water. The river also receives discharges from wastewater treatment plants, including the District's Blue Plains Plant and treatment plants for Arlington and Alexandria located just upstream of the DC/MD line. There are no drinking water intakes downstream of the District.

The Washington Ship Channel and Tidal Basin are man-made waterbodies located east of the Potomac River and were built in the late 19th century by the Army Corps of Engineers. The Washington Ship Channel runs from Hains Point at the confluence of the Anacostia and Potomac Rivers to the Tidal Basin. The primary purpose of the Tidal Basin is to flush the Washington Ship Channel with the freshwater of the Potomac River. Parklands/grass areas make up about 43 percent of the Tidal Basin watershed while 53 percent of the Washington Ship Channel watershed is comprised of government, commercial, and residential development. Recreational grass and parklands are found along the southern bank of the Ship Channel.

Consent Decree

This organics TMDL was completed by the District to partially meet the fourth-year TMDL milestone commitments under the requirements of the 2000 TMDL lawsuit settlement of *Kingman Park Civic Association et al. v. EPA*, Civil Action No. 98-758 (D.D.C.), effective June 13, 2000, as modified March 25, 2003. Fourth-year milestones also include the development of bacteria TMDLs for C&O Canal and Oxon Run and various metals, bacteria, and pH TMDLs for Oxon Run, Washington Ship Channel, and Tidal Basin.

IV. Technical Approach

When models are used to develop TMDLs, the model selection depends on many factors, including but not limited to, the complexity of the system being modeled, available data, and impact of the pollutant loading. The District DOH used an integrated modeling approach to develop the organics TMDLs for the Tidal Basin and Washington Ship Channel. The general framework uses the Environmental Fluid Dynamics Code (EFDC) model, which couples hydrodynamics, sediment transport, eutrophication, and toxics. The model design also simulates water quality, and pH. It utilizes a model grid structure divided into 265 active cells fitting the boundaries of each stream segment. Overall, EPA finds that the District's approach is reasonable and appropriate as described in the following sections.

Information used to support the modeling analysis and calibrate the model includes meteorological data, tidal elevation, flood gate operation, and stormwater runoff data combined with total suspended solids (TSS) and organics information. These are used to estimate the percent reduction necessary to meet water quality standards. The model is constructed using weather conditions from 1988, 1989, and 1990. Model inputs include runoffs from the storm water system, and direct runoffs from park areas, which are used to estimate average monthly loads to the Tidal Basin and Washington Ship Channel. Illicit and cross connections between sanitary and storm sewers however, were not accounted for in the model due to data limitations. Because of limited data, the model was based on simplified conservative assumptions. The organics are assumed as conservative materials, and apart from first-order decay rates, no chemical and biological reactions are considered.

Table 2 details the groupings used for polyaromatic hydrocarbons (PAHs). All other chemicals were considered individually in the model except for polychlorinated biphenyls (PCBs), which were considered in total.

Table 2 - PAH Subgroupings

Constituent	Chemical Designation
Polynuclear aromatic hydrocarbons (PAH) Model	
Napthalene	PAH1 (2 and 3 ring PAHs)
2-methyl napthalene	
Acenapthylene	
Acenapthene	
Fluorene	
Phenanthrene	
Fluoranthene	PAH2 (4 ring PAHs)
Pyrene	
Benz[a]anthracene	
Chrysene	
Benzo[k]fluoranthene	PAH3 (5 and 6 ring PAHs)
Benzo[a]pyrene	
Perylene	
Indeno[1,2,3-c,d]pyrene	
Benzo[g,h,i]perylene	
Dibenz[a,h+ac]anthracene	

V. Discussions of Regulatory Requirements

EPA has determined that these TMDLs are consistent with statutory and regulatory requirements and EPA policy and guidance. EPA's rationale for approval is set forth according to the regulatory requirements listed below.

The TMDL is the sum of the individual waste load allocations (WLAs) for point sources and the load allocations (LAs) for nonpoint sources and natural background and must include a margin of safety (MOS). The TMDL is commonly expressed as:

$$TMDL = \sum WLAs + \sum LAs + MOS$$

where

WLA = waste load allocation
LA = load allocation
MOS = margin of safety

1. The TMDLs are designed to implement the applicable water quality standards.

The TMDL Report states that the Tidal Basin and Washington Ship Channel are on the District's 1998 Section 303(d) list of impaired waters for organics because the District's ambient monitoring program disclosed exceedances of the water quality standards.

In the TMDL Report, the District lists the Tidal Basin and Washington Ship Channel's beneficial water uses as well as the general and specific water quality criteria designed to protect those uses. The designated uses for Tidal Basin and Washington Ship Channel are:

A. Primary contact recreation,
B. Secondary contact recreation and aesthetic enjoyment,
C. Protection and propagation of fish, shellfish and wildlife,
D. Protection of human health related to consumption of fish and shellfish, and
E. Navigation.

Table 3 - DC's Water Quality Standards for Metals

Metals	Criteria for Classes (ug/L)		
	Class C		Class D
	Criteria Maximum	Criteria	
Arsenic - Dissolved	150.00	340.00	0.14
Copper - Dissolved	12.31	18.61	NA
Lead - Dissolved	2.79	71.63	NA
Zinc - Dissolved	113.29	124.07	NA

The water quality criteria for copper, lead, and zinc is hardness dependant. The criteria shown are based on a hardness of 110 mg/L as $CaCO_3$ from DC DOH monitoring data. It should be noted that the District's water quality regulations 49 D.C. REG. 3012; and 49 D.C. REG. 4854 require very careful reading and the Federal Register (60 FR 22,231) must be consulted to obtain the correct numerical values and units for hardness dependent criteria. The TMDL report's Table 2-2: Dissolved Metals Numerical Criteria, and notes provided a complete explanation of the criteria.

The organic pollutant water quality criteria are found in the DC regulations at Section 1104.7, Table 3.

Table 4 - DC's Water Quality Standards for Organics

Organics	Criteria for Classes (ug/L)		
	Class C		Class D
	CCC	CMC	30-Day Average
Chlordane	0.004	2.4	0.00059
DDE	0.001	1.1	0.00059
DDD	0.001	1.1	0.00059
DDT	0.11	1.1	0.00059
Dieldrin	.00019	2.5	0.00014
Heptachlor Epoxide	0.0038	0.52	0.00011
PAH1	50.0	NA	1,4000.0
PAH2	400.0	NA	0.031
PAH3	NA	NA	0.31
Total PCBs	0.014	NA	0.00045

Within each PAH group, the most stringent water quality criterion was used as the criteria for each member of the group. Each group's constituents are shown in Table 4. For example, the Class D water quality standard for fluoranthene, pyrene, benz[a]anthracene, and chrysene are 370, 11000, 0.031, and 0.031 ug/L, respectively. Therefore, the most stringent of the individual standards, 0.031 ug/L is given in the TMDL report Table 2, and Table 4 above as the Class D standard for PAH2.

Because the EFDC model does not consider air deposition, the District estimated PCB air deposition using *Chesapeake Bay Basin Toxics Loading and Release Inventory*, May 1999, as their reference and their calculations are in Appendix B of the TMDL report. The TMDL report allocates approximately 5.6 percent of the instream PCB load to air deposition, and the remaining 94.4 percent to existing sources and requires a 99.67% reduction.

2. The TMDLs include a total allowable load as well as individual waste load allocations and load allocations.

The TMDL report divides storm water discharges into the following categories: separate stormwater, direct runoff, and direct deposit. EPA guidance memorandum clarifies existing EPA regulatory requirements for establishing wasteload allocations (WLAs) for NPDES storm water discharges in TMDLs approved or established by EPA.[1] Therefore, this document identifies WLAs for storm water discharges.

The key points established in the memorandum are:

- NPDES-regulated storm water discharges must be addressed by the wasteload allocation component of a TMDL.
- NPDES-regulated storm water discharges may not be addressed by the load allocation (LA) component of a TMDL.
- Storm water discharges from sources that are not currently subject to NPDES regulation may be addressed by the load allocation component of a TMDL.
- It may be reasonable to express allocations for NPDES-regulated storm water discharges from multiple point sources as a single categorical wasteload allocation when data and information are insufficient to assign each source or outfall individual WLAs.
- The wasteload allocations for NPDES-regulated municipal storm water discharge effluent limits should be expressed as best management practices.

The November 2002 memorandum [1] does recognize that WLA/LA allocations may be fairly rudimentary because of data limitations. The District of Columbia divided the Tidal Basin and Washington Ship Channel TMDLs into categories based on storm water (WLA) and direct runoff (LA). Therefore, the permitted storm water allocations were made based on the ratio of

[1]Memorandum *Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs*, from Robert H. Wayland, III, Director, Office of Wetlands, Oceans and Watersheds, and James A. Hanlon, Director, Office of Wastewater Management, to Water Division Directors, Regions 1 - 10, dated November 22, 2002.

sewered areas to unsewered areas. Appendix A reports the TMDLs for stream load reductions for organics from existing loads.

3. The TMDLs consider the impacts of background pollutant contributions.

Tidal Basin and Washington Ship Channel's background pollutant loads are made up from inputs from the direct runoff, direct deposits, and separate storm water sewers.

4. The TMDLs consider critical environmental conditions.

The TMDL Report considers critical environmental conditions in Tidal Basin and Washington Ship Channel by evaluating average monthly loads for three years. The three years represent average flow, a wetter than average year, and a drier than average year.

At the Ronald Reagan National Airport, the average annual rainfall for the period of record, 1949 to 1998, is 38.95 inches.[2] Yearly totals vary, from 26.94 inches in 1965 to 51.97 inches in 1972. Individual events, often hurricanes, can be significant. Hurricane Agnes in 1972 delivered approximately 10 inches of rain in the Washington, DC area. The District selected 1988 to 1990 as their representative rainfall years as shown:

Table 4 - Rainfall

Year	Annual Rainfall (inches)	Representing
1988	31.74	10 percentile, dry year
1989	50.32	90 percentile, wet year
1990	40.84	median, approx. 38 percentile

(LTCP-3-2, September 1999)

5. The TMDLs consider seasonal environmental variations.

The TMDL Report considers seasonal variations by modeling the watershed average monthly loads for three years.

6. The TMDLs include a margin of safety.

The Clean Water Act and federal regulations require TMDLs to include a margin of safety (MOS) to take into account any lack of knowledge concerning the relationship between effluent limitations and water quality. EPA guidance suggest two approaches to satisfy the MOS requirement. First, it can be met implicitly by using conservative model assumptions to develop the allocations. Alternately, it can be met explicitly by allocating a portion of the allowable load to the MOS.

[2] *Study Memorandum LTCP-3-2: Rainfall Conditions*, Draft, September 1999.

The District has chosen to use an explicit margin of safety equal to ten percent of the TMDL load.

7. There is reasonable assurance that the proposed TMDLs can be met.

Although the current District of Columbia MS4 (municipal separate storm sewer system) NPDES permit does not specifically list this TMDL because it was issued prior to establishing this TMDL, the MS4 promotes storm water load reductions. Additionally, the WWII Memorial permits provides regulatory authority to require providing reasonable assurance that the TMDLs will be implemented.

8. The TMDLs have been subject to public participation.

DC public noticed an October 2004 version of these TMDLs with the comment period closing on November 29, 2004. The TMDL report was placed in the Martin Luther King Jr. Library and a public notice was published in the D.C. Register. In addition, EPA requested the District to use their e-mail list for the TMDL meetings to notify the interested parties of public comment period extensions. EPA believes all interested parties have had adequate time to comment on these TMDLs.

Comments were received from Earthjustice Legal Defense Fund. As part of DC's TMDL submittal, a response to comments document was submitted to EPA via e-mail.