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

APR 27 2015

Dear Mr. Currey:

The U.S. Environmental Protection Agency (EPA), Region III, is pleased to approve the Total Maximum Daily Load (TMDL) report, *Total Maximum Daily Loads of Polychlorinated Biphenyls in South River Mesohaline Chesapeake Bay Segment, Anne Arundel County, Maryland.* The TMDL report was submitted by the Maryland Department of the Environment (MDE) to EPA for final review on December 8, 2014, and received on December 16, 2014. 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 South River Mesohaline Chesapeake Bay Segment (MD-SOUMH) was included on Maryland's 2012 Integrated Report as impaired by nutrients (nitrogen & phosphorous) for the South River Mesohaline Segment (1996), fecal coliform for the shellfish restricted areas in the South River (1996), PCBs in fish tissue (2002) and impacts to biological communities (2008) (MDE 2012). The fecal coliform TMDLs for the shellfish restricted areas in the South River watershed were approved by EPA in 2005. The Chesapeake Bay TMDL, which was approved by the EPA in December 2010, addressed the nutrient listing for the South River Mesohaline Segment. The listing for impacts to biological communities will be addressed at a future date. The TMDL established herein by MDE will address the total PCB (tPCB) listing for the waters of the South River.

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 South River Mesohaline Chesapeake Bay Tidal Segment satisfy 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,

S/n

Jon M. Capacasa, Director
Water Protection Division

Enclosure

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

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1650 Arch Street
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Decision Rationale
Total Maximum Daily Load of Polychlorinated Biphenyls in South River Mesohaline Chesapeake Bay Segment, Anne Arundel County, Maryland

S/n

Jon M. Capacasa, Director
Water Protection Division

Date: 4/27/15

Decision Rationale
Total Maximum Daily Loads of Polychlorinated Biphenyls in the South River Mesohaline Chesapeake Bay Segment in Anne Arundel County, 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. 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 present in a waterbody without exceeding water quality standards.

This document sets forth the U.S. Environmental Protection Agency's (EPA) rationale for approving the TMDL for total Polychlorinated Biphenyls (tPCB) in the South River Mesohaline Chesapeake Bay Segment. This TMDL is established to address impairments of water quality, caused by PCBs, as identified in Maryland's 2002 (fish tissue) Section 303(d) List for water quality limited segments. The Maryland Department of the Environment (MDE) submitted the report, *Total Maximum Daily Load of Polychlorinated Biphenyls in South River Mesohaline Chesapeake Segment, Anne Arundel County, Maryland,* dated September 2014, to EPA for final review on December 8, 2014 and received on December 16, 2014.

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, this TMDL considered reasonable assurance that the TMDL allocations assigned to nonpoint sources can be reasonably met.

II. Summary

Since the South River was identified as impaired for PCBs in fish tissue, the overall objective of the tPCB TMDL is to ensure that the "fishing" designated use, which is protective of human health related to the consumption of fish, is supported. The TMDL specifically allocates the allowable total PCB (tPCB) loading to the South River Mesohaline Chesapeake Bay

Segment. The annual average TMDLs and maximum daily loads (MDLs) for tPCBs for the South River are presented in Table 1. A list of all the NPDES regulated stormwater permits within the South River watershed that could potentially convey tPCB loads to the river is presented in Table 2.

Table 1. Summary of tPCB Baseline Loads, TMDL Allocations, MDL, and Associated Percent Reductions

Source	Baseline Load (g/year)	Baseline Percentage (%)	TMDL (g/year)	Load Reduction (%)	MDL (g/day)
Chesapeake Bay Mainstem Influence	2,227.0	97.8	1,124.0	49.5	4.62
Direct Atmospheric Deposition (to the Surface of the Embayment)	38.4	1.7	38.4	0.0	0.16
Watershed Nonpoint Sources	8.2	0.4	8.2	0.0	0.03
Nonpoint Sources	***2,273.6***	***99.8***	***1,171***	***48.5***	***4.81***
Summer Hill Mobile WWTP	0.024	0.001	0.024	0.0	0.00
NPDES Regulated Stormwater	3.9	0.2	3.9	0.0	0.02
Point Sources	***3.92***	***0.2***	***3.92***	***0.0***	***0.02***
MOS (5%)			62		0.25
Total	**2,278**	**100**	**1,237**	**45.7**	**5.08**

Table 2. NPDES Regulated Stormwater Permit Summary for the South River Watershed [1]

MDE Permit	NPDES	Facility	City	County
05-DP-3313	MD0068276	State Highway Administration (MS4)	State-wide	All Phase I (Anne Arundel)
09-GP-0000	MDR100000	MDE General Permit to Construct	All	All
04-DP-3316	MD0068306	Anne Arundel Phase 1 MS4	County-wide	Anne Arundel
03-IM-5500	MDR055500	City of Annapolis Phase II MS4	City-wide	Anne Arundel
02SW1179	MDR001179	Anne Arundel County - Crownsville	Annapolis	Anne Arundel
02SW2298	MDR002298	Anne Arundel County - Southern Districts Operations	Davidson	Anne Arundel
02SW1290	MDR001290	Reliable Contracting Co., Inc.	Millersville	Anne Arundel
02SW1331	MDR001331	SHA - Annapolis Shop	Annapolis	Anne Arundel

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 MS4s, 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

The South River is a 10-mile-long tidal tributary of the Chesapeake Bay in Anne Arundel County, Maryland. From its headwaters in western Anne Arundel County, in the vicinities of Crofton, Millersville and Crownsville, the river enters the Chesapeake Bay south of the historic port city of Annapolis. Its major non-tidal branches include the North River and Bacon Ridge Branch. The tidal range is 1.11 feet (0.34 meters (m)) based on the United States National Oceanic and Atmospheric Administration tidal station in Kent Point, MD. The drainage area of the South River is approximately 146 square kilometers (km^2) (36,126 acres). 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 South River watershed is a mixture of forest, urban, and agriculture. Forest occupies approximately 46.7% of the watershed, while 32.6% is urban, 11.4 is water/wetland, and 9.3% is agriculture.

Maryland Water Quality Standards specify that all surface waters of the State shall be protected for water contact recreation, fishing, and the protection of aquatic life and wildlife (COMAR 2014a). Additionally, the designated use of the waters of the South River is use II – *Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting* (COMAR 2013b).

The Maryland Department of the Environment (MDE) has identified the waters of the South River (MD-SOUMH) on the State's 2012 Integrated Report as impaired by nutrients (nitrogen & phosphorous) for the South River Mesohaline Segment (1996), fecal coliform for the shellfish restricted areas in the South River (1996), PCBs in fish tissue (2002) and impacts to biological communities (2008) (MDE 2012). The fecal coliform TMDLs for the shellfish restricted areas in the South River watershed were approved by EPA in 2005. The Chesapeake Bay TMDL, which was approved by the EPA in December 2010, addressed the nutrient listing for the South River Mesohaline Segment. The TMDL established by this report will address the total PCB (tPCB) listing for the tidal waters of the South River. The listing for impacts to biological communities will be addressed at a future date.

PCBs do not occur naturally in the environment. Therefore, unless existing or historical anthropogenic sources are present, their natural background levels are expected to be zero. The linkage between the "fishing" designated use and PCB concentrations in the water column is via the uptake and bioaccumulation of PCBs by aquatic organisms. Humans can be exposed to PCBs via consumption of aquatic organisms, which over time have bioaccumulated PCBs.

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 PCB TMDL submitted by MDE is designed to allow for the attainment of the South River Mesohaline Chesapeake Bay Segment's designated uses, and to ensure that there will be no PCB impacts affecting the attainment of these uses. Refer to Table 1 above for a summary of allowable loads.

Since the South River 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, is supported. However, the TMDL will also ensure the protection of all other applicable designated uses. This objective was achieved via the use of extensive field observations and a water quality model. The tidal prism model simulates the tPCB dynamic interactions between the water column and bottom sediments within the South River embayment and the Chesapeake Bay mainstem.

In 2011 and 2012, monitoring surveys were conducted by MDE to measure water column tPCB concentrations at tidal and non-tidal monitoring stations throughout the South River and its watershed. The non-tidal tPCB water column concentration data is required to characterize loadings from the watershed. Sediment samples were collected at tidal stations in 2011 to characterize tPCB sediment concentrations. Also, MDE collected fish tissue samples for PCB analysis in the South River and its watershed in October 2011 and March 2012. The tPCB concentrations for 5 out of 8 fish tissue composite samples (several species of fish including white perch, carp and yellow perch were collected) exceed the listing threshold, demonstrating that a PCB impairment exists within the South River.

As part of the analysis, both point and nonpoint sources of PCBs have been identified throughout the South River watershed. Nonpoint sources of PCBs include: 1) Chesapeake Bay mainstem tidal influence, 2) direct atmospheric deposition to the river, 3) runoff from non-regulated watershed areas within the South River's direct drainage. The transport of PCBs from bottom sediments to the water column through resuspension and diffusion can also be a major source of PCBs in estuarine systems; however under the framework of this TMDL it is not considered a source. No contaminated sites were identified in the South River watershed with the potential to discharge PCBs, based upon a review of the MDE Land Restoration Program's Geospatial Database (MDE 2014b). Point Sources in the South River watershed include one wastewater treatment plant (WWTP), Summer Hill Mobile Home Park WWTP (NPDES number MD0023272), and several stormwater discharges regulated under Phase I and Phase II of the NPDES stormwater program. There is one industrial process water facility in this watershed (Alliant Techsystems, Inc.), which has been determined to have no potential to discharge PCBs.

Nonpoint sources include loads from:

Chesapeake Bay Mainstem Tidal Influence – The South River embayment is highly influenced by tidal exchange of PCBs from the Chesapeake Bay mainstem. The tidal prism model, using observed tPCB concentrations measured at the mouth of the South River and within the South River embayment, predicts a gross tPCB input of 2,227 g/year from the Bay to the River and a gross tPCB output of 2,072 g/year from the River to the Bay. These loads result in a

net tPCB transport of 155 g/year from the Bay to the River. Therefore, currently the Chesapeake Bay mainstem is a major source of tPCBs to the South River embayment.

Atmospheric Deposition – There is no recent study of the atmospheric deposition of PCBs to the surface of the South River. Based on a Chesapeake Bay Program (CBP) 1999 study, a 1.6 $\mu g/m^2$/year tPCB depositional rate was estimated for non-urban areas and a 16.3 $\mu g/m^2$/year tPCB depositional rate was estimated for 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/m2/year of tPCBs (DRBC 2003). Since urban land use comprises less than one third of the South River embayment's watershed (32.6%), the 1.6 µg/m2/year tPCB depositional rate for non-urban areas resultant from CBP's 1999 study is appropriate for the South River watershed. Therefore, the atmospheric deposition load to the direct watershed can be calculated as multiplying 1.6 µg/m2/year by the South River watershed area of 146.2 km^2, which results in a load of 234 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 embayment. 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 South River from the watershed is approximately 2.3 g/year. However, this load is accounted for within the loading from the watershed and is inherently modeled as part of the non-regulated watershed runoff and the National Pollutant Discharge Elimination System (NPDES) Regulated Stormwater loads described below.

Similarly, the direct atmospheric deposition load to the surface of the river of 38.4 g/year was calculated by multiplying the surface area of the river (23.98 km^2) and the deposition rate of 1.6 $\mu g/m^2$/year.

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 4 watershed monitoring stations in the non-tidal tributaries of the South River in May, August, and October of 2011 and February 2012. To calculate the watershed flow, the daily flow rates from January 1, 2008 to December 31, 2013 at the nearest United States Geological Survey (USGS) station located at South Fork Jabez Branch at Millersville (USGS 01589795) were averaged. The flow from the South River watershed (48.366 ft^3/sec) was calculated by dividing its closest USGS station mean flow (0.858 ft^3/sec) by the USGS station drainage area (2.59 km^2), and multiplying this quotient by the watershed area (146 km^2). The South River watershed baseline tPCB loading (12.1 g/year) was calculated by multiplying its average flow and mean measured tPCB concentration (0.281 ng/L). The mean measured tPCB concentration is the average of all the concentration data at the 4 watershed stations. As mentioned above, about 2.3 g/year of the South River watershed's baseline load is attributed to atmospheric deposition to the land surface of the direct drainage, and is inherently captured within the total watershed tPCB baseline load of 12.1 g/year. The non-regulated watershed runoff tPCB baseline load (8.2 g/year) was estimated by multiplying the percentage of non-urban land use (67.4 %) within the watershed by the total watershed baseline load (12.1 g/year).

Resuspension and Diffusion from Bottom Sediments – The tidal prism model, applying observed tPCB concentrations in the water column and sediment, predicts a gross tPCB load of 4,284 g/year from bottom sediment to the water column through resuspension and diffusion and a gross tPCB load of 2,174 g/year from water column to the bottom sediment through settling. This results in a net tPCB transport of 2,110 g/year from the bottom sediment of the South River to the water column under baseline conditions. However, under the framework of this TMDL it is not considered a source

Point sources include loads from:

Industrial Process Water Facilities – One industrial process water facility (Alliant Techsystems, Inc.) was identified within the South River watershed. This facility has an SIC code (3812) but was determined as having no potential to discharge PCBs. Therefore, there is no tPCB load from industrial process water facility part for this TMDL.

Wastewater Treatment Plants – There is one wastewater treatment plant (WWTP), Summer Hill Mobile Home Park WWTP (NPDES number MD0023272), in the South River watershed. No tPCB effluent concentration data is available for Summer Hill Mobile Home Park WWTP, so the tPCB concentration was estimated based on the median tPCB effluent concentration from 13 WWTPs monitored by MDE in the Chesapeake Bay watershed (MDE 2006). The baseline tPCB load from this facility (0.024 g/year) was calculated based on the daily monitoring record (DMR) average discharge flow and the estimated median tPCB concentration. Table 4 provides information on the data used in the baseline load.

Table 4: Summary of Municipal WWTP tPCB Baseline Loads

Facility Name	NPDES	Average Concentration (ng/L)	Average Flow (MGD)	tPCB Baseline Load (g/year)
Summer Hill Mobile WWTP	MD0023272	0.91	0.019	0.024

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 South River watershed is entirely located within Anne Arundel County, Maryland. The NPDES stormwater permits within the watershed include: (i) the area covered under Anne Arundel County's Phase II jurisdictional MS4 permit, (ii) the State Highway Administration's Phase II 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 (3.9 g/year) was estimated by multiplying the percentage of urban land use (32.6%) of the direct drainage by the total direct drainage baseline load (12.1 g/year).

A tidal prism model that incorporates the influences of both fresh water discharge and tidal flushing was used to simulate the dynamic interactions between the water column and bottom sediments within the South River embayment and the Chesapeake Bay mainstem (MDE 2005, Kuo et al. 2005). The observed average tPCB concentrations in the water column and sediment (2011, 2012) were used to characterize the initial (baseline) model conditions. Based on the study of Ko and Baker (2004), on average the tPCB concentrations in the Upper Chesapeake Bay are decreasing at a rate of 6.5% per year. As a conservative estimation, this study assumes a PCB attenuation rate of 5.0% per year at the boundary between the South River and the Chesapeake Bay mainstem. All other inputs (i.e., fresh water inputs, tidal exchange rates, sediment and water column exchange rates, atmosphere deposition, and burial rate) were kept constant.

The model was initially run for 30,000 days to predict the time needed for the water column tPCB concentration to meet the site-specific tPCB water column TMDL endpoint. The results indicated that when the site-specific water column TMDL endpoint (0.48 ng/L) was met, the tPCB sediment concentration was still higher than the site-specific sediment TMDL endpoint (14 ng/g). Consequently, the model was run again for 30,000 days to predict the time needed for the sediment concentrations to reach the TMDL endpoint. After 4,480 days (about 12.3 years) the tPCB sediment concentration reached 14 ng/g, at which time the water column tPCB concentration was equal to 0.45 ng/L.

The Chesapeake Bay mainstem tidal influence and resuspension and diffusion from the bottom sediments are the two primary sources of tPCB baseline loads resulting in the PCB impairment in the South River embayment. However, the loads from resuspension and diffusion from bottom sediments are not considered to be directly controllable (reducible) loads and it is considered as an internal load within the modeling framework of the TMDL, therefore they are not included in the tPCB baseline load and TMDL allocation. Attainment of the site-specific tPCB water quality TMDL endpoints is expected to take place over time as the Chesapeake Bay mainstem tPCB concentrations continue to decline, which also results in the natural attenuation of tPCB levels in the legacy sediments (i.e., the covering of contaminated sediments with newer, less contaminated materials, flushing of sediments during periods of high stream flow, and biodegradation). Assuming that the tPCB concentrations in the Chesapeake Bay mainstem will continue to decline, at or above the current rate of 5% per year, no additional tPCB reductions will be necessary to meet the "fishing" designated use in the South River embayment.

IV. Discussion of Regulatory Conditions

EPA finds that MDE has provided sufficient information to meet all of the seven basic requirements for establishing a PCB TMDL for the South River watershed. Additionally, MDE provided reasonable assurance that the TMDL can be met. EPA's approval is outlined according to the regulatory requirements listed below.

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

Water Quality Standards 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 waters of the South River is use II – *Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting* (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 direct drainage portions of the South River (COMAR 2014).

The State of Maryland has adopted three separate water column tPCB criteria: a criterion for the protection of human health associated with the consumption of PCB contaminated fish (0.64 ng/L), as well as fresh water (14ng/L) and salt water (30ng/L) chronic tPCB criteria for the protection of aquatic life (COMAR 2013c; US EPA 2013a). As the South River is a tidal system, the saltwater aquatic chronic criterion is applied for assessing these waters. The water column mean tPCB concentration in the South River exceeds the human health tPCB criterion of 0.64 ng/L; however, none of the water column samples exceed the fresh and salt water aquatic life tPCB criterion of 14 ng/L and 30 ng/L.

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. Currently Maryland applies a tPCB fish tissue listing threshold of 39 ng/g. 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 South River and its watershed in October 2011 and March 2012. The tPCB concentrations for 5 out of 8 fish tissue composite samples (several species of fish including white perch, carp and yellow perch were collected) exceed the listing threshold, demonstrating that a PCB impairment exists within the South River.

Since the overall objective of the tPCB TMDL for the South River is to ensure the support of the "fishing" designated use, the tPCB fish tissue listing threshold (39 ng/g) was translated into an associated water column tPCB threshold concentration to apply within this analysis as the water column TMDL endpoint. The tPCB fish tissue listing threshold was translated into an associated tPCB water column concentration 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 81,193 L/kg for the South River, 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 then subsequently compared to the water column tPCB criteria concentrations to ensure that all

applicable criteria within the embayment would be attained. Based on this analysis, the water column tPCB concentration of 0.48 ng/L, derived from the tPCB fish tissue listing threshold, is selected as the TMDL endpoint for the South River, which is more stringent than the value of 0.64 ng/L for human health, and the fresh and salt water chronic aquatic life tPCB criteria of 14 ng/L and 30 ng/L, respectively.

Similarly, in order to establish a tPCB TMDL endpoint for the sediment in the River, a target tPCB sediment concentration was derived from the tPCB fish tissue listing. This was done using the Adjusted Sediment Bioaccumulation Factor (Adj-SediBAF) of 2.79 (unitless) for the South River. 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 level of 14.0 ng/g derived from the fish tissue listing threshold 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 tPCBs for the South River Mesohaline Chesapeake Bay Segment are 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 calculated from model-estimated tPCB loads from point and nonpoint sources using monitoring data. The tidal prism model developed for simulating ambient sediment and water column tPCB concentrations was used to determine the specific load reductions that would result in simulated tPCB concentrations in the sediment and water column that meet the TMDL endpoints. The allowable load was calculated as 1,237g/year for the South River.

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.

Attainment of the site-specific tPCB water quality TMDL endpoints is expected to take

place over time as the Chesapeake Bay mainstem tPCB concentrations continue to decline, which also results in the natural attenuation of tPCB levels in the legacy sediments (i.e., the covering of contaminated sediments with newer, less contaminated materials, flushing of sediments during periods of high stream flow, and biodegradation). Assuming that the tPCB concentrations in the Chesapeake Bay mainstem will continue to decline, at or above the current rate of 5% per year, no additional tPCB reductions will be necessary to meet the "fishing" designated use in the South River embayment.

Load Allocations

The TMDL summary in Table 1 contains the LAs for the South River. 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 nonpoint sources of PCBs identified in the South River Watershed include the Chesapeake Bay mainstem tidal influence, the direct atmospheric deposition to the river, and the runoff from non-regulated watershed areas within the South River's direct drainage. The transport of PCBs from bottom sediments to the water column through resuspension and diffusion can also be a major source of PCBs in estuarine systems; however under the framework of this TMDL it is not considered a source. No contaminated sites were identified in the South River watershed.

Model simulation results show that both the water column and sediment PCB targets will be met in about 12.3 years with only natural attenuation of tPCB concentration at the Chesapeake Bay mainstem. Therefore, no reduction is assigned to the watershed loads, including nonpoint source loads.

Wasteload Allocations

There are 9 permitted point sources within the South River watershed that could potentially convey tPCBs loads to the South River Mesohaline Chesapeake Bay Tidal Segment. Point Sources include one WWTP, and several stormwater discharges regulated under Phase I and Phase II of the NPDES stormwater program. There is one industrial process water facility in this watershed which has been determined to have no potential to discharge PCBs.

The WWTP and NPDES Regulated Stormwater WLA for the South River Watershed is 3.9 g/year and 0.024 g/year, respectively. Point source loads only account for 0.2% of the total tPCB baseline load. See discussion above on how the baseline loads were calculated. No reduction was assigned to the point source loads from the watershed.

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 TMDL is consistent with the regulations and requirements of 40 CFR Part 130.

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

PCBs do not occur naturally in the environment. Therefore, unless existing or historical anthropogenic sources are present, their natural background levels are expected to be zero. The TMDL considers the impact of background pollutants by considering land uses within the direct drainage portions of the South River watershed.

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. Critical condition are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards[1]. Critical conditions are a combination of environmental factor (e.g. flow, temperature, etc.), which have an acceptably low frequency of occurrence. In specifying critical condition in the waterbody, an attempt is made to use a reasonable worst-case scenario condition.

The TMDL is protective of human health at all times; thus it implicitly accounts for seasonal variations as well as critical conditions. 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

[1] EPA memorandum regarding EPA Actions to Support High Quality TMDLs from Robert H. Wayland III, Director, Office of Wetlands, Oceans, and Watersheds to the Regional Management Division Directors, August 9, 1999.

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 critical conditions on the "fishing" designate use in the South River watershed.

5) The TMDLs consider seasonal environmental variations.

The TMDL is protective of human health at all times; thus it implicitly accounts for seasonal variations. 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 South River and estimation of watershed loadings. 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 on the "fishing" designate use in the South River watershed.

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 (i.e. explicit), and the other approach is to incorporate the MOS as part of the design conditions (i.e. implicit).

Uncertainty within the model framework includes the estimated rate of decline in tPCB concentrations within the Chesapeake Bay mainstem, as well as the initial condition of mean tPCB concentrations that was selected for the model. 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 South River Mesohaline Chesapeake Bay Segment. The public review and comment period was open from July 17, 2014 through August 15, 2014. Copies of the draft document were placed in the Anne Arundel County Public Library – Annapolis Area Branch. The draft document was also available on the internet. MDE received three sets of written comments during the comment period. The comments were considered and addressed appropriately.

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 TMDL 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.

As discussed above, the Chesapeake Bay mainstem tidal influence and resuspension and diffusion from the bottom sediments have been identified as the two major sources of PCBs to the South River embayment. However, the loads from resuspension and diffusion from bottom sediments are not considered to be directly controllable (reducible) loads and it is considered as an internal load within the modeling framework of the TMDL, so they are not included in the tPCB baseline load and TMDL allocation.

Based on the Ko & Baker study, it is assumed that the tPCB concentrations in the Chesapeake Bay mainstem are decreasing at a rate of 5% per year. Given this rate of decline, the tPCB levels in the South River embayment are expected to decline over time due to natural attenuation, such as the burial of contaminated sediments with newer, cleaner materials and through biodegradation. Model scenario predict that with the natural attenuation of tPCB concentrations in the Chesapeake Bay mainstem the tPCB targets in both water column and sediment of the South River embayment will be met in about 12.3 years. No reduction is needed from the watershed load.

A new Chesapeake Bay Watershed Agreement was signed on June 16, 2014 which includes goals and outcomes for toxic contaminants including PCBs (CBP 2014). The toxic contaminant goal is to "ensure that the Bay and its rivers are free of effects of toxic contaminants on living resources and human health." Implementation of the toxic contaminant goal and outcomes under the new Bay agreement as well as discovering and minimizing any existing PCB land sources throughout the Chesapeake Bay watershed via future TMDL development and implementation efforts could further help to meet water quality goals in the South River.

One alternative for reducing the tPCB concentrations in the water column that MDE may consider is removal of PCB-contaminated systems (i.e., dredging). However, when considering dredging as an option, the risk versus benefit must be weighted as the removal of contaminated sediment may potentially damage the habitat and health of existing benthic and fish communities. In the case of the South River, by allowing for natural attenuation of PCBs in the sediment, water quality supportive of the "fishing" designated use will be achieved within 12.3 years while avoiding disturbance of the benthic habitat.

Additionally, discovering and minimizing any existing PCB land sources throughout the Chesapeake Bay watershed via future TMDL development and implementation efforts could further help to meet water quality goals in the South River watershed.

Under certain conditions, EPA's NPDES regulations allow the use of non-numeric, Best Management Practices (BMP) water quality based effluent limits (WQBELs). BMP WQBELs can be used where "numeric effluent limitations are infeasible; or the practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of the CWA" (CFR 2014c). For example, MDE's Phase I MS4 permits require restoration targets for impervious surfaces (*i.e.*, restore 10% or 20% of a jurisdiction's total impervious cover with no stormwater management/BMPs), and these restoration efforts have known total suspended solids (TSS) reduction efficiencies. Since PCBs are known to adsorb to sediments and their concentrations correlate with TSS concentrations, the significant restoration requirements in the MS4 permits, which will lead to a reduction in sediment loads entering the South River, will also contribute toward tPCB load reductions and meeting PCB water quality goals. Implementation of similar restoration measures within upstream jurisdictions would also contribute additional reductions to PCB loadings from the Chesapeake Bay mainstem and provide progress towards achieving the TMDL. Other BMPs that focus on PCB source tracking and elimination at the source rather than end-of-pipe controls are also warranted.

Where necessary, the source characterization efforts will be followed with pollution minimization and reduction measures that will include BMPs for reducing runoff from urban areas, identification and termination of ongoing sources (*e.g.*, industrial uses of equipment that contain PCBs), etc. The identified NPDES regulated WWTP and stormwater control agency permits will be expected to be consistent with the WLAs presented in this report. Numerous stormwater dischargers are located in the watershed including Municipal Phase I MS4, the SHA Phase I MS4, industrial facilities, State and Federal Phase II MS4s, and any construction activities on area greater than 1 acre.

An example of one jurisdiction with a PCB TMDL implementation plan is Montgomery County. The current Montgomery County Phase I MS4 permit requires that the jurisdiction develop implementation plans to meet its assigned NPDES Regulated Stormwater WLAs. In this TMDL, because its load was estimated at only 0.001% of the total PCB baseline load, the Anne Arundel County Phase I MS4 permit was not assigned a reduction and therefore no PCB implementation plan will be required. Development of implementation plans by regulated stormwater dischargers within upstream jurisdictions would also contribute additional reductions to PCB loadings from the Chesapeake Bay and provide progress towards achieving the TMDL.

PCBs are still being released to the environment via accidental fires, leaks, disposal of PCB containing products, etc. Therefore, MDE will continue to periodically monitor and evaluate 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 in the South River embayment.

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