FINAL

Comment Response Document
Regarding the Phosphorus and Sediment TMDLs for Centennial Lake
Howard County, MD

Introduction

The Maryland Department of the Environment (MDE) has conducted a public review of the proposed Total Maximum Daily Loads (TMDLs) for nitrogen and sediment loadings in Centennial Lake. The public comment period was open from November 15, 2001 to December 14, 2001. MDE received one set 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
Howard Saltzman	Howard County Department of Public Works; Bureau of Environmental Services	December 14, 2001	1 through 21

Comments and Responses

1. The commentor noted that the Executive Summary and Section 2.1 General Setting and Source Assessment of the document state that the lake lies on the Little Patuxent, but it actually lies on a tributary to the Little Patuxent.

   Response: MDE has incorporated the commentors' suggestions.

2. The commentor noted that the Executive Summary should be corrected to state that the WQIA is the second, not the third, factor that will provide assurance that this TMDL will be implemented.

   Response: MDE has incorporated the commentors' suggestions.

3. The commentor noted that Section 2.1 General Setting and Source Assessment of the document should state that the lake is owned by Howard County and managed by the Department of Recreation and Parks, not the Department of Public Works. The commentor additionally noted that the same section should state that the major tributary is Clark's Creek.

   Response: MDE has incorporated the commentors' suggestions.

4. The commentor noted that Figure 1 should clarify the lake watershed within the larger 12-digit watershed shown, and should also note that the 8-digit location map shows the location of the Little Patuxent River watershed, not the full Patuxent River watershed.

   Response: MDE has clarified the figure.

5. The commentor questioned why the water quality sampling data from 2001 in Appendix A is not discussed in Section 2.2 or in Appendix A.

   Response: The 2001 physical data presented in the draft document sent out for review was all that was available at the time. A more complete set of data from these sampling events has since been made available after laboratory analysis and QA/QC. Table A-1 (in Appendix A) has been augmented, and a discussion has been included in the TMDL text.

6. The commentor noted an inconsistency regarding how the ecoregion in which the lake is located is identified in Sections 2.1 and 3.0.

   Response: MDE has eliminated the inconsistency and clarified the document.

7. The commentor stated that justification should be provided for using a target that is associated with lakes experiencing eutrophication, when the TMDL is being established to prevent impairment associated with eutrophication.

   Response: The TMDL establishes an endpoint that is designed to prevent impairment associated with eutrophication. The chlorophyll *a* endpoint selected for Centennial Lake— a maximum of 20 µg/l, which corresponds to approximately 60 on the Carlson's Trophic State Index (TSI)—is in the lower range of eutrophy, which is an appropriate trophic state at which to manage this impoundment. This range, while associated with increased algal levels compared with mesotrophic conditions, is not associated with frequent, severe algal blooms, scums and fish kills. Additionally, the Centennial Lake supports a warm-water fishery, and moderate degrees of eutrophication are appropriate for the sustenance of the fishery.

8. The commentor stated that the TMDL document should clearly explain what target conditions represent attainment of water quality standards for sediments. Additionally, the commentor suggested that the TMDL document link the sediment load to the instream conditions (to sediment-associated impairments) and justify that determining the sediment loading capacity based on the phosphorus capacity will actually result in protecting uses currently impaired by sediment.

   Response: Selecting an endpoint to represent attainment of standards is difficult in the case of sedimentation. The challenge is to select a rate of sedimentation

that is reasonable, recognizing that a significant amount of sedimentation is inevitable. Selecting the endpoint is influenced by the designated use of the impoundment (*e.g.*, public water supply, flood control, power generation, or recreation), and the difference between costs of maintaining the designated use by either occasional dredging or preventing siltation. In the case of Centennial Lake, the use is limited to recreation and flood control.

It is commonly accepted that sediment loading rates are reduced as a result of controlling phosphorus loads. This is because sediment controls are implemented to control phosphorus, which is bound to sediment. Upon establishing the phosphorus TMDL, we posited the question, "will the concomitant reduction in the sedimentation rate be reasonable for maintaining recreational uses of the lake?" The concomitant sedimentation rate is estimated to result in preserving about 20 - 69% of the lake's design volume over a period of 100 years. We deem this sedimentation rate to be reasonable, and generally consistent with sedimentation rates documented in other approved sediment TMDLs. Examples are shown in the table below.

Table 1.

Volumetric preservation of various impoundments under sediment TMDL conditions.

TMDL	VOLUMETRIC PRESERVATION (100 year time span)
Centennial Lake	20% - 69%
Urieville Community Lake (MD)	40%
Tony Tank Lake (MD)	10% – 62.5%
Hurricane Lake (WV)	25%
Tomlinson Run Lake (WV)	Silted in

9. The commentor requested clarification regarding the origin of the outflow estimate of 4,877 acre-feet/year, given that this number is cited as an estimate in one section of the document but is referenced to a Department of Natural Resources source in another.

   Response: The cited discharge of 4,877 acre-feet/year is an estimate. MDE has eliminated the inconsistency and clarified the document.

10. The commentor noted a discrepancy concerning the estimated residence time stated on page 12 (36.5 days) and the residence time used in the calculations presented in Appendix A (38 days).

    Response: The correct hydraulic retention time is 38 days, which is rounded to approximately 0.1 yr. This was converted back to 36.5 days. The rounding error did not contribute to any analytical errors. MDE has eliminated the inconsistency and clarified the document.

11. The commentor stated that the TMDL document does not clearly explain how the phosphorus loading limit was determined based upon the chlorophyll a target of 20 µg/l and a TSI of 60, given that the Vollenweider Relationship does not directly include either of these parameters as a variable.

    Response: The two-tiered approach (using the Vollenweider Relationship and the Carlson's TSI) is necessary for exactly the reason the commentor describes. The Vollenweider Relationship is useful for describing the trophic state of a lake based on phosphorus loading rates. However, the Vollenweider Relationship only fixes a lake's trophic state within one of three broad categories—oligotrophic, mesotrophic or eutrophic. It does not facilitate the targeting of an endpoint other than at the boundary of one of these three categories. The Carlson's TSI allows the greater flexibility of establishing a numeric, quantifiable endpoint at any specified point across the spectrum of lake trophic state.

12. The commentor questioned why the text in Section 4.4 does not indicate the current TSI.

    Response: As described in the response to Comment 11, the Vollenweider Relationship describes the trophic state of a lake based on phosphorus loading rates—reliable estimates of which are readily available. The Carlson's TSI, on the other hand, relates measured, in-lake parameters (total phosphorus, chlorophyll *a* and Secchi depth) to the lake's trophic state. Such parameters, especially nutrient concentrations and light penetration, may fluctuate widely in response to meteorological events and other transient phenomena. It is therefore of questionable value to assign a TSI to a lake based on limited data that may not be sufficiently representative of the lake's overall condition. When using the TSI to establish an endpoint, this issue should be moot, since the timing and circumstances of data collection may be controlled, and professional judgement may be exercised in its interpretation and application.

    Strictly for purpose of comparison, an estimated current TSI may be computed using loading rates and the lake's annual discharge. This yields a TSI of 69 for Centennial Lake.

13. The commentor noted a discrepancy between the symbols used in Figure 5 and the description of what the symbols represent. By contrast, the intent of the circle used in Figure A1 is not explained.

    Response: MDE has clarified and standardized the figures.

14. The commentor stated that the explanation of the dissolved oxygen (DO) assessment in Section 4.5 appears to be incomplete, as the text indicated as "outlined below" is not.

    Response: Hypolimnetic dissolved oxygen saturation, as a function of a lake's trophic status, inherently incorporates Sediment Oxygen Demand (SOD) and Carbonaceous Biochemical Oxygen Demand (CBOD). These parameters are thus listed without unnecessary explanation. In fully-mixed lakes, these processes must be addressed as individual components of the overall lakewide oxygen budget. In Centennial Lake, the epilimnion meets State DO standards, whereas the hypolimnion, during summer thermal stratification, does not. Hence, the lakewide DO issue is addressed in the context of Maryland's interim interpretation of DO standards in thermally stratified lakes. The TMDL document is reworded to clarify the issue.

15. The commentor observed that the average daily phosphorus load stated on page 16 appears to be low.

    Response: The average daily phosphorus load should be 1.8 lbs/yr. MDE has corrected the error.

16. The commentor noted an apparent error in the following calculation (Page A5): "2,178,000 ft^2 x 0.093 m^2/ft^2 = 202,342.8 m^2." The commentor noted that the product of the two numbers is actually 202,554.

    Response: MDE uses unit-conversion software that extends conversion factors up to eight decimal places—*i.e.*, one m^2 = 0.09290304 ft^2. Using this conversion factor, the calculated total of 202,342.8 m^2 is accurate. The conversion factor is rounded to three decimal places for clarity. No significant change in any analyses would have resulted from this rounding difference.

17. The commentor questioned which of the two phosphorus loading rates cited in the document is correct.

    Response: The correct phosphorus loading rate on developed land is 0.52 lbs/acre-year. The inaccuracy was in the document only; the analyses were not affected. MDE has corrected the error.

18. The commentor stated that a discussion regarding the appropriateness of using streamflow records to estimate outflow from a lake should be included in the "Flow Estimation" section of Appendix A. The commentor also questioned whether it is correct to assume that the lake is at steady-state with no measurable losses (*e.g.*, evaporation).

    Response: In the absence of comprehensive, accurate and representative measured flow or discharge data from a lake, MDE estimated the discharge based on the best readily available data. Given the short hydraulic retention time of the lake, the contribution of pan evaporation to its overall hydrologic budget is insignificant.

    The flow estimation methods used are those of Carpenter, 1983. The explanation of the methodology has been augmented and clarified in the TMDL document.

19. The commentor noted that no explanation is given as to why an exponent value of 0.7 was used in calculating the flow estimation on page A6.

    Response: The flow estimation methods used are those of Carpenter, 1983. The exponent was determined empirically for several geographic regions in Maryland; Centennial Lake lies in the region for which 0.7 is the applicable exponent. The issue has been clarified in the TMDL document.

20. The commentor questioned how the existing sediment loads from each land use presented in the "Estimating the Sediment TMDL" section of Appendix A were determined.

    Response: Existing sediment loads were estimated using loading coefficients from the Chesapeake Bay Program Watershed Model, Phase 4.3 (segment 340). The TMDL has been clarified to reflect that.

21. The commentor noted a discrepancy between the referenced source of the land use information cited in the Technical Memorandum and the information on page 1 and Figure 2 in the main document.

    Response: The land use data are from Maryland Department of Planning (1997). The Technical Memorandum has been corrected.

References Cited:

Carpenter, David H. 1983. Characteristics of Streamflow in Maryland. Maryland Geological Survey Report of Investigations No. 35.

Maryland Department of Planning, 1997.