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Decision Rationale
Total Maximum Daily Loads for
Selected Streams in the Potomac Direct Drains Watershed, West Virginia

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I. Introduction

The Clean Water Act (CWA) requires a Total Maximum Daily Load (TMDL) to be developed for those waterbodies identified as impaired by a state where technology-based and other controls did not provide for attainment of water quality standards. A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a margin of safety (MOS), which may be discharged to a water quality-limited waterbody.

This document will set forth the U.S. Environmental Protection Agency's (EPA's) rationale for approving the TMDLs for fecal coliform bacteria and biological impairments on selected waterbodies in the Potomac Direct Drains Watershed. The TMDLs were developed to address impairment of water quality as identified in West Virginia's 2002, 2004, and 2006 Section 303(d) lists of impaired waters. EPA's rationale is based on the determination that the TMDLs meet the following eight regulatory conditions pursuant to 40 CFR §130.

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

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

From this point forward, all references in this approval rationale are found in West Virginia's TMDL Report *TMDLs for Selected Streams in the Potomac Direct Drains Watershed, West Virginia* (TMDL Report), unless otherwise noted.

II. Summary

Table 3-3 of the TMDL Report presents the waterbodies and impairments for which TMDLs have been developed for the Potomac Direct Drains Watershed by the West Virginia Department of Environmental Protection (WVDEP). The 26 waterbodies were identified on West Virginia's 2006 Section 303(d) List. TMDLs were developed for fecal coliform bacteria and/or biological impairments. These TMDLs represent the majority of the 29 segments in the Potomac Direct Drains Watershed that were identified on the 2006 Section 303(d) List. Three

segments were not included because they were either newly listed waters or the biological stressor identification did not singularly identify a causative pollutant. All waters and impairments excluded from TMDL development in this effort will remain on West Virginia's Section 303(d) List and will have TMDLs developed in 2011 or 2016 in accordance with West Virginia's Watershed Management Framework.

The TMDL is a written plan and analysis established to ensure that a waterbody will attain and maintain water quality standards. The TMDL is a scientifically-based strategy which considers current and foreseeable conditions, the best available data, and accounts for uncertainty with the inclusion of a MOS value. Conditions, available data, and the understanding of the natural processes can change more than anticipated by the MOS. The option is always available to refine the TMDLs for re-submittal to EPA for approval.

The subwatershed appendices provide additional details relative to their respective impaired waters and the applicable TMDLs (sum of wasteload allocations + sum of load allocations + margin of safety). Each subwatershed appendix presents applicable TMDLs for fecal coliform bacteria or sediment, as appropriate. Allocation spreadsheets also provide applicable TMDLs, wasteload allocations to individual point sources, and load allocations to categories of nonpoint sources. A Technical Report provides descriptions of the detailed technical approaches used throughout the TMDL development process. West Virginia developed an interactive ArcExplorer geographic information system (GIS) project that shows the spatial relationships between source assessment data and subwatershed TMDL allocations for selected streams in the Potomac Direct Drains watershed. The TMDLs are presented as average annual loads in pounds per year, or counts per year, because they were developed to meet TMDL endpoints under a range of conditions observed throughout the year. The TMDLs are also presented as equivalent average daily loads in pounds per day, or counts per day.

III. Background

The Potomac Direct Drains Watershed is located in the eastern panhandle of West Virginia and lies mostly within Morgan, Berkeley, and Jefferson Counties, with some portions of the watershed in Frederick and Clarke Counties in Virginia (Figure 3-1). The Potomac Direct Drains Watershed, a component of the Potomac River watershed, encompasses approximately 927 square miles. The Potomac River mainstem flows along the northern edge of the TMDL study area. Major tributaries include Opequon Creek, Back Creek, Sleepy Creek, and Town Run. Cities and towns in the watershed are Berkeley Springs, Martinsburg, Inwood, and Shepherdstown. The Potomac Direct Drains Watershed is dominated by forest land uses (49.9%), with some grassland (25.7%), urban/residential (9.3%), pasture (4.5%), and cropland (4.2%) (Table 3-1). All other land uses compose less than six percent of the total watershed area.

West Virginia conducted extensive water quality monitoring from July 2003 through June 2004 in the Potomac Direct Drains Watershed. The results of this effort were used to confirm the listing of waterbodies not meeting applicable water quality criteria and to identify

impaired waterbodies that were not previously listed. TMDLs were developed for the impaired waterbodies in six subwatersheds (Figure 3-2): Opequon Creek, Elks Run, Teague's Run, Jordan Run, Harlan Run, and Sleepy Creek. Table 3-3 presents the 26 impaired waters for which TMDLs are developed. The TMDLs were developed for fecal coliform bacteria and/or biological impairment including 43 TMDLs (waterbody/pollutant combinations). The six subwatersheds were further divided into 226 subwatersheds for modeling purposes (Figure 7-1). The subwatershed delineation provided a basis for georeferencing pertinent source information and monitoring data, and for presenting TMDLs.

These TMDLs were developed by West Virginia for non-consent decree waters listed on the 2002, 2004, and 2006 Section 303(d) Lists of impaired waters. These TMDLs help West Virginia to meet TMDL development pace requirements.

WVDEP recently assumed responsibility for the TMDL Program and utilized the Watershed Management Framework cycle approach for TMDL development. The framework divides the state into 32 major watersheds and operates on a five-year, five-step process. The watersheds are divided into five hydrologic groups (A - E). Each group is assessed once every five years and waters are placed on the Section 303(d) list of impaired waters, as necessary. The TMDL process begins in the first year of the cycle with pre-TMDL sampling and public meetings in the affected watersheds. The data is compiled and TMDL development begins in year two of the cycle. In the third year, TMDL development continues and the TMDL is drafted. The TMDL is finalized in the fourth year. In the fifth year of the cycle, TMDL implementation is initiated through the National Pollutant Discharge Elimination System (NPDES) permitting process and efforts toward limiting nonpoint source loading. Throughout the TMDL development process, there are numerous opportunities for public participation and input. The Potomac Direct Drains Watershed is in hydrologic group C and is one of the first TMDLs developed by WVDEP. West Virginia's TMDL process is described in Section 2.1 of the TMDL report.

Computational Procedures

Sections 4 and 5 of the TMDL Report discuss fecal coliform bacteria and sediment source assessment while Section 6 describes biological impairments and stressor identification methods. Fecal coliform bacteria sources include point sources, including individual sources covered under the NPDES program such as wastewater treatment plants, combined sewer overflows (CSOs), general sewage permits, and municipal separate storm sewers (MS4s); and unpermitted sources, including on-site treatment systems, stormwater runoff, agriculture, and natural background (wildlife). Sediment sources include: point sources, including construction stormwater general permits; MS4s and other individual and general NPDES permits for sewage treatment facilities; industrial process wastewater and stormwater associated with industrial activity; and unpermitted sources, including forestry, residential and urban lands, roads, agriculture, stream bank erosion, and other land disturbance activities. Stressor identification indicated that biological impairments were caused by sedimentation and/or organic enrichment. The Technical Report has expanded details of the source assessment and biological stressor

identification discussed in Sections 4, 5, and 6.

Biological integrity/impairment is based on a rating of the stream's benthic macroinvertebrate community using the multimetric West Virginia Stream Condition Index (WVSCI). Biological impairments were addressed by developing TMDLs for specific stressors. West Virginia utilized a stressor identification process to determine the primary causes of biologically-impaired streams including sedimentation or organic enrichment. Stressor identification was followed by stream-specific determinations of the pollutants for which TMDLs must be developed. Where the stressor identification process indicated sedimentation as a causative stressor, sediment TMDLs were developed. It is expected that implementation of those pollutant-specific TMDLs would address the biological impairment. Where organic enrichment was identified as a biological stressor, the waters also demonstrated violations of the numeric criteria for fecal coliform bacteria. It was determined that implementation of fecal coliform TMDLs would require the elimination of the majority of the existing fecal coliform sources and thereby reduce the organic and nutrient loading causing biological impairment. The TMDLs prescribe 100% fecal coliform reduction for all existing straight pipes and failing septic systems which would substantially reduce organic and nutrient loadings.

Section 7 describes the modeling processes employed during TMDL development with further details provided in the Technical Report. The Mining Data Analysis System (MDAS) was used to represent the source-response linkage in the Potomac Direct Drains watershed TMDL study area for fecal coliform. MDAS is a comprehensive data management and modeling system that is capable of representing loads from nonpoint and point sources in the watershed and simulating in-stream processes. MDAS is used to simulate watershed hydrology and pollution transport, as well as stream hydraulics and in-stream water quality. It is capable of simulating different flow regimes and pollutant loading variations. A customized Microsoft Excel spreadsheet tool was used to determine the fecal loading from failing septic systems identified during source tracking efforts by WVDEP. West Virginia's numeric and water quality criteria and an explicit MOS were used to identify the TMDL endpoints.

Sediment TMDLs were developed under a reference watershed approach and the MDAS modeling system that examined stream bank erosion and deposition processes. Load reductions for sediment-impaired waters were based on the sediment loading present in the unimpaired reference watershed. This approach is based on selecting a non-impaired watershed that shares similar land use, ecoregion, and geomorphologic characteristics with the impaired watershed. Stream conditions in the reference watershed are assumed to represent the conditions needed for the impaired stream to attain its designated uses. Given these parameters and a non-impaired WVSCI score, the Buzzard Run in the Opequon Creek watershed was selected as the reference watershed (Figure 7-3). Sediment loading rates were determined for impaired and reference watersheds. Both point and nonpoint sources were considered in the analysis and numeric endpoints were based on the calculated sediment loading from the reference watershed. Sediment load reductions necessary to meet these endpoints were then determined. TMDL allocation scenarios were developed based on an analysis of the degree to which contributing sources could be reasonably reduced.

EPA has determined that these TMDLs are consistent with statutory and regulatory requirements and EPA's policy and guidance. EPA's rationale for establishing these TMDLs is set forth according to the regulatory requirements listed below.

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

The applicable numeric water quality criteria are shown in Table 2-1. The applicable designated uses for all the waters subject to this report are aquatic life protection, water contact recreation, and public water supply. Although the designated use of aquatic life protection is applicable to the streams in the Potomac Direct Drains Watershed, violations of the numeric aquatic life criteria were not observed through pre-TMDL monitoring. In various waters, the water contact recreation and public water supply uses have been determined to be violated, pursuant to exceedances of the numeric water quality criteria for fecal coliform bacteria.

All West Virginia waters are subject to the narrative criteria in Section 3 of the Standards. That section, titled *Conditions Not Allowed in State Waters*, contains various provisions relative to water quality. The narrative water quality criterion at 46 CSR 1 - 3.2.i prohibits the presence of wastes in state waters that cause or contribute to significant adverse impacts on the chemical, physical, hydrologic, and biological components of aquatic ecosystems. This provision is the basis for the "biological impairment" determinations. Biological impairment signifies a stressed aquatic community. WVDEP determines the biological integrity of each stream based on a rating of the stream's benthic macroinvertebrate community using the multimetric WVSCI.

2. The TMDLs include a total allowable load as well as individual waste load allocations and load allocations.

A TMDL is the total amount of a pollutant that can be assimilated by the receiving water while still achieving water quality standards. TMDLs can be expressed in terms of mass per time or by other appropriate measures. TMDLs are comprised of the sum of individual WLAs for point sources, LAs for non-point sources, and natural background levels. In addition, the TMDL must include an MOS, either implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving stream. Conceptually, this definition is denoted by the following equation:

$$\text{TMDL} = \text{Summation of WLAs} + \text{Summation of LAs} + \text{MOS}$$

For purposes of these TMDLs only, wasteload allocations are given to NPDES-permitted discharge points and load allocations are given to discharges from activities that do not have an associated NPDES permit, such as failing septic systems and straight pipes. The decision to assign load allocations to these sources does not reflect any determination by WVDEP or EPA as to whether there are, in fact, unpermitted point source discharges. In addition, by establishing these TMDLs with failing septic systems and straight pipes treated as load allocations, WVDEP

and EPA are not determining that these discharges are exempt from NPDES permitting requirements.

Each subwatershed appendix presents applicable TMDLs for fecal coliform bacteria or sediment, as appropriate. Allocation spreadsheets also provide applicable TMDLs, wasteload allocations to individual point sources and load allocations to categories of unpermitted sources. The Fecal Coliform Bacteria Allocation Spreadsheet presents detailed fecal coliform TMDLs, LAs, WLAs, and MS4 WLAs. The Sediment Allocation Spreadsheet presents the detailed sediment TMDLs, LAs, WLAs for non-mining permits, WLAs for mining permits, MS4 WLAs, and construction stormwater WLAs. The TMDLs are presented as average annual loads in pounds per year or counts per year because they were developed to meet TMDL endpoints under a range of conditions observed throughout the year. The TMDLs are also presented as equivalent average daily loads in pounds per day or counts per day.

Fecal coliform bacteria sources are: point sources, including individual NPDES permits for wastewater treatment plants, CSOs, MS4s, and general sewage permits; and unpermitted sources, including on-site treatment systems, stormwater runoff, agriculture, and natural background (wildlife). Fecal coliform bacteria TMDLs were developed in 24 streams and will affect 36 permits including five publicly owned treatment works (POTWs), one combined sewer overflows (CSO), 27 privately owned sewage treatment plants ("package plants"), and three MS4s. The TMDLs allowed fecal coliform NPDES permits to remain at 200 counts/100 ml (monthly average) and 400 counts/100 ml (daily maximum). The City of Martinsburg, Berkeley County, and the West Virginia Department of Transportation (WVDOT) are designated MS4 entities and were given WLAs for fecal coliform bacteria. The City of Martinsburg has expended considerable effort to manage overflows from its combined collection system which currently has infrequent overflows. Modeling demonstrates that limited, infrequent overflows from the CSO can continue and a WLA was provided that may not be exceeded more than once per calendar month. Fecal coliform reductions will require elimination of illicit discharges, straight pipes, and leaking septic systems which would substantially reduce organic and nutrient loadings. Load allocations were assigned to agricultural landuses including pasture and croplands, on-site sewer systems including failing septic systems and straight pipes, residential landuses including urban/residential runoff from non-MS4 areas, and background and other nonpoint sources including wildlife sources from forested land and grasslands in non-MS4 areas. Fecal coliform reductions will require elimination of illicit discharges, straight pipes, and leaking septic systems, which would substantially reduce organic and nutrient loadings. The loadings from wildlife sources were not reduced.

Sediment TMDLs were developed in 19 streams to address biological impairments. Sediment WLAs were given to 297 construction stormwater permits encompassing 8,470 acres, three MS4s, and sewage treatment facilities. Within the sediment-impaired watersheds, there are sources that have sewage permits. WLAs for sewage treatment facilities were based on the 30 mg/l monthly average total suspended solids (TSS) effluent limitations contained in their permits. Under this TMDL, these permits are not required pollutant reductions and are authorized to continue operation under existing permit conditions. Sediment load allocations

were assigned to agricultural landuses including pasture and croplands, barren land areas including barren and burned forest areas, residential landuses including urban/residential runoff from non-MS4 areas, roads including paved and unpaved roads in non-MS4 areas, instream processes including bank erosion and deposition, and other nonpoint sources including forested areas and grassland in non-MS4 areas.

In 2003, the Virginia Department of Environmental Quality (VADEQ) completed a TMDL for fecal coliform bacteria for the Virginia portion of Opequon Creek. The Hydrologic Simulation Program – Fortran (HSPF)-based Virginia TMDL model calculated daily average stream flow and fecal coliform bacteria concentration at the point where Opequon Creek crosses the state line into West Virginia. The TMDL model output for the implemented TMDL condition was obtained from VADEQ and incorporated as a point source into the West Virginia TMDL model to account for the instream fecal contribution of Opequon Creek as it enters West Virginia.

VADEQ also completed a sediment TMDL for the Virginia portion of Opequon Creek. The TMDL calculated the average annual sediment load at the point where Opequon Creek crosses the state line into West Virginia. The Virginia TMDL's average annual sediment load under fully implemented TMDL conditions was 53,908 tons/year. This load was synchronized with modeled daily flow data to produce daily flow and TSS concentration values equal to the annual TMDL sediment load. These daily flow and TSS concentration values were incorporated as a point source into the West Virginia TMDL model to account for the instream sediment contribution of Opequon Creek as it enters West Virginia.

The TMDL development methodologies prescribe allocations that achieve water quality criteria throughout the watershed. Various provisions attempt equity between categories of sources and the targeting of pollutant reductions from the most problematic sources. Nonpoint source reductions did not result in loading contributions less than the natural conditions, and point source allocations were not more stringent than numeric water quality criteria.

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

The TMDL considers the impact of background pollutant contributions by considering loadings from background sources like wildlife. MDAS also considers background pollutant contributions by modeling all land uses.

4. The TMDLs consider critical environmental conditions.

According to EPA's regulation 40 CFR §130.7 (c)(1), TMDLs are required to take into account critical conditions for stream flow, loading, and water quality parameters. The intent of this requirement is to ensure that the water quality of the impaired waterbody is protected during times when it is 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. Critical conditions for waters impacted by land-based nonpoint sources generally occur during periods of wet weather and high surface runoff. In contrast, critical conditions for point source-dominated systems generally occur during low flow and low dilution conditions. Point sources, in this context, also include nonpoint sources that are not precipitation driven (i.e., fecal deposition to stream). High and low flow stream conditions and all point and nonpoint source loads were included in the development of these TMDLs, which should address the critical conditions of each water.

5. The TMDLs consider seasonal environmental variations.

Seasonal variations were considered while considering critical conditions, by running the daily simulation model for several years, from 1991 to 2004 for MDAS. Continuous simulation (modeling over a period of several years that capture precipitation extremes) inherently considers seasonal hydrologic and source loading variability.

6. The TMDLs include a margin of safety (MOS).

The CWA and Federal regulations require TMDLs to include an MOS to take into account any lack of knowledge concerning the relationship between effluent limitations and water quality. EPA guidance suggests two approaches to satisfy the MOS requirement. First, it can be met implicitly by using conservative model assumptions to develop the allocations. Alternately, it can be met explicitly by allocating a portion of the allowable load to the MOS.

An explicit MOS of five percent was included to counter uncertainty in the modeling process (Section 7.3.1). West Virginia also set the modeling endpoints to 95 percent of the water quality standards as an additional MOS, Section 7.3.1. West Virginia did not include a discussion regarding an implicit MOS but did use conservative model assumptions (such as assuming all point sources continually discharge at permit limits) to develop the allocations.

7. The TMDL has been subject to public participation.

Section 9 describes the public participation which included three meetings to present information on fundamental TMDL concepts and to present West Virginia's proposed TMDL allocation strategies, a 30-day public comment period, and final public informational meetings. The 30-day public comment period was held from February 14, 2007 to March 15, 2007, with a public meeting held on February 27, 2007, in Martinsburg, West Virginia. West Virginia received written comments from the following five entities: Elks Run Study Group, Mr. Paul Burke and Mr. Wm. Kelly Baty, the Town of Bolivar, VADEQ, and EPA. A responsiveness summary is included as part of this TMDL in Section 9.3.

While EPA was reviewing the final TMDL report for approval, EPA received four separate comment letters from Mr. Paul Burke, Ms. Barbara Humes of the Elks Run Study

Group, the Town of Bolivar, and the Corporation of Harpers Ferry which detailed their concerns regarding sewer system leaks. EPA worked with West Virginia and these entities to address their concerns.

IV. Discussion of Reasonable Assurance

EPA requires that there be a reasonable assurance that a TMDL can be implemented. Section 10 addresses reasonable assurance. There are three primary programs in effect which provide reasonable assurance that the TMDLs will be implemented. Section 10.1 discusses permit reissuance by WVDEP's Division of Water and Waste Management scheduled to begin in July 2007 for non-mining facilities and in January 2008 for mining facilities. Section 10.2 discusses the Watershed Management Framework Process. Section 10.3 discusses ongoing public sewer projects.

Section 11 discusses monitoring activities including NPDES compliance, nonpoint source project monitoring, and TMDL effectiveness monitoring.

Section 8 discusses the future growth and water quality trading in the Potomac Direct Drains watershed TMDL. In many cases, the implementation of the fecal coliform bacteria TMDLs will consist of providing public sewer service to unsewered areas. A new facility could be permitted in the watershed, provided that the permit includes average monthly and maximum daily fecal coliform limitations of 200 counts/100 ml and 400 counts/100 ml, respectively, which are the technology-based fecal coliform effluent limitations that are more stringent than applicable water quality criteria. For sediment, new mining or non-mining point sources may be permitted in the sediment-impaired watersheds with the implementation of applicable technology-based TSS requirements. Construction stormwater permits are provided specific future growth allowances in the sediment-impaired watersheds that are reserved for future construction stormwater permits.

There are no watershed associations specifically for the Potomac Direct Drains. However, there are several local watershed associations including the Sleepy Creek Watershed Association, the Opequon Creek Project Team, and the Elks Run Study Group. Also, there are Potomac River watershed associations including: Friends of the Potomac, Potomac Conservancy, and Potomac River Association.