May 17, 2012

Naomi Feger
Regional Water Quality Control Board, San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612

Via E-mail**:** *nfeger@waterboards.ca.gov*

SUBJECT: Draft San Francisco Bay Nutrient Strategy March 2012

Dear Ms. Feger:

The Bay Area Clean Water Agencies (BACWA) appreciates the opportunity to comment on the Water Board's Draft San Francisco Bay Nutrient Strategy dated March 2012. BACWA is a joint powers agency whose members own and operate publicly-owned treatment works (POTWs) and sanitary sewer systems that collectively provide sanitary services to over 6.5 million people in the nine county San Francisco Bay Area. BACWA members are public agencies, governed by elected officials and managed by professionals charged with protecting the environment and public health.

At the Stakeholder Advisory Group (SAG) meeting on March 29, 2012, stakeholders were invited to comment on the proposed Nutrient Strategy.

- Are the right work elements and tasks identified?
- Questions / comments about process.

BACWA comments regarding the process. At the March 29th meeting, the stakeholders were told that this would be one of several opportunities to comment on the Nutrient Strategy. We strongly support this position, as by its nature preparing numeric nutrient endpoints (NNE) is an iterative process. BACWA is also interested in the schedule and coordination. One of our members has specific discharge permit deadlines related to the NNE effort and another has a permit appealed because similar deadlines are not in the permit. To help address these permit related issues, BACWA requests the NNE schedule and the permit reissuance schedule be coordinated and displayed such that it is clear how deadlines fit and can be met.

The Draft Nutrient Strategy includes a Gantt Chart of approximate timing of work elements and tasks associated with the 5-year plan. BACWA recommends a version of the NNE milestones display POTW permit cycle renewals that meshes with the schedule displayed in the Gantt Chart. Additionally BACWA requests that CCCSD's permit required Suisun Bay nutrient studies be added to show how the schedules complement each other and how CCCSD will comply with the permit deadlines.

BACWA'S comments on Nutrient Strategy work elements: The five-year Nutrient Strategy identified six principal goals/tasks, which are listed below, along with comments:

1. Define the problem.

BACWA concurs that defining the nutrient problem should be the first goal/task. This will also be the most difficult task. Critical subtasks will include: partitioning the Bay, agreeing upon an assessment framework, summarizing knowledge of existing loads, and using a conceptual model to guide the ongoing data collection process.

The task of partitioning the Bay should consider physical features (e.g., residence time, stratification, etc.) as well as biochemical features (e.g., presence/absence of benthic grazers, light availability, etc.) that best describe each region of the Bay. The partitions should facilitate identification of loads and data needs. BACWA agrees that the Lower South Bay and the Suisun Bay are the most easily identifiable initial partitions to start.

BACWA agrees that it is important to recognize that to fully understand Bay water quality issues, a quantitative or deterministic model should be used to model the entire Bay system. This would facilitate computation of a complete Bay nutrient balance and hopefully eliminate ambiguities concerning the exchange of nutrients, phytoplankton, suspended solids, etc. between the partitioned sub-water bodies of the system.

2. Establish guidelines (water quality objectives; i.e., assessment framework) for nutrients, including ammonium, focusing on the endpoints of eutrophication and other adverse effects of nutrient over enrichment.

The first draft of the Assessment Framework is not scheduled to be released until March 2013. A draft framework needs to be released beforehand to frame the definition of the problem (Task 1). Given the importance of this task, BACWA recommends that a clear description of the peer review process be provided.

Based on similar studies for other water bodies, we recommend a two-tier peer review process: one peer review for the conceptual model, and a second peer review for the quantitative or deterministic model(s). The initial peer review should largely be comprised scientists, with some modelers, who are familiar with the Bay, including its history, processes and recent research. The goal of this first review would be to ensure that the conceptual model(s) evaluate the key state-variables and processes that need to be included in the quantitative or deterministic model(s) that will compile nutrient, organic matter, and suspended sediment loadings. These, in turn, will be linked to biological responses, water body uses, and indicators of adverse impacts of existing or potential nutrient over-enrichment.

The second peer review, for the quantitative or deterministic model(s), is discussed in our comments on Task 4.

3. Implement a monitoring program that supports regular assessments of the Bay.

EPA now recognizes that most watersheds are impaired by a combination of point and nonpoint sources. The first priority for the monitoring program should be ensuring that all loads, including both point and non-point sources, are identified and quantified. A review of findings from nutrient studies conducted in other water bodies around the nation is instructive. (See figure 1 and refer to Attachment A for a discussion of the Chesapeake Bay example).

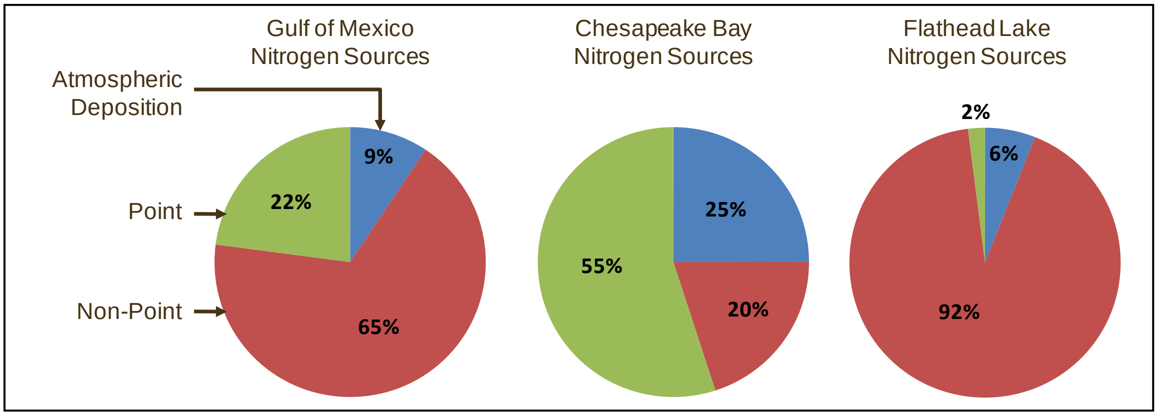

Figure 1. Nitrogen Loading Summaries for Gulf of Mexico, Chesapeake Bay, and Flathead Lake[1]

Figure 1 strongly supports the NNE literature recommendation to first focus on getting the loads right.

An additional non-point source load that pertains to the San Francisco Bay merits discussion. This is the oceanic load. The oceanic nutrients that enter and exit through the Golden Gate is a significant load that potentially could occult ambient nutrient levels. Quantification of the oceanic load will be essential to understanding nutrient dynamics in the Bay. In similar fashion, the nutrient load from the Central Valley is essential to quantify.

4. Develop and utilize nutrient load response models to support nutrient management decisions.

BACWA supports the use of a load response model of the entire bay system to predict future water quality response to management actions. This load response model(s) also needs to be peer reviewed.

This peer review should be more extensive than the peer review of the conceptual model. The panel is often called a Model Evaluation Group (MEG) in other water bodies (e.g., Long Island Sound model used to develop a nutrient TMDL; the NY/NJ Harbor model used to develop pathogen, nutrient and toxic contaminant TMDLs; the Massachusetts Bay model used to evaluate the water quality impacts of relocating the City of Boston's wastewater effluent from Boston Harbor into Massachusetts Bay; and, the Chesapeake Bay water quality model used to developed a nutrient and suspended sediment TMDL.) This panel should be comprised of four to six members comprised of scientists and modelers (both hydrodynamic and water quality practitioners) from outside the Bay Area, as well as one or two scientists from the Bay community who are not working on, nor colleagues of people who are working on, the development of the model(s)independent from the NNE process. The MEG should meet three or more times, depending on the duration of model development. The first meeting would be a "kick-off' meeting during which the modeling team would present to key stakeholders and the MEG:

[1] *Sources: Gulf of Mexico Hypoxia 2008 Action Plan, Chesapeake Bay Program Action Plan, Montana Department of Environmental Quality, Draft Nutrient Management Plan and Total Maximum Daily Load for Flathead Lake, Montana*

- Issues that drive the modeling process,
- The goals of the modeling effort,
- The model framework, including the choice of model code(s),
- Processes and underlying assumptions included in the model code(s),
- An overview of the data to be used for parameter specification and for model calibration/validation, and
- The expected metrics for assessing model skill.

Subsequent meetings would present a project status, including:

- Calibration status of the model, including model vs. data comparisons and skill assessment results to date,
- Model or data problems or issues identified and corrective actions, including model assumptions if the need for new model processes or algorithms are needed, and
- Feedback from the MEG and stakeholders as appropriate on the status of the model calibration.

However, RWQCB must also consider the uncertainty associated with the model and ensure that the management actions being considered do not lie too far outside the range for which the water quality model was calibrated and validated. BACWA recommends RWQCB consider the use of sensitivity analyses as well as methods to quantify model uncertainty, such as Monte Carlo analysis, Bayesian Monte Carlo analysis and/or maximum likelihood estimation methods; or request the MEG address this question and recommend methods as part of their mission.

Model uncertainty should be considered when evaluating future water quality response to management actions and when considering rulemaking. Dramatic changes have been observed in the Bay and Delta ecosystem (i.e., invasive species, ocean current oscillations, etc.) in the past and will continue to occur in the future. Thus, it is predictable that future water quality will change in ways unpredictable by water quality models. (Please see closing paragraphs). Given the magnitude of expenditures (both capital and O&M costs) that POTWs and others may be asked to make, it is important that sensitivity and uncertainty analysis be included in assessing model calibration/validation and evaluating future water quality management scenarios.

Importantly, the load response modeling must also assess the effectiveness of various nutrient management scenarios. The draft document acknowledges that the Bay is currently in an uncertain status with regard to nutrient impairment, but that concern is high that such impairment may happen in the future, given the high levels of N and P that currently exist. Therefore, there is time to assess various management scenarios as a component of the process of setting water quality objectives. The objectives should be set AFTER such information is developed, not before, so that unwarranted management actions by NPDES permittees are not required. This will require the modeling tools examine various plausible nutrient management scenarios to reach an understanding of the limits of our capability to affect various outcomes through different management strategies (given the large loads from the ocean that cannot be controlled and the large Central Valley non-point source loads that will be difficult to control). This information should then be used to inform the development of nutrient objectives in accordance with Sections 13241 and 13242 of the

Water Code. This is feasible and reasonable given (a) the high cost and impact of various management scenarios and (b) the absence of current impairment and the resulting time that we have to make sound regulatory decisions.

5. Evaluate control strategies to reduce nutrient loads to the Bay.

Two major elements must be considered to further development of Work Element 5.

5A. POTW Capital Planning Efforts

The nutrient effluent limits could result in the largest capital program for POTW's since the move to secondary treatment in the 1970's. Information gathered under the March 2, 2012, 13267 Letter to Municipal Dischargers was designed to provide data needed for facility planning. Relevant nutrient speciation analyses required for facility planning at POTWs are as follows[2]:

- Nitrogen
    - Ammonia
    - TKN
    - Nitrite + Nitrate
- Phosphorous
    - Total Phosphorus

While it has not yet been determined if the San Francisco Bay is in fact impaired by nutrient concentrations, the effort and time for POTWs to convert from secondary to advanced nutrient removal should not be underestimated. BACWA's estimate to convert all the facilities to nutrient removal ranges from $5 to $15 billion dollars. Sacramento Regional County Sanitation District is expecting to spend up to $2 billion dollars to convert their 181 mgd average dry weather flow capacity secondary treatment facility to nutrient removal/filtration/UV disinfection. The wide range in cost for SF Bay POTW's is attributed to variable nutrient removal objectives (e.g., role of averaging periods, and level of required treatment including nitrification only, nitrogen removal, and/or phosphorus removal.) coupled with the POTW-specific nature of a retrofit. This component of the evaluation of potential nutrient control strategies, by itself, will be a massive planning effort. And since the level of nutrient control, if any that will be required is not know, the planning is more complex.

5B. Nutrient Load Reductions

In addition to regulating nutrient discharges at point sources, there are other means with which to control and/or reduce nutrient loads to the Bay.

In terms of source control, a nutrient trading program that requires a reduction in nutrients entering the Bay might be a viable interim and long-term strategy. The Chesapeake Bay

[2] Although all the nutrient species within the 13267 Letter are present in POTW influent (e.g., dissolved organic nitrogen), they are not all necessarily required for facility planning. The listed nutrient species for facility planning captures total nitrogen and the relevant species for typical discharge permits.

initiated a nutrient trading program in 2005 which was a tool to bring all nutrient dischargers (both point and non-point) to the table. Such a program provides financial incentives for those less regulated than POTWs (e.g., agriculture).

In addition to nutrient source control strategies, a list of potential BMPs that might be viable for the Bay, and which could be implemented in the near term, are as follows:

- Riparian Forest buffers
- Livestock Fencing
- Conservation Tillage
- Detention Basins
- Wetlands (An Option for Point and Non-Point Source Dischargers)

The wetlands BMP option for non-point source dischargers is also an option for POTWs. Specifically, the Hayward-Marsh, an engineered wetland system commissioned in 1988, is designed to reclaim water for brackish wildlife habitat. The Hayward-Marsh serves as an example where reclaimed water is used to holistically improve an ecosystem. This approach could serve as a model for POTWs to reclaim water while potentially improving the overall health of the Bay.

The BMPs listed above would also have a smaller environmental impact than converting POTWs to nutrient removal (refer to Attachment B for a comparison of the environmental impacts).

6. Consider alternative regulatory scenarios for how to move forward with nutrient management in SF Bay.

The following notes are provided to assist in the further development of Work Element 6.

6A. Alternative Regulatory Approaches

A variety of nutrient management approaches in SF Bay may be considered that potentially range from voluntary efforts to regulatory programs, such as total maximum daily loads (TMDLs). The SF Bay will present unique challenges for nutrient management integration. The estuary environment differs from the sub-bays and tributary streams entering the delta. Further, the relationship between nutrient species, such as nitrogen and ammonia, has different impacts on water quality in the different segments of the Bay.

Regulatory programs that follow the NNE's could take on several dimensions that impact wastewater dischargers. Current regulatory program options are 1) narrative standards, 2) standard rule making, 3) TMDLs, 4) use attainability analysis (UAA), and 5) water quality variances. The advantages and disadvantages associated with each regulatory program are provided in Table 1. BACWA recommends a step-wise approach be employed that evaluates all options to address this complex problem.

Table 1. Permitting Options Advantages and Disadvantages Summary

Permitting Option	Advantages	Disadvantages
Narrative Standard	• Uses existing state Narrative Water Quality Standards • EPA encourages the use of existing narrative standards for nutrients when there is Insufficient Time or Data for Numeric Nutrient Standards Rule Making.	• Narrative nutrient criteria are widely used but are not easily applied. • Requires a subjective interpretation narrative standards to reach conclusions on nutrient thresholds for watershed plans, TMDLs and permitting • Narrative criteria are open to interpretation due to their vaguely descriptive nature • May not capture underlying complexities associated with nutrient impacts on water quality • EPA policy recommendations on interpretation of narrative standards for nutrients have not be issued • Because this is a unique interpretation of narrative standards, the Application May be More Subjective than Other Procedures
Standard Rule Making	• Predictable and Common State Rulemaking Process • Agency Led Development of Technical Basis • Subject to Public Review (Opportunity for Commentary)	• Focused on In-Water body Criteria • Numeric standards rule adoption process may be long due to need for scientific basis for establishing effects-based criterion for nutrients • Does Not Address Compliance Feasibility • Does Not Inform Permitting (Requires Separate Translation to Effluent Limits) • EPA Review and Approval
Total Maximum Daily Load (TMDL)	• Comprehensive Watershed Loading Analysis • Produces Both Point Source Wasteload Allocation (WLA) and Nonpoint Source Load Allocation (LA) • TMDL Implementation Plan Informs Management Efforts (Permitting, Schedule, Funding, etc)	• Large Time and Resource Investment for Watershed Analysis • Requires Water Quality Targets (WQ Standards, Interpretation of Standards or WQ Data) • Lack of Implementation Plan(s) • EPA has Approval Authority
Use Attainability Analysis (UAA)	• Change Beneficial Uses • Potential Stakeholder Driven Development • Considers Technical Feasibility and Affordability • Basis for Net Ecological Benefit (NEB)	• Large Time and Resource Investment for Watershed Analysis • Regulatory Agency Acceptance Not Assured • Has Not Been Applied in California.
Water Quality Variances	• Addresses Compliance with Unattainable Water Quality Standards • Considers Technical Feasibility and Affordability • Basis for Technology Based Effluent Limits for Feasible Compliance	• Temporary (Limited to 20 yrs) • Periodic Review & Re-establishment (Every 3 to 5 yrs)

6B. Role of Permit Averaging Period

EPA's NPDES Permit Writer's Manual (EPA, 1996) states that for municipal wastewater treatment plants, permit limits should be expressed in average monthly and average weekly limits. Maximum daily limits can be used for toxics in order to capture acute toxicity criteria. Unlike toxic substances, nutrients have slow-acting impacts. As a result, BACWA recommends that nutrient limits should be expressed as longer averaging periods. Rather than require maximum month and maximum daily limits that can be problematic for POTWs to design around (refer to Attachment C for a discussion of the Sacramento Regional County Sanitation District's recent NPDES permit), BACWA recommends that the RWQCB eventually employ the use of seasonal or annual limits if nutrient removal is deemed necessary at the end of the NNE process.

BACWA cautions the RWQCB and the stakeholders that while the nutrient strategy is well thought out, its goals are very ambitious. As suggested by the memo "Key Issues for Delta Science - A Report of the Delta Independent Science Board," the magnitude of the undertaking of determining how to restore the SF Bay Delta is large and will be an iterative process that will change as we learn. Adaptation is needed to address the water quality issues in the Delta as the conditions in the area change. The draft strategy proposes that the RWQCB and the stakeholders move forward on a consensus basis. We think that because the outcome of the NNE could affect the amount of water the Water Contractors take from the Delta and could result in projects that form the majority of the capital programs for the Bay Area POTWs for the next 10 to 20 years, that consensus will be hard to reach. We do agree that informing the process with expert panels, advisory groups and peer reviewing results will ameliorate much of the lack of consensus, as long as there is agreement on how the panels are used and who is on the panel. We suggest that as the draft schedule is laid out, the RWQCB and the stakeholders develop a process for vetting the panels.

BACWA appreciates the Regional Water Board's close attention to the comments made herein, and representatives of BACWA would be more than happy to meet with you to discuss our comments and concerns in more detail if necessary.

Respectfully Submitted,

James M. Kelly
Executive Director
Bay Area Clean Water Agencies

cc: BACWA Executive Board
James Ervin, BACWA Permits Committee Chair

Attachment A – Chesapeake Bay Regulatory Example

In 1999, two organizations (the American Canoe Association, Inc. and the American Littoral Society) sued in federal court to require that the states fully comply with the Clean Water Act for water quality protection of Chesapeake Bay. The result was a consent order, accepted by the states and EPA, which resulted in a new promise to complete studies to define the acceptable level of pollution in Bay tributaries and the Bay. In 2000, a goal to reduce nutrient and sediment pollution to remove the Bay from EPA's impaired water body listing by 2010 was agreed to in the document Chesapeake 2000 (Chesapeake Bay Program, 2000). This agreement effectively postponed the development of a TMDL.

In 2005, Chesapeake Bay jurisdictions implemented a permitting process that limited the amount of nitrogen and phosphorus that the Bay watershed's 483 significant POTWs discharged. Pennsylvania established nutrient trading in December 2006. In 2007, Maryland set limits for POTWs discharging 500,000 gallons per day (gpd) or more that were based on the design flow of each plant as of April 2003, and concentrations of 3.0 mg/L total nitrogen and 0.3 mg/L total phosphorus using enhanced nutrient removal technology. To achieve these limits, Maryland established the Bay Restoration Fund with the purpose of creating a dedicated fund, financed by wastewater customers, to upgrade Maryland's POTWs with enhanced nutrient removal (ENR) technology. In 2009, facilities claimed to have met 78 percent of the goal to reduce nitrogen and 99 percent of the goal to reduce phosphorus.

Unfortunately, the Chesapeake 2000 initiative fell short of its overall goals. This example demonstrates the importance of getting all the nutrient loads quantified. Despite significant financial investment in requiring that all POTWS which discharge >0.5 million gallons per day (mgd) were required to implement ENR technologies, water quality in the Chesapeake Bay has not improved because stormwater and agricultural non-point source loads have not achieved similar decrees of reductions.

Attachment B – Comparison of Point versus Non-Point Source Control BMPs

A comparison of the sustainability impacts for point versus non-point source BMPs is provided in Table B2. The overall energy and chemical demand are negligible for BMPs at non-point source dischargers and the overall habitat is improved.

Table B1. Environmental Comparison of Point and Non-Point Source Dischargers

Approach	Electrical Power	Chemical Use	Greenhouse Gas	Additional Watershed Enhancements
Point Source: Nutrient Removal[3]	25 - 275% more than secondary treatment	Metal salts and external Carbon source	25 – 275% more than secondary treatment	None
Nonpoint Source: Best Management Practices *	None	None	Sequesters carbon	Enhanced habitat, aesthetics, sediment reduction

* Conservation tillage, grass buffers, detention basins, wetlands

Despite the potentially smaller environmental impact, BACWA member agencies are aware that BMPs for non-point source dischargers are less reliable and proven than nutrient removal technologies at POTWs. Thus, they are not necessarily viewed as the "silver bullet" if nutrient loads are found to impair water quality in the Bay during the NNE process. Rather, these options should be thoroughly considered and evaluated as a means to establish an equitable, cost effective, and sustainable approach to nutrient management that considers all nutrient load dischargers to the Bay.

[3] Falk, MW, Neethling, JB, Reardon (2011) Striking the Balance between Nutrient Removal in Wastewater Treatment and Sustainability. WERF Research Project under Nutrient Challenge, NUTR1R06n.

Attachment C – SRCSD Averaging Period Example

A case in point where short-term averaging periods for nutrient removal will be particularly problematic to meet is the recently adopted NPDES permit for the Sacramento Regional Wastewater Treatment Plant (CA0077682).

The governing parameter of the permit is the extremely low maximum daily total ammonia concentration (2.2. mg N/L). The POTW must be designed to meet this worst- case scenario over a calendar year. This type of limit results in an inefficient POTW with respect to energy consumption because all the pumps/blowers are designed for higher flows than what they encounter on a day-to-day basis. Had the permit been structured for maximum month (such as 2.2 mg N/L ammonia on a calendar month), the air activated sludge basins and pumps could have been reduced. The net overall benefit in utilizing longer-term averaging periods is less equipment/materials and more efficient POTWs while meeting the same end point.