



The State of New Hampshire
Department of Environmental Services



Robert R. Scott, Commissioner

October 23, 2019

Ralph Abele, Chief, Water Quality Standards Section
EPA New England, Region 1
5 Post Office Square - Suite 100
Boston, MA 02109-3912
VIA email

Re. Response to July 3, 2019 letter requesting the sound scientific rationales for the amendments to State water quality standards (transmitted via email)

Dear Mr. Abele,

NHDES provides the following in response to your letter dated July 3, 2019 requesting the sound scientific rationales for the amendments to State water quality standards in RSA 485-A:2 and RSA 485-A:8,II, regarding Dissolved Oxygen (DO) criteria and the river flow to be used establishing nutrient effluent limits in wastewater discharge permits.

NHDES has had discussions with the state legislators who proposed the original bill that struck dissolved oxygen percent saturation from New Hampshire's RSA 485-A:2 and stipulated that neither the 7Q10 nor any equally low flow may be used in establishing nutrient effluent limits in wastewater discharge permits per their changes to RSA 485-A:8, II. During that meeting on August 6, 2019, representatives of the communities that requested the legislative change, the legislators that proposed the bill and NHDES had a lengthy discussion about the water quality standards process. These conversations are ongoing but many of those present at the discussion appeared to understand that a request to change that legislation may be desirable. Those discussions are ongoing and subject to the timeframes and processes of the NH General Court.

Regarding the 7Q10 issue, NHDES is in the process of creating an alternative framework for nutrient effluent permitting that will include a numeric target and flow, guidance on modeling, and a description of other approaches for different situations. This guidance will eventually replace or augment the 7Q10 approach that was previously described in administrative rule and approved by EPA. Given the need for public participation and legislative input into that action, NHDES will need additional time to bring that proposal to EPA.

Regarding the dissolved oxygen saturation issue, NHDES offers the following information. In an effort to aid NHDES' support of the removal of the dissolved oxygen percent saturation from the state's water quality standards, Clifton Bell of Brown and Caldwell provided text to NHDES. The portion of Mr. Bell's text that is pertinent to the discussion about dissolved oxygen saturation is provided here;

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Technical Justification for Removal of NH'S Percent DO Saturation Criteria

EPA has asked DES for the technical basis for removal of the minimum 75 percent saturation dissolved oxygen (DO) criterion for Class B waters. EPA specifically cited a concern that “the removal of the percent saturation standard without the addition of more stringent concentration criteria to protect early life stages would not adequately protect the State’s aquatic life designated use.” New Hampshire’s remaining DO criteria are consistent with 304(a) criteria for DO. As USEPA is aware, 304(a) criteria are a sufficient regulatory basis for state criteria, and so the simplest manner to respond to the request would be to refer USEPA to the 304(a) criteria and the associated technical support document (USEPA, 1986). However, we offer additional explanation here for the purposes of clarity and detail. The technical justification of the removal of the minimum DO percent saturation consists of two major parts: (1) percent DO saturation is neither a necessary nor preferred metric for expression of DO-related criteria; and (2) NH’s existing DO concentration criteria are fully protective of aquatic life uses, including early life stages.

Percent DO saturation is neither a necessary nor preferred metric for expression of DO-related criteria. As USEPA is aware, USEPA has not promulgated 304(a) criteria for percent DO saturation, and EPA has approved the water quality standards of many states without DO percent saturation criteria. Moreover, USEPA has correctly pointed out that concentration is a superior metric for expression of DO-related criteria. As stated by USEPA (1986):

Expressing the criteria in terms of the actual amount of dissolved oxygen available to aquatic organisms in [mg/L] is considered more direct and easier to administer compared to expressing the criteria in terms of percent saturation. Dissolved oxygen criteria expressed as percent saturation...are more complex and could often result in unnecessarily stringent criteria in the cold months and potentially unprotective criteria during period of high ambient temperature or at high elevations.

Since the publication of the 1986 USEPA DO criteria, there are been various sophisticated re-evaluations of DO criteria that have confirmed the utility of concentration and not involved the use of percent saturation criteria. Examples include USEPA (2000), USEPA (2003), and Pennsylvania DEP (2013). This finding has been further confirmed by experts consulted through NH’s Water Quality Standards Advisory Committee, as part of NH’s ongoing efforts to evaluate goals for the Great Bay. As stated by Diaz (2017):

A dissolved oxygen (DO) criterion set at 75% air saturation is likely overly protective for almost all estuarine species that would utilize Great Bay...The use of DO saturation does complicate criteria application as DO saturation is primarily a function of temperature and salinity, with a minor effect from barometric pressure. Current literature (including EPA’s freshwater and marine DO criteria documents) would support the use of concentration-based criteria...

NH's existing DO concentration criteria are fully protective of aquatic life uses, including early life stages. NH's DO concentration criterion for Class B waters is an instantaneous minimum of 5 mg/L except for cold water fish spawning areas, which have seasonal criteria of 8 mg/L (instantaneous minimum) and 9.5 mg/L (7-day average). These values are exactly coincident with 304(a) dissolved criteria concentration promulgated by USEPA for the protection of early life stages. Specifically, USEPA (1986) cites 5 mg/L as the appropriate instantaneous minimum for protection of warm water early life stages, 8 mg/L as the appropriate instantaneous minimum for protection of cold water early life stages, and 9.5 mg/L as the appropriate 7-day average for protection of cold water early life stages. Considering the consistency with USEPA's own promulgated criteria for protection of early life stages, there is no technical basis for USEPA's concern that NH's criteria are not protective of aquatic life or early life stages.

As stated above, 304(a) criteria are a sufficient regulatory basis for state criteria, and NH refers EPA Region 1 to USEPA (1986) for the technical justification of the criteria. However, it should be emphasized that the 1986 USEPA criteria were set primarily based on chronic effects and thus have a very large margin of safety against acute effects, which would only occur at much lower concentrations. The criteria (including the minimum concentrations) were "based primarily on growth data and information on temperature, diseases, and pollutant stress". Minimum criteria to protect only against acute mortality during brief exposures would have been lower. For example, the USEPA (1986) literature review indicated that thresholds of acute impacts were as high as 1-3 mg/L for some sensitive freshwater warm water fish species. The freshwater limit to avoid acute mortality was cited as 4 mg/L, which included a margin of safety above the concentrations of acute impact. The minimum criteria for warmwater was recommended as 5 mg/L based on growth data, which provides an additional margin of safety against acute or short-term impacts. With this understanding, there is no need to derive additional criteria (or use percent saturation criteria) to protect against short-term DO excursions.

While dissolved oxygen percent saturation has been part of New Hampshire's water quality standards since 1947 (183:1 created Revised Law (R.L.) chapter 166.), Mr. Bell's text lays out that there is uncertainty in how New Hampshire's 75% daily average dissolved oxygen can be supported by 304(a) guidance and the water quality standards approval process provided by the Clean Water Act. Dissolved oxygen saturation is a good indicator of biological activity but a flawed water quality criteria (i.e. DO could be 0% at night and 150% during the day and still average 75%). Given that the DO concentration standard is well justified by EPA guidance and a large collection of scientific literature, and that NHDES is not proposing to change that standard at this time, there is no jeopardy to New Hampshire's designated uses by the elimination of the DO saturation standard. Furthermore, as shown in many 303d/305b reports from the state, New Hampshire takes water quality monitoring very seriously, has a robust strategy for assessing waters and is comprehensive in its integrated assessment.

I look forward to additional conversations with you and your staff about this response and am open to a meeting to discuss this at your convenience.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Ted Diers', written over a light blue horizontal line.

Ted Diers, Administrator
Watershed Management Bureau

cc. Bob Scott, NHDES Commissioner
Tom O'Donovan, NHDES Water Division Director
Ken Edwardson, NHDES Senior Scientist

References

- Diaz, R.J. 2017. NH Hampshire Marine DO Criteria Update. Letter to Dean Peschel, Feb 14, 2017. 8 p.
- Pennsylvania Dept. of Environmental Protection. 2013. Rationale for Development of Ambient Water Quality Criteria for Dissolved Oxygen – Aquatic Life Use. 13 p.
- U.S. Environmental Protection Agency. 1986. Ambient Water Quality Criteria for Dissolved Oxygen. EPA 440/5-86-003. 54 p.
- U.S. Environmental Protection Agency. 2000 Ambient Aquatic Life Water Quality Criteria for Dissolved Oxygen (Saltwater): Cape Cod to Cape Hatteras. EPA-822-R-00-12. 140 p.
- U.S. Environmental Protection Agency. 2003. Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll a for the Chesapeake Bay and Its Tidal Tributaries. EPA 903-R-03-002. U.S. Environmental Protection Agency, Region 3, Chesapeake Bay Program Office, Annapolis, MD.