Comment Response Document
Regarding the Total Maximum Daily Loads of Fecal Bacteria for the Liberty Reservoir Basin in Baltimore and Carroll Counties, MD

The Maryland Department of the Environment (MDE) has conducted a public review of the proposed Total Maximum Daily Loads (TMDLs) of Fecal Bacteria for the Liberty Reservoir basin. The public comment period was from July 28, 2008 through August 27, 2008. MDE received one set of written comments during the public comment period.

On August 27, 2008, MDE received a letter from the Reservoir Watershed Management Program with statements and comments from members of the Reservoir Technical Group (RTG) on the draft Liberty fecal bacteria TMDL. These comments are summarized below, with MDE's responses.

Comments and Responses

1. RTG member Donald Outen of Baltimore County expressed the opinion that the Maryland Department of Planning's (MDP) digital land-use maps tend to overstate the extent of urban land cover in a given area by including as "urban" medium- and low-density residential areas that are often mostly covered in grass and woods. He wondered what effect that exaggeration might have had on the process of estimating runoff-related bacterial loads in each of the six subwatersheds.

   Response: MDE uses MDP data for consistency in all bacteria TMDL projects. However, in MDE's non-tidal bacteria TMDL methodology, bacteria loads are not calculated based on land use, but on Bacteria Source Tracking (BST), long term flow data and geometric mean concentrations from monitoring data. Varying proportions of pervious/impervious land cover in mid- and low-density residential areas will not have any effect on the estimated bacteria contributions to the streams in any particular watershed.

2. RTG member Bill Stack of Baltimore City (Department of Public Works) "has raised questions about the weighting given to the coliform bacteria loads believed to be coming from wildlife in the subwatersheds."

   Response: We assume the comment refers to the "risk factor" assigned to each of the four source categories in the scenario descriptions. As explained in the TMDL report (See Section 4.6), risk was defined on a scale of one to five, where it was assumed that human sources had the highest risk and wildlife the lowest risk. The highest risk is given to humans because human sources would potentially have the highest risk of causing gastrointestinal illness. (Human pathogens are more prevalent in humans than animals, and enteric viral diseases spread from human to human.) Therefore, based on scientific research and best professional judgment, assigning the lowest risk factor to wildlife sources was considered appropriate. The risk factors given to the different source categories have been reviewed and accepted by scientists involved in the development of the bacteria TMDL methodology.

3. Several members of the RTG have expressed the view that the procedural and statistical questions raised by the group should be discussed in a meeting with MDE staff, to determine whether alternative approaches/assumptions would result in significantly lower or higher calculated values for the current annual bacterial loads entering the respective streams.

   Response: The methodology and assumptions used in the development of the Liberty Reservoir bacteria TMDL have been used for many years by MDE to develop numerous TMDLs submitted to and approved by EPA. The methodology is well known, and assumptions in the analysis are made based on scientific research and best professional judgment, and are widely accepted by many technical review groups. The procedural and statistical questions raised by the RTG's comments are fully addressed below. While open to consideration of proposed alternative methodologies for developing bacteria TMDLs, MDE does not believe that exploring other approaches for calculating the bacterial loads in this watershed is warranted.

4. The remaining text of the letter describes the following two areas of concern:

a) The first concern is that the proposed load reductions seem to be unattainable. The letter references the maximum practicable reduction (MPR) scenario in the draft TMDL and the statement therein that three of the six sub-watersheds could not meet water quality standards based on MPRs. As the letter notes, this is followed by a second scenario that allows reductions to increase up to 98%for all sources including wildlife in those three watersheds, in order to meet the standards. Members of the RTG question the validity of adopting a load reduction strategy with such extreme load reductions. Since it appears from the TMDL analysis that it will be impossible to attain the desired annual and seasonal bacterial loading goals through any combination of ordinary pollution control measures, what is the practical value of adopting such a TMDL (with the force of law)? What are signatories to the RWMA to do with these numbers? What kinds of extreme control measures would have to be adopted—and at whose expense?

   Response: The TMDL is an objective technical analysis that identifies the maximum load of the impairing substance that the waterbody can assimilate and still meet the water quality criteria. The primary purpose of a TMDL is to provide planning information to direct implementation activities. TMDLs also generate information that may be used to refine the overall water resource management framework under the Clean Water Act. For example, bacteria TMDLs that have been developed across the nation are revealing, and quantifying, the contribution of wildlife sources. Current bacteria water quality criteria do not distinguish among sources, despite scientific evidence that the relative risk to public health varies by source. The mounting evidence generated by bacteria TMDL analyses has motivated a national dialogue about bacteria criteria development.

   The purpose of the MPR scenario mentioned above is to determine whether applying maximum practicable reductions (i.e., those that are technically feasible to implement) will result in achieving the goals of the TMDL. When that is shown not to be the case, as in three of six subwatersheds of the Liberty Reservoir basin, the second scenario is

applied in order to quantify the additional reductions needed beyond the MPRs. The results of this quantitative analysis in the Liberty Reservoir TMDL, requiring very high reductions in order to meet water quality standards in certain subwatersheds, reflect the issues under discussion in the ongoing national dialogue on bacteria water quality criteria.

The Assurance of Implementation section of the TMDL report proposes implementing the maximum practicable reductions as the initial stage of a long-term process. Additional information generated during this first stage of implementation will support future decisions regarding the feasibility of achieving the existing criteria. During that time, it is likely that the national dialogue on bacteria criteria will also advance. In the interim, MDE will work with local governments on common sense actions. These will include ways of achieving bacteria reductions as a concomitant benefit of nutrient and sediment controls, and strategies for protecting human health, which is the ultimate purpose of the bacteria criteria.

b) The second area of concern stated in the RTG letter is the potential of this TMDL to divert efforts to reduce phosphorus and sediment loads as required by the 2005 Reservoir Watershed Management Agreement which is committed to reduce annual sediment and phosphorus loadings to all three of the Baltimore Metropolitan Reservoirs. The RTG questions whether it is possible to begin implementation of ambitious new efforts to reduce bacterial inputs to the streams in the Liberty watershed (which apparently do not have significant effects on Liberty Reservoir water quality) without being forced to diminish or compromise our ongoing efforts to significantly reduce phosphorus and sediment inputs (with their well-documented in-lake effects) to all three reservoirs. RTG's concerns relate directly to the Assurance of Implementation presented in the TMDL report.

Response: The State is sensitive to the concern that TMDLs could potentially disrupt local programs and has voiced this awareness since the late 1990s. MDE believes it is possible to start efforts to reduce bacteria inputs to the streams and we urge local governments and the agricultural community to make use of implementation methods that reduce bacteria as a concomitant benefit of nutrient and sediment reduction activities. This includes proper management of animals and their waste, stormwater management practices involving filtering and settling, programs to identify and correct illicit connections to storm sewers, and programs to manage failing sewage infrastructure. In addition, some nutrient management plans, although not directly linked, will help reduce bacteria loads (e.g., management of manure application practices). We also urge local governments to identify any sources of bacteria that pose a particularly high human health risk and thus warrant special attention (e.g., popular outdoor areas that are subject to improper human waste disposal due to lack of bathroom facilities).

4. The remaining comments are from RTG member Steve Stewart of Baltimore County (Department of Environmental Protection and Resource Management) and were provided as an attachment to the RWMP/RTG letter. These are more technical and specific comments on the analysis and assumptions of the TMDL.

a) The first comment concerns the methods used to calculate (estimate) the annual bacterial load entering the so-called "downstream subwatershed". The calculation of the load for the "downstream subwatershed" was based on an average of the loads for the five upstream subwatersheds, as were the BST results. A number of issues are raised regarding this method of calculation.

- The loads should be based on monitoring data, which is lacking from what is called the downstream subwatershed.

  Response: MDE field staff monitored at one additional site located downstream of the Liberty Reservoir, but measurements at that station are not representative of the water quality of the upstream areas because the reservoir acts as a sink for bacteria. Data from that station were not used in the TMDL analysis. MDE conducts water quality monitoring to provide as much data as possible in support of TMDL development projects. Sometimes field staff are unable to collect data in a subwatershed for various reasons (time and budgetary constraints, limited accessibility, etc.). Where data are not available, MDE uses other methods to develop TMDL analyses, such as literature values, data from nearby watersheds, or estimating values using statistical approaches. Based on EPA guidance (40 CFR 130.2) "load allocations are best estimates of the loading, which may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading." For the Liberty Reservoir fecal bacteria TMDL, MDE believes that using data from monitoring stations located within the watershed under study was the best appropriate technique to estimate loads in the unmonitored areas.

- Each of the upstream subwatersheds discharges directly to the reservoir or near the reservoir, which is not impaired by fecal bacteria. They do not discharge to the downstream subwatershed and therefore, using an average of the five upstream subsheds is not applicable.

  Response: See response to comment above. In addition, the statement "they do not discharge to the downstream subwatershed" is only partially true. Most of the west side of the "downstream subwatershed" is located downstream of the monitored sites. The eastern area of the watershed consists of many small streams; collecting representative data in that area would be prohibitively expensive. MDE believes that averaging the five upstream watersheds is appropriate in a watershed of the size and the relatively uniform characteristics of the Liberty Reservoir watershed.

- The land use characteristics for the downstream subwatershed are significantly different than any of the upstream subwatersheds. It has a significantly higher percentage of forest and lower percentages of agriculture and pasture. Therefore, it cannot be assumed that the upstream subwatershed fecal bacteria monitoring results are representative of the downstream subwatershed, nor that the distribution between the different fecal bacterial sources is the same.

Response: For bacteria load calculations, similarity of land uses and land use proportions from one subwatershed to another is not necessarily a reliable indicator of a similarity in loads. Unlike sediment or nutrients, bacteria loads are not calculated in Maryland TMDLs based on land use, but rather on BST, flow data and average geometric mean concentrations from monitoring data. Land use is only one of a number of variables that may impact predicted loadings from one subwatershed to another; one would also have to consider population densities, livestock numbers, number of septics, etc., in attempting a comparison of the estimated load for a monitored watershed to that projected for an unmonitored watershed. Even consideration of such variables, though, may not result in similar loads between two watersheds, as bacteria are so unpredictable. As an example of this unpredictability, a comparison of two other subwatersheds in the area, BEA0016 and MDE0026, reveals a similar land use distribution; however, their bacteria concentrations are very different - 153 MPN/100ml vs. 402 MPN/100ml (278 MPN/100ml vs. 607 MPN/100ml during the seasonal period). Given such variability in fecal bacteria loads, averaging the loads from five monitored subwatersheds to estimate a load for the unmonitored subwatershed is both reasonable and appropriate.

- The land use characteristics of the downstream subwatershed most closely approximate the Little Morgan Run subwatershed. If fecal coliform loads and sources are to be applied to the downstream subwatershed without monitoring data, then the Little Morgan Run values should be used. These values are the lowest of the five subwatersheds that were monitored.

  Response: As explained in the previous response, given the variability of bacteria, and lacking any direct correlation with land use proportions, using an average of the loads from several monitored subwatersheds to project an estimated load for the "downstream" subwatershed is the best approach, since averaging generates a sort of middle ground, and "evens out" several different load contributions from the various subwatersheds within one watershed.

- The results of this change in loading rates to correspond to the loading rates for Little Morgan Run would be the ability to achieve the reduction necessary using the Maximum Practicable Reduction Scenario, and not to have to resort to the second scenario of reductions, higher than MPRs.

  Response: Since land use is not the basis for calculating the loads, it should not be the basis for a comparative calculation of a load for the "downstream" subwatershed, as Mr. Stewart proposes in recommending estimating that load based on the Morgan Run subwatershed (because it most closely resembles the land use characteristics of the "downstream" subwatershed). While using the Little Morgan Run loading rates may result in reductions for the downstream subwatershed that are achievable through the Maximum Practicable Reduction scenario, it is not a reliable method for estimating more accurate loads and reductions in the unmonitored subwatershed.

b) Mr. Stewart's second comment is provided in full, as follows:

- The samples collected 12/17/2003 exhibited the highest concentration by far for all stations, with the exception of BEA0016. While these samples were collected during the highest daily flow recorded, the samples from 11/19/2003 were close in flows to that date and yet exhibited much lower sample results. Is this a realistic result; could there have been a QA/QC problem? A re-analysis based on removal of the sampling on this date should be conducted to estimate the effect of this outlier. While the geometric mean calculation provides some buffering of the effects of extreme values, it does not remove the effect.

  Response: As was explained in the responses above, bacteria concentrations in water exhibit a high degree of variability. They occur in concentrations that vary widely (i.e., over orders of magnitude) because bacteria reproduce and die off in a non-linear fashion as a function of many environmental factors, including temperature, pH, turbidity (UV light penetration) and settling. In all of the bacteria TMDLs MDE has developed, this degree of variability has always been present. MDE does not detect evidence of a QA/QC problem in this instance; therefore, the high values referred to should not be discarded from the data set for arbitrary reasons.

  For illustration purposes only, we estimated the loads again, removing the 12/17/03 samples, and the results are as follows:

- There is no effect in the percent reductions, because reductions are driven by seasonal concentrations (samples between May 1st and September 30th).

- Loading caps will be reduced (although not significantly) because the percent reductions will be applied to lower annual baseline loads (baseline loads are estimated using all year samples).