December 15, 2015

Office of Water
U.S. Environmental Protection Agency
Via electronic mail: POTWOptiNP@epa.gov

The National Association of Clean Water Agencies (NACWA) appreciates the opportunity to comment on the draft document "Case Studies on Implementing Low-Cost Modifications to Improve Nutrient Reduction at Wastewater Treatment Plants" (*Case Studies Document*), dated August 2015.

The *Case Studies Document* provides an interesting and in-depth look at how some utilities have achieved modest reductions in total nitrogen (TN) with capital and operational costs much lower than would have been required if traditional biological nutrient removal had been deployed. The document, however, fails to discuss the relevance of this information in the broader policy debate on nutrients.

The Executive Summary briefly mentions this debate, stating that the "[t]he economic implication of regulating nutrients is often perceived as an impediment to progress." Cost is an important consideration, but it is not the only or even a major reason why nutrient controls are less prevalent than EPA might want. There are a host of other reasons why clean water utilities are concerned about nutrient controls and conclusions based solely on cost do not address the broader technical and policy issues involved. This is undoubtedly a technical guidance document, but without some additional discussion of the larger nutrient issue and how this information informs the broader policy dialogue, the importance of EPA's findings is diminished.

The approaches outlined in the *Case Studies Document*, as discussed further below, can often have significant technical and hidden, unaccounted for financial consequences for the treatment plant and the community it serves, which should be highlighted clearly in the document. The document should also acknowledge that many of the Clean Water Act-mandated control levels that are being put in place across the country are currently at – or will be set at – levels lower than what can be achieved consistently with the modifications described in this document.

National Association of Clean Water Agencies
1816 Jefferson Place, NW
Washington DC 20036-2505

p 202.833.2672 f 202.833.4657
www.nacwa.org · info@nacwa.org

Specific Comments

1. EPA did not conduct a nationwide survey on this topic, so the document should more accurately state that these opportunities for nutrient removal optimization exist, not that they "are common," as stated in the Executive Summary.

2. The *Case Studies Document* contains almost no reference to the loss of treatment capacity that often accompanies the type of plant modifications described in the document. The excess treatment capacity that allows for these modification was, for some communities, realized when large industries relocated, resulting in reduced flows to the treatment plant. But for many communities, excess treatment capacity has been planned and installed to ensure the community can continue to grow and remain economically healthy. In other words, that excess capacity has already been paid for by the community and to use that capacity without appropriately accounting for the lost investment, or at least flagging this as a major issue in the document, is a significant omission.

3. Most of the plants are relatively small and in some cases very small – less than 1 MGD in design flow. NACWA's technical experts understand that the modifications described in the document are much more feasible at smaller treatment plants. The document should discuss in more detail the limitations of applying these modifications to medium and large utilities.

4. The discussion of activated sludge in Section 2.3.1 on page 30 of the document was flagged by NACWA's members as a potential concern. Specifically EPA's expansion of the definition of activated sludge to include anaerobic and anoxic processes:

   > ***Although activated sludge is conventionally defined to include only aerobic processes, the term can be used to describe systems that include anaerobic and anoxic processes in addition to aerobic ones.***

   NACWA requests that EPA provide a citation to support this statement. Is this expanded definition generally agreed upon by the larger engineering community? NACWA's members are concerned that such an expansion of the definition for activated sludge could open the door to include nutrients as a part of secondary treatment contrary to EPA's previous decision not to do so.

5. On November 9, 2012, NACWA wrote to EPA to urge the Agency to deny a petition from the Natural Resources Defense Council (NRDC) to modify secondary treatment to include nutrient reduction. NRDC raised arguments in its petition that methods for removing nutrients, similar to those EPA is exploring in the *Case Studies Document*, support modifying the definition of secondary treatment to require limits on nitrogen and phosphorus. Although EPA appropriately denied NRDC's petition, NACWA's comments on that aspect of the petition – excerpted below – remain relevant today in the context of EPA's *Case Studies Document:*

   > ***Modest nitrogen reductions are possible with some potential for incidental phosphorus removal in activated sludge facilities through process changes and low-cost capital modifications. However, any***

reductions depend on the type of plant, wastewater characteristics, temperature, wet weather events and availability of excess aerated capacity.

Nitrification is the limiting factor in biological nitrogen removal processes, because nitrifying organisms have a much lower specific growth rate than heterotrophic organisms used for denitrification and BOD removal (Water Environment Federation (WEF) MOP-34). Furthermore, nitrifying organisms are more impacted by factors such as temperature, pH, and inhibitory chemicals:

- *Growth rate: Existing activated sludge plants were typically designed for BOD removal. BOD removal is mediated by heterotrophic organisms which have a much higher growth rate versus the autotrophic organisms that mediate the nitrification process. This difference drives the size of the aerobic bioreactors. For example, a system designed for only BOD removal might require only half the volume of a system designed for BOD removal with nitrification (Metcalf & Eddy, 4th Edition 2003). This means that if an activated sludge plant does not have excess aerated capacity it will be unable to reliably nitrify. If nitrification does not occur, nitrogen removal cannot take place.*

- *Temperature: Specific growth rate is affected by temperature. As the temperature drops the growth rate drops and as the temperature increases the growth rate increases. This is significant for treatment plants in colder climates. When a treatment plant is designed for BNR, temperature is taken into account and the aerated bioreactor volume is increased to accommodate these lower temperatures. This means that unless there is significant excess aerated capacity, the plant will not nitrify reliably and if nitrification is lost in cold weather, it may take several days to weeks to reestablish nitrification.*

- *pH: Nitrification reactions produce acid. Influent wastewater must have sufficient alkalinity measured as calcium carbonate ($CaCO_3$) to buffer the process or the pH will decrease. If the pH decreases to 6.5 or lower nitrification can be inhibited. If there is insufficient alkalinity, chemicals will have to be added, which means installation of a chemical feed system and purchase of chemicals. This then adds to the operating and maintenance costs of a treatment plant.*

If a treatment plant has the excess capacity as discussed above and can install any necessary equipment (e.g., chemical feed system), achieving an annual average total nitrogen concentration below 12 mg/L is still difficult for these modified plants in many cases. Ambient temperatures impact the biological treatment process and the modifications made to achieve nutrient reductions are similarly influenced by temperature. Wet weather, especially in cold weather conditions, can significantly reduce the amount of nitrogen removed even in well-designed biological nitrogen removal plants. Wet weather dilutes influent thus reducing the amount of readily biodegradable chemical oxygen demand (rbCOD) which is needed for denitrification. Significant wet weather events can result in washout of biomass with can reduce even BOD removal efficiency.

NACWA's information from the engineering community indicates that such process modifications and retrofits are increasingly being used and are helping to achieve reductions in nutrient levels. The

> ***engineering community has done a tremendous job at finding ways for communities to more cost-effectively meet water quality based effluent limits where local water quality demands it. But such retrofits have their limitations. In addition to the technical limitations and considerations described above, a more highly-trained staff is required for biological nutrient removal facilities and more laboratory testing is also required. In addition, if a treatment plant uses excess plant capacity for nitrogen removal, then that excess is not available for future growth within the community and additional costs would be incurred to expand the facilities capacity.***

NACWA appreciates the opportunity to comment on the *Case Studies Document* and welcomes a continued dialogue with EPA on these issues. Again, the information presented in the document is insightful and should be shared with the clean water community. However, the report needs to be appropriately qualified by the limitations of these modifications, the negative impacts on capacity that they can have, and the reality that these modifications may not be sufficient to meet the very stringent nutrient limits that often result from the water quality-based elements of the Clean Water Act.

Sincerely,

Chris Hornback
Chief Technical Officer