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

MAY 0 4 2017

Mr. Matt Rowe, Acting Director
Science Services Administration
Maryland Department of the Environment
1800 Washington Blvd., Suite 540
Baltimore, Maryland 21230-1718

Dear Mr. Rowe:

The U.S. Environmental Protection Agency (EPA), Region III, is pleased to approve the sediment TMDL for the Lower Gunpowder Falls watershed. The TMDL report, *Total Maximum Daily Load of Sediment in the Lower Gunpowder Falls Watershed, Baltimore County, Maryland* was submitted by the Maryland Department of the Environment (MDE) to EPA for final review on September 23, 2016, and was received on September 27, 2016. 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 Lower Gunpowder Falls watershed (MD-02130802) 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 Lower Gunpowder Falls watershed as impaired by total suspended solids (TSS), chlorides, and sulfates 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 Lower Gunpowder Falls watershed satisfies each of these requirements.

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

If you have any questions or comments concerning this letter, please do not hesitate to contact me, or your staff may contact Maria Garcia, Maryland TMDL coordinator, at 215-814-3199.

Sincerely,

Dominique Lueckenhoff, Acting Director
Water Protection Division

Enclosure

cc: D. Lee Currey, MDE-WMA
Melissa Chatham, MDE-SSA

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Decision Rationale
Total Maximum Daily Load of Sediment
Lower Gunpowder Falls Watershed
Baltimore County, Maryland

Dominique Lueckenhoff, Acting Director
Water Protection Division

Date: 5-4-2017

Decision Rationale
Approval of Total Maximum Daily Load of Sediment
Lower Gunpowder Falls Watershed, Baltimore 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 establishes a target for the total load of a particular pollutant that a water body can assimilate and divides that load into wasteload allocations (WLAs), given to point sources, load allocations (LAs), given to nonpoint sources and natural background, and a margin of safety (MOS), which accounts for any uncertainty.

This document sets forth the U.S. Environmental Protection Agency's (EPA) rationale for approving the TMDL for sediment in the Lower Gunpowder Falls 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 Lower Gunpowder Falls Watershed, Baltimore County, Maryland,* to EPA for final review on September 23, 2016, which was received on September 27, 2016. The TMDL in this report addresses the Total Suspended Solids (TSS) impairment in the MD 8-Digit Lower Gunpowder Falls Watershed (MD-02130802) 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 WLAs and 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, the terms TSS and sediment may be used interchangeably, consistent with MDE's Biological Stressor Identification (BSID) as discussed below.

II. Summary

The TMDL specifically allocates the allowable sediment loading and applies only to the non-tidal, 1st-4th order streams contained in the MD 8-digit Lower Gunpowder Falls watershed

(MD-02130802). There are ten permitted point sources, in addition to those covered under the MDE general construction permit, in the TMDL watershed and assigned WLAs. 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 Lower Gunpowder Falls 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 Lower Gunpowder Falls watershed. The long term maximum daily TMDL is presented in Table 2. WLAs for permitted point sources are provided in Tables 3 and 4.

Table 1: Lower Gunpowder Falls Watershed Average Annual TMDL of Sediment/TSS (ton/yr)

TMDL (ton/yr)	=	LA_{LGF}	+	NPDES Stormwater WLA_{LGF}	+	Process Water WLA_{LGF}	+	MOS
3,696	=	1,832	+	1,856	+	8	+	Implicit

Table 2: Lower Gunpowder Falls Maximum Daily Load of Sediment/TSS (ton/day)

MDL (ton/day)	=	LA_{LGF}	+	NPDES Stormwater WLA_{LGF}	+	Process Water WLA_{LGF}	+	MOS
24.7	+	12.2	+	12.4	+	0.07	+	Implicit

Table 3: Lower Gunpowder Falls Sediment TMDL Process Water Point Source WLAs

Facility Name	NPDES #	Permit Type	WLA Type	Baseline Load (ton/yr)	WLA (ton/yr)	WLA (ton/day)	Reduction (%)
Glen Arm WWTP & WTP	MD0067903	WMA2	Aggregate	8	8	0.07	0
Glen Meadows Retirement Community	MD0022951	WMA2	Aggregate				
United Container Acquisition Building Business Trust WWTP	MD0024635	WMA2	Aggregate				
Richlyn Manor WWTP	MD0022713	WMA2	Aggregate				

Table 4: Lower Gunpowder Falls Sediment TMDL Allocations for NPDES Regulated Stormwater WLAs

NPDES Regulated Stormwater Sector	NPDES #	Baseline Load (ton/yr)	WLA (ton/year)	WLA (ton/day)	Reduction (%)
Baltimore County Phase I MS4	MD0068314	3,095	1,009	6.7	67
SHA Phase I MS4	MDR068276	163	53	0.4	67
"Other NPDES Regulated Stormwater"[1]	N/A	1,061	794	5.3	30
Total		**4,319**	**1,856**	**12.4**	**57**

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

Table 5: Lower Gunpowder Falls Watershed NPDES Stormwater Permits

NPDES Permit #[1]	Facility Name	NPDES Regulated Stormwater WLA Sector
MD0068314	Baltimore County	County Phase I MS4
MDR068276	State Highway Administration	SHA Phase I MS4
MDR055501	General Permit for Discharges from State and Federal Small MS4s	Other NPDES Regulated Stormwater
MDR001971	Baltimore County Bureau of Highways Shop 7-2	Other NPDES Regulated Stormwater
MDR002052	Baltimore County Public Schools – Providence Road Bus Lot	Other NPDES Regulated Stormwater
MDR000108	Eastern Sanitary Landfill	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 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 Lower Gunpowder Falls watershed is located entirely within Baltimore County, Maryland. The watershed is located in the Coastal Plain and Eastern Piedmont regions. The watershed begins at the Loch Raven Reservoir dam and flows generally towards the east where it meets the tidal portions of Gunpowder River. The tidal Gunpowder River is separately identified as the tidal Gunpowder River Oligohaline Chesapeake Bay Segment (GUNOH). Sediment reductions are also required in the Lower Gunpowder Falls watershed to meet the sediment allocations assigned to the GUNOH segment as part of the Chesapeake Bay TMDLs[1],

[1]There is a sediment TMDL for the GUNOH segment of the Chesapeake Bay as part of the Chesapeake Bay TMDLs established by EPA in December 2010. The sediment allocations and reductions set forth in the Chesapeake Bay TMDLs, while applicable within the Lower Gunpowder Falls watershed, are intended to resolve impairments in the downstream Chesapeake Bay segments and were not intended to and do not address any impairment within the non-

established by the USEPA on December 29, 2010. The total drainage area of the Lower Gunpowder Falls watershed is approximately 29,200 acres. The land-use distribution of the watershed consists primarily of forest (41.9%) and urban land (40.1%), with smaller amounts of crop (13.9%) and pasture (3.7%).

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 Lower Gunpowder Falls watershed is associated with two assessment units in Maryland's Integrated Report: a non-tidal 8-digit watershed (MD-02130802) and an estuary portion (Chesapeake Bay segment: Gunpowder River Oligahaline (GUNOH)). This TMDL applies to the non-tidal 8-digit Lower Gunpowder Falls watershed (MD-02130802). The Lower Gunpowder Falls watershed was originally listed for biological impairment on the 2002 Integrated Report. That 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 MDE's Biological Stressor Identification (BSID) analysis report for the Lower Gunpowder Falls watershed, the 2002 aquatic life use impairment (biological listing) for the non-tidal MD 8-digit watershed was refined and identified as impaired by TSS, sulfates, and chlorides and requiring TMDLs. The TMDL established herein by MDE addresses the TSS listing for the non-tidal 8-digit Lower Gunpowder Falls (MD-02130802) as identified in MDE's 2014 Integrated Report.

The sediment TMDL submitted by MDE ensures that watershed sediment loads are at a level that supports the Use Class I/III/IV designation, which are discussed further below, for the Lower Gunpowder Falls watershed (MD-02130802). 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 BSID methodology was applied. The BSID analysis applies a case-control, risk-based, weight-of-evidence approach to identify potential causes of biological impairment. The risk-based approach estimates the strength of association between various stressors and an impaired biological community. The BSID analysis then identifies individual stressors as probable or unlikely causes of the poor biological conditions within a given watershed, and subsequently reviews ecological plausibility. Finally, the analysis concludes whether or not these individual stressors or groups of stressors are contributing to the impairment. The BSID analysis determined that the biological impairment in the Lower Gunpowder Falls watershed is due in part to stressors within the sediment parameter and instream habitat groupings. Specifically; bar formation, channel alteration, epifaunal substrate, channelization, instream habitat structure, riffle/run quality, and concrete/gabion present were contributing to the biological impairment in the watershed. As a result, the aquatic life use impairment identified on Maryland's Integrated Report (2002) was refined to identify

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tidal MD-02130802 segment. The sediment allocations and reductions in this TMDL are intended to address sediment impairments within the non-tidal MD-02130802 segment.

TSS as pollutant cause and requiring a TMDL (MDE 2012c). The objective of the sediment TMDL established herein is to reduce sediment loads and detrimental, negative effects on aquatic life in the Lower Gunpowder Falls watershed, to levels that support the Use Class I/III/IV designations for the watershed.

The BSID applies only to 1st through 4th order streams in a watershed. Therefore, aquatic life in the Lower Gunpowder Falls watershed mainstem is assessed using Maryland Department of Natural Resources (DNR) CORE/TREND program data. The biological monitoring results from two DNR CORE/TREND stations along the Lower Gunpowder Falls watershed mainstem indicate that mainstem water quality can be classified as fair to good. Statistical analysis of the long term CORE/TREND data indicates that since 1976, water quality at one station (GUN0036) has not changed and water quality at the other station has shown moderate improvement (GUN0125). These results are based on percent EPT, taxa number, biotic index, and diversity index. Based on these results biological communities are not considered impaired (or impacted) in the mainstem of the Lower Gunpowder Falls. Therefore, sediment is not a stressor in the mainstem, and the TMDL was only developed for the 1st-4th order streams of the non-tidal Lower Gunpowder Falls watershed.

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. 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 15 water quality monitoring stations were used to characterize the Lower Gunpowder Falls watershed for TMDL development. The biological assessment was based on the combined results of Maryland Biological Stream Survey (MBSS) Round 1 and Round 2 data, which includes thirteen stations. The BSID analysis used the ten biological/physical habitat monitoring stations from the MBSS Round 2 data collection. Additionally, two monitoring station from the Maryland CORE/TREND monitoring network were applied within the TMDL analysis

The watershed model chosen to estimate the sediment loads for the Lower Gunpowder Falls watershed TMDL was the Chesapeake Bay Program (CBP) P5.3.2 watershed model, and 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 Lower Gunpowder Falls 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).

As stated above, 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. Reference watersheds were selected 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. 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 Lower Gunpowder Falls watershed (estimated as 6.7) was calculated using CBP P5.3.2 2009 Progress Scenario EOS loads, to best represent current conditions. A comparison of the Lower Gunpowder Falls 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 Lower Gunpowder Falls *all forested sediment load.* The resulting load is considered the maximum allowable load the watershed can sustain and support aquatic life.

It was determined that the MD 8-Digit Lower Gunpowder Falls average annual TMDL of sediment/TSS is 3,696 ton/yr (a 46% reduction from the baseline load). This TMDL consists of point and nonpoint source allocations and is comprised of a Load Allocation (LA_{LGF}) of 1,832

ton/yr, an NPDES Stormwater Waste Load Allocation (NPDES Stormwater WLA_{LGF}) of 1,856 ton/yr, and a Process Water Waste Load Allocation (Process Water WLA_{LGF}) of 8 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 Lower Gunpowder Falls watershed. EPA, therefore, approves this sediment TMDL for the Lower Gunpowder Falls 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. There are several different designated uses for streams in the Lower Gunpowder Falls watershed. The designated use for the Lower Gunpowder Falls non-tidal mainstem (U. S. Route 95 upstream to Cromwell Bridge Road) is Use Class IV (Recreational Trout Waters). Most tributaries to the mainstem, including Minebank Run and Jennifer Branch are Use Class I (Water Contact Recreation and Protection of Aquatic Life). Pierce Branch, Cowen Run, Haystack Branch, Sweathouse Branch, Long Green Creek, and their respective tributaries are designated as Use Class III (Nontidal Coldwater Aquatic Life). The mainstem Gunpowder Falls, east of Philadelphia Rd, is designated as Use Class II (Support of Estuarine and Marine Aquatic Life and Shellfish Harvesting). Figure 1 of the TMDL report shows the different designated use classes of the Lower Gunpowder Falls watershed. As discussed above, the TMDL only applies to the 1^{st}-4^{th} order streams, and not the mainstem. This TMDL will ensure that watershed sediment loads are at a level to support the Use Class I/III/IV designations for the Lower Gunpowder Falls watershed, and more specifically, at a level to support aquatic life..

The water quality impairment of the Lower Gunpowder Falls 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. The BSID analysis determined that the biological impairment in the Lower Gunpowder Falls watershed is due in part to stressors within the sediment parameter and instream habitat groupings. Specifically; bar formation, channel alteration, epifaunal substrate, channelization, instream habitat structure, riffle/run quality, and concrete/gabion present 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 also identifies inorganic pollutants (sulfates and chlorides) and anthropogenic channelization 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.

The sediment TMDL established herein reduces sediment loads, and subsequent effects on aquatic life in the 1st through 4th order streams in the MD 8-Digit non-tidal Lower Gunpowder Falls watershed, to levels that support the designated uses for the watershed. EPA finds 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 sediment TMDL for the Lower Gunpowder Falls watershed is consistent with 40 CFR §130.2(i) because the total loads provided by MDE equal the sum of the 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 Lower Gunpowder Falls 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 TMDL loading and associated reductions are averaged at the watershed scale; however, it is important to recognize that some subwatersheds may require higher reductions than others, depending on the distribution of the land-use. The sediment TMDL for the Lower Gunpowder Falls watershed was calculated to be 3,696 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.

As stated above, it has been determined that sediments are only impairing aquatic life in the 1st through 4th order tributary streams within the Lower Gunpowder Falls watershed, and not 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 Lower Gunpowder Falls watershed.

The Lower Gunpowder Falls Baseline Load and TMDL are presented in Table 6.

Table 6: Lower Gunpowder Falls Baseline Load, TMDL, and Total Reduction Percentage

Baseline Load (ton/yr)	TMDL (ton/yr)	Total Reduction (%)
6,916	3,696	46

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 above contains the LA for the Lower Gunpowder Falls watershed.

As indicated above, the computational framework chosen for the Lower Gunpowder Falls 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, 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.

Controllable loads were determined, in accordance with the Chesapeake Bay TMDL, as the difference between the CBP 2010 "No Action" Scenario and the "Everything, Everyone, Everywhere" (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.

The controllable loads for each nonpoint source sector were calculated as the difference between the CBP P5.3.2 "No Action" and "E3" scenario loads. The allocations were calculated by applying equal reductions to the reducible loads of all predominant land use sectors. The reducible load is defined as the difference between the No Action (NA) scenario and the E3 scenario. The NA scenario represents current land-uses without any sediment controls applied, while the E3 scenario represents application of all possible BMPs and control technologies to current land-use. More detailed information regarding the calculation of the LA is also available in "*Maryland's Phase I Watershed Implementation Plan for the Chesapeake Bay Total Maximum Daily Load.*"

Table 7 provides one possible scenario for the allocations of the nonpoint source sediment loads in the Lower Gunpowder Falls Watershed.

Table 7: Lower Gunpowder Falls Sediment TMDL Allocation by Nonpoint Source Category (tons/year)

General Land Uses[1]	Detailed Land-Use	Baseline Load	LA	Reduction
Forest	Forest	426	426	0%
	Harvested Forest	29	20	32%
AFOs	Animal Feeding Operations	10	10	0%
Pasture	Pasture	115	95	17%
Crop	Crop	1,929	1,242	37%
Nursery	Nursery	50	39	21%

Note: [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 individual municipal permits, general MS4 permits, and the general permit for stormwater discharges from construction sites in the Lower Gunpowder Falls watershed. The permits can be grouped into two categories, process water and stormwater. Information for the sediment WLAs in this TMDL are included in Tables 1-5, above.

The process water category includes those loads generated by continuous discharge sources whose permits have TSS limits (i.e., contributors to the watershed sediment load). Other permits that do not meet these conditions are considered *de minimis* in terms of the total watershed sediment load. There are four municipal Wastewater Treatment Plants (WWTPs) within the Lower Gunpowder Falls watershed that contribute to the overall sediment load. There are no individual industrial process water permits. The WLAs for the WWTPs are calculated based on their TSS limits and corresponding flow information, which are discussed in Sections 2.2.2 and 4.6 of the main report. The total estimated TSS loads from the four WWTPs are based on current, average permit limits and equal an aggregate of 8 ton/yr. See Table 3, above.

The stormwater category includes all NPDES regulated stormwater discharges, both general and individual. In the Lower Gunpowder Falls watershed, these include the Baltimore County Phase I jurisdictional MS4 permit, the Phase I State Highway Administration (SHA) MS4 permit, and other NPDES stormwater permits. These stormwater permits are regulated based on 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 Baltimore County Phase I jurisdictional MS4 permit and the SHA Phase I MS4 permit. Aggregate WLAs have been calculated for 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 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[2]. Critical conditions are a combination of environmental factors (e.g., flow,

[2] 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.

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 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. 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. 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 Lower Gunpowder Falls watershed. The public review and comment period was open from May 19, 2016, through June 17, 2016. MDE received two sets of written comments, provided a comment response document that adequately addressed comments, and made changes accordingly to the final TMDL.

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 Lower Gunpowder Falls 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 Lower Gunpowder Falls watershed and to meet sediment target loads for downstream Chesapeake Bay segments identified in the Chesapeake Bay TMDLs, established by EPA in 2010 and scheduled for full implementation by 2025. The Bay TMDLs require 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 tributary segments. 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 TMDLs 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 TMDLs 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 TMDLs will also support the restoration and protection of local water quality.

The proposed approach for achieving the Lower Gunpowder Falls watershed reduction targets will be based on an appropriate selection of the comprehensive implementation strategies described in Maryland's Phase I Watershed Implementation Plan (WIP) and Phase II WIP, the centerpieces of the State's "reasonable assurance" of implementation for the Bay TMDLs. 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 Gunpowder Oligohaline segment-shed have been met, MDE will revisit the status of sediment impacts on aquatic life in the non-tidal waters of the Lower Gunpowder Falls watershed, based on monitoring data that will be collected in the watershed. The primary dataset that will be used to reevaluate the status of sediment impacts on aquatic life will be MDDNR-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 Lower Gunpowder Falls 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 responsibility for local governments to achieve nutrient and sediment reduction goals, Maryland has continued to increase funding in the Chesapeake and Atlantic Coastal Bays Trust Fund. According to the Section 40 Report, even though the annual restoration funds for the four agencies (DNR, MDA, MDE, MDP) varies from year to year, the total restoration funds for the first three years of the Chesapeake Bay WIP implementation evaluated time period (FY00 – FY02) was $882,327,165, while the total for the past four years of the period (FY12 – FY15) was $2,383,507,560, an increase of 170 percent. This increase was driven in part by the two primary Bay restoration Special Funds: The Bay Restoration Fund and the Chesapeake and Atlantic Coastal Bays Trust Fund. 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. 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%. 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.