Comment Response Document
Regarding the Total Maximum Daily Load (TMDL) of Sediment for the Jones Falls Watershed, Baltimore City and Baltimore County, Maryland

The Maryland Department of the Environment (MDE) has conducted a public review of the proposed TMDL of sediment for the Jones Falls Watershed. The public comment period was open from July 22, 2009 through August 20, 2009. MDE received two sets of written comments.

Below is a list of commentors, their affiliation, the date comments were submitted, and the numbered references to the comments submitted. In the pages that follow, comments are summarized and listed with MDE's response.

List of Commentors

Author	Affiliation	Date	Comment Number
William Stack	Baltimore City Surface Water Management Division of the Department of Public Works	August 18, 2009	1-4
Steve Stewart	Baltimore County Department of Environmental Protection and Resource Management	August 20, 2009	5-12

Comments and Responses

1. The commentor states that the TMDL should have used monitoring data as a reality check against the modeling results. For instance, Baltimore City participated in a monitoring study with Johns Hopkins University in 1980 for the Upper Jones Falls watershed above Lake Roland and developed sediment loading estimates that were 2,661 pounds/acre/year, which is substantially greater than the model estimate of 488 pounds/acre/year. The commentor continues by stating that although the study is 30 years old, it is unlikely that the rates could vary that much. Furthermore, the Hopkins study found that Lake Roland had greater than a 90% sediment removal rate, even though the lake was virtually filled.

   Response: The *edge-of-field* (EOF) erosion rates applied within the Jones Falls watershed sediment TMDL analysis are the long term target rates that are used in the Chesapeake Bay Program Phase 5 (CBP P5) watershed model. The CBP P5 watershed model uses information from existing studies conducted within local Maryland Piedmont region drainage basins to estimate the urban sector long term target EOF rates. Since the urban EOF rates are based on local watershed studies, the difference in the absolute value of the sediment loads may result from the estimation of the sediment delivery ratio used in calculating the *Edge-of-Stream* (EOS) load. An explanation on how the sediment delivery ratio is applied in the analysis can be found in Section 2.2.1 of the main TMDL report. Alternately, the difference in magnitude between sediment loadings estimated by MDE and Baltimore City may also result from the natural variability in sediment loads and concentrations and consequently the inherent uncertainty in modeling sediment delivery and transport.

Additionally, during the model development process, significant emphasis was placed on making sure that the land use EOF rates were accurate relative to one another. This enabled MDE to apply a reference watershed approach in the development of all nontidal sediment TMDLs throughout Maryland, including the Jones Falls. The reference watershed approach used in the TMDLs is based on a comparison of the current watershed sediment load to the all-forested watershed sediment load (see Sections 4.2 and 4.3 of the main TMDL report). This relationship is also used to calculate TMDL reductions. Therefore, regardless of the magnitude of the sediment loads, consistent required reduction levels will always be produced since the land use EOF rates are assumed to be accurate relative to one another.

Finally, the actual loading rates that will be applied within the CBP P5.3 watershed model may be slightly different than the current target values. The model is still in development and therefore was not used for this TMDL analysis. These loading rates will be calibrated to actual monitoring data in the CBP P5.3 watershed model. Thus, final calibration of the model may result in a different delivery ratio that would change all land use yields by the same ratio. However, due to the reference watershed approach applied within this analysis, the same level of reductions for impaired watersheds would still be required, even though the absolute value of the sediment loads will most likely be revised.

Since the CBP P5 watershed model target values were used in the analysis, the results, at least in terms of the required reduction levels to ensure that there are no sediment related impacts to aquatic life, will be consistent with 1) the results of the actual CBP P5.3 model, 2) the forthcoming Chesapeake Bay nutrient and sediment TMDLs, and 3) all other nontidal sediment TMDLs developed across the state. Therefore, the long term target CBP P5 loading rates were applied for consistency purposes, as outlined above, rather than using Jones Falls specific sediment loading rate estimates.

While the Johns Hopkins University Study states that Lake Roland is an effective sediment trap, monitoring data from both the Maryland Biological Stream Survey (MBSS) and Department of Natural Resources (DNR) Core/Trend program downstream of the impoundment indicate that the biology of both the lower order tributaries and mainstem is impaired. Furthermore, the biological stressor identification process (BSID) confirms that sediment is impairing the biology at these stations, thus indicating that even though the lake serves as a sediment trap, increased sediment loads are still impacting aquatic life in both the mainstem and tributaries downstream of the lake due to localized conditions. This examination of the sediment impairment both upstream and downstream of the impoundment parallels the way in which the applied model calculates the watershed sediment load.

The lake’s role as a sediment trap on the mainstem does not affect the calculation of the watershed baseline load for the purposes of this analysis, relative to the model that was applied. The CBP P5 watershed model, as applied in terms of this nontidal 8-digit watershed sediment TMDL, does not simulate sediment transport along the mainstem. Rather, the target EOF sediment erosion rates from the CBP P5 model, combined with a land use specific sediment delivery ratio per model segment, are used to calculate the amount of sediment delivered to the entire length of the mainstem. Thus, the evaluation of the watershed sediment load, and subsequent reductions required to meet the TMDL, solely constitute an examination of how much sediment is reaching the mainstem of a given 8-digit watershed and how much of this load must be reduced in order to ensure there will be no sediment related impacts to aquatic life.

2. The commentor disagrees with the assumption that development since 1984 is 100% effective in removing sediment and has had no impact on stream erosion. There needs to be documentation supporting this assumption.

   Response: The TMDL analysis does not state that the stormwater control structures associated with development post 1984 is 100% effective in removing sediment, and furthermore, the analysis does not state that these stormwater controls associated with post 1984 development have no impact on stream erosion. In fact, MDE contends that all development post 1984 has some impact on stream water quality, biology, and streambank erosion. MDE defines the current maximum feasible amount of urban area that could be retrofitted as all pre 2002 development. However, for the purposes of this analysis, the pollutant reduction scenarios were applied to pre 1985 urban land primarily because a majority of the land in these watersheds was developed prior to 1985. If local government assessments indicate that there are cost effective opportunities to retrofit post 1985 acres in these watersheds, the implementation of those practices should be pursued and can be credited toward National Pollutant Discharge Elimination System (NPDES) permit requirements and meeting Stormwater Wasteload Allocations (SW-WLAs). Lastly, the application of pollutant reduction scenarios to pre 1985 urban land was also consistent with the specific urban stormwater, two year Chesapeake Bay restoration milestones recently set by MDE.

3. The commentor states that the 65% average Best Management Practice (BMP) Total Suspended Solids (TSS) removal efficiency is based on conventional volume treatment, yet the TMDL assessment clearly shows that stream restoration will have to be the BMP of choice to meet the loading rates. The sediment load reduction estimates that the Chesapeake Bay Program (CBP) has calculated for stream restoration projects are extremely low, which implies that sediment erosion from stream channels in urban areas is equally as low. The commentor recommends that MDE’s Science Services Administration (SSA) work with CBP to determine more appropriate stream restoration project reduction efficiencies.

   Response: Maryland's current stormwater management law requires that BMPs have an efficiency of 80% for TSS; however, NPDES stormwater permits are designed to give localities as much flexibility as possible in meeting retrofit requirements. Therefore, because not every retrofit opportunity will be capable of meeting the current criteria, MDE has conservatively estimated a 65% TSS removal efficiency for stormwater retrofits. The 65% TSS removal efficiency is based on the average monitored removal efficiencies of all stormwater BMPs put in place since 1985 (Claytor and Schueler 1997; Baldwin et al. 2007; Baish and Caliri 2009). Stream restoration projects are not stormwater BMPs and will need to be accounted for differently.

The TMDL assessment does not imply that stream restoration will be the approach of choice to achieve the required TMDL reductions and subsequently improve biological conditions, as impacted by elevated sediment loads. Rather, stream restoration projects are merely one of the many tools, along with stormwater BMPs, street sweeping, reforestation, stream buffer plantings, etc., that MDE would anticipate local jurisdictions will employ to meet the TMDL. Since streambank erosion accounts for a majority of the delivered sediment load and a significant amount of the watershed is impervious, implying that there is a very small upland sediment source, it would also be expected the flow controls and impervious surface reductions, as stated in Section 5.0 (i.e., the *Assurance of Implementation*) of the TMDL report, would need to be implemented as well to decrease flow volume and shear stress in order to subsequently reduce streambank erosion.

The sediment load reductions as calculated by CBP for stream restoration projects are based on monitoring data from a limited set of stream restoration projects in Maryland. The CBP is advised through a technical sub-committee, which is comprised of local, State, and federal agencies. As additional stream restoration projects are monitored, the CBP technical advisory committee may choose to revise estimates. MDE encourages local governments to participate in CBP proceedings and share data on stream restoration projects. If Baltimore City or other local jurisdictions have specific monitoring data on stream restoration projects and TSS reduction rates, they are encouraged to use these data when showing progress toward meeting SW-WLAs.

4. The commentor claims that the following text within the TMDL report is incorrect:

> "Currently, MDE requires that large and medium municipal separate storm sewer systems (MS4s) retrofit 10% of existing urban land area where there is failing or no stormwater management every permit cycle (5 years). This level of restoration has been determined to be the current maximum feasible, regulated stormwater reduction scenario. Therefore, the reductions applied within this TMDL analysis are consistent with this 10% retrofit goal to existing urban land every 5 years with an estimated 65% TSS reduction efficiency from future stormwater BMPs".

The commentor then states that the 65% TSS reduction efficiency applied within the analysis assumes that all impervious area receives the "maximum possible" treatment. However, MDE's Water Management Administration (WMA) has not specifically defined "impervious area treatment" relative to MS4 permitting requirements. The commentor goes on to say that both SSA and WMA must agree on the definition of the urban BMP reduction efficiency, which should then be thoroughly vetted with the MS4 jurisdictions. This is especially critical since Baltimore City has been advised that when their MS4 permit is renewed, which is scheduled to occur in January of 2010, the retrofit requirement for impervious areas over the five year permit cycle will double from 20% to 40%. If the 65% standard is adopted, the level of restoration defined as being maximum feasible will have to change, since meeting the 20% retrofit requirement at the maximum level of treatment within a five year permit cycle will not be practical because of funding limitations faced by local governments. Finally, the commentor states that the listing of loan and grant programs is insufficient.

Response: The 65% TSS removal efficiency for stormwater BMP retrofits does not assume the maximum possible treatment of impervious areas. It assumes an average treatment of impervious areas based on the stormwater BMPs that have been installed throughout Maryland since 1985 (Claytor and Schueler 1997; Baldwin et al. 2007; Baish and Caliri 2009), and therefore reflects the estimated removal capabilities of stormwater BMP retrofits that will be implemented by local jurisdictions. The 65% TSS reduction rate has not been adopted as a retrofit standard by MDE. Therefore, it is not a requirement that local jurisdictions need to adhere to, but rather, it is simply a means by which to provide a reasonable estimate of future sediment loads from urban areas that will be retrofitted in the future, in an effort to achieve the required TMDL reductions and provide some sort of guide for TMDL implementation. Also, please see the response to Comment 3 for further information regarding the estimated 65% removal efficiency for future stormwater BMPs.

In terms of loans and grants available to local jurisdictions, the list contained in the *Assurance of Implementation* of the report is considered to be exhaustive. If there are other loans or grants available to local jurisdictions from outside of MDE, localities are encouraged to inform SSA of these programs, and we will oblige by adding them to the *Assurance of Implementation*.

5. The commentor asserts that the statement in the 2nd paragraph on page 3 regarding schist and gneiss rocks being of volcanic origin is incorrect. Rather, they were originally sedimentary rocks that were transformed via heating into metamorphic rocks.

   Response: MDE acknowledges that this statement is incorrect, and the document has been revised accordingly.

6. The commentor states that the predominant soil series identified within the watershed is not the Baile series, which have poorly drained soils, as the analysis claims, but rather the Baltimore County Soil Survey identifies the Baltimore-Conestoga-Hagerstown soil association, which has well drained soils that overly the Cockeysville Marble, as being the predominant soil series in the watershed.

   Response: MDE acknowledges that this statement is incorrect, and the document has been revised accordingly.

7. The commentor references the BSID analysis for the Jones Falls watershed and states that the analysis shows a clear difference in biological conditions between 1) the Jones Falls mainstem and its tributaries upstream of Lake Roland and 2) the more highly urbanized area downstream of Lake Roland in addition to Towson Run and its tributaries, yet the analysis lumps the entire watershed. The commentor proposes that the report acknowledge the “good” biological conditions in the Jones Falls mainstem and its tributaries upstream of Lake Roland

and limit the TMDL analysis to the impaired sections downstream of Lake Roland as well as Towson Run and its tributaries.

Response: The commentor is correct in stating that the BSID analysis shows a clear difference in the biological conditions between the portions of the watershed located upstream of Lake Roland, except for Towson Run and its tributaries, and downstream of Lake Roland in addition to Towson Run and its tributaries. This difference in biological conditions has been acknowledged and is pointed out within the BSID analysis (See Section 4.0 *Stressor Identification Results – Summary Section*) (MDE 2009), and this information can be used during the TMDL implementation phase for targeting specific areas of the watershed.

Relative to limiting the TMDL analysis to solely the portion of the Jones Falls watershed downstream of Lake Roland, several factors had to be considered. First, the original 1996 sediment listing is for the entire Jones Falls 8-digit watershed, implying that the entire basin is impaired for sediment. Second, the current biological listing methodology and assessment for *Integrated Report* impairment identification is also conducted at the 8-digit watershed scale. This methodology is based on statistical analyses and a probabilistic sampling design from the MBSS dataset that provides the most accurate assessment at the 8-digit watershed scale. Thus, besides the identification of individual site impairment, it is difficult to characterize any sort of degradation on a smaller geographic scale due to a possible limitation in sampling stations. Despite these limitations, MDE has divided 8-digit watersheds in historic nontidal sediment TMDLs based on 1) the identification of good biological conditions at MBSS sampling sites, 2) calculated forest normalized sediment loads less than the reference watershed sediment loading threshold in individual watershed segments, and 3) when the CBP P5 model segmentation applied within the analyses allows for such a separation. For example, when multiple CBP P5 model segments, the scale at which sediment loads are calculated (subsequently aggregated to the 8-digit level for reporting), comprise an 8-digit watershed, if the monitoring data and/or estimated forest normalized sediment loads indicate that the individual CBP P5 model segment is not impaired, the watershed will often be divided into two TMDL segments, whereby reductions will only be applied to the TMDL segment identified as impaired. However, in the case of the Jones Falls watershed, the entire watershed is comprised of only one CBP P5 segment.

8. The commentor states that the analysis should account for the deposition of sediment in Lake Roland and the subsequent effect on downstream sediment loads.

   Response: Please see the response to Comment 1.

9. The commentor points out that the sediment loading per acre in the Jones Falls watershed sediment TMDL is approximately half of the derived sediment loading per acre in the Gwynns Falls watershed sediment TMDL analysis, yet the difference in total urban land use, as characterized within the respective TMDL reports, is minimal (i.e., 87.5% in the Gwynns Falls watershed and 73.9% in the Jones Falls watershed). Furthermore, the percentage of the total sediment load attributed to urban land use in the two analyses is even closer, at 91.1% and 88.7% for the Gwynns Falls and Jones Falls analyses, respectively. Thus, since the same

loading rates were used in both analyses, it would appear that the difference in the calculated sediment loadings per acre can be accounted for via the total impervious urban area within each respective watershed, which indicates that greater efforts are needed to assure that the impervious land cover is accurate. Finally, the commentor states that the per acre sediment load calculated from the Jones Falls watershed analysis is in line with the county's estimates.

Response: The commentor is correct in assuming that the difference in sediment yields (per acre sediment loads) between the Jones Falls Watershed and the Gwynns Falls watershed, whereby the Gwynns Falls watershed sediment yield (0.53 tons/acre/year) is more than two times greater than the Jones Falls watershed sediment yield (0.24 tons/acre/year), can be largely accounted for the via the difference in imperviousness between the two drainage basins (32.7% impervious and 20.2% impervious for the Gwynns Falls and Jones Falls watersheds, respectively).

The land use and impervious surface data applied within the TMDL analysis are used within the CBP P5 watershed model (See section 2.0 of the TMDL report for further information), and were considered to be the best available data that provided the required consistency across the entire Chesapeake Bay watershed. Localities are encouraged to use their own land use and impervious data during the TMDL implementation phase, in order to more accurately depict areas in need of retrofitting, impervious surface reduction, develop more precise modeling procedures, etc., but to remain consistent with both the forthcoming Chesapeake Bay nutrient and sediment TMDL and the other nontidal sediment TMDLs developed across the state, MDE decided it best to apply the same land use and impervious data sets that have been used in the CBP P5 watershed model.

10. The commentor references the last paragraph of page 26 and says that while it is true the county has an obligation via their NPDES Phase I MS4 stormwater permit to retrofit 10% of the impervious cover regulated under the permit every 5 years, at an estimated 65% TSS removal efficiency for future stormwater BMPs, it would take up to16 years to meet the required 21.9% reduction.

    Response: The commentor is correct. It would take approximately 4 permit cycles to meet the 21.9% reduction in sediment loads required by the TMDL. MDE performed this calculation, but did not include the results in the TMDL report, as there is no legally mandated timeframe for achieving TMDLs. MDE's TMDL achievement timeframe calculation was strictly based on 1) the amount of watershed area that needs to be retrofitted in order to achieve the required reduction in sediment loads and 2) Phase I MS4 permitting requirements. The average 65% reduction from stormwater BMP retrofits (please see the responses to Comments 3 and 4 regarding the 65% TSS removal efficiency being an average estimate for forecasting purposes rather than a permitting requirement) was implicit in the calculation (i.e., the calculation was primarily area based assuming the 65% reduction efficiency).

    In the TMDL analysis, reductions were applied to 35% of the total urban area (the entirety of which being areas developed prior to 1985) in order to meet the assimilative loading capacity of the watershed, and there are a total of 27,382 impervious and pervious urban acres in the watershed. Thus, 35% of this area equates to 10,953 acres. If, based on Phase I MS4 permitting requirements, 10% of this area (i.e., 2,738 acres) is retrofitted every 5 years using 2005 as a baseline (land use year applied in the TMDL thereby equating to the TMDL baseline year), it would take 4 permit cycles, or 20 years, to retrofit the entirety of the area required to achieve the TMDL.

11. The commentor questions whether or not the analysis implies that the county would not get credit towards achieving the specified TMDL reductions for improvements made to stormwater management structures installed after 1985 to further trap sediment and reduce peak flows? Since stormwater BMPs are not 100% efficient, how does the modeling analysis account for increases in sediment load from new development. Furthermore, retrofitting is usually conducted via the installation of upland stormwater control structures, but since the majority of the sediment load being attributed to stream channel erosion, installing upland retrofits will not totally address the problem of destroyed habitat (i.e., the TMDL is related stream biological impairments). The commentor then claims that the report needs to acknowledge the need for stream restoration as a tool not only reducing TSS loads resultant from streambank erosion but also as a means of restoring damaged stream habitat. Stream restoration is mentioned only once on the 4th paragraph of page 33. Also, street sweeping, inlet cleaning, increases in the urban tree canopy, and reforestation should be included in the discussion of implementation practices. Lastly, the commentor states that the inclusion of increases in the urban tree canopy and reforestation are implementation practices that should be mentioned in addition to, not as part of, the discussion of riparian buffers.

    Response: Improvements made to stormwater management structures installed post 1985 will still count towards meeting the reduction in sediment loads required by the TMDL. The application of reductions to solely urban areas developed prior to 1985 with no stormwater control structures is merely one of the many ways in which the TMDL can be achieved. Since retrofitting those areas developed prior to the genesis of stormwater management regulations would achieve the greatest reductions, it seemed reasonable to MDE to first apply the reductions to these areas. In the TMDL scenario, the assimilative loading capacity of the watershed was achieved via solely applying the reductions to these pre 1985 urban areas; however, the TMDL can be achieved via other retrofitting scenarios. Therefore, improvements to control structures installed post 1985 will still count towards achieving the TMDL, as long as the Phase I MS4 jurisdiction can demonstrate as such. Lastly, the application of sediment reduction scenarios to pre 1985 urban land was also consistent with the specific urban stormwater, two year Chesapeake Bay restoration milestones recently set by MDE.

    These TMDLs do not forecast future growth and stormwater loads. The TMDLs and loads are based upon historical land use data. The MS4 reductions are applied to this static data set. Future growth is addressed as part of the State's Comprehensive Planning Process and its Water Resource Element (WRE), which local jurisdictions are required to prepare and submit to the Maryland Department of Planning. As part of this process, jurisdictions are encouraged to project future growth scenarios and evaluate how they relate to the approved TMDLs (i.e, do the sediment loadings associated with future growth scenarios represent progress towards or deviation from approved TMDLs). New development post 2010 will require the implementation of Environmental Site Design (ESD) to the maximum extent practicable. The sediment loadings from which should reflect "woods in good condition". However, since the 2007 Maryland Stormwater Management Act has yet to be implemented, the actual sediment loadings from these areas have not been estimated.

As the commentor has stated, the TMDL report does recognize, in the *Assurance of Implementation*, the importance of stream restoration in both reducing sediment loads and improving stream biological habitat. However, as also stated in the *Assurance of Implementation*, it is expected that upland control structures will be installed to primarily reduce flow, which will therefore decrease the amount of streambank erosion occurring within the watershed and subsequently decrease watershed sediment loadings. Lastly, MDE strives to continually update and improve the *Assurance of Implementation* section of the TMDL. Thus, we appreciate your input on this section and will be glad to include the referenced BMPs in the TMDL report.

12. The commentor states that the degree of sediment impairment throughout the watershed is likely to vary by tributary and the associated land use within each sub-basin. Does MDE have any more detailed modeling analyses for the individual tributaries, or would MDE be able to provide assistance to the local governments in setting specific reduction targets for the individual tributaries?

    Response: As detailed in the TMDL, the modeling analysis for all nontidal sediment TMDLs is done at the CBP P5 watershed model segment level, which aggregates to the Maryland 8-digt watershed scale. Therefore, the CBP P5 segment would be the most detailed level of modeling that MDE has available, but it does not specify sediment loadings to individual tributaries. Additionally, for this particular TMDL, the Jones Falls 8-digit watershed happens to consist of only one CBP P5 segment. Therefore, the sediment loading information presented in the TMDL report is the most detailed information that MDE has available. The department would have provided the modeling results per individual CBP P5 model segment to the county as requested had the watershed been comprised of multiple CBP P5 segments.

    MDE does recognize that impairment level can vary throughout the 8-digit assessment unit. Information is provided in the TMDL that indicates where probable sediment impacts could be present throughout the watershed. This information includes monitoring stations, with both biological and physical habitat sediment related information, and also detailed land use information with categories (e.g. urban, agricultural) consistent with sediment budgets. The combination of these two data sources can help to identify areas for potential sediment reductions and/or to develop a more spatially refined monitoring strategy for implementation. Additionally, many local jurisdictions have additional monitoring and land use data at a local level that can be useful in completing a detailed assessment of sediment impacts.

REFERENCES

Baish, A. S., and M. J. Caliri. 2009. *Overall Average Stormwater Effluent Removal Efficiencies for TN, TP, and TSS in Maryland from 1984-2002*. Baltimore, MD: Johns Hopkins University.

Baldwin, A. H., S. E. Weammert, and T. W. Simpson. 2007. *Pollutant Load Reductions from 1985-2002*. College Park, MD: Mid Atlantic Water Program.

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