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June 25, 2013

San Francisco Estuary Institute
Attention: Dr. David Senn
4911 Central Avenue
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San Francisco Bay Regional Water Quality Control Board
Attention: Naomi Feger
1515 Clay Street
Oakland, CA 94612

Via email: davids@sfei.org , nfeger@waterboards.ca.gov

Subject: Sacramento Regional County Sanitation District Comments on May 1, 2013 DRAFT San Francisco Bay Nutrient Conceptual Model and May 2013 Draft White Paper: A Review of Scientific Approaches Supporting NNE Assessment Framework Development for San Francisco Bay

The Sacramento Regional County Sanitation District (SRCSD) appreciates the opportunity to comment on the May 2013 Draft San Francisco Bay Nutrient Conceptual Model (draft Conceptual Model) and White Paper: A Review of Scientific Approaches Supporting NNE Assessment Framework Development (Assessment Framework Development). SRCSD provides wastewater collection and treatment services to 1.4 million residents of the greater Sacramento area. SRCSD operates its treatment system in compliance with its National Pollutant Discharge Elimination System (NPDES) permit, providing protection of beneficial uses in the Sacramento River and Sacramento-San Joaquin Delta.

SRCSD's NPDES permit is regularly updated, and the permit renewal process relies heavily on the available Delta-related science. While science does inform the regulatory processes in the San Francisco Bay and the Delta, ultimately, regulatory policy will guide any changes to the ecosystem drivers. Therefore, we want to make sure that policy-makers have information on the many other drivers that can contribute to ecosystem health (e.g., changes in flow regime, physical alterations to habitat, land use changes, invasive species, contaminants, and nutrients).

Through the water quality regulatory process, Delta science has "real-world" implications for all communities in the San Francisco Bay and the Delta. As a result, it is imperative that Delta science is reviewed critically before being applied to the regulatory process. Therefore, we respectively request that when draft documents are distributed by any group that they also be provided to the Stakeholders Advisory Group at the same time. This will allow for a more thorough and timely review by all stakeholders.

Overall, SRCSD believes that the Draft Conceptual Model and Assessment Framework are well developed documents that will guide the implementation of the Nutrient Management Strategy for the Bay. However, we believe that both documents would

be improved if the relationship between nutrients, Delta foodweb productivity, and the Pelagic Organism Decline were discussed. Also, we have a concern with the possibility that "de facto" numeric objectives for algal mass or dissolved oxygen will be used in permitting and other regulatory processes (such as TMDLS) without being subject to a formal standards development process.

For more technical comments, please see the attached memorandums from Larry Walker Associates.

Thank you for the opportunity to comment on the Draft Conceptual Model and Assessment Framework. If you have any questions about our comments, please contact me at (916) 876-6030, or dornl@sacsewer.com

Sincerely,

Linda Dorn
Environmental Program Manager

cc: Ken Landau, Assistant Executive Officer, CVRWQCB
Chris Foe, Staff Environmental Scientist, CVRWQCB
Prabhakar Somavarapu
Kurt Ohlinger
Terrie Mitchell
Tim Mussen
Jason Lofton

Attachment: 1. LWA Memorandum, June 21, 2013, Prepared by: Tom Grovhoug, P.E., Comments on DRAFT San Francisco Bay Nutrient Conceptual Model dated May 1, 2013.

2. LWA Memorandum, June 21, 2013, Prepared by: Diana Engle, Ph.D., Comments on the May2013 Draft White Paper: "A Review of Scientific Approaches Supporting NNE Assessment Framework Development for San Francisco Bay".

Technical Memorandum

LARRY WALKER ASSOCIATES

DATE: June 21, 2013

TO: Linda Dorn, SRCSD

COPY TO: Terrie Mitchell, SRCSD
Kurt Ohlinger, SRCSD

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SUBJECT: **Comments on DRAFT San Francisco Bay Nutrient Conceptual Model dated May 1, 2013.**

The following are comments generated upon review of the Draft San Francisco Bay Nutrient Conceptual Model dated May 1, 2013.

Overall, the subject report is well conceived and provides valuable foundational information for the San Francisco Bay Nutrient Numeric Endpoint (NNE) effort. The following comments are offered in the spirit of strengthening and clarifying the content of the subject report.

Page 7, line 291: It is suggested that a closing paragraph be added to this section to reiterate that studies are required to establish the validity and/or relative importance of the various hypotheses that have been offered regarding nutrient-related problems in San Francisco Bay. Additionally, modeling tools and studies are required to determine whether changes in nutrient loads, which are indirectly connected to ambient nutrient levels in the Bay, would affect predictable and significant changes in the potential problem areas identified in Section 3.

Page 8, line 318: Ultimately, conceptual food web models that extend to higher trophic levels (zooplankton, benthos and fish) will be required in Suisun Bay (and possibly elsewhere) to address the role of nutrients and productivity on the Delta food web and the Pelagic Organism Decline. The time frame for this work should be discussed in the report.

Page 27, line 1169: Regarding the "ammonium paradox" hypothesis, a key aspect is the presumption that clam grazing "may in fact be low" during spring conditions when the suggested effect is believed to occur. Of course, the relative importance of this effect in limiting phytoplankton blooms as compared to factors which are well known to affect blooms in Suisun Bay

(light limitation, stratification, residence time and clam grazing) is the key question. The conceptual model report should describe the information required to rigorously address the relationship of the ammonium paradox hypothesis to periods of reduced clam grazing and to the other factors which are known to have significant effects on blooms.

Page 47, line 2083: The discussion regarding the 2011 copepod toxicity study by Teh et al. should be modified to include reference to available information pertaining to deficiencies with the subject study. These deficiencies were well documented in written comments in the Regional Board record made by Central Contra Costa Sanitary District pertaining to its NPDES permit, which was adopted in February 2012. Problems involving test methodology, data analysis, and data interpretation raised significant uncertainty regarding the toxicity values reported in the subject study.

Page 54, line 2382: The wording of this sentence regarding the effect of POTW load reductions on harmful algal blooms (HAB) and nuisance algal blooms (NAB) and suboptimal phytoplankton composition could be taken as a statement of fact, rather than as a hypothetical, as is intended. It is suggested that a paragraph be added to this section to clarify that studies must be performed and tools must be developed and utilized to determine whether load reductions will create significant benefits or "mitigate impairments". As demonstrated by the curves shown in Figure 7.3, the effect of load reductions on ambient conditions and the magnitude of the resulting ambient condition will be very important in assessing the associated incremental benefits.

Page 55, line 2409 and page 57, line 2531: Same comment as above.

Page 57, 2507: The nutrient contributions from the San Joaquin River to the Delta could shift significantly if the "peripheral tunnels" project, as advocated in the Bay Delta Conservation Plan (BDCP), is implemented. The conceptual model report should identify the potential effects that major changes in the management of Delta flows and the implementation of major projects, such as the BDCP, will have on loadings of nutrients to the Bay.

Technical Memorandum

LARRY WALKER ASSOCIATES

DATE: June 21, 2013

TO: Linda Dorn, SRCSD

COPY TO: Terrie Mitchell, SRCSD
Kurt Ohlinger, SRCSD

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SUBJECT: **Comments on the May 2013 Draft White Paper: "A Review of Scientific Approaches Supporting NNE Assessment Framework Development for San Francisco Bay".**

The following are comments generated upon review of the May 2013 Draft White Paper: "A Review of Scientific Approaches Supporting NNE Assessment Framework Development for San Francisco Bay". Comments are grouped by topical area presented in the white paper.

Subhabitat Prioritization

At the beginning of section 2.5 (p. 13) it is stated:

> *"The SF Bay Water Board, with advice from stakeholders, chose to prioritize the development of NNE assessment framework for subtidal habitats in SF Bay. Seagrass, intertidal habitat, and diked Baylands are not included in this initial work."*

It seems important to provide a summary of the rationales for this prioritization.

Role of non-nutrient-related cofactors that affect customary biological indicators.

The white paper would benefit from a discussion of how factors that mitigate the potential responses to nutrients in the San Francisco Estuary (SFE) would be used in an assessment framework, or a rationale for excluding them. For example, how will non-nutrient factors that reduce the risk of eutrophication (or "oligotrophication" as proposed by some for Suisun Bay), or that exacerbate undesirable conditions, be used during assessments of system condition? Will turbidity or benthic grazer abundance data be used in an assessment framework? Mineral turbidity does not appear to be accounted for in the assessment approaches summarized in Table 3.4. Will coastal ocean conditions or the status of climatic indices that can affect phytoplankton communities

in the Bay (like the Pacific Decadal Oscillation) be included as a line of evidence? Will factors such as temperature or flow, that are widely expected to affect harmful algal bloom (HAB) abundance, be included in the assessment? How do we detect "false positives" during the assessment process?

Nutrient "indexing"

Several of the example assessment frameworks discussed in Section 3 utilize winter dissolved inorganic nitrogen (DIN) to track or score nutrient condition (see p. 23, and associated text). It does not seem that winter DIN would be appropriate for assessing nutrient-risk in SFE segments during the times of year when productivity (or eutrophy) is of most concern, for several reasons including:

- Biogeochemical processes are strongly influenced by temperature, and thus will affect the extent to which nutrients are supplied or removed from the water column. For example, pelagic nitrification will be markedly different in winter than in summer.
- Pronounced seasonal and interannual variation in riverine flow (natural or driven by water operations in the Delta) would seem to limit the usefulness of winter DIN as a proxy for year-round nutrient supply.
- Nutrient loading is affected by precipitation and other seasonal factors that affect runoff from urban and vegetated portions of the watershed (like irrigation return flows). Does winter DIN reflect the nutrient load that is transported to the upper SFE during the algal growth season?
- Habitat restoration planned for the upper estuary is presumably expected to augment nutrient supplies in adjacent subtidal habitat (per Bay Delta Conservation Plan (BDCP) planning documents). Will the timing of water exchanges between restored floodplain and tidal wetlands, and the associated transport of wetland-derived nutrients, be accounted for by winter DIN levels?

It would be helpful if the white paper provided some examples of how nutrient conditions might be indexed or assessed in the SFE.

Definition of Reference Conditions

According to Table 3.4, six of the seven example assessment frameworks summarized in Section 3 use "deviation from reference conditions" as the method of assessment of indicators. The white paper provides a fair amount of detail regarding the scoring procedures and metrics for the various biological and chemical indicators (equations, matrices, "one out/all out", etc.). Except for a little information for the OSCAR framework (see page. 34), the white paper does not describe the strategies that were used to define "high", "good", "poor", etc. or how they relate to reference conditions. Are scoring procedures based on a population of unimpaired water bodies, historic conditions, model results, best professional judgment, literature surveys?

The method by which "good" and "bad" are likely to be defined for several of the proposed eutrophication indicators for SFE (in particular, phytoplankton biomass, productivity, and assemblage, and macroalgal biomass and cover) is important information for the audience of the white paper, so current proposals for determining thresholds and reference conditions should be summarized in the white paper.

Note that Tables 3.12 and 3.13 are not displaying in the on-line pdf of draft document.

Self-fulfilling IBI Prophesies

On page 45, it is described how 38 phytoplankton metrics were used to derive an IBI for Chesapeake Bay.

> "*Thirty-eight phytoplankton metrics were used to quantify the status of phytoplankton communities relative to water quality conditions (Table 3.12). Least-impaired (reference) habitat conditions have low dissolved inorganic nitrogen (DIN) and orthophosphate (P04) concentrations and large Secchi depths. Impaired (degraded) habitat conditions have high DIN and P04 concentrations and small Secchi depths*."

IBIs should be based on relationships between biotic assemblages and evidence of impairment of beneficial uses (such as low DO), not on nutrient concentrations. Otherwise, the IBI is being used as a proxy indicator of nutrient concentrations, not as an unbiased indicator of biological integrity.

"Good" Levels of Phytoplankton Biomass Expected in Example Frameworks

It is worth noting that the levels of phytoplankton biomass (chl.-a) that are listed as reference levels or thresholds for "good" condition are very low in the example frameworks. In Table 3.7, the threshold for the UK WFD framework for average chl.-a is <15 or 10 µg/L, depending on salinity range. For the EPA NCA framework, the "Good" chl.-a range is 0-5 µg/L. For the OSPAR framework, the threshold is 15 µg/L. In Table 3.10, in reference to the OSPAR framework, background concentrations for chl.-a for various European regions range up to 12 µg/L, but most are less than 10 µg/L.

Such levels of phytoplankton biomass are considered to be "near starvation" levels for pelagic zooplankton in Bay/Delta gray literature and in several peer-review scientific articles. In addition, particularly for Suisun Bay, there is considerable stakeholder nostalgia for historic (pre-*Corbula*) chl.-a levels ranging (intermittently) as high as 30-40 µg/L.

Before a SFE assessment framework is established, such contrasting visions for phytoplankton biomass need to be resolved, and consensus reached on goals for standing biomass in the SFE.

Desirable Attributes of an Assessment Framework

On p.3, six desirable attributes of a framework are proposed:

- The assessment framework should employ indicator(s) that have a strong linkage to Bay beneficial uses. This linkage should be scientifically well supported and easily communicable to the public.
- One or more primary indicators of the assessment framework should have a predictive relationship with surface water nutrients and/or nutrient loads to the Bay.
- The assessment framework should employ the indicator(s) classify the Bay segments from very high ecological condition to very low ecological condition. It should be explicit how the magnitude, extent, and duration of the effects that cause the segment to be classified differently.
- The assessment framework should be spatially explicit for different segments of the Bay and different habitat types (deep versus shallow subtidal) as warranted by the ecological nature of response to nutrients.
- The assessment framework should specify what are the appropriate methods used to measure the indicator and the temporal and spatial density of data required to make that assessment.

- It should provide guidance on how the data should be analyzed to categorize the Bay segments.

The second attribute is potentially problematic. Although an assessment indicator ought to have a predictive relationship with nutrients and/or nutrient loads, it should also ***not*** have predictive relationships with ***non-nutrient factors*** that could confound interpretation of monitoring data and lead to "false positive" conclusions of nutrient-related impairment. This is a particularly acute problem in the Suisun Bay segment (and possibly the San Pablo Bay segment) where nutrient concentrations and loads are unavoidably linked to Delta outflows, leading to ambiguous (and sometimes contentious) interpretations of biological data. For example, lower nutrient concentrations in Suisun Bay may accompany a high Delta outflow period. If a biological perturbation were observed during such a period (for example, a bloom of a particular phytoplankton taxon), it might be circumstantially linked to a change in a nutrient concentration, but non-nutrient factors related to flow might serve as alternative explanations for the monitoring data (e.g., alterations in stratification, residence time, salinity, or temperature favorable to the taxon in question).

Regulatory Burden of Proof

On p. 5, in the paragraph starting "Numeric Endpoint," it is stated:

> *"Numeric endpoints are guidance that presumably can evolve over time without the need to go through a formal standards development process."*

It is not clear how nutrient numeric endpoints (presumably for non-nutrient metrics, such as algal biomass or DO levels) will ultimately be interpreted by the State and Regional Boards, and there is a possibility that they will become "de facto" numeric objectives in permitting and other regulatory processes, without being subject to a formal standards development process. For example, the widely cited benthic chlorophyll-a threshold for wadeable streams (an "endpoint" of 150 mg/m^2), which has not undergone a formal standards development process, is already being incorporated into CA TMDLs as a target. TMDL targets cannot change ("evolve") outside of a formal Regional Board process (a TMDL re-opener) which is not guaranteed to occur based on evolving scientific opinions. Also, will "endpoints" be used by Regional Boards as a basis for 303(d) listings? Finally, it seems likely that DO endpoints arising from the NNE process for estuaries (coastal estuary NNE process, perhaps that for SFE) will be considered for adoption as Basin Plan objectives, especially if they are more conservative than current WQOs.

Use of Macrobenthos Data in SFE Assessments

In Table 2.1 (p. 11), data gaps and recommended next steps are outlined for the proposed primary and supporting indicators for the various habitat types in the SF Bay. For the indicator "Macrobenthos taxonomy, abundance and biomass" under Subtidal Habitat, the recommended next step is described as follows:

> *"Recommend utilization of IE-EMP dataset to explore use of macrobenthos to be used reliably to diagnose eutrophication distinctly from other stressors in oligohaline habitats. This may involve including biomass in the protocol to improve ability to diagnose eutrophication."*

It would be helpful to distinguish the potential use of macrobenthic taxa whose biomass would potentially ***confound*** determinations of impairment from the potential use of macrobenthic taxa

which are potential indicators of nutrient impairment (e.g., pollution-resistant taxa). For example, molluscs may confound use of phytoplankton indices as indicators of nutrient impairment in various segments of the SFE. Would benthic grazer biomass be considered in a multiple-lines-of-evidence approach as a indicator of nutrient *risk* (e.g., "benthic grazers are hiding a nutrient problem"), or as an indicator of *low risk* (e.g., nutrients will not cause a problem because benthic grazing provides mitigation), or as the alternative cause of the impairment itself (e.g., a cause of low net productivity in Suisun Bay). Because benthic grazing enters every debate about productivity and nutrients in the Bay/Delta, the white paper should explain how monitoring data for benthic grazers might, or might not, be used in an assessment framework, and how that might differ from the use of data for other macrobenthic taxa.

Minor Comment

On page 5, in the paragraph beginning "Section 303(c)(2)(B) of the Clean Water Act…", short definitions are provided for three kinds of water quality criteria, as follows:

- "*Biological criteria: a description of the desired biological condition of the aquatic community, for example, based on the numbers and kinds of organisms expected to be present in a water body.*
- *Nutrient criteria: a means to protect against nutrient over-enrichment and cultural eutrophication.*
- *Sediment criteria: a description of conditions that will avoid adverse effects of contaminated and uncontaminated sediments.*"

For consistency with the other definitions, the second definition could be revised as follows:

"Nutrient criteria: ~~a means to protect against~~ a description of the conditions that will avoid nutrient over-enrichment and cultural eutrophication."