Tetra Tech Responses to Busseron Creek Comments
July 7, 2008

Comment: Another overarching concern with the data used in TMDL development involves the flow duration curve development. The USGS gauge on Busseron Creek was inactive between December 2, 2003 and May 2, 2007, which includes the time that the water chemistry was sampled. The flow during this time period was estimated from nearby Mill Creek. The draft TMDL says that this is explained in Appendix G, which is not included in the draft. Because the cited Appendix G is not included in the draft TMDL, the accuracy of the streamflow analysis is impossible to assess. It is doubtful that the watershed characteristics and resulting flow regime of Mill Creek can be assumed to accurately depict those of Busseron Creek based on location alone. Because the streamflow data is the foundation for all subsequent TMDL calculations, the validity of all conclusions about stream impairment and maximum loads is questionable. Appendix G should be included with the draft TMDL.

Response: We regret that Appendix G was inadvertently not included with the original draft TMDL report. It is included with the revised draft report and shows that the characteristics of the Busseron and Mill Creek watershed are similar. For example, the primary land uses in both watersheds are crops and forest, both watersheds consist primarily of C soils with slow infiltration rates, and the flow gages drain similarly sized areas (236 square miles to 240 square miles). The concurrently measured flows are also similar, with approximately 74 percent of the variability in the Busseron Creek flows explained by the observed flows at the Mill Creek gage. The use of the Mill Creek flows to estimate the missing Busseron Creek flows is therefore considered reasonable. (We would also like to point out that flow data were not used to make any impairment determinations, as is implied in the comment. All impairment determinations were made based on either water chemistry or biological data collected within the Busseron Creek watershed.)

Comment: The flows for each subwatershed were derived using drainage area ratios as described on page 21. This assumes that the entire watershed has the same runoff characteristics. However, runoff depends predominantly on characteristics such as land use, land cover, and surface gradient, which are not accounted for in this analysis.

Response: Estimating flow volumes using drainage area ratios does assume there are similar runoff characteristics between the site with the observed flow data and the site without the data. Since observed flow data were available within the Busseron Creek watershed this is believed to be a valid assumption (i.e., the observed flows are being extrapolated back to sites that contribute to the flow observed at the gage). We acknowledge that this approach is subject to some uncertainty in upstream areas where there are unique characteristics, such as predominantly draining one type of land use or soil type. However, there would still be uncertainty in applying alternative approaches (e.g., rainfall/runoff modeling) to estimating flows in these locations.

Comment: Furthermore, it is evident that very little quality assurance / quality control checks were performed on the data. Dissolved aluminum data at Station 11 shows six dates below the detection limit (not listed), two dates measuring 58.6 µg/L and 66.8 µg/L, and one date showing 18,200 µg/L. Unless flow conditions were substantially different during this extreme measurement, it is obvious that it is an outlier and a result of either sampler or laboratory error. The data should undergo rigorous quality assurance and quality control analyses before it is used to make regulatory decisions.

Response: All data handling and processing conducted for the TMDL were done in accordance with the approved *Quality Assurance Project Plan for Development of Total Maximum Daily Loads (TMDLs) for the Busseron Creek Watershed in Indiana.* The referenced value of 18, 200 µg/L dissolved aluminum at Station 11 was retained in the analysis because (1) flow conditions were very high during this sampling event (10/17/2006) with flows estimated at the 6th percentile and (2) there were other high measurements of dissolved aluminum observed within the watershed (e.g., values of 9130, 9150, and 10,800). It should also be noted that Station 11 would have still been considered impaired even if this value had been discarded since several other observations exceeded the total aluminum target. The observed data also did not factor into the calculation of the loading capacity in any way.

Comment: The draft TMDL does not include any flow data to correlate with the water chemistry sample events (DNR or IDEM). There is also no discussion on how the field flow data was measured or estimated. Because this information is necessary to properly evaluate the flow duration curves and determine if the data collected is representative of a range of flow conditions, it should be included in the draft TMDL.

Response: The draft TMDL presents the estimates of existing daily loads by flow zone, thus providing a correlation to the flow conditions during which sampling occurred. The water quality data were primarily collected during mid-range, moist, and high flow conditions but with some data collected during low flow periods. No flow data collected by DNR or IDEM (if available) were used during development of the TMDL.

Commented [KK1]: I am not aware of any instantaneous flows measured by DNR or IDEM and did not use any during development of the TMDL.

Comment: Lastly, Appendix A shows the collected water quality data used in the analysis. For values below the detection limit, an "ND" is listed. However, the detection limits of these analyses are not presented. Furthermore, the values below detection are excluded from all statistical calculations (mean, median, maximum, minimum) in this section giving a misleading picture of the actual water quality.

Response: A table listing the detection limits was added to the revised Appendix B. In addition, impairment determinations were made based upon whether samples exceeded water quality standards and therefore are not affected by the calculation of means and medians. (Minimum and maximum values are independent of the treatment of detection limits.)