

July 30, 2015



Citizens for Pennsylvania's Future
610 North Third Street
Harrisburg, PA 17101-1113
P 717.214.7920 / 800.321.7775
F 717.214.7927
info@pennfuture.org
www.pennfuture.org

Sent Via Electronic Mail: berlin.lenka@epa.gov
(hard copy to follow)

Ms. Lenka Berlin
U.S. EPA, Region III, 3WP30
1650 Arch Street
Philadelphia, PA 19103

**Re: Draft Wissahickon Creek TMDL
Total Phosphorus TMDL for the Wissahickon Creek Watershed,
Pennsylvania (May 20, 2015)**

Dear Ms. Berlin:

Citizens for Pennsylvania's Future (PennFuture) submits these comments on the May 2015 draft *Total Phosphorus TMDL for the Wissahickon Creek Watershed, Pennsylvania* (2015 Draft TMDL) prepared by the U.S. Environmental Protection Agency (EPA), Region 3. The 2015 Draft TMDL is intended to supplement the nutrient portion of EPA's October 2003 *Total Maximum Daily Load For Sediment and Nutrients, Wissahickon Creek Watershed* (2003 Nutrient TMDL), which addressed the pollutants ammonia nitrogen, nitrate-nitrite, orthophosphate, and carbonaceous biochemical oxygen demand.

PennFuture is a public interest membership organization dedicated to creating a just future in which the environment, communities, and the economy thrive. One focus of PennFuture's work is to improve and protect water resources and water quality across Pennsylvania through public outreach and education, advocacy, and litigation. PennFuture has reviewed and commented on dozens of TMDLs prepared for Pennsylvania waters, including the EPA's January 2010 *Acid Mine Drainage TMDLs for the Kiskiminetas-Conemaugh River Watershed, Pennsylvania*.

1. It is appropriate for EPA to supplement the 2003 Nutrient TMDL in order to address the ongoing impairment of the aquatic life use by nuisance algal growth.

As the 2015 Draft TMDL explains, the 2003 Nutrient TMDL acknowledged that the dissolved oxygen (DO) endpoints¹ on which it relied might not be sufficient to address one

¹ At the end of the second full paragraph on page 2, the 2015 Draft TMDL incorrectly uses the word "maximum" instead of "minimum" in describing Pennsylvania's daily average DO criterion. As drafted, the passage in question also contains an extraneous "the" before the word "both." The passage should read: "the 2003 nutrient TMDL therefore was based on achieving and maintaining both the minimum and minimum daily average DO criteria (i.e., the surrogate nutrient endpoints)."

specific dimension of the impairment of the Wissahickon Creek watershed's aquatic life use: nuisance-level growth of algae in the streams. (2015 Draft TMDL, pp. 2-4) At the time, EPA lacked sufficient site-specific data to develop defensible instream nutrient endpoints directed specifically at eliminating nuisance algae growth. It sensibly chose to limit the 2003 Nutrient TMDL to the dimension of the impairment it could address immediately – low instream DO levels – while recognizing that additional TMDLs might be necessary if the pollutant load reductions required by the 2003 Nutrient TMDL to increase instream DO levels did not result in sufficient reduction in algae growth. After completing the 2003 Nutrient TMDL, EPA turned to collecting the data and performing the analysis necessary to address the remaining, algae-related aspect of the impairment. The 2015 Draft TMDL is part of EPA's ongoing, nationwide efforts to advance the science and the regulatory mechanisms for alleviating nutrient impairments of waterways and water bodies.

Addressing the algae-related aquatic life use impairments in the Wissahickon Creek watershed is reasonable and well within EPA's authority under Section 303(d) of the Clean Water Act, 33 U.S.C. § 1313(d). Indeed, given the data confirming that algae-related impairments persist despite the fact that the 2003 Nutrient TMDL has been in effect for nearly a dozen years the, EPA has an obligation to supplement the existing TMDL to address the ongoing, additional impairment.

2. EPA should supplement its justification for focusing the 2015 Draft TMDL exclusively on phosphorus.

Relying on data collected from streams across the Northern Piedmont ecoregion, the 2015 Draft TMDL starts from the premise that phosphorus is the limiting nutrient for the streams in the Wissahickon Creek watershed. Based on that fundamental premise, the 2015 Draft TMDL sets an instream endpoint only for phosphorus, and accordingly targets only phosphorus for loading reductions.

After consulting with scientists familiar with the Wissahickon Creek watershed and current monitoring data for the watershed, PennFuture concurs with EPA's decision to focus the 2015 Draft TMDL on phosphorus. The underlying premise of that decision, however, is to some extent called into question by one study included in EPA's collection of supporting documents, and in particular by that study's discussion of data suggesting that some streams in the Wissahickon Creek watershed may be nitrogen-limited. In the final TMDL, EPA's selection of the target nutrient(s) must be supported by an analysis that expressly addresses that watershed-specific data concerning the limiting nutrient(s).

A. A fundamental premise of the 2015 Draft TMDL is that phosphorus generally is the limiting nutrient in the Wissahickon Creek watershed.

The 2015 Draft TMDL is designed to achieve an instream average concentration (or "endpoint") for total phosphorus (TP) of 40 micrograms per liter ($\mu\text{g/L}$). EPA's selection of that endpoint is based on two reports prepared for EPA Region 3 by Tetra Tech, Inc., for the express purpose of recommending nutrient endpoints for use in the development of TMDLs applicable to streams in the Northern Piedmont ecoregion of Pennsylvania. The first report, prepared in

2007,² applied a multiple-lines-of-evidence framework to arrive at Tetra Tech's initial recommendation of endpoint TP concentration of 40 µg/L as an average during the growing season (April to October), the period of greatest risk for nuisance algal growth in streams. The second report, a "Follow-up Analysis" prepared in 2011 and finalized in 2012,³ updated one line of analysis based on EPA's publication of a revised guidance document in 2010, but confirmed the original result: "the recommended TP endpoint in the original report (40 µg/L) remains unaltered in the opinion of the authors."⁴ (Paul, et al., 2011, p. 25)

A premise of the two Tetra Tech endpoint reports was that most streams in the Northern Piedmont region are "phosphorus limited," meaning that the ratio of nitrogen to phosphorus (N:P ratio) is such that the growth of algae is dependent on the amount of phosphorus present in the stream. In that situation, reducing the amount of phosphorus will reduce the amount of algae present in the stream, while reducing the amount of nitrogen will have no effect on the amount of algae (at least until the N:P ratio is reduced to the critical levels of 16:1 (molar), or 7:1 by weight distinguishing phosphorus-limited streams from nitrogen-limited streams). The 2007 Tetra Tech report explained:

The traditional, critical N:P Redfield molar ratio is 16:1, values below indicating N limitation and those above, P limitation. Ratios have to be considered in relation to supply and become less meaningful as nutrient supplies exceed uptake capacity of streams. Even so, clearly more than 95 percent of the streams sampled in the northern piedmont region were P limited, relative to Redfield.

² Paul, M.J. and L. Zheng. 2007. Development of Nutrient Endpoints for the Northern Piedmont Ecoregion of Pennsylvania: TMDL Application. Prepared by Tetra Tech, Inc., Owings Mills, MD for United States Environmental Protection Agency, Region 3 (Nov. 20, 2007).

³ Paul, M.J., J. Robbani, L. Zheng, T. Rafi, S. Bai, and P. von Loewe. 2011. Development of Nutrient Endpoints for the Northern Piedmont Ecoregion of Pennsylvania: TMDL Application Follow-up Analysis. Prepared by Tetra Tech, Inc., Owings Mills, MD for United States Environmental Protection Agency, Region 3 (July 18, 2012). This report is cited as "Paul, et al. 2011," but the date of the "Final Draft" posted on the EPA Region 3 web page is "18 July 2012."

⁴ Section 6 of Tetra Tech's 2011/2012 Follow-up Analysis ("Data Analysis – Regression with Bins"), shows that for the most highly urbanized sites (referred to as "group 3 sites" in the report), the correlations between TP concentration and benthic macroinvertebrate metrics are insignificant. The report explains that for these more urbanized, "group 3" sites, the primary impacts on aquatic life appear to come from stressors other than nutrients, and as a result, scatterplots of data show that many "group 3" sites have poor biological metric scores notwithstanding their low TP concentrations. (Paul, et al., 2011, pp. 9-19) Given that the entire Wissahickon Creek watershed is considered an urbanized area as defined by the Bureau of the Census (2015 Draft TMDL, p. 32), most streams in the watershed presumably fall within "group 3," for which instream TP concentration is a weak predictor of the stream's aquatic life condition. The final TMDL should address this aspect of the data, expressly explaining why, despite the weak correlation between TP concentration and benthic macroinvertebrate metrics at urbanized monitoring sites, it is appropriate to establish an instream phosphorus endpoint to alleviate the impairment of the Wissahickon Creek watershed by nuisance algae growth.

Because these systems are not N limited, relationships between TN [total nitrogen] and response measures are questionable at best. The fact that N is not limiting also means that TN likely contributes less to use impairment for eutrophication in this region. Endpoints are best derived when clear connections to use impairment can be made.

Paul and Zheng. 2007, p. 26. Although the authors of the 2007 report “[could not] recommend an N target,” they did suggest possible endpoints for TN derived from the target concentration of 40 µg/L for TP by applying generalized TN:TP ratios.⁵ *Id.* at 26-27.

With respect to the issue of the limiting nutrient, citing the 2007 Tetra Tech report, the 2015 Draft TMDL states:

Endpoints are best derived when clear connections to use impairment can be made (Paul and Zheng 2007). EPA’s nutrient criteria development guidance recommends that a state adopt criteria for both causal variables (TN and TP) and both response variables (chlorophyll *a* and some measure of turbidity) to be fully effective for the prevention of eutrophic conditions.

However, controlling nuisance algal growths is often more cost-effective where one causal variable (nitrogen (N) or phosphorus (P)) is the limiting nutrient. Defining the limiting nutrient is the first step in identifying nutrient-algal relationships to control nutrient enrichment and algal growth (EPA 2000). *EPA’s analyses concluded that streams in the Northern Piedmont ecoregion are predominately P-limited; and, there was not a strong correlation between nitrogen and biological variables because the streams are not N-limited. The fact that N is not limiting* also means that TN likely contributes less to use impairment from eutrophication in this region (Paul and Zheng 2007).

2015 Draft TMDL, p. 12 (emphasis added)

Thus, an essential premise of the 2015 Draft TMDL is that phosphorus is the limiting nutrient for the streams in the Wissahickon Creek watershed. As presented in the 2015 Draft TMDL, that assumption is based on the condition that predominates in the Northern Piedmont ecoregion. Although PennFuture believes the assumption is valid, EPA should better justify it by supplementing the administrative record with a discussion of watershed-specific data concerning the N:P ratios in the streams of the Wissahickon Creek watershed.

⁵ Applying the average TN:TP molar ratio of 208:1 for reference streams in the Piedmont region to the 40 µg/L target for TP, the 2007 report derived an TN endpoint of 3.8 mg/L. The report went on to note that, while “consistent with other Piedmont Streams, the concentration of 3.8 mg/L “seems very high for TN, especially for export to an estuary.” Applying a lower ratio of 43:1 used by EPA, the 2007 report derived an alternative TN endpoint of 780 µg/L for TN. Paul and Zheng. 2007, p. 27. However, as discussed in Comment 2.B., below, the TN:TP ratios for streams in the Wissahickon Creek watershed are far lower than 43:1, and indeed are generally lower than traditional Redfield ratio of 16:1 (molar) and 7:1 (by weight).

B. By failing to analyze the evidence of possible nitrogen limitation in the Wissahickon Creek watershed, EPA has not adequately justified its decision to focus the 2015 Draft TMDL exclusively on phosphorus.

A third Tetra Tech report⁶ made available by EPA Region 3 as a supporting document for the 2015 Draft TMDL is cited in the 2015 Draft TMDL as *Evaluation of Nutrients as a Stressor of Aquatic Life in Wissahickon Creek, PA*, and by the short forms “Stressor Verification Study” and “Paul 2012.” (2015 Draft TMDL, p. 8) Section 1.1 of the 2015 Draft TMDL (“History of the Wissahickon Nutrient TMDLs”), briefly describes Tetra Tech’s two nutrient endpoint studies and the recommended “numeric endpoint of 40 µg/L TP for the Northern Piedmont Ecoregion of Pennsylvania to protect aquatic life uses.” (2015 Draft TMDL, p. 3) It then asserts that “EPA further ensured [the] appropriate application [of the recommended TP endpoint] to the Wissahickon Creek Watershed through a stressor verification analysis conducted in 2012.” (*Id.*)

In fact, one section of the Stressor Verification Study suggests that relying exclusively on an endpoint for TP may not be appropriate because of distinctive conditions in the Wissahickon Creek watershed. The Stressor Verification Study tests the hypothesis “that nutrients are a stressor on the condition of aquatic life in Wissahickon Creek, Pennsylvania” (Paul 2012, p. 6) by evaluating eight predictions arising from the causal model for such adverse impacts. In evaluating (and confirming) the second prediction – that elevated nutrient loads in the Wissahickon Creek watershed will alter N:P ratios from their expected levels – the text of the Stressor Verification Study states, in full:

The conceptual model also posits that enrichment in nutrients will likely also alter N:P ratios, which can alter competitive relationships among taxa that vary in their preferences for N and P concentrations and ratios. A survey of reference site N:P ratios in the Piedmont region yielded molar ratios of 184:1 (weight ratio of 83:1) which is above the traditional Redfield ratio of 16:1 (7:1 by weight) considered indicative of balanced growth and would indicate that the Piedmont is generally P limited (Paul and Zheng 2007), an observation also consistent with the general N:P ratios resulting from the Wadeable Streams Assessment (Herlihy and Sifneos 2008), which indicates reference site ratios of 25:1 (11:1 by weight), still indicative of P limitation.

N:P ratios in the Wissahickon were calculated *based on paired N and P data for 2005* and seasonally during the growing season (July, August, September). These indicated a diverse range of ratios (Figure 5). Seasonally, only two sites had ratios, by weight, above 7, *suggesting that most sites in this watershed were relatively N limited*, in contrast to reference sites. *As annual averages*, four sites exhibited values above 9, but *the majority still indicated more relative N limitation (greater P enrichment relative to N enrichment) when compared to reference sites*. This alteration in nutrient

⁶ Paul, M.J. 2012. Evaluation of Nutrients as a Stressor of Aquatic Life in Wissahickon Creek, PA. Prepared by Tetra Tech, Inc., Owings Mills, MD for United States Environmental Protection Agency, Region 3.

ratios relative to reference is additional evidence for enrichment in these watersheds, consistent with the prediction. *It is important to note that ratios, at such high nutrient concentrations, have reduced applicability in inferring true limitation since it is unlikely, at the nutrient concentrations observed, that either N or P are limiting primary producer growth.* The relative ratios, however, inform conclusions about the degree of relative enrichment and while both nutrients in this watershed were enriched relative to reference in this watershed, the Wissahickon exhibits greater relative P enrichment.

Paul 2012, pp. 14-15 (emphasis added throughout).

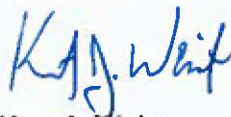
Although the 2015 Draft TMDL includes one paragraph summarizing the Stressor Verification Study (2015 Draft TMDL, p. 8), it does not even mention the Stressor Verification Study in its later discussion of the issue of the limiting nutrient: “EPA’s analyses concluded that streams in the Northern Piedmont ecoregion are predominately P-limited; and, there was not a strong correlation between nitrogen and biological variables because the streams are not N-limited.” (2015 Draft TMDL, p. 12) That statement in the 2015 Draft TMDL obviously clashes with the statements emphasized above in the in the passage quoted from the Stressor Verification Study, and in particular with the Study’s assertion that the growing season monitoring data for the Wissahickon Creek watershed “sugges[t] that most sites in this watershed were relatively N limited.” (Paul 2012, p. 14)

It is important to note, however, two specific points emphasized in the passage from the Stressor Verification Study quoted above. First, at least some of the data analyzed were from 2005, so efforts to reduce nutrient loading and other developments during the ensuing decade might have altered the N:P ratios in the Wissahickon Creek watershed. Second, the statement that “ratios, at such high nutrient concentrations, have reduced applicability in inferring true limitation since it is *unlikely*, at the nutrient concentrations observed, *that either N or P are limiting* primary producer growth,” suggests that the Wissahickon Creek watershed should be considered neither N-limited nor P-limited. If these qualifications factor into EPA’s decision to target only phosphorus, EPA should expressly explain those points in the final TMDL report.

In sum, because of the watershed-specific data concerning N:P ratios discussed in the Stressor Verification Study, EPA may not simply assume that the condition of P-limitation that predominates in the Northern Piedmont ecoregion similarly controls in the Wissahickon Creek watershed. In finalizing the TMDL, EPA should supplement its analysis of the question of the target nutrient(s) by expressly addressing the watershed-specific data discussed in the Stressor Verification Study.

Thank you for your consideration of these comments. You may reach me at 717-214-7925 if you have any questions.

Sincerely,



Kurt J. Weist
Senior Attorney

cc: Ashley Toy, PA TMDL Coordinator, EPA Region III (by electronic mail only)