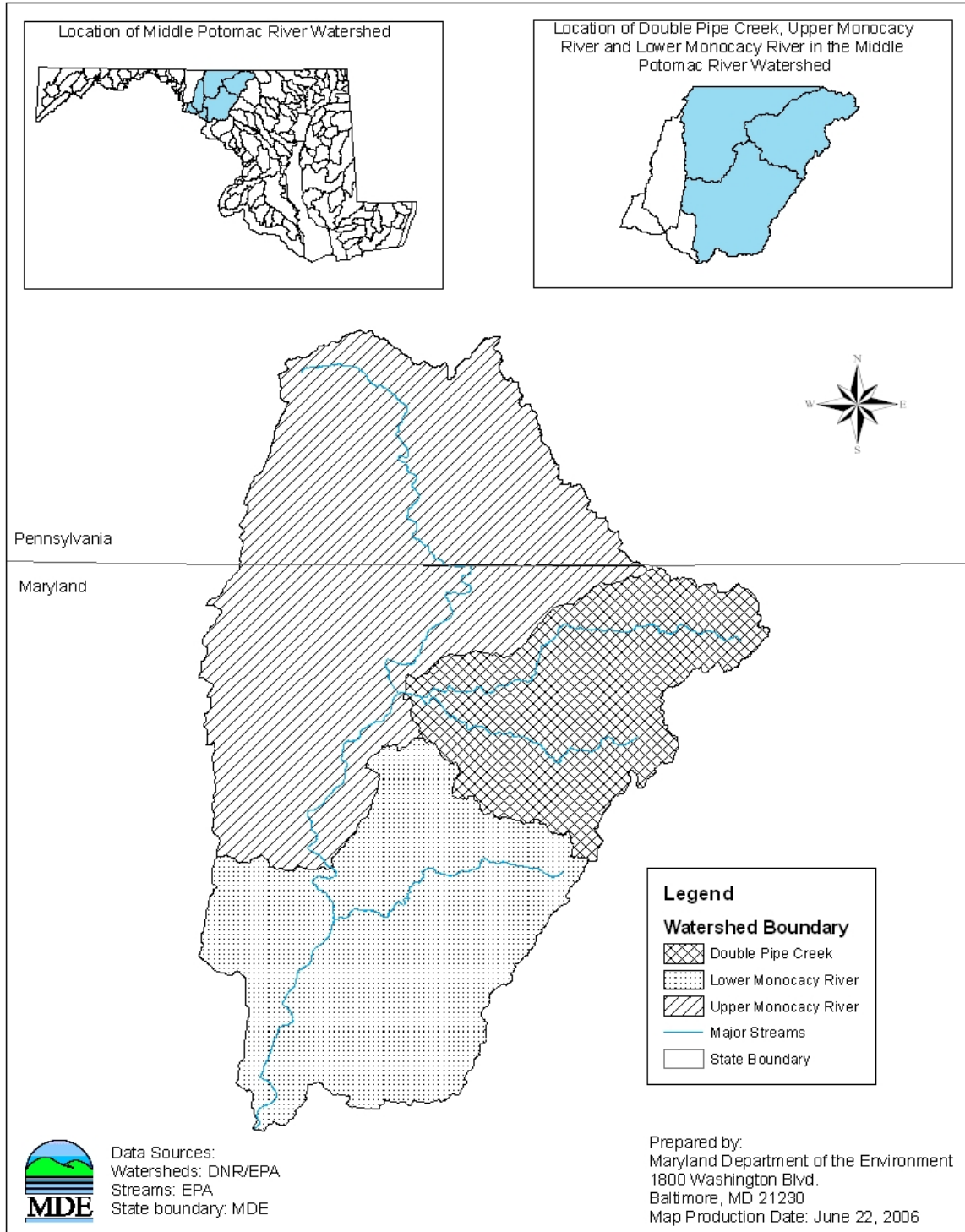


FINAL

APPENDIX D – Sediment TMDLs for the Double Pipe Creek, MD 8-Digit Upper Monocacy River, and Lower Monocacy River Watersheds

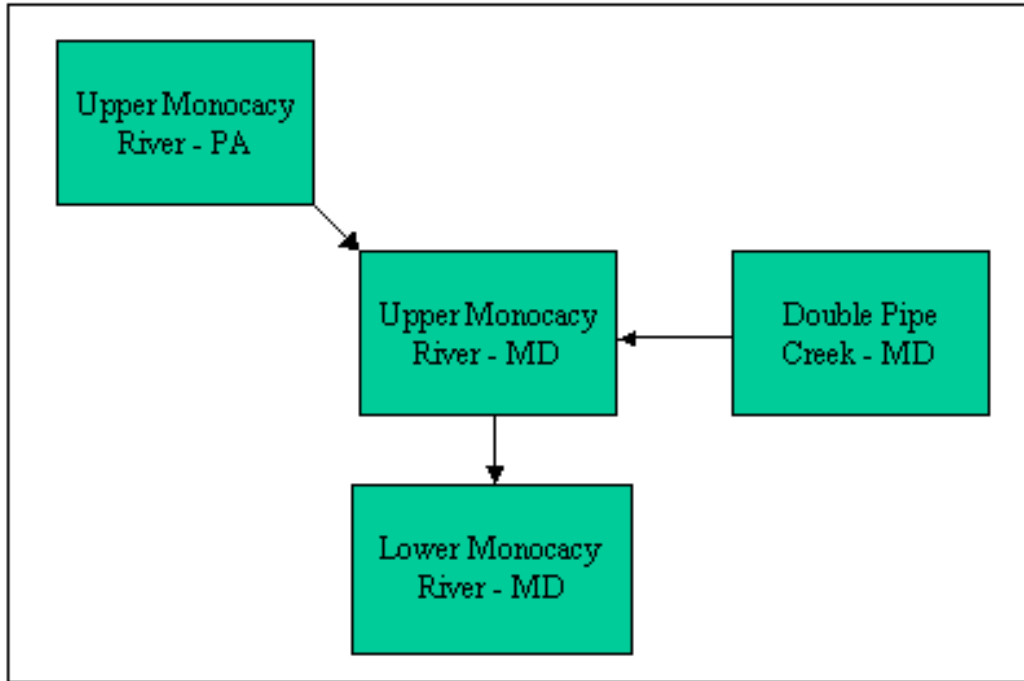
The purpose of this appendix is to explain the hydrologic relationship between the Double Pipe Creek, Upper Monocacy River, and Lower Monocacy River watersheds and how this affects the sediment TMDLs for each of the respective watersheds. As illustrated in Figure D-1, the three watersheds are hydrologically connected, beginning with the Double Pipe Creek watershed to the east. The Double Pipe Creek watershed flows into the Upper Monocacy River watershed, near the town of Rocky Ridge. It is also shown in Figure D-1 that the Upper Monocacy River watershed includes land in Pennsylvania and Maryland. The combined flow from the Upper Monocacy River and the Double Pipe Creek flows into the Lower Monocacy River. The hydrologic connectivity of the watersheds is illustrated in Figure D-2.

The baseline sediment loads for the watersheds are shown in Tables D-1 through D-3. The TMDL calculations are shown in Tables D-4 through D-6. Further information can be found in the individual TMDL documents for each watershed (MDE 2008a,b).



Note: A separate sediment TMDL has been developed for Lake Linganore, a subwatershed within Lower Monocacy River watershed (MDE 2003), and is presented as an upstream load within the Lower Monocacy River TMDL.

Figure D-1: Location of the Double Pipe Creek, Upper Monocacy River, and Lower Monocacy River Watersheds



Note: A separate sediment TMDL has been developed for Lake Linganore, a subwatershed within the Lower Monocacy River watershed (MDE 2003), and is presented as an upstream load within the Lower Monocacy River TMDL.

Figure D-2: Flow Schematic of the Double Pipe Creek, Upper Monocacy River, and Lower Monocacy River Watersheds

Table D-1: Double Pipe Creek Baseline Sediment Loads (ton/yr)

Total Baseline Load (ton/yr)	=	Nonpoint Source BL_{DP}	+	NPDES Stormwater BL_{DP}	+	Process Water BL_{DP}
35,224.3	=	29,674.5	+	5,189.8	+	360.0

Table D-2: MD 8-digit Upper Monocacy River Baseline Sediment Loads (ton/yr)

Total Baseline Load (ton/yr)	=	Upstream Baseline Load¹		+	MD 8-digit Upper Monocacy River Watershed Baseline Load Contribution					
		BL_{PA}	BL_{DP}²		Nonpoint Source BL_{UM}	NPDES Stormwater BL_{UM}	Process Water BL_{UM}			
98,725.7	=	20,511.9	+	35,224.3	+	38,679.3	+	4,129.1	+	181.1

- Notes:**¹ Although the upstream values are reported as single values, they could include point and nonpoint sources.
² For Double Pipe Creek watershed point and nonpoint source characterization please refer to “Total Maximum Daily Load of Sediment in the Double Pipe Creek Watershed, Frederick and Carroll Counties, Maryland” (MDE 2008b).

Table D-3: Lower Monocacy River Baseline Sediment Loads (ton/yr)

Total Baseline Load (ton/yr)	=	Upstream Baseline Load¹		+	Lower Monocacy River Watershed Baseline Load Contribution					
		BL_{LL}²	BL_{UM}³		Nonpoint Source BL_{LM}	NPDES Stormwater BL_{LM}	Process Water BL_{LM}			
146,420.0	=	11,585.0	+	98,725.7	+	27,073.4	+	8,312.5	+	723.4

- Notes:**¹ Although the upstream values are reported as a single value, they include point and nonpoint sources.
² For the Lake Linganore watershed point and nonpoint source characterization, please refer to the “Total Maximum Daily Load of Phosphorus and Sediments for Lake Linganore, Frederick County, Maryland” (MDE 2003).
³ For the Upper Monocacy River watershed point and nonpoint source characterization, please refer to the “Total Maximum Daily Load of Sediment in the Upper Monocacy River Watershed, Frederick and Carroll Counties, Maryland” (MDE 2008a).

Table D-4: Double Pipe Creek Average Annual TMDL (ton/yr)

TMDL (ton/yr) =	LA _{DP} +	NPDES Stormwater WLA _{DP} +	Process Water WLA _{DP} +	MOS
24,199.1	20,461.1	3,377.9	360.0	Implicit

Table D-5: Upper Monocacy River Average Annual TMDL (ton/yr)

TMDL (ton/yr)	LA			+	WLA		+	MOS
	LA _{PA} ¹	+ LA _{DP} ²	+ LA _{UM}		NPDES Stormwater WLA _{UM}	+ Process Water WLA _{UM}		
66,707.3	19,362.2	+ 24,199.1	+ 20,823.1	+	2,141.8	+ 181.1	+	Implicit
	Upstream Load Allocation ^{3,4}				MD 8-digit Upper Monocacy Watershed River TMDL Contribution			

- Notes:**¹ LA_{PA} was determined to be necessary in order to meet Maryland water quality standards within the Upper Monocacy River watershed.
² For Double Pipe Creek watershed WLA and LA characterization please refer to “Total Maximum Daily Load of Sediment in the Double Pipe Creek Watershed, Frederick and Carroll Counties, Maryland” (MDE 2008b).
³ A delivery factor of 1 was used.
⁴ Although for the purpose of this analysis upstream loads are referred to as LAs, they could include point and nonpoint sources.

Table D-6: Lower Monocacy River Average Annual TMDL (ton/yr)

TMDL (ton/yr)	LA			+	WLA		+	MOS
	LA _{LL} ¹	+ LA _{UM} ²	+ LA _{LM}		NPDES Stormwater WLA _{LM}	+ Process Water WLA _{LM}		
90,158.0	7,073.0	+ 66,707.3	+ 12,397.5	+	3,256.8	+ 723.4	+	Implicit
	Upstream Load Allocations ^{3,4}				Lower Monocacy River Watershed TMDL Contribution			

- Notes:**¹ For Lake Linganore watershed WLA and LA characterization, please refer to the “Total Maximum Daily Loads of Phosphorus and Sediments for Lake Linganore, Frederick County, MD” (MDE 2003).
² For Upper Monocacy River watershed WLA and LA characterization, please refer to the “Total Maximum Daily Load of Sediment in the Upper Monocacy River Watershed, Frederick and Carroll Counties, Maryland” (MDE 2008a).
³ Although for the purpose of this analysis the upstream load is referred to as an LA, it could include loads from point and nonpoint sources.
⁴ A delivery factor of 1 was used for all of the Upstream Load Allocations.