

# CENTER FOR REGULATORY REASONABLENESS

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October 2, 2014

## VIA U.S. FIRST CLASS MAIL & E-MAIL

The Honorable Gina McCarthy, Administrator  
Mr. Chris Zarba, Director, Science Advisory Board  
USEPA Headquarters  
1200 Pennsylvania Avenue, NW  
Washington, DC 20460

**RE: Request for an SAB Peer Review of EPA Region I “Sentinel Approach” Used to Determine Numeric Nutrient Criteria for Estuarine Waters**

Dear Administrator McCarthy and Mr. Zarba:

The Center for Regulatory Reasonableness requests that the Science Advisory Board (SAB) convene a full peer review regarding a novel procedure, created by EPA Region I, to establish numeric nutrient criteria for estuarine waters (known as the “*sentinel approach*”). This *sentinel approach* is being actively implemented by the Region to impose “state of the art” nitrogen reduction requirements on municipal wastewater facilities in Massachusetts. It is also used to develop applicable water quality standards for setting stormwater management program requirements. The total cost associated with these new scientific methods easily will exceed \$1 billion in Massachusetts alone. Application of this method in other New England states would greatly increase the economic impact of this new procedure. As discussed below, use of this method constitutes a “highly influential scientific assessment” that should have undergone SAB review prior to its imposition on the regulated community. Because such procedures designed to ensure that scientific methods are sound were not followed, we request that SAB now undertake such a review.

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### **Description of Sentinel Approach and Basic Flaws in This Scientific Method**

The “sentinel approach” is serving as the basis for determining the estuarine nutrient criteria and for imposing stringent nitrogen limitations (3.0 mg/L TN) on communities discharging to the Taunton Estuary. The method is used to assert that a specific TN concentration is required, to attain dissolved oxygen water quality standards anywhere in the estuary, without any water quality modeling or consideration of any factors affecting DO conditions at a particular location. The Taunton permit “fact sheet” describes the methods, as follows:

To determine an appropriate threshold concentration, EPA applied the [sentinel] procedure developed by the Massachusetts Estuaries Project of identifying a target nitrogen concentration threshold, based on a location within the estuary where water quality standards are not violated, in order to identify a nitrogen concentration consistent with unimpaired conditions. This approach is consistent with EPA guidance regarding the use of reference conditions for the purposes of developing nutrient water quality criteria.<sup>1</sup>

Applying the sentinel approach, EPA identified an area in the open waters of Mount Hope Bay (a location outside of the Taunton Estuary and part of Narragansett Bay) with the fewest DO violations. EPA stated that Station MHB16, located at the southern end of Mount Hope Bay near the Sakonnet River tidal strait, always met the 5.0 mg/L minimum DO criterion over the observed time period. Based on observations, mean annual TN concentrations from 2004-2006 at Station MHB16 ranged from 0.45-0.50 mg/L. With no further explicit analysis or consideration of any physical, chemical or hydrological information influencing DO at the location, EPA selected Station MHB16 as the “sentinel” site and 0.45 mg/L as the TN criterion necessary to attain a 5 mg/l DO concentration at all Taunton estuary locations many miles away.

Contrary to Agency’s assertion, this is not a “reference condition” approach and does not reflect the type of more detailed analyses needed to produce a reliable “reference condition” criteria. The physical conditions (e.g., bathymetry, current velocity, light availability) at Station MHB16 were never shown to be comparable to the Taunton Estuary/River. In fact, they would be expected to differ significantly based solely on their markedly dissimilar locations in the estuary. Moreover, it is well recognized by the scientific community that ambient DO is influenced, directly and indirectly, by several physical, chemical, and biological factors that vary by location. Absent data and analysis of these major factors, there can be no confidence that meeting the TN concentration in one location will result in the same DO response as at Station MHB16. Moreover, using the “sentinel method”, it is not even apparent that the DO response at Station MHB16 is due to or controlled by the ambient TN level at that location. Clearly, other

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<sup>1</sup> Taunton Wastewater Treatment Plant Draft Permit No. MA0100897. At 29.

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variables influence DO in the waters nearest the sentinel station and setting TN limits farther up the Taunton River in this “sentinel site” approach has no valid scientific basis.

These concerns were reiterated in an independent review (Attachment 1) by Dr. Steven Chapra, a nationally recognized expert in nutrient impacts assessment:

There are a number of reasons why the sentinel method employed to come up with the nutrient criteria is fundamentally flawed and ultimately I have no expectation that meeting the ambient criteria chosen via this method will result in acceptable water quality throughout the system. First, it needs to be understood that this approach created to derive the Taunton permit requirements is novel and not specified as a scientifically defensible method for addressing DO-related problems in any published literature that I am familiar with in my 42 years of conducting water quality impact assessments. TN is not a pollutant that directly controls water column DO in estuarine systems. Therefore, as an initial point, the claim that simply controlling to achieve a specific TN level will produce a specific DO response, is simply a false and scientifically incorrect assumption.

Second, both the reference condition and the stressor-response approaches are typically based on data from a number of similar systems. Statistical techniques are then employed to determine the most likely value of the nutrient criteria that correlates with acceptable water quality, after making sure that the system locations and physical factors are similar. The use of multiple systems and screening to ensure similar habitat and physical conditions (hydrodynamics and hydrology), greatly increases the reliability that the resulting nutrient criteria is generally valid and not the result of an outlier. In contrast, the use of a single station by the present study without any documentation that the other locations of the estuary are similar in hydrology/hydrodynamics and other critical factors (e.g., stratification and sources of DO demand) provides little confidence that the oxygen objective will be met at all (or even any) locations in the system. This is precisely the type of simplified analyses that EPA’s Science Advisory Board informed the Agency was not sufficient or scientifically defensible in developing nutrient criteria and nutrient management approaches...

As is well documented in the literature, the oxygen at any estuarine location depends on a variety of factors including oxygen reaeration, depth, sediment oxygen demand, sediment-water exchange of nutrients, nitrification and denitrification, point source carbonaceous and nitrogenous loadings, degree of vertical mixing, horizontal transport from both upstream and downstream directions, algal productivity, hydrolysis, organic carbon and organic nitrogen loads from allochthonous sources in the watershed, etc., etc., etc. *The failure to evaluate and consider any of these factors renders the present assessment pure speculation, which is, in any event, demonstrably in error. TN could not possibly be the single factor controlling the DO regime in the Taunton estuary given the numerous non-nutrient factors known to influence this and other estuarine systems. [...]*<sup>2</sup>

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<sup>2</sup> Chapra, Steven. (4 Sept. 2014). Assessment of the Scientific Basis of the Taunton Wastewater Treatment Plant Draft NPDES Permit (MA0100897). (Emphasis added).

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The Science Advisory Board previously reviewed the use of somewhat similar scientific methods for setting nutrient criteria in stream environments.<sup>3</sup> EPA, however, never published any simplified methods applicable to estuarine environments. Apparently, the Agency now believes that it may simply “piggyback” on those prior reviews by claiming that this new method is simply an extension of a previously reviewed method. It clearly is not as confirmed by Dr. Chapra: “No published EPA guidance document on assessment of DO and nutrient conditions in estuarine settings indicates that this is an accepted method of analysis.” As this is a novel method which EPA has created for estuarine system assessment and nutrient criteria derivation, it too must undergo SAB review.<sup>4</sup>

### **Procedures Applicable to Determining the Need for SAB Review**

According to the EPA’s Peer Review Handbook, “[p]eer review is intended to uncover any technical problems or unresolved issues in a preliminary (or draft) work product through the use of independent experts [...] so that the final work product will reflect sound technical information and analyses.”<sup>5</sup> The fundamental principle underlying EPA’s Peer Review Handbook is that “all influential scientific and technical work products used in decision making will be peer reviewed.”<sup>6</sup> While regulations are not, in and of themselves, subject to peer review, “if a regulation is supported by influential scientific information or a highly influential scientific assessment, [e.g., ecological risk assessments, exposure assessments, weight-of-evidence analyses],<sup>7</sup> the underlying work product should be peer reviewed before EPA issues the proposed regulation.”<sup>8</sup> Likewise, a site-specific decision, such as permitting, is not itself “subject to peer review. [...] However, if a site-specific decision is supported by influential scientific information, or a highly influential scientific assessment, that work product should be peer reviewed.”<sup>9</sup> Thus, the regulatory vehicle used to implement a novel scientific approach does not control whether or not an SAB review should occur.

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<sup>3</sup> USEAP Science Advisory Board, April 2010 SAB Review of Empirical Approaches for Nutrient Criteria Derivation

<sup>4</sup> Section 304(a) also requires EPA to undertake a public review process for new criteria derivation methods – no such review has occurred in this instance.

<sup>5</sup> USEPA Science Policy Council, *Peer Review Handbook (3<sup>rd</sup> Ed)*, EPA/100/B-06/002, (hereinafter *Handbook*) § 1.2.1.

<sup>6</sup> *Handbook* § 2.2.2 (emphasis in original).

<sup>7</sup> *Handbook* § 2.2.4 (OMB defines highly influential scientific assessments as influential scientific information that “the agency or the Administrator determines to be a scientific assessment that:

- a) Could have a potential impact of more than \$500 million in any year, or
- b) Is novel, controversial, or precedent-setting or has significant interagency interest.”).

<sup>8</sup> *Handbook* § 1.2.10. *See also id.*, at § 2.2.10.

<sup>9</sup> *Handbook* § 2.4.14.

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**a. The “Sentinel Approach” constitutes “influential scientific information” or a “highly influential scientific assessment”**

To be “influential scientific information,” the regulatory program or policy position must meet at least one of eight requirements. The “sentinel approach” governing the Taunton Estuary permits meets *five of eight key criteria*:

- 1) Establishes a significant precedent, model, or methodology (*The method is being used to set all permit requirements in a major estuarine system and is asserted by EPA Region I as a scientifically defensible method, allowing for its use in any other estuarine setting.*);
- 2) Is likely to have an annual effect on the economy of \$100 million or more, or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, Tribal, or Local governments or communities (*This approach is being applied to estuaries in EPA Region I, including Narragansett Bay. Communities will incur great costs (easily in excess of \$1 billion) to achieve compliance and future growth will be frozen since further TN reductions will be difficult if not impossible to achieve given “limits of technology” conclusions reached based on this assessment method. User rates are anticipated to increase significantly to achieve the effluent limitations imposed based on this method.*);
- 3) Addresses significant controversial issues (*Uniform nutrient criteria for estuaries, which EPA abandoned for the State of Florida, is a highly controversial topic as evidenced by the litigation filed in similar situations, prior SAB reviews, and extensive public interest in the derivation of nutrient criteria.*);
- 4) Focuses on a significant emerging issue (*How to properly set uniform estuarine nutrient criteria to attain DO objectives is a matter yet to be assessed by EPA.*);
- 5) Considered an innovative approach for a previously defined problem or methodology (*Claims that the sentinel approach is considered acceptable as a reference condition method when it relies on a single data point with no consideration of other relevant factors, consideration of which the SAB has previously noted is essential, is plainly innovative, if not unprecedented.*).<sup>10</sup>

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<sup>10</sup> Handbook § 2.2.3.

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### b. The “sentinel approach” has “major impact”

The process for determining which EPA technical procedures are subject to peer review also considers whether the scientific method will have a “major impact,” defined as “hav[ing] applicability to a broad spectrum of regulated entities and other stakeholders, or that it will have narrower applicability, but with significant consequences on a smaller geographic or practical scale.”<sup>11</sup> In addition, peer review of the environmental models EPA uses to inform its regulatory decisions is generally appropriate.<sup>12</sup> Again, the “sentinel approach” plainly meets these descriptions as it creates water quality criteria applicable to entire estuarine systems, with “a potential impact of more than \$500 million in any year.”<sup>13</sup> It also claims that complex DO conditions may be assessed and resolved simplistically, which has never been claimed by any prior EPA nutrient criteria development document.<sup>14</sup>

In the recent past, comparable situations have resulted in SAB conventions or formal peer reviews. In 2009, EPA convened an SAB to review similar draft guidance entitled *Empirical Approaches for Nutrient Criteria Derivation* (EPA, August 17, 2009) that was intended to create nutrient criteria for streams.<sup>15</sup> This guidance recommended using simplified empirical methods with no required demonstration that the nutrient was actually causing the system response of concern. Even those documents, however, did not claim DO conditions in estuaries could or should be resolved using simplified methods. In 2013, New Hampshire DES agreed to a peer review of its 2009 *Numeric Nutrient Criteria for the Great Bay Estuary* that EPA Region I provided the technical expertise to develop. As part of that criteria development, EPA had supported using simplified statistical methods to assess nutrient-related DO impacts in tidal rivers. This 2009 DES report also relied upon simplified statistical methods while failing to complete a confounding factors analysis or to adequately confirm “cause and effect.” Both of the ensuing peer reviews determined that the disputed agency criteria derivation methods and guidance for developing nutrient criteria were not scientifically defensible.<sup>16</sup> Although the approach with respect to creating a direct TN:DO relationship was roundly criticized, EPA has, once again, sought to create such a relationship. These latest methods created by EPA Region I, as noted by Dr. Chapra, employ even less robust assessments of the relevant factors influencing

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<sup>11</sup> *Handbook* § 2.2.3.

<sup>12</sup> *Handbook* § 2.2.16.

<sup>13</sup> See *Handbook* § 2.2.4, fn 5, *supra*.

<sup>14</sup> *Id.*; see also *Handbook* Appendix B, “Office of Management and Budget Final Information Quality Bulletin for Peer Review,” at B-8 (“[t]hese assessments include, but are not limited to, state-of-science reports; technology assessments; *weight-of-evidence analyses*; meta-analyses; health, safety, or ecological risk assessments; toxicological characterizations of substances; *integrated assessment models*; hazard determinations; or exposure assessments”) (emphasis added).

<sup>15</sup> See “SAB Review of Empirical Approaches for Nutrient Criteria Derivation,” EPA-SAB-10-006 (April 27, 2010)

<sup>16</sup> See, Joint Report of Peer Review Panel for Numeric Nutrient Criteria for the Great Bay Estuary. February 13, 2014. Available online at: <http://des.nh.gov/organization/divisions/water/wmb/coastal/documents/20140213-peer-review.pdf>.

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nutrient impacts in natural waters than those considered insufficient in the two independent peer reviews.

In summary, the EPA Region I “sentinel approach” has the capability to misdirect enormous local resources without producing any meaningful changes in water quality. As noted by the SAB itself:

*Numeric nutrient criteria developed and implemented without consideration of system specific conditions (e.g., from a classification based on site types) can lead to management actions that may have negative social and economic and unintended environmental consequences without additional environmental protection.” (SAB at 38) (US EPA 2010)*

This latest EPA approach to nutrient criteria development is far more technically deficient than earlier methods that were either greatly modified or abandoned based on SAB review recommendations. None of the earlier SAB reviews addressed EPA’s current claim that specific estuarine DO concentrations may be met by employing “sentinel approach” to derive the single protective nutrient level for the entire system, via methods that ignore system hydrodynamics and the numerous bio-chemical factors affecting the DO regime. It is therefore essential that the highest level of independent scientific review is applied to the review of this new “sentinel approach” methodology so that misdirection of local and state resources is avoided.

Thank you for your consideration of this request. We look forward to the Agency’s response.

Sincerely,



\_\_\_\_\_  
John C. Hall  
Executive Director

Attachments

cc: Mayor Thomas C. Hoye, Jr.  
Joseph Federico, P.E., BETA  
Congressman Joseph Kennedy