Technical Memorandum

Significant Phosphorus Point Sources in the Antietam Creek Watershed

The U.S. Environmental Protection Agency (EPA) requires that Total Maximum Daily Load (TMDL) allocations account for all significant sources of each impairing pollutant (CFR 2011). This technical memorandum identifies the significant point sources of phosphorus in the Antietam Creek watershed. Detailed allocations are provided for those point sources included within the National Pollutant Discharge Elimination System (NPDES) Process Water Waste Load Allocation (WLA) and Regulated Stormwater WLA of the Antietam Creek TMDL Contributions (See Executive Summary of the main report for further description of all watershed TMDL contributions and allocations). The WLA also includes an allocation to concentrated animal feeding operations (CAFOs), but the WLA for CAFOs is not presented here in more specific detail than in the main report. The State reserves the right to allocate the TMDLs among different sources in any manner that is reasonably calculated to protect aquatic life from nutrient related impacts.

The Antietam Creek Watershed Phosphorus TMDLs are presented in terms of an average annual load established to be protective of aquatic health. WLAs have been calculated for NPDES regulated individual industrial, individual municipal, individual municipal separate storm sewer systems (MS4s), general industrial stormwater, and general MS4 permits in the Antietam Creek watershed. The permits can be grouped into two categories, process water and stormwater.

The NPDES process water category includes those loads generated by the following continuous discharge sources: (1) major municipal wastewater treatment plants (WWTPs) (facilities with flow of 0.5 MGD or more) that are slated for Enhanced Nutrient Removal (ENR); (2) minor municipal WWTP (facilities discharging less than 0.5 mgd) and industrial facilities whose permits have total phosphorus (TP) limits; (3) minor municipal WWTPs with no phosphorus permit limits; and (4) industrial facilities which, based on the process involved, are expected to discharge nutrients. There are 12 municipal WWTPs permitted to discharge phosphorus in the Antietam Creek watershed. These include four major WWTPs slated for ENR (Boonsboro WWTP (MD0020231), MD Correctional Institute (MD0023957), Winebrenner Water Treatment Plant (MD003221), and Hagerstown WWTP (MD0021776)). There are twelve minor industrial facilities capable of discharging phosphorus within the Antietam Creek watershed.

The WLAs for process water sources are based on the WLAs assigned to each facility under the Chesapeake Bay TMDL (EPA, 2010) and Maryland's Phase I and Phase II Watershed Implementation Plans (WIPs) (MDE 2010 and 2012, respectively). These WLAs are designed to meet the Phase II 2025 final implementation goal for the Bay TMDL. The WLAs are loading caps which are designed to accommodate future growth after full implementation of the Bay TMDL in 2025. The WLAs for major and minor municipal facilities with nutrient permit limits are calculated based on their phosphorus limits and design flow. The WLAs for the remainder of the minor municipal facilities are calculated based on their design flow or their projected 2020

flow, whichever is less, and expected maximum phosphorus concentrations of 3 mg/l. Twelve industrial facilities discharging process water in the Antietam Creek watershed have the capacity to discharge TP in their process water. Under the Chesapeake Bay TMDL, industrial facilities capable of discharging phosphorus in their process water were given WLAs based on the results of monitoring required by their permits and professional judgment. These WLAs were adopted for the Antietam Creek Phosphorus TMDL.

Table 1 provides one possible scenario for the distribution of the average annual phosphorus point source loads attributed to the process water point sources in the Antietam Creek watershed. Individual WLAs are given for major facilities and an aggregate WLA is given for all minor process water facilities in the watershed including both municipal and industrial facilities. See Sections 2.2.2, 4.6 of the main report for further details.

The stormwater category includes all NPDES regulated stormwater discharges. There are 25 NPDES Phase I and Phase II stormwater permits identified throughout the Antietam Creek watershed. These include both general Phase I and II stormwater permits. These stormwater permits are regulated based on Best Management Practices (BMPs) and do not include nutrient limits. In the absence of nutrient limits, the baseline loads for these NPDES regulated stormwater discharges are calculated using phosphorus loading rates and acreages from developed land-uses within the watershed. These calculations are described in more detail below.

Individual WLAs have been calculated for the Washington County Phase II NPDES permit and the SHA Phase I MS4 permit. An aggregate WLA has been calculated for the general municipal Phase II NPDES stormwater permits for the towns of Hagerstown and Smithburg. Other NPDES regulated stormwater permits include state and federal regulated developed land, all industrial facilities permitted for stormwater discharges, and general construction permits.

The computational framework chosen for the Antietam Creek watershed TMDL was the Chesapeake Bay Program Phase 5.3.2 (CBP P5.3.2) Watershed Model. Within this TMDL, the NPDES regulated stormwater baseline phosphorus loads generated within the Antietam Creek watershed are calculated from edge-of-stream (EOS) loads within the watershed and represent a long-term average loading rate. EOS loads are calculated as a product of the developed land-use acreage and the average annual simulated phosphorus loading rates (lbs/ac/yr) from the 2009 Progress Scenario (US EPA 2010b). The 2009 Scenario represents current land-use, loading rates, and BMP implementation simulated using precipitation and other meteorological inputs from the period 1991-2000 to represent variable hydrological conditions. The 1991-2000 simulation period represents the baseline loading rates in the TMDL for Chesapeake Bay segments. Further details of the phosphorus load calculations from developed land can be found in Section 2.2.1 of the main report.

To determine the different NPDES stormwater WLAs, MDE has further refined the CBP P5.3.2 developed land-use. The refined CBP P5.3.2 land-use contains the specific level of detail needed to determine individual and aggregate WLAs for the Washington County Phase II jurisdictional MS4, the SHA MS4, the Phase II jurisdictional MS4s, and "Other NPDES regulated

stormwater," which includes stormwater from federal state, and industrial facilities, mining and extractive operations, and land under construction. The methods used by MDE to refine CBP P5.3.2 developed land-use are described within CBP P5.3.2 Land Use and MDE Urban Source Sector Delineation - Development Methodology (MDE 2009a).

In order to achieve the estimated phosphorus load reductions applied to urban land, which are necessary to meet the TMDL, current Phase I MS4 permits require the jurisdictions to retrofit 10% of existing impervious area where there is failing, minimal, or no stormwater management (estimated to be areas developed prior to 1985) every permit cycle (five years) (*i.e.*, the jurisdiction needs to install/institute stormwater management practices to treat runoff from these existing impervious areas) (MDE 2009a). Extending these permitting requirements to all urban stormwater sources (*i.e.*, not solely those sources regulated via Phase I MS4 permits) would require that all impervious areas developed prior to 1985 be retrofit at this pace. Additionally, MDE estimates that future stormwater retrofits will have, on average, a 35% TP reduction efficiency (Claytor and Schueler 1997; Baldwin *et al.* 2007; Baish and Caliri 2009). By default, these retrofits will also provide treatment of any adjacent urban pervious runoff within the applicable drainage area (See Sections 4.5 and 4.6 of the main report for further details).

Table 2a provides a detailed list of all NPDES regulated stormwater discharges within the Antietam Creek watershed. Table 2b provides one possible scenario for the distribution of the average annual phosphorus point source loads attributed to NPDES regulated stormwater point sources in the Antietam Creek watershed. (See Sections 4.5 - 4.6 of the main report for further details).

In January 2009, Maryland implemented new regulations governing CAFOs (COMAR 26.08.01, 26.08.03, and 26.08.04), which were approved by the EPA in January, 2010. Under these regulations, CAFOs are required to fulfill the conditions of a general permit. These conditions include instituting a Comprehensive Nutrient Management Plan (CNMP) which meets the Nine Minimum Standards to Protect Water Quality (MDE 2009b). The general permit also prohibits the discharge of pollutants, including nutrients, from CAFO production areas except as a result of event greater than the 25-year, 24-hour storm. Based on the TMDL methodology approach of applying an equal percent reduction to all controllable loads, the Antietam Creek Phosphorus TMDL does not require a reduction in phosphorus loads from CAFOs. Table 3 provides the baseline load and WLA for CAFOs.

Table 1: Antietam Creek Phosphorus TMDL Allocations for Process Water Point Sources

Location	NPDES	Name	WLA Type		Flow (MGD)	Baseline Load (lb/yr)	WLA (lb/yr)
Mainstem	MD0021776	HAGERSTOWN WWTP	Municipal	Individual	8.00	8,837	7,309
	MD0023957	MARYLAND CORRECTIONAL INSTITUTE		Individual	1.60	599	1,462
MD 8-Digit	MD0020231	BOONSBORO WWTP		Individual	0.53	1,817	457
	MD0003221	WINEBRENNER WATER RECLAMATION FACILITY		Individual	1.00	1,014	914
Mainstem	MD0062308	ANTIETAM WWTP	Municipal	Aggregate	N/A	5,692	11,809
	MD0020362	FUNKSTOWN WWTP					
MD 8-Digit	MD0053198	BROOK LANE PSYCHIACTRIC CENTER WWTP					
	MD0053066	FAHRNEY-KEEDY MEMORIAL HOME					
	MD0023868	GREENBRIER STATE PARK					
	MD0024627	HIGHLAND VIEW ACADEMY WWTP					
	MD0022926	HUNTER HILL APARTMENTS WWTP					
	MD0024317	SMITHSBURG WWTP					
Mainstem	MD0002151	HOLCIM (US) INC.	Industrial				
MD 8-Digit	MDG766259	BEAVER CREEK GOLF COURSE	Industrial				
	MDG498022	C. WILLIAM HETZER, INC. - HOT MIX ASPHALT PLAN					
	MDG766220	CAMP LOUISE					
	MDG766301	FOUNTAIN HEAD COUNTRY CLUB					
	MD0060267	HESCO, INC.					
	MDG498020	L.W. WOLFE ENTERPRISES, INC.					
	MDG491387	LAFARGE BEAVER CREEK CONCRETE PLANT					
	MDG490588	MARTIN MARIETTA - BOONSBORO QUARRY					
	MDG766209	MT. LENA RECREATION CLUB					
	MD0066974	NEWSTECH MD, LP					
	MDG493125	THOMAS BENNETT HUNTER INC - HAGERSTOWN CONCRETE PLANT					
Total						**17,959**	**21,951**

Table 2a: NPDES Regulated Stormwater Permits in the Antietam Creek Watershed

MDE Permit #	Facility	SW NPDES Group
MS4-WA-001	CITY OF HAGERSTOWN MS4	Municipal Phase-II
MS4-WA-002	TOWN OF SMITHSBURG MS4	Municipal Phase-II
MS4-WA-003	WASHINGTON COUNTY MS4	County Phase-II
MDR055500	STATE HIGHWAY ADMINISTRATION MS4	SHA Phase II
	MDE GENERAL PERMIT TO CONSTRUCT	Other NPDES Reg SW
02SW0061	JAMISON DOOR COMPANY	Other NPDES Reg SW
02SW0168	ROCKY TOP WOOD PRESERVERS, INC.	Other NPDES Reg SW
02SW0237	HAGERSTOWN BLOCK COMPANY	Other NPDES Reg SW
02SW0332	MARYLAND CORRECTIONAL INSTITUTION	Other NPDES Reg SW
02SW0479	CLEAN EARTH OF MARYLAND, INC.	Other NPDES Reg SW
02SW0598	ROADWAY EXPRESS, INC. – HAGERSTOWN	Other NPDES Reg SW
02SW0715	CONSERVIT, INCORPORATED	Other NPDES Reg SW
02SW0748	MARYLAND METALS, INC.	Other NPDES Reg SW
02SW0749	MARYLAND METALS, INC. - ANTIETAM DRIVE	Other NPDES Reg SW
02SW0854	UNITED PARCEL SERVICE – HAGERSTOWN	Other NPDES Reg SW
02SW0907	HAGERSTOWN REGIONAL AIRPORT	Other NPDES Reg SW
02SW1046	FEDERAL EXPRESS CORP. – HAGERSTOWN	Other NPDES Reg SW
02SW1114	ELWOODS AUTO EXCHANGE	Other NPDES Reg SW
02SW1337	SHA - HAGERSTOWN SHOP	Other NPDES Reg SW
02SW1374	NORTHROP GRUMMAN - CALIFORNIA MICROWAVE SYSTEMS	Other NPDES Reg SW
02SW1450	EASTERN SECTION HIGHWAY BUILDING	Other NPDES Reg SW
02SW1466	SOUTHERN SECTION HIGHWAY FACILITY	Other NPDES Reg SW
02SW1467	WASHINGTON COUNTY HIGHWAY DEPARTMENT	Other NPDES Reg SW
02SW1686	FEDEX FREIGHT EAST, INC. HAGERSTOWN CC	Other NPDES Reg SW
02SW1803	PHILIP H. ROHRER, JR.	Other NPDES Reg SW
02SW1877	HAGERSTOWN WWTP	Other NPDES Reg SW

Table 2b: Antietam Creek Watershed Phosphorus TMDL Allocations for NPDES Regulated Stormwater Point Sources

NPDES Regulated Stormwater Point Source	NPDES Permit #	Baseline Load (lbs/yr)	TMDL (lbs/yr)	Reduction %
Washington County Phase II	MD0068306	8,228	6,427	21.9%
Municipal Phase II MS4	MDR055500	4,880	3,903	20.0%
SHA Phase I MS4	MD0055501	1,473	1,158	21.4%
Other NPDES Regulated Stormwater		1,457	1,206	17.2%
Total		16,037	12,694	20.8%

Note: Individual load contributions may not add to total load due to rounding.

Table 3: Antietam Creek Watershed Phosphorus TMDL Allocations for NPDES Regulated Concentrated Animal Feeding Operations

NPDES Regulated Animal Feeding Operations	Baseline Load (lbs/yr)	TMDL (lbs/year)	Reduction (%)
	92	**92**	**0%**

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