

## Technical Memorandum

### ***Significant Phosphorus and Sediment Nonpoint Sources in the Liberty Reservoir Watershed***

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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 2012). This technical memorandum identifies the significant nonpoint sources of phosphorus and sediment in the Liberty Reservoir watershed. Detailed allocations are provided for those nonpoint sources included within the Liberty Reservoir Phosphorus and Sediment TMDL Load Allocations (LAs). These are conceptual values that are designed to meet the TMDL thresholds. The State reserves the right to allocate the phosphorus and sediment TMDLs among different sources in any manner that is reasonably calculated to protect the designated uses of the Liberty Reservoir from nutrient or sediment related impacts.

The Liberty Reservoir Phosphorus and Sediment TMDLs are presented in terms of average annual loads established to ensure that there will be no nutrient or sediment impacts on the recreational, aquatic life, and public water supply designated uses of the reservoir. The computational framework chosen for the Liberty Reservoir Phosphorus and Sediment TMDLs was 1) a refined version of the Chesapeake Bay Program Phase 5.3.2 (CBP P5.3.2) watershed model, which was used to estimate the phosphorus and sediment loads entering the reservoir during the 2001-2005 simulation period; 2) a CE-QUAL-W2 (W2) model of the Liberty Reservoir itself, which was used to simulate the impact that the phosphorus and sediment loads from the watershed model have on water quality in the reservoir; and 3) the CBP P5.3.2 watershed model 2009 Progress Scenario, which was used to estimate the current, or baseline, loads to the reservoir. The nonpoint source phosphorus and sediment loads generated within the Liberty Reservoir watershed are calculated as edge-of-stream (EOS) loads and represent a long-term average loading rate. Further details of the nonpoint source phosphorus and sediment load calculations can be found in Sections 2.2, 4.2, and 4.3 of the main TMDL report and the modeling report for this TMDL, *Modeling Framework for Simulating Hydrodynamics and Water Quality in Liberty Reservoir* (ICPRB 2012).

In the Liberty Reservoir watershed, crops, pasture, nurseries, National Pollutant Discharge Elimination System (NPDES) regulated urban land, Animal Feeding Operations (AFOs), Concentrated Animal Feeding Operations (CAFOs), and industrial process water facilities were identified as the predominant controllable sources. Forest is the primary non-controllable source, as it represents the most natural condition in the watershed. Direct atmospheric deposition on water is a minor source that primarily originates outside of the watershed. Atmospheric deposition will be reduced by existing state and federal programs and therefore is not addressed in this TMDL. There are no Combined Sewer Overflows (CSOs) in the Liberty Reservoir watershed, and phosphorus and sediment loads from septic systems are considered insignificant. Although loads from urban land are a major controllable source, within the Liberty Reservoir watershed the entirety of the phosphorus and sediment loads from urban land are considered to be regulated under NPDES Phase I and II stormwater permits. Therefore, they are considered a point source that must

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be included in the Waste Load Allocation (WLA) portion of a TMDL (US EPA 2002). Thus, the reductions to the urban stormwater phosphorus and sediment loads are defined in the point source technical memorandum. See Sections 4.5 and 4/6 of the main TMDL report for further details.

The baseline nonpoint source phosphorus and sediment loads were estimated using the CBP P5.3.2 watershed model 2009 Progress Scenario. The controllable loads for each nonpoint source sector were calculated as the difference between the CBP P5.3.2 “E3” and 2009 Progress scenario loads. The LAs for the nonpoint source sectors were then calculated based on applying an equal percent reduction to the controllable loads for each sector, as described in Section 4.6 of the main TMDL report.

Table 1 provides one possible scenario for the distribution of the annual nonpoint source phosphorus loads amongst the different nonpoint source sectors in the Liberty Reservoir watershed. Table 2 provides one possible scenario for the distribution of the annual nonpoint source sediment loads amongst the different nonpoint source sectors in the Liberty Reservoir watershed. The source categories in Tables 1 and 2 represent aggregates of multiple sources (e.g., crop is an aggregate of high till, low till, and hay).

**Table 1: Liberty Reservoir Phosphorus TMDL Nonpoint Source Sector LAs**

<b>General Nonpoint Source Sector</b>	<b>Detailed Nonpoint Source Sector</b>	<b>Baseline Load (lbs/yr)</b>	<b>LA (lbs/yr)</b>	<b>Reduction (%)</b>
Forest	Forest	6,885	6,885	0
	Harvested Forest	258	13	95
AFOs	Animal Feeding Operations	831	42	95
Pasture	Pasture	4,216	518	88
Crop	Crop	27,853	8,689	69
Nursery	Nursery	10,149	7,477	26
Atmospheric Deposition	Atmospheric Deposition	1,230	1,230	0
<b>Total</b>		<b>51,421</b>	<b>24,853</b>	<b>52</b>

**Table 2: Liberty Reservoir Sediment TMDL Nonpoint Source Sector LAs**

<b>General Nonpoint Source Sector</b>	<b>Detailed Nonpoint Source Sector</b>	<b>Baseline Load (tons/yr)</b>	<b>LA (tons/yr)</b>	<b>Reduction (%)</b>
Forest	Forest	3,019	3,019	0
	Harvested Forest	208	133	36
AFOs	Animal Feeding Operations	45	43	5
Pasture	Pasture	423	307	27
Crop	Crop	8,842	6,774	23
Nursery	Nursery	182	161	12
Atmospheric Deposition	Atmospheric Deposition	0	0	0
<b>Total</b>		<b>12,720</b>	<b>10,438</b>	<b>18</b>

**REFERENCES**

CFR (Code of Federal Regulations). 2012. *40 CFR 130.2(i)*.

[http://edocket.access.gpo.gov/cfr\\_2011/julqtr/40cfr130.2.htm](http://edocket.access.gpo.gov/cfr_2011/julqtr/40cfr130.2.htm) (Accessed April, 2012).

Interstate Commission on the Potomac River Basin (ICPRB). 2012. *Modeling Framework For Simulating Hydrodynamics And Water Quality In The Liberty Reservoir, Baltimore And Carroll Counties, Maryland*. Rockville, MD: Interstate Commission on the Potomac River Basin.

US EPA (U.S. Environmental Protection Agency). 2002. *Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs*. Washington, DC: U.S. Environmental Protection Agency.