

Technical Memorandum

Significant Biochemical Oxygen Demand, Nitrogen, and Phosphorus Nonpoint Sources in the Anacostia Watershed

The U.S. Environmental Protection Agency requires that Total Maximum Daily Load (TMDL) allocations account for all significant sources of each impairing pollutant. This technical memorandum identifies, in detail, the significant nonpoint sources of biochemical oxygen demand (BOD), total nitrogen (TN) and total phosphorus (TP) in the Anacostia watershed and their distribution between different land uses. Details are provided for allocating nonpoint source (NPS) loads for these constituents to different land use categories. These are conceptual values that are within the TMDL thresholds. The State of Maryland (MD) and the District of Columbia (DC) expressly reserve the right to allocate the TMDLs among different sources in any manner that is reasonably calculated to achieve water quality standards (WQSs).

The NPS loads that were used in the development of the BOD, TN, and TP TMDLs account for all sources, including both natural and human-induced components. Annual average NPS loads were estimated using a combination of results from the United States Geological Survey's (USGS) ESTIMATOR model and the HSPF model. As explained in the main document, the HSPF model was used to simulate the fate and transport of BOD, TN, and TP in the non-tidal drainage areas of the Anacostia's main tributaries, the Northwest Branch, the Northeast Branch, Lower Beaverdam Creek, and Watts Branch. The HSPF model was calibrated against the loads from the ESTIMATOR Model. The HSPF model results provided daily flow and constituent load inputs for the TAM/WASP model for Lower Beaverdam Creek, Watts Branch, and tidal drainage areas. The ESTIMATOR model was used to compute daily BOD, TN, and TP loads for the Northwest Branch and the Northeast Branch. HSPF was used as well to provide a breakdown of the constituent loads by source, i.e., from the various land uses (agriculture, forest, or urban) or, in the case of TP, from streambank erosion.

The HSPF model was used to compute average annual BOD and nutrient loads from the three land use categories, agricultural, forest, and urban land, and, in the case of TP, from streambank erosion. In Maryland's portion of the Anacostia, all developed land and streambank erosion contributions are included in the point sources technical memorandum as municipal separate storm sewer system (MS4) or other regulated stormwater loads. In DC, all loads from developed land except the direct drainage to the Anacostia are treated as MS4 or other regulated stormwater loads. Atmospheric deposition to land surfaces is included in the loads attributed mixed agriculture, forest and other herbaceous, and urban land uses. The land use information was based on Maryland Department of Planning, Montgomery County Department of Environmental Protection (MCDEP) and the Maryland National Capital Park and Planning Commission – Prince George's County (M-NCPPC-PG) data, as described in section 2.1.2 of the main report.

The potential BOD, TN, and TP allocations for nonpoint sources, reflected in the TMDL analysis, are designed to protect aquatic life in both MD and DC tidal and non-tidal waters of the Anacostia River, meet MD and DC Chla WQSs in their respective portions of the watershed, meet the numeric criteria for water clarity in the tidal waters, and meet all DO criteria for the MD and DC’s designated uses in the tidal Anacostia. The main report explains how the TAM/WASP modeling framework has been used to determine the allocation of average annual loads that meets all seasonal WQSs, and Appendix C explains in more detail how the average annual loads meet seasonal DO criteria.

Table 1 provides one possible scenario for the distribution of the annual BOD NPS loads between forest and agricultural land, the significant land use categories in the non-tidal Anacostia watershed. Tables 2 and 3 provide possible scenarios for the distribution of annual TN and TP NPS loads, respectively between different land use categories. Table 4 shows the NPS loads attributed to forest in the MD Tidal TMDLs and the direct drainage in the DC Upper and Lower Anacostia TMDLs. Other developed land and streambank erosion contributions in DC and MD are treated as MS4 or other regulated stormwater loads and are included in the point sources technical memorandum.

**Table 1
Annual NPS Loads Attributed to
Significant Land Uses for Non-tidal Anacostia BOD TMDLs (lbs/year)**

Landuse Category	NWB	NEB	LBC	Watts Br	Total	% of Non-tidal NPS Loads
Mixed Agricultural	2,206	8,633	0	0	10,840	57%
Forest and Other Herbaceous	1,320	5,315	1,214	169	8,017	43%
Total	3,526	13,948	1,214	169	18,857	100%

NWB = Northwest Branch; NEB = Northeast Branch; LBC = Lower Beaverdam Creek; Watts Br = Watts Branch

**Table 2
Annual NPS Loads Attributed to
Significant Land Uses for Non-tidal Anacostia TN TMDLs (lbs/year)**

Landuse Category	NWB	NEB	LBC	Watts Br	Total	% of Non-tidal NPS Loads
Mixed Agricultural	3,348	13,606	0	0	16,954	69%
Forest and Other Herbaceous	1,255	6,023	313	43	7,634	31%
Total	4,603	19,629	313	43	24,588	100%

NWB = Northwest Branch; NEB = Northeast Branch; LBC = Lower Beaverdam Creek; Watts Br = Watts Branch

Table 3
Annual NPS Loads Attributed to
Significant Land Uses for Non-tidal Anacostia TP TMDLs (lbs/year)

Landuse Category	NWB	NEB	LBC	Watts Br	Total	% of Non-tidal NPS Loads
Mixed Agricultural	39	600	0	0	639	72%
Forest and Other Herbaceous	45	180	20	3	249	28%
Total	84	780	20	3	888	100%

NWB = Northwest Branch; NEB = Northeast Branch; LBC = Lower Beaverdam Creek; Watts Br = Watts Branch

Table 4
Annual NPS Loads Attributed to Sources in the Tidal Anacostia (lbs/year)

TMDL	Source	BOD	TN	TP
Maryland Tidal	Forest	179	98	4
Upper Anacostia	Direct Drainage	66,548	4,123	361
Lower Anacostia	Direct Drainage	29,704	1,868	162