



February 25, 2016

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Subject: Comments on the Scientific Basis to Assess the Effects of Nutrients on San Francisco Bay Beneficial Uses (AF Report)

Dear Contract Manager and Authors of the Subject Report:

In accordance with the request made at the Feb 9, 2016 Nutrient Management Strategy (NMS) Stakeholder Advisory Group meeting and subsequent notification on the Water Board's web site, BACWA is submitting comments on Appendix C (*Scientific Basis for Establishing Chlorophyll a Thresholds for San Francisco Bay*) of the AF Report, due to our understanding that the intent is to seek peer review and publication of Appendix C in the near future.

BACWA has several serious concerns about the overall approach used to develop the AF Report and the AF Report itself, specifically the publication of Appendix C. We would like to see the publication effort deferred pending further review by the NMS Steering Committee. We believe that Appendix C, once published, will become the standard by which impairment of the Bay will be judged regardless of the Water Board's stated intent. We do support, a "test drive" of the AF Report conclusions, associated classification tables, additional data collection, and potential refinement of the document over time. This need was also stated in the AF Report itself... "Given its importance, the authors of this document fully acknowledge the uncertainty in the AF classification scheme and need for refinement, through multiple iterations of basic research, monitoring, and modeling." (p. 41)

This letter does not contain an exhaustive list of concerns since the short timeframe for comments has constrained a more thorough review of the AF Report and its Appendices. Nonetheless, we do want to submit this comment letter on the proposed publication of Appendix C by the February 25, 2016 deadline. At this time, we have five major concerns as follows:

1. Publication Prior to Thorough Vetting With the NMS Steering Committee

The AF Report was prepared outside of the collaborative stakeholder driven effort created for implementing the NMS. The AF Report with Appendices has not been presented to the NMS Steering Committee nor to the Nutrient Technical Workgroup as was hoped for with the creation of the NMS governance structure that embodies the “one tent” concept. We feel that the presentation and review by the Steering Committee is a necessary step that supersedes what appears to be a desire to rush Appendix C to publication. It is worth noting that the RMP Steering Committee, at their January 19, 2016 meeting, approved guidelines for “Review of RMP Products” (agenda package page 149) in part to minimize the potential for “unintended consequences” of reports, manuscripts, presentations or press releases being released without appropriate stakeholder review. While we recognize that the Report and manuscript in Appendix C were not funded by the RMP, we believe that the same principles of document review should be applied given the extensive overlapping nutrient related responsibilities amongst the authors, the San Francisco Estuary Institute (SFEI)/RMP, and NMS members.

We certainly recognize the hard work of the authors and the scientists who provided input on the report, but we do have concerns that the standards for a peer review associated with publication may not result in the same rigor that we would like to see for documents that provide the foundation for development of critical policy.

The AF Report took well over three years to prepare. Comments are being requested within the matter of a few weeks after making the AF Report with Appendices available for review online and after providing a one-time opportunity for questions during which the results were also first presented (February 9, 2016 SAG meeting). Even at this point, access to the raw data has not been provided. A thorough review of the document, including raw data, will take at least a couple of months. As such, BACWA requests an extended comment deadline.

2. Need For More Data

Appendix C states in various places that more data is needed. Despite this acknowledgment, generalized conclusions regarding acceptable *chlorophyll a* concentrations are presented in Appendix C. Some of the broadest conclusions seem to be policy statements that are not well supported. Appendix C is poised to justify *chlorophyll a* thresholds while clearly pointing to significant data gaps that should be addressed before considering next policy steps, potentially leading to costly and uncertain outcomes from any management actions.

The three lines of evidence used in Appendix C to derive *chlorophyll a* thresholds, the *chlorophyll a*: dissolved oxygen (DO) relationship, the *chlorophyll a*: toxins relationship, and the *chlorophyll a*: HABs relationship, are not developed in a consistent manner. Unique data sets are used to prove each line of evidence and there is no consideration for water year type in the analysis. The DO line of evidence is evaluated according to sub-embayment, with the final bay wide *chlorophyll a* threshold supported by conditional probability analysis of only the Lower South Bay and South Bay, while the toxin line of evidence is supported by three years of SPATT data collected during drought conditions and includes stations up to Rio Vista which implies that toxins are being imported to the Bay and are outside the control of the NMS. Appendix C tries to establish a correlation between *chlorophyll a* and HAB abundance and algal toxins however there are significant concerns on the uncertainty and feasibility of these relationships. For example, for cyanotoxin, OEHHA (2012) specifically states that public health decisions require measured concentrations of the cyanotoxins not cell counts due to the complexity of the relationships between the cell counts and cyanotoxin concentrations. There is also an uncertain relationship between HAB abundance and SPATT toxin detections. It is also not clear how, where, or if HAB cell counts were correlated to SPATT detections. In addition the SPATT toxin concentration was found to not correspond to that in the water columns (David Senn presentation). Finally, Figure 6b of Appendix C does not show increased probability to exceed alert levels when *Alexandrium* is removed. These inconsistencies in the development of the three lines of evidence highlight the need for more data to fill the data gaps. The data gaps are acknowledged in the following excerpts from Appendix C, pages 21 and 22:

- "... the ecological significance of HAB species in SFB is not well known."
- "... spatial and temporal dynamics of low summer DO and seasonal maxima of *chlorophyll a* that support DO consumption require additional study."
- "In depth investigations into phytoplankton contribution to the SFB carbon budget and its relative influence on the coupling of pelagic and benthic metabolism are needed to better understand the ... empirical relationships between DO and *chlorophyll a* in SB and LSB."
- "Finally, there is a need to review the relevance and adequacy of scientific data supporting WQC for DO in SFB, specifically LSB."
- "... we recognize that *chlorophyll a* thresholds are responsive to changes in fundamental drivers of phytoplankton dynamics, such as oceanic exchange, top-down grazing, and light limitation."

If Appendix C is to serve as a call for more data collection and interpretation to support the stated lines of evidence, we completely agree. However, if it is to be used to support the assertion that phytoplankton, and hence HABs, can be controlled in the Bay by nutrient concentrations, then much more research needs to be performed before drawing conclusions. This is an underlying premise of the NMS.

3. Inclusion of Policy Statements

Some specific conclusions stated in Appendix C appear to be policy recommendations rather than scientific conclusions, and therefore should not be included in the document. Examples are as follows:

- Page 22: Given the uncertainty in SFB's trajectory amidst global change, it is this potential for high biomass production that motivates establishment of chlorophyll a water quality goals to support nutrient management of SFB, and underlines the need for continued monitoring of SFB to understand how these fundamental relationships may change in the future.
- Page iii: These findings justify the establishment of chlorophyll a thresholds to support nutrient management of SFB, given uncertainty about the future trajectory of water quality in this important estuarine ecosystem.

A technical document should stay solely within the bounds of presenting scientific data and not venture into stating what policy is appropriate.

4. Conclusions Are Based on Questionable Assumptions and Appear to be Inconsistent with Actual Data/Presentations

The basic scientific approach and assumptions in the document seem overly broad and at times inconsistent with actual data and conclusions drawn. Examples are as follows:

- The DO Water Quality Objective of 5.0 mg/l was intended to be applicable to main water masses, not sloughs and shallow marshes, yet the document refers to that objective with only bare qualification that it may not be the ultimate goal.
- DO was considered to be the "keystone indicator" within the AF, yet work on an improved classification scheme for DO was explicitly deferred, as were recommendations on a prescribed monitoring program for DO. The statistical AF analyses were conducted based on the existing Basin Plan Water Quality Objectives, with all their known limitations (pp. 37-38).
- Advice offered by the author at the Feb 9th SAG meeting was that chlorophyll a endpoints should be given moderate weight, because of uncertainty in thresholds that lead to unacceptable risk of HAB toxin and low DO. This statement stands in stark contrast of the "justified" chlorophyll a threshold of 13 mg/m³ listed in Appendix C.
- Appendix C concludes that increased chlorophyll a leads to increased HABs (p. 4), yet the probability plots in Figure 6 do not match the conclusion, with the exception of one HAB species: Alexandrium. The plot would seem to falsify the relationship of HABs to chlorophyll a.

- Appendix C implies that chlorophyll levels can be controlled and that nutrient management is the controllable factor. Here again, observations in the North and South Bays strongly indicate otherwise.
- Appendix C should provide at least a brief summary of the key causal non-nutrient related factors for the oft-cited three-fold increase in South Bay chlorophyll since 1998-1999 (i.e. trophic cascade where oceanic changes caused increased populations of fish, crabs and shrimp in the estuary that feed on bivalve mollusks, resulting in near absence of bivalves since 1999, releasing their grazing pressure on phytoplankton and increasing the accumulation of algal biomass (Cloern and Jassby 2012, pp. 15-16, 21-22; Cloern et al. 2016, p. 518)).
- Stratification is a critical hydrodynamic phenomenon that needs to occur to allow development of the peak algal blooms that of concern in this AF Report. However, the analysis of stratification is only briefly referenced in Appendix C (p. 38). The stratification analysis in Appendix D by Mark Stacy of UCB showed it to occur only infrequently, with only 6 stratification events of 7 to 10 days observed over a 20 year period based on sensors at the San Mateo Bridge. This causal factor needs greater consideration in the AF.
- Figure 7 shows a flat relationship of the Central Bay HAB probability with chlorophyll a and a much higher HAB probability in Central Bay than that of the SB and LSB, yet Central Bay has a much lower chlorophyll a concentration (and DIN) compared to that of the SB and LSB (Figure 4). Potential impact from coastal-Bay exchange and lack of data by sub-embayment could attribute to this finding, which point out to the need for more data and study.
- Page ii (Line 18): “Quantile regressions of chlorophyll a with HAB abundance and DO were significant...”, a direct contradiction to Page 17 (Line 416): “The lack of consistent, significant relationships between DO and chlorophyll a in SUB, SPB and CB sub-embayment...”

5. Uncertainty as to How Beneficial Uses will be Considered

The paper provides no specific linkage to beneficial use impairment, but does acknowledge that there is no current impairment. BACWA members believe that the basis for impairment decisions is ultimately whether or not beneficial uses are being attained. We are concerned that the issue of beneficial uses attainment (e.g., aquatic life) seems to be greeted with reluctance or even open skepticism. A frequent retort is that monitoring beneficial uses is too costly, and the Science Plan, which is under-funded, cannot afford to go down that track. Some BACWA members, however, are collecting significant data on beneficial uses in LSB at a relatively low cost. Understanding the role of beneficial uses in assessing the condition of the Bay is a topic worth discussion for inclusion in the NMS and AF.

Summary and Next Steps

BACWA has several serious concerns about the overall approach used to develop this report and the report itself, specifically the publication of Appendix C. We would like to see the publication effort deferred pending further review by the NMS Steering Committee.

Meanwhile, BACWA is in the process of retaining a consultant with expertise in assessing the impacts of nutrients in estuaries, and the role of HABs, DO and *chlorophyll a*. This expertise is needed to assist us in thoroughly understanding the report. It will allow us to submit thoughtful comments on the next steps in “test driving” the document over the coming years, and aid in its refinement, in accordance with the Water Board’s intent. We are interested in continuing to work with the Water Board in the collaborative stakeholder driven process. The stakeholder process continues to fund monitoring and modeling and the other scientific studies to evaluate nutrients and the health of the Bay.

Since one of our main interests is how the AF Report and Appendix C will be used in implementing the NMS, BACWA would like to be actively involved in selecting the questions to be addressed by the proposed Assessment Framework “test drive” and in reviewing the results. We believe that everyone involved desires to see a “test drive” that is viewed as a collaborative, transparent effort and getting stakeholders involved in the development of the “test drive” will help ensure that goal is achieved.

We hope you will seriously consider this request to not move forward with publication of the document at this time.

Sincerely,



David R. Williams
Executive Director
Bay Area Clean Water Agencies

cc: BACWA Board