FINAL

Comment Response Document
Regarding the Total Maximum Daily Load of Sediment in the Non-Tidal South River Watershed, Anne Arundel County, Maryland

The Maryland Department of the Environment (MDE) has conducted a public review of the proposed Sediment TMDL for the South River Watershed. The public comment period was open from January 23, 2017 through February 21, 2017. MDE received one set of written comments.

Below is a list of the commentors, their affiliations, the date comments were submitted, and the number referenced to the comments. In the pages that follow, comments are summarized along with MDE's responses.

List of Commentors

Author	Affiliation	Date	Comment Number
Mr. Jesse Iliff	South RiverKeeper, South River Federation	2/21/17	1-7

Comments and Responses

1. The commentor questions the ability of the Chesapeake Bay Program Phase 5.3.2 (CBP P5.3.2) watershed model to accurately capture watershed characteristics in the South River watershed. The commentor gives the example that the model does not include in-stream erosion. The commentor states that the narrative definition given in the document for edge of stream (EOS) loads includes, "…the intervening processes of deposition on hillsides and sediment transport through smaller rivers and streams," but that the equation presented for the EOS loads does not have a factor for in-stream channel erosion. The equation accounts for acreages of different land uses within the watershed, but in-stream area or stream channel area is not a land use included in the TMDL. The commentor continues that the narrative definition does not mention sediment delivery factor in the modeled river reaches, which are likely significant, given the 100 cfs or greater flow found in these reaches. The commentor states that clarification of how the Chesapeake Bay Program (CBP) model accounts for in-stream erosion and sediment delivery is needed before an accurate baseline loading can be determined, and before the effect of any best management practices (BMPs) can be applied to the modeled EOS loads.

   Response: The CBP 5.3.2 model can accurately capture watershed characteristics in the South River watershed because the model segmentation was specifically designed to aggregate to the MD 8-digit watershed scale, in order to be used in local TMDLs. The South River watershed is composed of multiple modeling segments, each incorporating locally-defined land coverage and best management practices, as well as soil composition information derived from the U.S General Soil Map (STATSGO). This level of specificity allows the model to effectively estimate sediment loads, even at this smaller scale.

Regarding in-stream erosion, the full definition of EOS loads, as given in the model documentation report is as follows:

> *EoS loads are defined as the loads that enter the river reaches represented in the model. They represent not only the erosion from the land but all the intervening processes of deposition on hillsides and sediment transport through smaller rivers and streams that are not represented in the Phase 5.3 Model. The influence of the sum of the processes is contained in the estimated sediment delivery ratio[factor], which represents the ratio between sediment transported at a watershed outlet and erosion generated in the watershed. The EoS load for a reach is, therefore, the integration of sediment load scour, transport, storage, and fate from all smaller watersheds and streams unrepresented in the model.*

Given the full definition, it is understood that the in-stream erosion is contained in the SDF term in Equation 2.1 of the TMDL.

$$\sum_{i}^{n} EOS = Acres_i * EOF_i * SDF_i$$

The full narrative definition has been added to the TMDL for clarification. A full description of how the model accounts for in-stream erosion can be found in the model documentation report entitled *Chesapeake Bay Phase 5 Community Watershed Model.* This document is available online at http://www.chesapeakebay.net/about/programs/modeling/53/. Information regarding sediment simulation is found in Section 9: ftp://ftp.chesapeakebay.net/modeling/P5Documentation/SECTION_9.pdf.

2. The commentor refers to the TMDL calculation stating that the forest normalized sediment loads and the all forested sediment load are problematic due to the omission of in-stream sediment erosion (see Comment 1). Since this calculation is the basis of the TMDL calculation, the commentor urges the Department to supplement the CBP modeling figures expressed in the TMDL with actual measurements in the field as soon as possible to determine how well the CBP model serves the South River watershed, and make any modification such measurements indicate are appropriate.

   Response: As stated in the Response to Comment 1, the sediment contribution from small stream channel erosion is accounted for in the CBP P5.3.2 model within the sediment delivery factor (SDF).

   Additionally, the model includes data from 164 sediment calibration points. The modeled sediment loads were calibrated to this data to achieve an optimal agreement between the modeled and observed values. While more data points are always desirable, it has been determined that this number of points is enough to accurately estimate sediment loads at the MD 8-digit watershed scale.

While this TMDL is considered to provide an accurate characterization of watershed loadings and is based off of the best available data, the Department recommends using site-specific monitoring as part of the implementation process to verify the effectiveness of any implementation activities. Information collected through the implementation process, could also be used to inform future modeling. Those conducting field measurements are encouraged to submit the data to the Department.

3. The commentor asks whether the *forest normalized sediment load* is the same as the *sediment loading threshold*.

   Response: The *forest normalized sediment load* is the ratio of the actual watershed sediment load (baseline) to a theoretical *all forested watershed load,* the value if a watershed had only forest land use. The *sediment loading threshold* is the value of the *forest normalized sediment load* that is determined to be representative of a watershed that supports aquatic life. The *sediment loading threshold* is based on the *forest normalized load* values for a group of reference watersheds. The median of the reference group *forest normalized load* values was selected as the *sediment loading threshold.*

4. The commentor asks whether y_{forest_i} is the same variable as y_{for} in Equations 4.2 and 4.1, respectively.

   Response: The two variables represent the same concept. Equation 4.2 has been updated to use the same variable from Equation 4.1.

5. The commentor presented the following information: The Upper Patuxent Watershed (56,446 acres) is immediately adjacent to the South River watershed (36,200 acres) and shares similar land use patterns and soil conditions. Each is almost entirely located in the Coastal Plain geologic province, and each is composed primarily of Group B soils (Upper Patuxent- 47%; South- 65.4%). However, the Upper Patuxent has a TMDL of 66,421.1 tons/year, while the South River TMDL is 1,982 tons/year. Considering only area of the watershed, a reasonable inference is that the Upper Patuxent would have a sediment load a bit less than double that of the South River, not 33 times as much.

   Response: The values presented in the commentor's statement represent the baseline sediment loads for the two watersheds, not the TMDL values as stated in the comment. Additionally, in interpreting these loads, it is important to note that the total TMDL and baseline loads for the Upper Patuxent River include contributions from two upstream watersheds, which makes them much larger. The following are the comparable values for within each 8-digit watershed:

Watershed	Baseline (tons/year)	TMDL (tons/year)
Upper Patuxent River (02131104)	21,666	19,638
South River (02131003)	1,982	1,546

The commentor also makes his assessment based on "Considering only area of the watershed…". While area is an important factor in determining total sediment loads, there are several factors to consider when comparing sediment loads between watersheds. First, the two watersheds have different land use types – the Upper Patuxent River watershed has a higher percent urban and agriculture than the South River watershed and a lesser percent of forested land, which will cause it to have higher total sediment loads. Second, each land area has a delivery factor to account for how much of the sediment gets from a particular land use to the stream, based on its proximity to the stream. If the higher sediment land use types (e.g. urban) are closer to the stream in Upper Patuxent, EOS sediment loads will be higher. Third, the two TMDLs were developed using different models, with the Upper Patuxent River TMDL based on the CBP P5.2 watershed model and the South River TMDL based on the P5.3.2 model. The model iterations represent two separate calibrations, with the potential for different water quality data being included and therefore different sediment loading rates. Finally, various unique watershed characteristics and processes can drive differences in sediment loads, such as percent impervious, type of agricultural activities, and presence of stormwater management practices.

6. The commentor presented the following information: Anne Arundel County's Site Assessment Report for its Glebe Branch Tributary project (submitted last August) estimated bank erosion rates at 0.066 tons/yr/ft based on Rosgen BANCS methodology and the North Carolina BEHI erosion rate curves, with a total of 547 tons/yr of predicted erosion from the entire tributary. This is but one of fifteen major tributaries on the River, but would account for over ¼ of the total sediment load predicted by the TMDL.

   Response: Appendix B of the Chesapeake Bay Program's report, *Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects*, provides a detailed description for how to reconcile BANCS load reductions with loads from the Chesapeake Bay Watershed Model. This appendix relates specifically to the calculation of Stream Restoration Credits under Protocol 1 for prevented sediments.

   The appendix explains that, "the scale at which the CBWM simulates sediment dynamics corresponds to basins that average about 60 to 100 square miles in area. The model does not explicitly simulate the contribution of channel erosion to enhanced sediment/nutrient loadings for smaller 1st, 2nd, and 3rd order streams not included as part of the CBWM reach network (i.e., between the edge-of-field and edge-of-stream), that is, scour and deposition with the urban stream channel network with these basins are not modeled."

"The CBWM operates on the assumption that all sediment loads are edge-of-field and that transport and associated losses in overland flow and in low-order streams decrement the sediment load to an edge-of-stream input."

"The sediment loss between the edge-of-field and the edge-of-stream is incorporated into the CBWM as a sediment delivery ratio (SDR). This ratio is multiplied by the predicted edge-of-field erosion rate to estimate the eroded sediments actually delivered to a specific reach (U.S. EPA, 2010)"

"[J]urisdictions must apply the SDR to the sediment (TSS) loading reductions for Protocol 1 and the Interim Rate. For ease of computation, the SDRs from Table B-3 have been averaged and grouped into either Coastal Plain (SDR = 0.061) or non-Coastal Plain (SDR = 0.181)."

Implementers should follow the approach laid out in the expert panel report to ensure that stream restoration load reductions are compatible with the edge-of-stream loads expressed in this TMDL.

7. The commentor presented the following information: The CBP model inputs for forested land cover across the entire Chesapeake watershed is unable to account for the heavy historical agricultural land use leaving highly erodible soil at the top of our watershed. Bacon Ridge Branch is so named because of intensive hog farming in the area for almost a century. The animals ground the soil into dust, and while there is a 50 year old forest there now, the soil underlying it is much finer than typical forest soil substrate.

   Response: As was discussed in Response 1, the CBP P5.3.2 Model incorporates a spatially-explicit soil characterization derived from the STATSGO dataset, which should capture variations in soil particle size, and simulate the processes affecting their transport to the edge-of-stream. Since the Integrated Report listing and TMDL are at the MD 8-digit watershed scales, the resolution of data used in model development is sufficient.

   For implementation purposes, it may be beneficial to collect data at a finer level. MDE views the TMDL development and implementation process as iterative and retains the authority to revisit its TMDLs if additional information demonstrates the TMDL is insufficient for protecting water quality. Information collected through the implementation process, could be used to inform future modeling, and those conducting restoration projects are encouraged to submit data to the Department regarding the water quality impacts of specific features within the watershed. This data could also help in designing projects to have the greatest effectiveness or in prioritizing projects to maximize impact. Legacy issues could mean that certain locations would provide a greater impact to water quality than others.