UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Mr. D. Lee Currey, Director
Science Services Administration
Maryland Department of the Environment
1800 Washington Blvd., Suite 540
Baltimore, Maryland 21230-1718

JUN 3 0 2014

Dear ~~Mr.~~ Lee Currey:

The U.S. Environmental Protection Agency (EPA), Region III, is pleased to approve the report, *Total Maximum Daily Loads of Polychlorinated Biphenyls in Lake Roland of Jones Falls Watershed in Baltimore County and Baltimore City, Maryland.* The TMDL report was submitted by the Maryland Department of the Environment (MDE) to EPA for final review on September 30, 2013, and received on October 18, 2013. The TMDL was established and submitted in accordance with Section 303(d)(1)(c) and (2) of the Clean Water Act to address impairments of water quality as identified in Maryland's Section 303(d) List.

The Maryland Department of the Environment (MDE) has identified the waters of the Lake Roland of the Jones Falls (MD-02130904-Lake_Roland) on the State's 2012 Integrated Report as impaired by chlordane (1996) and PCBs in fish tissue (2002) (MDE 2012). A chlordane TMDL was approved by the EPA in 2001. The Lake Roland impoundment was delisted for chlordane in the State's 2012 Integrated Report as data collected in 2007 established that fish tissue concentrations for chlordane were below the fish consumption listing threshold. This TMDL addresses the PCBs in fish tissue impairment only.

In accordance with Federal regulations at 40 CFR §130.7, a TMDL must comply with the following requirements: (1) be designed to attain and maintain the applicable water quality standards; (2) include a total allowable loading and as appropriate, wasteload allocations for point sources and load allocations for nonpoint sources; (3) consider the impacts of background pollutant contributions; (4) take critical stream conditions into account (the conditions when water quality is most likely to be violated); (5) consider seasonal variations; (6) include a margin of safety (which accounts for uncertainties in the relationship between pollutant loads and instream water quality); and (7) be subject to public participation. In addition, these TMDLs considered reasonable assurance that the TMDL allocations assigned to the nonpoint sources can be reasonably met. The enclosure to this letter describes how the PCB TMDL for the Lake Roland of the Jones Falls watershed satisfies each of these requirements.

As you know, any new or revised National Pollutant Discharge Elimination System permits must be consistent with the TMDL's wasteload allocation pursuant to 40 CFR §122.44(d)(1)(VII)(B). Please submit all such permits to EPA for review as per EPA's letter dated October 1, 1998.

If you have any questions or comments concerning this letter, please do not hesitate to contact Ms. Helene Drago, TMDL Program Manager, at 215-814-5796.

Sincerely,

Jon M. Capacasa, Director
Water Protection Division

Enclosure

cc: Melissa Chatham, MDE-SSA
Jay Sakai, MDE-WMA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
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Decision Rationale
Total Maximum Daily Load of Polychlorinated Biphenyls in Lake Roland of Jones Falls Watershed in Baltimore County and Baltimore City, Maryland

Jon M. Capacasa, Director
Water Protection Division

Date: 6/30/14

Decision Rationale
Total Maximum Daily Loads of Polychlorinated Biphenyls in
Lake Roland of Jones Falls Watershed, Maryland

I. Introduction

The Clean Water Act (CWA) requires a Total Maximum Daily Load (TMDL) be developed for those waterbodies identified as impaired by the State where technology based and other controls will not provide for attainment of water quality standards (WQS). A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a Margin of Safety (MOS) that may be discharged to a waterbody without exceeding water quality standards.

This document sets forth the U.S. Environmental Protection Agency's (EPA) rationale for approving the TMDLs for total Polychlorinated Biphenyls tPCB) in the Lake Roland of Jones Falls Watershed. The TMDL was established to address impairments of water quality, caused by PCBs, as identified in Maryland's Section 303(d) List. The Maryland Department of the Environment (MDE) submitted the report, *Total Maximum Daily Loads of Polychlorinated Biphenyls in Lake Roland of Jones Falls Watershed, Baltimore County and Baltimore City, Maryland,* dated August 2013, to EPA for final review on September 30, 2013, and received on October 18, 2013.

EPA's rationale is based on the TMDL report and information contained in the computer files provided to EPA by MDE. EPA's review determined that the TMDLs meet the following seven regulatory requirements pursuant to 40 CFR Part 130.

1. The TMDL is designed to implement applicable water quality standards.
2. The TMDL includes a total allowable load as well as individual wasteload allocations (WLAs) and load allocations (LAs).
3. The TMDL considers the impacts of background pollutant contributions.
4. The TMDL considers critical environmental conditions.
5. The TMDL considers seasonal environmental variations.
6. The TMDL includes a MOS.
7. The TMDL has been subject to public participation.

In addition, these TMDLs considered reasonable assurance that the TMDL allocations assigned to nonpoint sources can be reasonably met.

II. Summary

The TMDL specifically allocates the allowable tPCB loading to the Lake Roland of Jones Falls Watershed. There are 23 point sources of tPCB, which are included in the WLA. The fact that the TMDL does not assign WLAs to any other sources in the watershed should not be construed as a determination by either EPA or MDE that there are no additional sources in the

watershed that are subject to the National Pollutant Discharge Elimination System (NPDES) program. In addition, the fact that EPA is approving this TMDL does not mean that EPA has determined whether some of the sources discussed in the TMDL, under appropriate conditions, might be subject to the NPDES program. The annual average TMDLs and maximum daily load (MDL) for tPCB for the Lake Roland Impoundment is presented in Table 1. Individual annual and maximum daily WLAs for permitted point sources are provided are also included in Table 1.

Table 1. Summary of TMDL Allocations and MDLs in the Lake Roland Impoundment

Source	TMDL (g/year)	MDL (g/day)
Direct Atmospheric Deposition	2.5	0.02
Non-regulated Watershed Runoff	20.5	0.15
Contaminated Sites	0.2	0.00
Nonpoint Sources/LAs	***23.2***	***0.17***
WWTP[1]	0.014	0.00
NPDES Regulated Stormwater[2]		
Baltimore County	17.6	0.13
Baltimore City	0.069	0.0005
Point Sources/WLAs	***17.7***	***0.13***
MOS (5%)	***2.1***	***0.02***
Total	**43.0**	**0.32**

Notes: [1] WWTP Baseline Load was considered to be *de minimis*
[2] Load per jurisdiction applies to all NPDES stormwater dischargers within the jurisdiction's portion of the watershed draining to Lake Roland. These dischargers are identified in Table 2 below.

Table 2. Summary of NPDES Regulated Stormwater Permit Summary for the Lake Roland Impoundment[1]

MDE Permit	NPDES	Facility	City	County
04DP3313	MD0068276	State Highway Administration (MS4)	State-Wide	All Phase I (Baltimore County and City)
09GP0000	MDR100000	MDE General Permit to Construct	All	All
05DP3317	MD0068306	Baltimore County MS4	County-Wide	Baltimore
04DP3315	MD0068292	Baltimore City MS4		
02SW0105	MDR000105	Hedwin Corporation - Roland Heights	Baltimore City	Baltimore City
02SW0255	MDR000255	Woodberry Quarry Landfill	Baltimore City	Baltimore City
02SW0599	MDR000599	Pepsi Bottling Group, LLC	Baltimore City	Baltimore City
02SW0702	MDR000702	Baltimore City DPW - Northeastern Substation	Baltimore City	Baltimore City
02SW0704	MDR000704	Baltimore City DPW - Middletown Fueling Substation	Baltimore City	Baltimore City
02SW0707	MDR000707	Baltimore City DPW - Fallsway Substation	Baltimore City	Baltimore City

MDE Permit	NPDES	Facility	City	County
02SW0747	MDR000747	U.S. Postal Service - Oliver Street VMF	Baltimore City	Baltimore City
02SW0861	MDR000861	Hollins Organic Products, Inc.	Baltimore	Baltimore
02SW1056	MDR001056	Veolia Transportation - Baltimore	Baltimore City	Baltimore
02SW1156	MDR001156	Norfolk Railway Corporation-Flex-flo Terminal	Baltimore City	Baltimore City
02SW1211	MDR001211	Cold Spring Landfill	Baltimore City	Baltimore
02SW1296	MDR001296	Cockeys Enterprises, Inc.	Stevenson	Baltimore City
02SW1675	MDR001675	MTA - North Avenue Lightrail Facility	Baltimore City	Baltimore
02SW1676	MDR001676	MTA - Kirk Avenue Bus Division	Baltimore City	Baltimore City
02-SW-1751	MDR001751	SHA - Brooklandville Shop	Brooklandville	Baltimore
02SW1810	MDR001810	Potts & Callahan, Inc. - Repair Shop	Brooklandville	Baltimore
02SW2140	MDR002140	Ellicott Dredges, LLC	Baltimore City	Baltimore City
02SW3029	MDR003029	Pall Filtration & Separations Group - Greenspring	Timonium	Baltimore

Note: [1] Although not listed in this table, some individual process water permits incorporate stormwater requirements and are accounted for within the NPDES Stormwater WLA, as well as additional Phase II permitted MS4, such as military bases, hospitals, etc.

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 that considers current and foreseeable conditions, the best available data, and accounts for uncertainty with the inclusion of a MOS value. The option is always available to refine the TMDL for resubmittal to EPA for approval if environmental conditions, new data, or the understanding of the natural processes change more than what was anticipated by the MOS.

III. Background

Lake Roland is an impoundment located in the Jones Falls, a tributary to the Patapsco River Mesohaline Chesapeake Bay Segment. The watershed draining to the impoundment covers approximately 96.8 square kilometers (km^2) (23,910 acres) and spans portions of Baltimore County and Baltimore City. The total population in the embayment's watershed is approximately 106,414 (US Census Bureau 2010).

According to the United States Geological Survey's (USGS) 2006 land cover data (USGS 2013), which was specifically developed to be applied within the Chesapeake Bay Program's (CBP) Phase 5.3.2 watershed model land use in the Lake Roland impoundment watershed is predominantly urban and forest. Urban land use occupies approximately 46.7%, while 42.5% is forested, 9.4% is agricultural, and 1.4% is water/wetlands.

Maryland WQSs specify that all surface waters of the State shall be protected for water contact recreation, fishing, and protection of aquatic life and wildlife (COMAR 2013a). The designated use of the Lake Roland impoundment is Use I - *Water Contact Recreation, and*

Protection of Non-tidal Warmwater Aquatic Life (COMAR 2013b). There are no "high quality," or Tier II, stream segments (Benthic Index of Biotic Integrity [BIBI] and Fish Index of Biotic Integrity [FIBI] aquatic life assessment scores > 4 [scale 1-5]) located within the embayment's watershed requiring the implementation of Maryland's anti-degradation policy (COMAR 2011c; MDE 2010).

The Maryland Department of the Environment (MDE) has identified the waters of the Lake Roland impoundment (Integrated Report Assessment Unit ID: MD-02130904-Lake_Roland) on the State's 2012 Integrated Report as impaired by chlordane (1996) and PCBs in fish tissue (2002) (MDE 2012). The TMDL established herein by MDE will address the tPCB listing for the Lake Roland impoundment, for which a data solicitation was conducted, and all readily available data from the past twelve years have been considered. A chlordane TMDL was approved by the EPA in 2001. The Lake Roland impoundment was delisted for chlordane in the State's 2012 Integrated Report as data collected in 2007 established that fish tissue concentrations for chlordane were below the fish consumption listing threshold

CWA Section 303(d) and its implementing regulations require that TMDLs be developed for waterbodies identified as impaired by the State where technology based and other required controls do not provide for attainment of water quality standards. The overall objective of the tPCB TMDL established in this document is to ensure that the "fishing" designated use, which is protective of human health related to the consumption of fish, in the Lake Roland impoundment is supported. However, this TMDL will also ensure the protection of all other applicable designated uses within the impoundment. This objective was achieved via the use of extensive field observations and a water quality model. The model incorporates the influences of freshwater inputs, and exchanges between the water column and bottom sediments, thereby representing realistic dynamic transport within the impoundment.

The State of Maryland adopted three separate water column tPCB criteria: criterion for protection of human health associated with the consumption of PCB contaminated fish, as well as fresh and salt water chronic tPCB criteria for protection of aquatic life. The Maryland human health tPCB criterion is set at 0.64 nanograms/liter (ng/L), or parts per trillion (ppt) (COMAR 2013c; US EPA 2013a). The Maryland fresh and salt water chronic aquatic life tPCB criterion are set at 14 ng/L and 30 ng/L, respectively (COMAR 2013c; US EPA 2013a).

In addition to the water column criteria described above, fish tissue monitoring can serve as an indicator of PCB water quality conditions. The Maryland fish tissue monitoring data is used to issue fish consumption advisories/recommendations and determine whether Maryland waterbodies are meeting the "fishing" designated use. Only data results from the analysis of skinless fillets, the edible portion of fish typically consumed by humans, is used for assessment purposes and development of this TMDL. Currently Maryland applies a tPCB fish tissue listing threshold of 39 ng/g, based on a fish consumption limit of 4 meals per month. When tPCB fish tissue concentrations exceed this threshold, the waterbody is listed as impaired for PCBs in fish tissue in Maryland's Integrated Report as it is not supportive of the "fishing designated use (MDE 2012). MDE collected fish tissue samples for PCB analysis in the Lake Roland

impoundment and its watershed in 2000, 2003, and 2007. The tPCB concentrations for 8 out of 15 fish tissue composite samples (several species of fish including carp, black crappie, largemouth bass, bluegill were collected) exceed the listing threshold, demonstrating that a PCB impairment exists within the Lake Roland impoundment.

In 2010, monitoring surveys were conducted by MDE to measure water column tPCB concentrations at stations within the Lake Roland impoundment and throughout the watershed. Sediment samples were collected in 2010 as well to characterize tPCB sediment concentrations in the Lake Roland impoundment.

The PCB analysis presented in this document is based on tPCB concentrations that are calculated as the sum of the detected PCB congeners/congener groups. The congener distribution is representative of all congeners present in the industrially produced Aroclor mixtures. A list of congeners detected under this analytical method is presented in Appendix A of the TMDL report. Table 3 summarizes the tPCB data for the fish tissue, water column, and sediment samples that were applied in developing this TMDL. The water column mean tPCB concentration within the Lake Roland impoundment exceeds the human health criterion of 0.64 ng/L; however, none of the water column samples exceed the fresh water aquatic life tPCB criterion of 14 ng/L.

Table 3. Summary of Fish Tissue, Water Column, and Sediment tPCB Data

tPCB Data	Units	Sampling Years	Sample Size	tPCB Concentration		
				Mean	Maximum	Minimum
Fish Tissue	ng/g	2000, 2003, 2007	15	52.5	146.2	10.4
Water Column	ng/L	2010	24	1.98	5.41	0.16
Sediment	ng/g	2010	4	84.3	109.5	72.0

Both point and nonpoint sources of PCBs have been identified throughout the Lake Roland watershed. The following nonpoint sources have been identified in the Lake Roland impoundment's watershed:

Resuspension and Diffusion from Bottom sediment - The numerical model, applying observed tPCB concentrations in the water column and sediment, predicts a net tPCB transport of 207.6 g/year from the bottom sediment of the Lake Roland impoundment to the water column under baseline conditions. Although re-suspension and diffusion from bottom sediments serves as a source of PCBs to the water column, it is still not considered to be a directly controllable source (reducible) since the load contribution is resultant from other point and nonpoint source inputs (both historic and current) within the watershed. In addition, the water quality model developed for this TMDL simulates conditions within the water column and sediment as a single system therefore exchanges between the sedment and water column are considered an internal loading. Only external sources to the system areassigned a baseline load or allocation within a TMDL.

Atmospheric Deposition - There is no recent study of the atmospheric deposition of PCBs to the surface of the Lake Roland impoundment. CBP's Atmospheric Deposition Study (US

EPA 1999) estimated a net deposition of 16.3 micrograms/square meter/year (μg/m^2/year) of tPCBs for urban areas and a net deposition of 1.6 μg/m^2/year of tPCBs for regional (non urban) areas. In the Delaware River estuary, an extensive atmospheric deposition monitoring program conducted by the Delaware River Basin Commission (DRBC) found PCB deposition rates ranging from 1.3 (non urban) to 17.5 (urban) μg/m^2/year of tPCBs (DRBC 2003). The 16.3 μg/m^2/year tPCB depositional rate for urban areas resultant from CBP's 1999 study is applied to the Lake Roland impoundment and its watershed, following the method assigned for the Baltimore Harbor tPCB TMDL (MDE 2011a). The direct atmospheric deposition load to the surface of the impoundment of 6.4 g/year was calculated by multiplying the surface area of the Lake Roland impoundment (0.39 km^2) and the deposition rate of 16.3 μg/m^2/year. Similarly, the atmospheric deposition load to the watershed can be calculated by multiplying 16.3 μg/m^2/year by the watershed area (excluding the impoundment) of 96.3 km^2, which results in a load of 1570.3 g/year. However, according to Totten *et al.* (2006), only a portion of the atmospherically deposited tPCB load to the terrestrial part of the watershed is expected to be delivered to the impoundment. Applying the PCB pass-through efficiency estimated by Totten *et al.* (2006) for the Delaware River watershed of approximately 1%, the atmospheric deposition load to the Lake Roland impoundment from the watershed is approximately 15.7 g/year. This load is accounted for within the loading from the watershed and inherently modeled as part of the non-regulated watershed runoff/National Pollutant Discharge Elimination System (NPDES) Regulated Stormwater loads described below.

Non-regulated Watershed Runoff - The non-regulated watershed runoff tPCB load corresponds to the non-urbanized areas (*i.e.*, primarily forest and wetland areas) of the watershed. MDE collected water column samples for PCB analysis at 3 non-tidal monitoring stations in the tributaries of Lake Roland impoundment on January, April, July and October of 2010. Additionally, 12-year monthly flow averages from the closest USGS gage (USGS 01589440) were obtained and the mean flow was calculated. The Lake Roland watershed was divided into four sub-watersheds according to the locations of the monitoring stations and land use. The flows of the sub-watersheds and the whole watershed were calculated by dividing the USGS mean flow by the USGS drainage area, and multiplying the respective watershed areas. The watershed baseline loading of each sub-watershed was calculated by multiplying the average flow and mean tPCB concentration of the sub-watershed. For the sub-watershed without any tPCB measurement, the mean tPCB concentration of the other 3 sub-watersheds was used. The total watershed tPCB baseline load for the Lake Roland impoundment is 54.1 g/year. About 15.7 g/year of the Lake Roland impoundment watershed's baseline load is attributed to atmospheric deposition to the land surface of the watershed, and is inherently captured within the total watershed tPCB baseline load of 54.1 g/year.

The non-regulated watershed runoff tPCB load only corresponds to the non-urbanized areas (*i.e.*, primarily forest and wetland areas) of the watershed. The load associated with the urbanized area of the watershed represents the NPDES Regulated Stormwater tPCB baseline load. The non-regulated watershed runoff tPCB baseline load (28.9 g/year) was estimated by multiplying the percentage of non-urban land use (53.3 %) within the watershed by the total watershed baseline load (54.1 g/year).

Contaminated Sites - The term contaminated site refers to areas with known PCB soil contamination, as documented by state or federal hazardous waste cleanup programs (*i.e.*, state or federal Superfund programs). When compared against the human health screening criteria for soil and groundwater exposure pathways, PCBs are not necessarily a contaminant of concern at these sites, but they have been screened for, reported, and detected during formal site investigations. One contaminated site has been identified within the Lake Roland watershed (The Har Sinai Property). The site was identified based on information gathered from the EPA's Superfund database and MDE's Land Restoration Program Geospatial Database (LRP-MAP) (US EPA 2013b; MDE 2013). Soil tPCB concentration data and site information was obtained from Land Management Administration's (LMA) contaminated site survey and investigative records. Figure 7 depicts its location. The median tPCB concentration of the site samples was multiplied by the soil loss rate, which is a function of soil type, pervious area, and land cover, to estimate the tPCB edge of field (EOF) load. A sediment delivery ratio of 0.54 was applied to calculate the final edge-of-stream (EOS) load. The contaminated site tPCB baseline load is estimated to be 0.2 g/year.

The following point sources have been identified in the Lake Roland impoundment's watershed:

Municipal WWTP- Stevenson University WWTP (NPDES MD0066001) is the only municipal WWTP that has been identified within the Lake Roland watershed. As no tPCB effluent concentration data is available for this facility, the concentration was estimated based on the median tPCB effluent concentration from 13 WWTPs monitored by MDE in the Chesapeake Bay watershed. The baseline tPCB loading (0.014 g/year) was calculated based on the daily monitoring record (DMR) average discharge flow (0.011 million gallons per day [MGD]) and the estimated median tPCB concentration (0.91 ng/l).

Industrial Process Water - Industrial process water facilities are included in Maryland's tPCB TMDL analyses if: 1) they are located within the applicable watershed, and 2) they have the potential to discharge PCBs. As per the guidance developed by Virginia (VA) for monitoring point sources in support of TMDL development, specific types of industrial and commercial operations are more likely than others to discharge PCBs based on historic or current activities. The State identified specific types of permitted industrial and municipal facilities based on their Standard Industrial Classification (SIC) codes as having the potential to contain PCBs within their process water discharge (VADEQ 2009). There are three industrial process water facilities within the watershed. However, none of them has the potential to discharge PCBs.

NPDES Regulated Stormwater - MDE estimates pollutant loads from NPDES regulated stormwater areas based on urban land use classification within a given watershed. The 2006 USGS spatial land cover, which was used to develop CBP's Phase 5.3.2 watershed model land use, was applied in this TMDL to estimate the NPDES Regulated Stormwater tPCB Baseline Load. The Lake Roland watershed spans a portion of Baltimore County and Baltimore City, Maryland. The NPDES stormwater permits within the watershed include: (i) the area covered under Baltimore County and Baltimore City's Phase I jurisdictional MS4 permit, (ii) the State

Highway Administration's Phase I MS4 permit, (iii) state and federal general Phase II MS4's, (iv) industrial facilities permitted for stormwater discharges, and (v) construction sites. The NPDES Regulated Stormwater tPCB Baseline Load (25.2 g/year) was estimated by multiplying the percentage of urban land use (46.7%) within the watershed by the total watershed baseline load (54.1 g/year). Since the identified PCB contaminated site is located within the urban land use area, its EOS load of 0.2 g/year is subtracted giving a final NPDES Regulated Stormwater tPCB baseline load of 25.0 g/year.

The water quality model developed for simulating ambient sediment and water column tPCB concentrations within the Lake Roland impoundment was used to determine the specific load reductions for each controllable source category that would result in simulated tPCB concentrations in the sediment and water column that meet the TMDL endpoints. The results of this scenario establish the load reductions per source category and the associated WLAs and LAs necessary to achieve the TMDL. The TMDL was calculated to be 43 g/yr, and it includes an LA, of 23.2 g/yr, a WLA of 17.7 g/yr and a MOS of 2.1 g/yr.

IV. Discussion of Regulatory Conditions

EPA finds that MDE has provided sufficient information to meet all seven of the basic requirements for establishing a PCB TMDL for the Lake Roland of Jones Falls watershed. EPA, therefore, approves this PCB TMDL for the Lake Roland of Jones Falls watershed. This approval is outlined below according to the seven regulatory requirements.

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

WQS consist of three components: designated and existing uses; narrative and/or numerical water quality criteria necessary to support those uses; and an anti-degradation statement. Maryland WQSs specify that all surface waters of the State shall be protected for water contact recreation, fishing, and protection of aquatic life and wildlife (COMAR 2013a). The designated use of the Lake Roland impoundment is Use I - *Water Contact Recreation, and Protection of Non-tidal Warmwater Aquatic Life* (COMAR 2013b). There are no "high quality," or Tier II, stream segments (Benthic Index of Biotic Integrity [BIBI] and Fish Index of Biotic Integrity [FIBI] aquatic life assessment scores > 4 [scale 1-5]) located within the embayment's watershed requiring the implementation of Maryland's anti-degradation policy (COMAR 2011c; MDE 2010). The State of Maryland adopted three separate water column tPCB criteria: criterion for protection of human health associated with the consumption of PCB contaminated fish, as well as fresh and salt water chronic tPCB criteria for protection of aquatic life. The Maryland human health tPCB criterion is set at 0.64 nanograms/liter (ng/L), or parts per trillion (ppt) (COMAR 2013c; US EPA 2013a).

As described above, MDE evaluates whether a waterbody meets PCB related WQSs based on two criteria: 1) for PCBs in fish tissue, the use of the tPCB Integrated Report fish tissue listing threshold (39 ng/g, or ppb), or 2) for PCBs in the water column, the human health tPCB water column criterion (0.64 ng/L, or ppt) and the fresh and saltwater chronic tPCB criteria for

protection of aquatic life (14 ng/L and 30 ng/L, or ppt, respectively). Since the Lake Roland impoundment was identified as impaired for PCBs in fish tissue, the overall objective of the tPCB TMDL established in this document is to ensure that the "fishing" designated use, which is protective of human health related to the consumption of fish, in the impoundment is supported; however, this TMDL will also ensure the protection of all other applicable designated uses within the impoundment.

The tPCB fish tissue listing threshold was translated into an associated tPCB water column concentration to provide a TMDL endpoint as the water quality model only simulates tPCB water column and sediment concentration and does not incorporate a food web model to predict tPCB fish tissue concentrations. This was accomplished using the Adjusted Total Bioaccumulation Factor (Adj-tBAF) of 59,461 L/kg for Lake Roland, the derivation of which follows the method applied within the Potomac River tPCB TMDLs (Haywood and Buchanan, 2007). A total Bioaccumulation Factor (tBAF) is calculated per fish species, and subsequently the tBAFs are normalized by the median species lipid content and median dissolved tPCB water column concentration in their home range to produce the Adj-tBAF per species. The most environmentally conservative of the Adj-tBAFs is then selected to calculate the TMDL endpoint water column concentration. This final water column tPCB concentration was subsequently compared to the water column tPCB criteria concentrations, as described above, to ensure that all applicable criteria within the impoundment would be attained.

Based on this analysis, the human health water column tPCB criterion of 0.64 ng/L was selected as the TMDL endpoint for the Lake Roland impoundment, which is more stringent than the value of 0.66 ng/L derived from the tPCB fish tissue listing threshold, and the salt and fresh water aquatic life tPCB chronic criteria of 30 ng/L and 14 ng/L, respectively.

Similarly, in order to establish a TMDL endpoint for the sediment in the Lake Roland impoundment, a tPCB sediment concentration was derived from the tPCB fish tissue listing threshold as the water quality model only simulates tPCB sediment concentrations and not tPCB fish tissue concentrations. This was done using the Adjusted Sediment Bioaccumulation Factor (Adj-SediBAF) of 1.02 (unit-less) for the Lake Roland impoundment, the derivation of which follows the method applied within the Potomac River tPCB TMDLs (Haywood and Buchanan 2007). Similar to the calculation of the water column Adj-tBAF, a sediment Bioaccumulation Factor (SediBAF) is calculated per fish species, and subsequently the SediBAFs are normalized by the median species lipid content and median organic carbon tPCB sediment concentration in their home range to produce the Adj-SediBAF per species. The most environmentally conservative of the Adj-SediBAFs is then selected to calculate the sediment TMDL endpoint tPCB concentration. Based on this analysis, the tPCB concentration of 38.1 ng/g for the Lake Roland impoundment is set as the sediment TMDL endpoint.

EPA believes these are reasonable and appropriate water quality goals.

2) ***The TMDLs include a total allowable load as well as individual wasteload allocations and load allocations.***

Total Allowable Load

EPA regulations at 40 CFR §130.2(i) state *that the total allowable load shall be the sum of individual WLAs for point sources, LAs for nonpoint sources, and natural background concentrations*. The TMDL for PCBs Lake Roland of Jones Falls Watershed is consistent with 40 CFR §130.2(i) because the total loads provided by MDE equal the sum of the individual WLAs for point sources and the land based LAs for nonpoint sources.

The allowable load was determined by first estimating a baseline load. The mean observed tPCB water column and sediment concentrations in year 2010 in the Lake Roland impoundment were used to characterize initial (baseline) model conditions. A tPCB loading reduction scenario was conducted by gradually reducing the current watershed loading. When a total load reduction of 29% is applied, the water column TMDL endpoint is met and the Lake Roland impoundment is supportive of the "fishing" designated use. As the load reduction increases beyond 29%, the length of time required to achieve the TMDL endpoint in the water column decreases. Final sediment concentrations also meet the TMDL sediment endpoint for all reduction scenarios and as the load reductions increases so do the final sediment concentrations. The final sediment concentration will be higher with greater initial load reductions as less time has passed in order for sediment concentrations to decline. In order to assess the effect of varying the baseline conditions on the time required to achieve the TMDL, the upper and lower bounds of the 95% confidence interval (CI) around the mean water column tPCB concentration were estimated and applied in the analysis assuming a tPCB load reduction of 29%. The time required to reach the TMDL endpoints increased by about 17% (3.2 years) compared to the actual baseline condition when the higher tPCB water column concentration was used as the baseline condition.

In the Baltimore Harbor tPCB TMDL (MDE 2011a), a 91.5% tPCB reduction from Jones Falls tributary is required. As Lake Roland watershed is located at the upstream part of the Jones Falls watershed, a 91.5% tPCB reduction from Lake Roland is required to meet the downstream conditions. Based on the calculation of 95% CI analysis conducted 1,534 days is required to meet the water column TMDL endpoint after a 91.5% reduction. At that time the sediment concentration will be 27.1 ng/g and also meets the sediment tPCB TMDL endpoint. For this TMDL, all the calculations and tables will be displayed for a 29% reduction, as this TMDL is designed to meet the TMDL condition solely within the Lake Roland Impoundment.

The allowable load was calculated as 43 g/year. This load is considered the maximum allowable load the watershed can assimilate and still attain water quality standards. The allowable load was reported in units of grams/year for the average annual load and in grams/day for the maximum daily load. Expressing TMDLs using these units is consistent with Federal regulations at 40 CFR §130.2(i), which states that *TMDLs can be expressed in terms of either mass per time, or other appropriate measure*. The average annual and maximum daily tPCB

TMDLs are presented in Table 1.

Load Allocations

According to Federal regulations at 40 CFR §130.2(g), LAs are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading. Wherever possible, natural and nonpoint source loadings should be distinguished.

The TMDL summary in Table 1 contains the LAs for the Lake Roland of Jones Falls Watershed. LAs have been assigned to atmosphere deposition and non-regulated watershed runoff. In order to meet the "fishing" designated use in the impoundment, the TMDL requires load reductions of 60.9% from atmospheric deposition and 29.07% from non-regulated watershed runoff.

Given that the contaminated site baseline load constitutes a relatively small percentage of the Total Baseline Load (0.33%), it is currently not subjected to any reductions. In addition, contaminated sites have already undergone some degree of remediation in accordance with MDE's Superfund or VCP programs.

Loads from re-suspension and diffusion from bottom sediments were necessary for inclusion within the model to predict tPCB concentrations within the impoundment; however, they are not deemed to be directly controllable within the framework of the TMDL. In addition, the water quality model simulates conditions within the water column and sediment as a single system therefore exchanges between the sediment and water column are considered an internal loading. Only external sources to the system are assigned baseline loads and allocations within a TMDL. Therefore, this source will not be assigned an allocation or a required reduction.

Wasteload Allocations

There are 23 point sources of PCBs that have been identified in the Lake Roland of Jones Falls Watershed which are included in the WLAs. Point sources include one municipal WWTP, and 22 NPDES regulated stormwater facilities.

Stevenson University WWTP (NPDES: MD0066001) is the only municipal WWTP that has been identified within the Lake Roland impoundment's watershed. The estimated tPCB baseline loading for the facility's outfall 001 is 0.014 g/year. The WWTP baseline load only accounts for 0.02 % of the total baseline load and was therefore considered *de minimis* as no appreciable environmental benefit would be gained by reducing this load. The elevated tPCB concentrations in wastewater are believed to be primarily due to external sources (*e.g.*, source water, atmospheric deposition, and stormwater runoff) infiltrating the waste water collection system through broken sewer lines and connections. There are currently no effluent tPCB limits established in the discharge permits for WWTPs. Inclusion of a WLA in this document does not reflect any determination to impose a tPCB effluent limit.

NPDES regulated stormwater allocations to the Lake Roland impoundment will be expressed as a single, aggregate WLA for each county (or local political jurisdiction, *i.e.*, Baltimore City). Upon approval of the TMDL, "NPDES-regulated municipal stormwater and small construction storm water discharges effluent limits should be expressed as Best Management Practices (BMPs) or other similar requirements, rather than as numeric effluent limits" (US EPA 2002). The NPDES Regulated Stormwater WLA was established by reducing the NPDES Regulated Stormwater Baseline Loads proportionally to the Non-regulated watershed runoff baseline load, after the WLAs for the remaining source sectors were set, until the TMDL was achieved.

The NPDES Regulated Stormwater Baseline Load to the Lake Roland impoundment constitutes a large portion of the total baseline load to the impoundment, and it therefore requires a 29.2 % reduction. The NPDES Regulated Stormwater WLA for the impoundment is 17.7 g/year. Table 4 lists the aggregate NPDES Regulated Stormwater WLA subdivided by jurisdiction (Baltimore County and Baltimore City).

Table 4. Summary of the NPDES Regulated Stormwater tPCB Baseline Load, WLA, and Load Reduction

Jurisdiction	tPCB Baseline Load (g/year)	tPCB WLA (g/year)[1]	tPCB Reduction (%)
Baltimore County	24.9	17.6	29.32
Baltimore City	0.098	0.069	29.59
Total	**25.0**	**17.7**	**29.2**

Note: [1] The load per jurisdiction represents an aggregation of loads from all of the permitted stormwater entities within the jurisdiction.

Federal regulations at 40 CFR §122.44(d)(1)(vii)(B) require that, for an NPDES permit for an individual point source, the effluent limitations must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the State and approved by EPA. There is no express or implied statutory requirement that effluent limitations in NPDES permits necessarily be expressed in daily terms. The CWA 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 CWA 502(11). Unlike the CWA's definition of TMDL, the CWA definition of "effluent limitation" does not contain a "daily" temporal restriction. NPDES 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, refer to Benjamin H. Grumbles memo (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.*

EPA has authority to object to the issuance of an NPDES permit that is inconsistent with

WLAs established for that point source. It is also expected that MDE will require periodic monitoring of the point source(s) through the NPDES permit process, in order to monitor and determine compliance with the TMDL's WLAs. Based on the foregoing, EPA has determined that the TMDLs are consistent with the regulations and requirements of 40 CFR Part 130.

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

The TMDLs consider the impact of background pollutants by considering land uses.

4) The TMDLs consider critical environmental conditions.

EPA regulations at 40 CFR §130.7(c)(1) require TMDLs to account for critical conditions for stream flow, loading, and water quality parameters. The intent of the regulations is to ensure that: (1) the TMDLs are protective of human health, and (2) the water quality of the waterbodies is protected during the times when they are most vulnerable.

The TMDL is protective of human health at all times; thus, it implicitly accounts for critical conditions. Achievement of the TMDL endpoints for sediment and water column through the implementation of load reductions will result in PCB levels in fish tissue acceptable for human consumption without posing a risk for development of cancer. Bioaccumulation of PCBs in fish is driven by long-term exposure through respiration, dermal contact, and consumption of lower order trophic level organisms. The critical condition defined by acute exposure to temporary fluctuations in PCB water column concentrations during storm events is not a significant pathway for uptake of PCBs. Since PCB levels in fish tissue become elevated due to long-term exposure, it has been determined that the selection of the annual average tPCB water column and sediment concentrations for comparison to the endpoints applied within the TMDL adequately considers the impact of seasonal variations and critical conditions on the "fishing" designated use in the Lake Roland Impoundment.

5) The TMDLs consider seasonal environmental variations.

As mentioned above, the TMDL is protective of human health at all times and therefore it implicitly accounts for seasonal variations as well as critical conditions. Monitoring of PCBs was conducted on a quarterly basis to account for seasonal variation in establishing the baseline condition for ambient water quality in the Lake Roland impoundment and estimation of watershed loadings. Also, since PCB levels in fish tissue become elevated due to long-term exposure, it has been determined that the selection of the annual average tPCB water column and sediment concentrations for comparison to the endpoints applied within the TMDL adequately considers the impact of seasonal variations and critical conditions on the "fishing" designated use in the Lake Roland Impoundment.

6) The TMDLs include a Margin of Safety.

The requirement for a MOS is intended to add a level of conservatism to the modeling process in order to account for uncertainty. Based on EPA guidance, the MOS can be achieved through two approaches. One approach is to reserve a portion of the loading capacity as a separate term, and the other approach is to incorporate the MOS as part of the design conditions.

Uncertainty within the model framework includes the initial condition of mean tPCB concentrations that was selected for the Lake Roland impoundment. A model sensitivity analysis was conducted using the 95% CI's as the initial condition to determine the influence on recovery time for achieving the TMDL endpoints supportive of the "fishing" designated use. Further explanation of this analysis is found in Section 5.2 and Appendix F of the TMDL report. In order to account for these uncertainties, MDE applied an explicit 5% MOS, in order to provide an adequate and environmentally protective TMDL.

7) The TMDLs have been subject to public participation.

MDE provided an opportunity for public review and comment on the PCB TMDL for the Back River embayment watershed. The public review and comment period was open from August 19, 2013 through September 17, 2013. MDE received four sets of written comments. All the comments were satisfactorily addressed by MDE.

A letter was sent to the U.S. Fish and Wildlife Service pursuant to Section 7(c) of the Endangered Species Act, requesting the Service's concurrence with EPA's findings that approval of this TMDL does not adversely affect any listed endangered and threatened species, and their critical habitats.

V. Discussion of Reasonable Assurance

EPA requires that there be a reasonable assurance that the TMDLs can be implemented. WLAs will be implemented through the NPDES permit process. According to 40 CFR §122.44(d)(1)(vii)(B), the effluent limitations for an NPDES permit must be consistent with the assumptions and requirements of any available WLA for the discharge prepared by the State and approved by EPA. Furthermore, EPA has the authority to object to issuance of an NPDES permit that is inconsistent with WLAs established for that point source.

The TMDL calls for substantial reductions in tPCB loads from diffuse sources present throughout the Lake Roland impoundment's watershed. Given that PCBs are no longer manufactured, and their use has been substantially restricted, it is reasonable to expect that with time PCB concentrations in the aquatic environment will decline. The tPCB levels in Lake Roland are expected to decline over time due to natural attenuation, such as the burial of contaminated sediments with newer, cleaner materials and through biodegradation. However, PCBs are still being released to the environment through a variety of activities such as fires, leaks, etc. Therefore, natural attenuation alone is not expected to completely eliminate the PCB impairment in Lake Roland. Due to the potential existence of unidentified sources of PCB

contamination through the watershed and the significant load reductions required to meet the TMDL endpoints, achievement of these TMDLs may not be feasible by solely enforcing effluent limitations on known point sources and implementing BMPs on nonpoint sources. Therefore, an adaptive approach of implementation is anticipated, with subsequent monitoring to assess the effectiveness of the ongoing implementation efforts to manage potential risks to both recreational and subsistence fish consumers.

A collaborative approach involving MDE and the identified NPDES permit holders as well as those responsible for nonpoint PCB runoff throughout the watersheds will be used to work toward attaining the WLAs and LAs presented in this report. The reductions will be implemented in an adaptive and iterative process that will: 1) identify specific sources, or areas of PCB contamination, within the impoundment's watershed, and 2) target remedial action to those sources with the largest impact on water quality, while giving consideration to the relative cost and ease of implementation. The implementation efforts will be periodically evaluated, and if necessary, improved, in order to further progress toward achieving the water quality goals.

Any future monitoring should include congener specific analytical methods. Ideally, the most current version of EPA Method 1668 should be used, or other equivalent methods capable of providing low-detection level, congener specific results. In establishing the necessity and extent of data collection, MDE will collaborate with the affected stakeholders, and take into account data that is already available, as well as the proper characterization of intake (or pass through) conditions, consistent with NPDES program "reasonable potential" determinations and the applicable provisions of the Environment Article and COMAR for permitted facilities.

Given the persistent nature of PCBs, the difficulty in removing them from the environment and the significant reductions necessary in order to achieve water quality goals in Lake Roland, effectiveness of the implementation effort will need to be reevaluated throughout the process to ensure progress is being made towards reaching the TMDLs. MDE also periodically monitors and evaluates concentrations of contaminants in recreationally caught fish, shellfish, and crabs throughout Maryland. MDE will use these monitoring programs to evaluate progress towards meeting the "fishing" designated use.

For more details about Reasonable Assurance for this TMDL refer to Section 6.0 of the TMDL report.