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

SEP 30 2016

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

Dear Mr. Currey:

The U.S. Environmental Protection Agency (EPA), Region III, is pleased to approve the report, *Total Maximum Daily Load of Sediment in the Swan Creek Watershed, Harford County, Maryland.* The TMDL report was submitted by the Maryland Department of the Environment (MDE) to EPA for final review on September 28, 2015 and received on October 2, 2015. 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 MD 8-digit Swan Creek watershed (MD-02130706) was originally identified in Maryland's 2002 Integrated Report as impaired for aquatic life use due to impacts to biological communities. The listing was based on the biological assessment methodology, which uses aquatic health scores, consisting of the Benthic Index of Biotic Integrity (BIBI) and Fish Index of Biotic Integrity (FIBI). As a result of a biological stressor identification analysis report prepared by MDE, the 2002 aquatic life use impairment (biological listing) for this non-tidal MD 8-digit watershed was refined and identified the Swan Creek watershed as impaired by total suspended solids (TSS) and total phosphorus (TP) and requiring TMDLs. The TMDL established herein by MDE addresses the TSS listing as identified on MDE's 2014 Section 303(d) List.

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 Sediment TMDL for the Swan Creek 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 me, or your staff may contact Maria Garcia, Maryland TMDL coordinator, at 215-814-3199.

Sincerely,

Jon M. Capacasa, Director
Water Protection Division

Enclosure

cc: Lynn Buhl, MDE-WMA
Melissa Chatham, MDE-SSA

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Decision Rationale
Total Maximum Daily Load of Sediment
Swan Creek Watershed
Harford County, Maryland

Jon M. Capacasa, Director
Water Protection Division

Date: 9/30/16

Decision Rationale
Total Maximum Daily Load of Sediment in the Swan Creek Watershed
Harford 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 (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 water quality limited waterbody.

This document sets forth the U.S. Environmental Protection Agency's (EPA) rationale for approving the TMDL for sediment in the Swan Creek Watershed. The TMDL was established to address impairments of water quality, caused by sediment, as identified in Maryland's 2014 Section 303(d) List. The Maryland Department of the Environment (MDE) submitted the report, *Total Maximum Daily Load of Sediment in the Swan Creek Watershed, Harford County, Maryland,* dated August 2015 to EPA for final review on September 28, 2015 and received on October 2, 2015. The TMDL in this report addresses the Total Suspended Solids (TSS) impairment in the MD 8-Digit Swan Creek Watershed (MD-02130706) as identified on Maryland's 2014 Section 303(d) List.

EPA's rationale is based on the TMDL Report and information in the computer files provided to EPA by MDE. EPA's review determined that the TMDL meets 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.

From this point forward, all references in this rationale can be found in the TMDL report, *Total Maximum Daily Load of Sediment in the Swan Creek Watershed, Harford County, Maryland*, unless otherwise noted. In addition, the terms TSS and sediment may be used interchangeably.

II. Summary

The TMDL specifically allocates the allowable sediment loading and applies to the non-tidal, 1st-4th order streams contained in the MD 8-digit Swan Creek watershed (MD-02130706). There are five permitted point sources 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 sediment TMDL is presented as an average annual load in tons per year because it was calculated so as to not cause any sediment related impacts to aquatic health. The long term maximum daily sediment TMDL is presented in tons per day. The calculation of the long term maximum daily TMDLs is explained in Appendix B of the TMDL report. The average annual MD 8-Digit Non-Tidal Swan Creek Watershed TMDL is summarized in Table 1. The TMDL is the sum of the LAs, NPDES Stormwater WLA, Process Water WLA, and implicit MOS. The LAs include nonpoint source loads generated within the Swan Creek watershed. The long term maximum daily TMDL is presented in Table 2. Individual annual and daily WLAs for permitted point sources are provided in Tables 3 and 4.

Table 1: Swan Creek Watershed Average Annual TMDL of Sediment/TSS (ton/yr)

TMDL (ton/yr)	=	LA_{SC}	+	NPDES Stormwater WLA_{SC}	+	Process Water WLA_{SC}	+	MOS
729	=	361	+	366	+	2	+	Implicit

Table 2: Swan Creek Maximum Daily Load of Sediment/TSS (ton/day)

MDL (ton/day)	=	LA_{SC}	+	NPDES Stormwater WLA_{SC}	+	Process Water WLA_{SC}	+	MOS
1.97	+	0.97	+	0.98	+	0.02	+	Implicit

Table 3: Swan Creek Sediment TMDL Process Water Point Source WLAs

Facility Name	NPDES #	Permit Type	WLA Type	Baseline Load (ton/yr)	WLA (ton/yr)	Reduction (%)
SWAN HARBOR DELL MOBILE HOME PARK	MD0023043	WMA2	Aggregate	2	2	0

Table 4: Swan Creek Sediment TMDL Allocations for NPDES Regulated Stormwater WLAs

NPDES Regulated Stormwater Sector	NPDES #	Baseline Load (ton/yr)	WLA (ton/year)	Reduction (%)
Harford County Phase I MS4	MD0068268	63	56	13
Municipal Phase II MS4	MDR055500	177	154	13
SHA Phase I MS4	MDR055501	30	26	13
Other NPDES Regulated Stormwater[1]	N/A	136	130	4
Total		**407**	**366**	**10**

Note: [1]See Table 5, below for the list of "Other NPDES Regulated Stormwater" permits.

Table 5: Swan Creek Watershed NPDES Stormwater Permits

NPDES Permit #[1]	Facility Name	NPDES Regulated Stormwater WLA Sector
MD0068268	Harford County	County Phase I MS4
MDR055500	Town of Bel Air	Municipal Phase II MS4
MDR055500	City of Aberdeen	Municipal Phase II MS4
MDR055500	City of Havre de Grace	Municipal Phase II MS4
MDR068276	State Highway Administration	SHA Phase I MS4
MDR001244	Comer Construction, Inc.	Other NPDES Regulated Stormwater
MDR000404	Harford Systems, INC.	Other NPDES Regulated Stormwater
MDR001896	Plastipak Packaging, Inc	Other NPDES Regulated Stormwater
MDR001787	Smuckers Quality Beverages, Inc	Other NPDES Regulated Stormwater
N/A	MDE General Permit to Construct	Other NPDES Regulated Stormwater

Note: [1]N/A: Permit does not have an NPDES number. For the industrial stormwater permits, the permit number listed is the MDE permit application number.

The TMDL is a written plan 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 Swan Creek watershed is located entirely within Harford County, Maryland. The watershed is located in the Coastal Plain and Piedmont regions. It is located approximately four miles south of the mouth of the Susquehanna River. The lower portion of Swan Creek is a small shallow tidal embayment. However, the specific MD 8-Digit Swan Creek watershed consists of non-tidal streams. The total drainage area of this watershed is approximately 15,870 acres not including water/wetlands. Approximately 50 acres of the watershed area is covered by water. The total population in the Swan Creek watershed is approximately 12,580. The town of Aberdeen is partially within this watershed. The land-use distribution of the Swan Creek watershed consists primarily of forest (43.4%) and urban land (39.3%), with smaller amounts of

crop (12.8%) and pasture (4.2%).

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 watershed. Tier II segments would require the implementation of Maryland's anti-degradation policy.

The waters of the Swan Creek watershed has been identified in Maryland's Integrated Reports as impaired by multiple pollutants. The Chesapeake Bay Tidal Fresh segment (CB1TF) related to Swan Creek was identified as impaired by nutrients – total phosphorus and total nitrogen (1996, Designated Use Class II – Open-Water Fish and Shellfish– total suspended solids; 2012, Designated Use Class II – Seasonal Migratory Fish Spawning and Nursery Subcategory). The Chesapeake Bay TMDL established by the USEPA on December 29, 2010 addresses these listings. The MD 8-digit Swan Creek watershed (MD-02130706) was originally identified in Maryland's 2002 Integrated Report as impaired for aquatic life use due to impacts to biological communities. The listing was based on the biological assessment methodology, which uses aquatic health scores, consisting of the Benthic Index of Biotic Integrity (BIBI) and Fish Index of Biotic Integrity (FIBI). As a result of a biological stressor identification analysis report prepared by MDE, the 2002 aquatic life use impairment (biological listing) for this non-tidal MD 8-digit watershed was refined and identified the Swan Creek watershed as impaired by TSS and total phosphorus (TP) and requiring TMDLs. The TMDL established herein by MDE addresses the TSS listing as identified in MDE's 2014 Integrated Report.

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 sediment TMDL submitted by MDE ensure that watershed sediment loads are at a level that supports the Use Class I designation for the Swan Creek watershed (MD-02130706). Refer to Tables 1 and 2 above for a summary of allowable loads.

Currently in Maryland, there are no specific numeric criteria that quantify the impact of sediment on the aquatic life of non-tidal stream systems. Therefore, to determine whether aquatic life is impacted by elevated sediment loads, MDE's Biological Stressor Identification (BSID) methodology was applied. The BSID identifies the most probable cause(s) for observed biological impairments throughout MD's 8-digit watersheds (1st through 4th order streams only) by ranking the likely stressors affecting a watershed using a suite of physical, chemical, and land-use data. The ranking of stressors was conducted via a risk-based, systematic, weight-of-evidence approach. The risk-based approach estimates the strength of association between various stressors and an impaired biological community. The BSID analysis then identifies individual stressors (pollutants) as probable or unlikely causes of the poor biological conditions within a given MD 8-digit watershed and subsequently concludes whether or not these individual stressors or groups of stressors are contributing to the impairment. The BSID analysis for the MD 8-digit Swan Creek watershed identified TSS/sediment/instream habitat, low DO, and high pH as potential stressors. As a result, the aquatic life use impairment identified on Maryland's Integrated Report (2002) was refined to identify TSS and total phosphorus as pollutants requiring a TMDL. The objective of this TMDL is to ensure that watershed sediment loads are at a level that supports the Use Class I designation for the Swan Creek watershed. The TMDL will

address water clarity problems and associated impacts to aquatic life in Swan Creek caused by high sediment and TSS concentrations, and therefore addresses the TSS listing (2014).

In order to quantify the impact of sediment on the aquatic life of non-tidal stream systems, a reference watershed TMDL approach was used, which resulted in the establishment of a *sediment loading threshold.* This threshold is based on a detailed analysis of sediment loads from watersheds that are identified as supporting aquatic life (i.e., reference watersheds) based on Maryland's biocriteria (Roth et al. 1998, 2000; Stribling et al. 1998; MDE 2008). This threshold is then used to determine a watershed specific sediment TMDL endpoint. The resulting loads are considered the maximum allowable loads the waterbody can receive without causing any sediment related impacts to aquatic health.

A total of 12 water quality monitoring stations were used to characterize the Swan Creek watershed for the purpose of this TMDL. The BSID analysis used the eleven biological/physical habitat monitoring stations from the MBSS Round 1 - 3 data collection. Additionally, one monitoring station from the Maryland CORE/TREND monitoring network was applied within the TMDL analysis.

The watershed model chosen to estimate the sediment loads for the Swan Creek watershed TMDL was the CBP P5.3.2 watershed model, specifically the EOS sediment loads. The spatial domain of the CBP P5.3.2 watershed model segmentation aggregates to the MD 8-digit watersheds, which is closely consistent with the impairment listing. The nonpoint source baseline sediment loads generated within the Swan Creek watershed are based on the EOS loads from the CBP P5.3.2 watershed model 2009 Progress Scenario. CBP P5.3.2 Progress Scenario EOS loads are calculated as the sum of individual land-use EOS loads within the watershed and represent a long-term average loading rate. Individual land-use EOS loads are calculated within the CBP P5.3.2 watershed model as a product of the land-use area, land-use target EOF loading rate, and loss from the EOF to the main channel. BMP data and reduction efficiencies are then subsequently applied to produce the final EOS loads. The loss from the EOF to the main channel is the *sediment delivery factor* and is defined as the ratio of the sediment load reaching a basin outlet to the total erosion within the basin. A *sediment delivery factor* is estimated for each land-use type based on the proximity of the land-use to the main channel. Thus, as the distance to the main channel increases, more sediment is stored within the watershed (i.e., *sediment delivery factor* decreases).

To quantify the impact of sediment on the aquatic life of non-tidal stream systems, a reference watershed TMDL approach was used and resulted in the establishment of a *sediment loading threshold.* Comparison of watershed sediment loads to loads from reference watersheds requires that the watersheds be similar in physical and hydrological characteristics. To satisfy this requirement, in the original methodology, Currey et al. (2006) selected reference watersheds only from the Highland and Piedmont physiographic regions. This region is consistent with the non-coastal region that was identified in the 1998 development of FIBI and subsequently used in the development of BIBI (Roth et al. 1998; Stribling et al. 1998). The biocriteria methodology assesses biological impairment at the MD 8-digit watershed scale based on the percentage of MBSS monitoring stations, translated into watershed stream miles, that have BIBI and/or FIBI scores lower than the Minimum Allowable IBI Limit (MAL). The MAL is calculated based on the average annual allowable IBI value of 3.0 (on a scale of 1 to 5). It accounts for annual

variability and helps to avoid classification errors (i.e., false positives) when assessing for biological impairments.

To further reduce the effect of the variability within the Highland and Piedmont physiographic regions (i.e., soils, slope, etc.), the watershed sediment loads were then normalized by a constant background condition, the all forested watershed condition. This new normalized term, defined as the *forest normalized sediment load*, represents how many times greater the current watershed sediment load is than the *all forested sediment load.* The *forest normalized sediment load* for this TMDL is calculated as the current watershed sediment load divided by the *all forested sediment load.*

Eleven reference watersheds were selected from the Highland and Piedmont physiographic region. Reference watershed forest normalized sediment loads were calculated using CBP P5.3.2 watershed model 2009 Progress Scenario EOS loads. The median and 75th percentile of the reference watershed *forest normalized sediment loads* were calculated and found to be 3.6 and 7.2, respectively. The median value of 3.6 was established as the sediment loading threshold as an environmentally conservative approach to develop this TMDL.

The *forest normalized sediment load* for the Swan Creek watershed (estimated as 3.8) was calculated using CBP P5.3.2 2009 Progress Scenario EOS loads, to best represent current conditions. A comparison of the Swan Creek watershed *forest normalized sediment loads* to the *forest normalized reference sediment load* (also referred to as the *sediment loading threshold*) demonstrates that the watershed exceeds the *sediment loading threshold*, indicating that it is receiving loads above the maximum allowable load that it can sustain and still meet water quality standards. The allowable load for the impaired watershed is calculated as the product of the *sediment loading threshold* (determined from watersheds with a healthy biological community) and the Swan Creek *all forested sediment load.* The resulting load is considered the maximum allowable load the watershed can sustain and support aquatic life.

The MD 8-Digit Swan Creek Average Annual TMDL of Sediment/ TSS is 729 ton/yr (a 5% reduction from the baseline load). This TMDL consists of point and nonpoint source allocations and is comprised of a Load Allocation (LA_{SC}) of 361 ton/yr, an NPDES Stormwater Waste Load Allocation (NPDES Stormwater WLA_{SC}) of 366 ton/yr, and a Process Water Waste Load Allocation (Process Water WLA_{SC}) of 2 ton/yr. See Table 1, above.

IV. Discussion of Regulatory Conditions

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

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. The designated use of the MD 8-digit Swan Creek non-tidal mainstem

and its tributaries is Use I (Water Contact Recreation and Protection of Aquatic Life).

The water quality impairment of the MD 8-Digit Swan Creek watershed addressed by this TMDL is caused by an elevated sediment load beyond a level that the watershed can sustain, thereby causing sediment related impacts that cannot support aquatic life. Assessment of aquatic life is based on benthic and fish Index of Biotic Integrity (IBI) scores, as demonstrated via the BSID analysis for the watershed. The BSID analysis has determined that the biological impairment in the MD 8-Digit Swan Creek watershed is due in part to sediment-related stressors. Specifically, the analysis confirmed that individual stressors within the sediment parameter grouping were contributing to the biological impairment in the watershed.

Reductions in sediment loads are expected to result from decreased watershed erosion, which will then lead to improved benthic and fish habitat conditions. Specifically, sediment load reductions are expected to result in an increase in the number of benthic sensitive species present, an increase in the available and suitable habitat for a benthic community, a possible decrease in fine sediment (fines), and improved stream habitat diversity, all of which will result in improved water quality.

The TMDL, however, will not completely resolve the impairment to biological communities within the watershed. Since the BSID watershed analysis identifies low DO and high pH as possible stressors impacting the biological conditions, additional TMDL or TMDLs may be needed to address the impacts to biological communities. This impairment to aquatic life will only be fully addressed when all impairing substances identified as impacting biological communities in the watershed are reduced to levels that will meet water quality standards, as established in future TMDLs for those substances.

Based on the analysis of benthic monitoring results at the CORE/TREND station, it has been determined that the mainstem of the MD 8-Digit Swan Creek watershed is supportive of aquatic life and is therefore not impaired by sediment. The TMDL will be restricted to the 1st through 4th order tributaries within the MD 8-Digit watershed and will exclude the Swan Creek mainstem.

The objective of the sediment TMDL established herein is to reduce sediment loads, and subsequent effects on aquatic life in the 1st through 4th order streams in the MD 8-Digit Swan Creek watershed, to levels that support the Use I designation for the watershed. EPA agrees 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 of sediment for the Swan Creek 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.

In the TMDL calculation, the allowable load for the impaired watershed is calculated as the product of the *sediment loading threshold* (determined from watersheds with a healthy biological community) and the Swan Creek all *forested sediment load* (see Section 4.2 of the TMDL report). The resulting load is considered the maximum allowable load the watershed can sustain and support aquatic life. The sediment TMDL for the Swan Creek watershed was calculated to be 729 ton/yr. The sediment TMDL and allocations are presented as mass loading rates of tons per year for the average annual load and tons per day for the maximum daily load. Expressing TMDLs as annual average and maximum daily mass loading rates 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, toxicity, or other appropriate measure.* The annual average and maximum daily sediment loads are presented above in Tables 1 and 2, respectively.

It has been determined that sediments are only impairing aquatic life in the 1st through 4th order tributary streams within the MD 8-Digit non-tidal Swan Creek watershed. It has been determined that sediment is not impairing the aquatic life in the watershed's mainstem. Therefore, the TMDL was developed solely for the 1st through 4th order tributaries in the MD 8-Digit non-tidal Swan Creek watershed.

The MD 8-Digit Swan Creek Baseline Load and TMDL are presented in Table 6.

Table 6: Swan Creek Baseline Load, TMDL, and Total Reduction Percentage

Baseline Load (ton/yr)	**TMDL** (ton/yr)	**Total Reduction** (%)
770	729	5

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 LA for the Swan Creek watershed.

As indicated above, the computational framework chosen for the MD 8-Digit Swan Creek sediment TMDL was the CBP P5.3.2 watershed model 2009 Progress Scenario EOS sediment loads. Individual land-use EOS loads are calculated within the CBP P5.3.2 watershed model as a product of the land use area, land use target EOF loading rate, and loss from the EOF to the main channel (i.e., sediment delivery factor). For the 2009 Progress Scenario, Best Management Practice (BMP) data and reduction efficiencies are then subsequently applied to produce the final EOS loads.

In order to attain the TMDL loading cap calculated for the watershed, equal reductions were applied to the predominant controllable sources (i.e., significant contributors of sediment to the stream system). If only these predominant sources are controlled, the TMDL can be achieved in the most effective, efficient, and equitable manner. In the Swan Creek watershed, crops, pasture, and nurseries were identified as controllable nonpoint sources. Forest is the only

non-controllable source, as it represents the most natural condition in the watershed. Sediment loads from urban lands in this watershed are regulated entirely under NPDES permits and are considered a point source. Therefore, the reductions required from urban land sediment loads are given a WLA.

Controllable loads were determined, in accordance with the Chesapeake Bay TMDL, as the difference between the CBP 2010 "No Action" Scenario and the "E3" Scenario, where the No Action Scenario represents current land-uses and point sources without nutrients controls, while the E3 Scenario represents application of all possible BMPs and control technologies to current land-uses and point sources. This allocation methodology provides credit for existing BMPs in place, which is one the reasons the resulting reduction vary among source sectors.

In this watershed; crop, pasture, nursery, urban land, CAFOs, and municipal WWTPs were identified as the predominant controllable sources. Forest is the primary non-controllable source, as it represents the most natural condition in the watershed. Urban stormwater sediment loads are regulated under the NPDES MS4 program and therefore included in the WLA.

Table 7 provides one possible scenario for the allocations of the nonpoint source sediment loads in the Swan Creek Watershed.

Table 7: Swan Creek Sediment TMDL Allocation by Nonpoint Source Category (tons/year)

General Land Uses[1]	Detailed Land-Use	Baseline Load (ton/year)	LA (ton/year)	Reduction
Forest	Forest	87	87	0%
	Harvested Forest	3	3	0%
Pasture	Pasture	13	13	0%
Crop	Crop	256	256	0%
Nursery	Nursery	1	1	0%

[1]The source categories represent aggregates of multiple sources (e.g., crop is an aggregate of high till, low till, and hay).

Wasteload Allocations

WLAs have been calculated for NPDES regulated stormwater permits, process water permits, general industrial stormwater permits, and the general permit for stormwater discharges from construction sites in the MD 8-Digit Swan Creek watershed. The permits can be grouped into two categories, process water and stormwater. Refer to tables 3, 4, and 5 for WLAs for this sediment TMDL.

The process water category includes those loads generated by continuous discharge sources whose permits have total suspended solids (TSS) limits (i.e., contributors to the watershed sediment load). There is one process water source with explicit TSS limits in the Swan Creek watershed that contributes to the watershed sediment load, which is a municipal discharge. The total estimated TSS load from this source is based on current, average permit limits and is equal to 2 ton/yr. No reductions were applied to these sources, since such controls would produce no discernable water quality benefit when nonpoint sources and regulated

stormwater sources comprise greater than 99% of the total watershed sediment load. See Table 3, above.

The stormwater category includes all NPDES regulated stormwater discharges, both general and individual. In the Swan Creek watershed, these include the Harford County Phase I jurisdictional MS4 permit, the Phase I State Highway Administration (SHA) MS4 permit, a general Phase II jurisdictional MS4 permit, and other general Phase I and II stormwater permits. These stormwater permits are regulated based on Best Management Practices (BMPs) and do not include TSS limits. In the absence of TSS limits, the baseline loads for these NPDES regulated stormwater discharges are calculated using the nonpoint source loads from the urban land use within the watershed. The associated WLAs are calculated by applying reductions to the urban land use.

Individual WLAs have been calculated for the Harford County Phase I jurisdictional MS4 permit and the SHA Phase I MS4 permit. Aggregate WLAs have been calculated for: 1) the Phase II jurisdictional MS4; and 2) the other general Phase I and II NPDES stormwater permits. Other NPDES regulated Phase I and Phase II stormwater permits include non-jurisdictional general MS4s, all industrial facilities permitted for stormwater discharges, and general construction permits. This aggregate WLA is referred to as the "Other NPDES regulated stormwater" WLA. See Tables 4 and 5, above.

In order to calculate the NPDES stormwater WLA, MDE further refined the CBP P5.3.2 urban land-use. For any given watershed, the refined CBP P5.3.2 land-use contains the specific level of detail needed to determine individual and aggregate WLAs for county Phase I jurisdictional MS4s, the State Highway Administration (SHA) Phase I MS4, Phase II jurisdictional MS4s, and "Other NPDES Regulated Stormwater" entities.

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 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 TMDL consider the impact of background pollutants by considering the sediment load from natural sources such as forested land. The CBP P5.2 model also considers background pollutant contributions by incorporating all 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. Critical conditions 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 factors (e.g., flow, temperature, etc.), which have an acceptably low frequency of occurrence. In specifying critical conditions in the waterbody, an attempt is made to use a reasonable worst-case scenario condition.

The biological monitoring data used to determine the reference watersheds reflect the impacts of stressors (i.e., sediment impacts to stream biota) over the course of time and therefore depict an average stream condition (i.e., captures all high and low flow events). Since the TMDL endpoint is based on the median of forest normalized loads from watersheds assessed as having good biological conditions (i.e., passing Maryland's biocriteria), by the nature of the biological data described above, it must inherently include the critical conditions of the reference watersheds. Therefore, since the TMDL reduces the watershed sediment load to a level compatible with that of the reference watersheds, critical conditions are inherently addressed.

5) The TMDLs consider seasonal environmental variations.

This TMDL accounts for seasonality through various methods. Specifically, seasonality is captured in several components. First, it is implicitly included through the use of the biological monitoring data as biological monitoring data reflect the impacts of stressors over time, as described above. Second, the MBSS dataset included benthic sampling in the spring (March 1 - April 30) and fish sampling in the summer (June 1 - September 30). Benthic sampling in the spring allows for the most accurate assessment of the benthic population, and therefore provides an excellent means of assessing the anthropogenic effects of sediment impacts on the benthic community. Fish sampling is conducted in the summer when low flow conditions significantly limit the physical habitat of the fish community, and it is therefore most reflective of the effects of anthropogenic stressors as well. Moreover, the sediment loading rates used in the TMDL were determined using the CBP P5.3.2 model which is based on Hydrological Simulation Program Fortran (HSPF) model, which is a continuous simulation model with a

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[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.

simulation period 1985-2005, thereby addressing annual changes in hydrology and capturing wet, average, and dry years.

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. MDE has adopted an implicit MOS for this TMDL. It is proposed that the estimated variability around the reference watershed group used in this analysis already accounts for such uncertainty. Analysis of the reference group *forest normalized sediment loads* indicates that the 75th percentile of the reference watersheds is a value of 7.2 and that the median value 3.6. Based on this analysis, the *forest normalized reference sediment load* (also referred to as the *sediment loading threshold*) was set at the median value of 3.6 (Currey et al. 2006). Use of the median as the threshold creates an environmentally conservative estimate, and results in an implicit MOS.

7) The TMDLs have been subject to public participation.

MDE provided an opportunity for public review and comment on the sediment TMDL for the MD 8-Digit Swan Creek watershed. The public review and comment period was open from August 20, 2015 through September 18, 2015. MDE received no written comments.

A letter was sent to the U.S. Fish and Wildlife Service (US FWS) 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 MD 8-Digit Swan Creek sediment TMDL is expected to be implemented as part of a staged process recently developed by Maryland. This staged process is designed to achieve both the sediment reductions needed within the MD 8-Digit Swan Creek watershed and to meet sediment target loads consistent with the Chesapeake Bay TMDL, established by EPA in 2010 (US EPA 2010a) and scheduled for full implementation by 2025. The Bay TMDL requires reductions of nitrogen, phosphorus, and sediment loads throughout the Bay watershed to meet water quality standards that protect the designated uses in the Bay and its tidal tributaries. Bay TMDL implementation planning has been primarily focused on nutrient (nitrogen and phosphorus) reductions; however, reductions in sediment loadings and the attainment of the applicable sediment allocations specified within the Bay TMDL are expected to occur as a result

of implementation measures to control nutrients. Therefore, even though the Bay TMDL implementation framework has focused on meeting the nutrient allocations, it still ensures the achievement of the required sediment allocations and reductions.

The sediment reductions for the Bay TMDL are independent of those needed to implement any TMDLs developed to address sediment-related impairments in Maryland's non-tidal watersheds, although their reduction goals and strategies do overlap. For example, the implementation planning framework, developed by the Bay watershed jurisdictions in partnership with EPA, provides a staged approach to achieving Bay TMDL sediment reduction goals that is also applicable to the implementation of any sediment TMDLs developed for local non-tidal watersheds. In short, sediment reductions required to meet the Chesapeake Bay TMDL will also support the restoration and protection of local water quality.

The proposed approach for achieving the Swan Creek watershed reduction targets will be based on an appropriate selection of the comprehensive implementation strategies described in Maryland's Phase I WIP (MDE 2010) and Phase II WIP (MDE 2012b), the centerpieces of the State's "reasonable assurance" of implementation for the Bay TMDL. The strategies encompass a host of BMPs, pollution controls and other actions for all source sectors that cumulatively will result in meeting the State's 2017 interim nutrient and sediment reduction targets, as verified by the Chesapeake Bay Water Quality Model.

Once the Bay TMDL sediment target loads for the Swan Creek Tidal Fresh segment-shed have been met, MDE will revisit the status of sediment impacts on aquatic life in the non-tidal waters of the Swan Creek watershed, based on monitoring data that will be collected in the watershed following EPA approval of the TMDL. The primary dataset that will be used to reevaluate the status of sediment impacts on aquatic life will be MBSS biological monitoring data, which is applied within the BSID analysis for the watershed to determine whether or not sediments are impacting aquatic life. The same parameters used to identify sediment related impacts to aquatic life within the BSID will be reassessed. The results of this reassessment will determine whether additional sediment reductions are needed in the watershed, or whether the sediment TMDL goals for the MD 8-Digit Swan Creek watershed have in fact been met.

In addition, MDE plans to use a series of actions and funding programs to support TMDL implementation. Some of these include:

- In response to the WIP and the increased burden on local governments to achieve nutrient and sediment reduction goals, Maryland has continued to increase funding in the Chesapeake and Atlantic Coastal Bays Trust Fund. For Fiscal Year 2013, in addition to $25 million (pending) for the Trust Fund, $38 million in general obligation bonds were made available to local communities for implementation of stormwater capital improvements. Funding was also increased to support implementation of natural filters on public lands ($9 million), funding for Soil Conservation Districts from 16 to 39 positions ($2.2 million), and funding for the cover crop program is at $12 million – a record level. For more information on Maryland's implementation and funding strategies to achieve nutrient and sediment reductions throughout the State's portion of the Chesapeake Bay watershed, please see Maryland's Phase II Watershed Implementation Plan.

- In agricultural areas, comprehensive soil conservation plans can be developed that meet criteria of the USDA-NRCS Field Office Technical Guide (USDA 1983). Soil conservation plans help control erosion by modifying cultural practices or structural practices. The reduction percentage attributed to cultural practices is determined based on changes in land-use, while structural practices have a reduction percentage of up to 25%. In addition, livestock can be controlled via stream fencing and rotational grazing. Sediment reduction efficiencies of methods applicable to pasture land-use range from 40% to 75% (USEPA 2004). Lastly, riparian buffers can reduce the effect of agricultural sediment sources through trapping and filtering, and reforestation, whether adjacent to part of the watershed stream system or in a watershed's interior, can decrease agricultural sediment sources as well.

- Some other examples of programs that can provide funding for local governments and agricultural sources include the Federal Nonpoint Source Management Program (§ 319 of the Clean Water Act), Buffer Incentive Program (BIP), State Water Quality Revolving Loan Fund, Bay Restoration Fund, Chesapeake Bay Trust Fund. Details of these programs and additional funding sources can be found at http://www.dnr.state.md.us/bay/services/summaries.html.

For more details about these and other legislative actions and funding programs, refer to Section 5.0 of the TMDL report.