PROPOSED WORKPLAN FOR DEVELOPMENT OF A NUTRIENT CONTROL PROGRAM

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1.0 Introduction and Purpose of Document

The California State Water Resources Control Board (State Water Board) has initiated the process to develop nutrient objectives and a program of implementation for the state's surface waters. Staff envisions that the objectives and program of implementation would be adopted as amendments to the Inland Surface Water, Enclosed Bays and Estuaries Plan. The nutrient amendments could include objectives and implementation guidance to help improve water quality in aquatic habitats by providing the endpoints that describe conditions necessary to protect beneficial uses. Creating nutrient amendments for the state will assist in supporting the Water Boards' Mission to preserve, enhance and restore the quality of California's water resources, and ensure their proper allocation and efficient use for the benefit of present and future generations.

The purpose of this document is to: 1) lay out an overarching strategy that will govern the development of nutrient objectives for freshwater and estuarine habitats and 2) describe the process and technical work elements that the State Water Board will pursue to collect the information it requires to develop nutrient objectives, focusing on wadeable streams in the first phase.

2.0 Previous Work on Nutrient Objectives

In 1999 the US Environmental Protection Agency Region 9 (US EPA) and the State Water Board began development of nutrient objectives, focused on streams and lakes. Pilot studies were conducted to analyze existing data and explore alternative approaches. Based on these pilot studies, State Water Board staff favor an approach to establish nutrient objectives known as the Nutrient Numeric Endpoint (NNE) framework. The NNE is comprised of two components. First, it would establish a suite of numeric endpoints based on the ecological response of an aquatic waterbody to nutrient over-enrichment (eutrophication, e.g., algal biomass, dissolved oxygen). Second, models would be used to link the ecological response endpoints to site-specific numeric nutrient targets and other potential management controls.

A conceptual framework describing the NNE framework and review of applicable indicators was completed (Tetra Tech 2006) and recommended regulatory endpoints were proposed for streams and lakes (Tetra Tech 2006, Appendix 1). Spreadsheet models were developed for streams and lakes to serve as scoping tools. It is envisioned that the NNE response endpoints and models would serve as *guidanc*e to translate *narrative* water quality objectives for nutrients and biostimulatory substances and/or conditions. Draft scoping models were previously developed for lakes and streams by Tetra Tech (2006). For streams, two types of models were included in the Benthic Spreadsheet Model: 1) statistical model based on empirical field data developed by Dodds et al. (1998) for temperate streams in North America and 2) simplified versions of the QUAL2K, an EPA-supported steady state mechanistic model. The standard and revised QUAL2K models in the Benthic Spreadsheet Tool were optimized to the Dodds empirical relationship. For lakes, a scoping model was developed based on a simplified version of the BATHTUB model, a model developed and supported by the Army Corps of Engineers for uses in US lakes and reservoirs. At the time that these models were developed, model optimization occurred without the benefit of an abundance of data from California waterbodies. A substantial dataset on wadeable stream algal and nutrient concentrations is now available for many parts of the State. The State Water Board is interested in utilizing these wadeable stream data to make additional refinements to the response indicator numeric endpoints and scoping models.

Since publication of the conceptual framework and recommended endpoints for streams and lakes, the SWRCB and EPA Region 9 have also funded updates to the science supporting the freshwater NNE (Tetra

Tech 2006). The SWRCB has also funded science to support the development of regulatory endpoints for California estuaries (McLaughlin and Sutula 2008, Sutula et al. 2011), including San Francisco Bay (McKee et al. 2011, SFRWQCB 2012).

3.0 Guiding Principles

The state's effort to create nutrient objectives has several fundamental guiding principles. These include:

1) **The state should develop nutrient objectives that address nutrient pollution and biostimulatory substances and/or conditions (Figure 1).** Nutrient pollution can result in the overproduction of primary producers (e.g. algae and macrophytes) and heterotrophs (e.g. bacteria). This organic matter can have adverse consequences to aquatic life through changes in water and sediment quality as well as changes to the food web. Environmental variables such as hydrology, available light, etc. can modify the ecosystem response to nutrients. Anthropogenic activities that alter these environmental variables can in some cases lead to biostimulatory conditions (lead to increased eutrophication) even under low nutrient conditions. Therefore a policy is needed that addresses both nutrient pollution and biostimulatory substances and/or conditions.

2) **The state should develop narrative nutrient objectives with numeric guidance.** The addition of numeric guidance to narrative objectives provides two important benefits: 1) a framework for consistent quantitative assessments and interpretation; and 2) the potential to trigger enforcement and remedial actions that narrative objectives do not. However, numeric guidance should consider different expectations for different types of systems including unaltered, moderately, and even highly modified waterbodies.

3) **Numeric guidance should have a strong linkage to beneficial use**. Nutrient pollution may results in adverse ecological responses in a waterbody. Indicators of these ecological responses are more directly linked to beneficial uses than nutrients. Therefore, the state is considering the option that nutrient objectives may consist of a set of numeric endpoints for these biological and chemical indicators, plus models to establish waterbody specific nutrient numeric targets.

4) **The state should have numeric guidance for all waterbody types.** The State Water Board intends to develop numeric guidance that translates the narrative nutrient objective for all waterbody types.

5) **There should be statewide consistency with regional flexibility**. Statewide consistency is an important component of equity among stakeholders and is therefore crucial for statewide objective development. However, it is well recognized that the state has many different ecosystems, each of which has varying biological characteristics. Therefore, a defensible statewide program must accommodate the unique qualities of these different waterbodies and habitat types. Furthermore, our knowledge of the ecology of our waterbodies varies throughout the state so the refinement of numeric guidance will likely proceed at different rates in different regions.

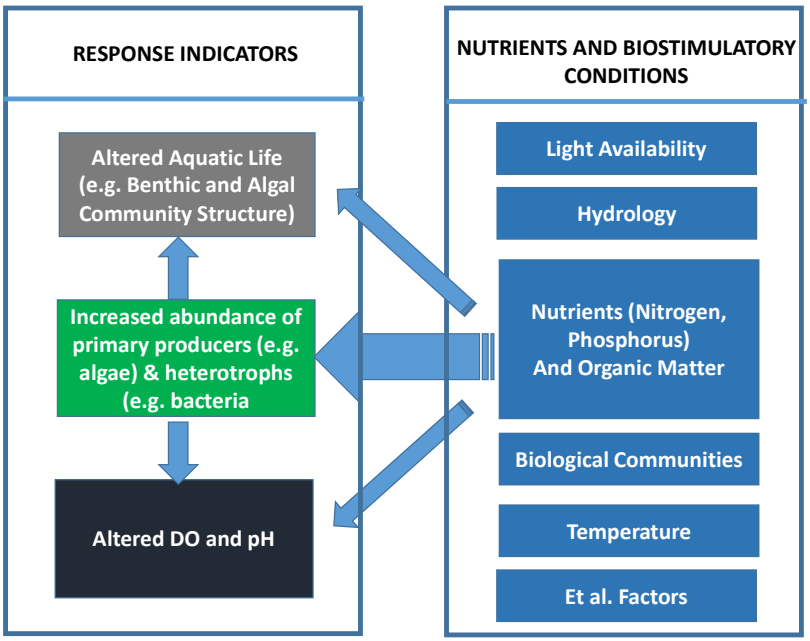

Figure 1. Conceptual model of symptoms (response indicators; left-hand box) of eutrophication and other adverse effects of nutrient pollution and biostimulatory conditions (right hand box).

4.0 Strategy to Develop Numeric Guidance to Interpret Narrative Nutrient Objectives

California is a large state and has a tremendous number and diversity of waterbodies. It is not possible to develop numeric guidance for all these waterbody types in the near-term; it will be necessary to prioritize the adoption for specific waterbody types. Three phases are envisioned for development and adoption of the nutrient policy amendments. The bulk of previous work has been focused on freshwater habitats, specifically wadeable streams. For this reason, State Water Board staff's near-term strategy is to complete development and adoption of nutrient policy amendments to address the following elements by January 2016, hereto referred to as "Phase I":

1) Description of the options and recommended conceptual approach to support the interpretation of narrative guidance applicable to all waterbodies and

2) Specific guidance for wadeable streams.

Work to complete numeric guidance for lakes will be completed pending additional technical work (Phase 2). Technical work supporting development of numeric guidance for California estuaries and non-wadeable rivers will be completed in Phase 3. Strategies and technical workplans are available describing nutrient objective development for San Francisco Bay (SFRWQCB 2012) and the rest of the State's estuaries (McLaughlin and Sutula 2008). A workplan governing science to support NNE development in the Delta is under development (Chris Foe, Central Valley Regional Water Quality Control Board, personal communication). Programs to develop nutrient objectives are now underway for the San Francisco Bay and the Delta. They are being led by the San Francisco and Central Valley Regional Water Boards, respectively. The State Water Board is supporting both Regional Boards in these efforts and coordinating with them to assure consistency in approach.

Table 1. Approximate schedule for adoption of guidance supporting nutrient objectives for California waterbodies.

Type	Science	Regulatory Amendments	
		Development	Adoption
Conceptual Approach[1]	2014	2015	2017
Wadeable streams	2014	2015	2017
Lakes	2014-2017	2017	2018
Estuaries[2] and Non-wadeable streams/rivers	2014-2018	2018	2020
San Francisco Bay	TBD	TBD	TBD
Delta	TBD	TBD	TBD

5.0 General Approach for Phase I

There are six basic tasks that have been identified for nutrient objective development for Phase I (Table 2). Some of the tasks are technical and some are not, but taken all together they represent the major milestones necessary for a scientifically-defensible and equitable program.

Table 2. Summary of tasks and description to complete first phase of nutrient objective development.

No.	Task	Description
1	Outreach	Actively reaching out to technical, regulatory, regulated, and non-governmental stakeholders to ensure that their ideas, suggestions, and concerns are fully considered. This task will continue throughout the project.
2	Conceptual Approaches, Waterbody Definition and Classification	Provides the problem statement, an overview of conceptual approaches to nutrient objective development, and definitions and classification of waterbodies.
3	Conduct and Synthesize Science to Support Numeric Guidance in Wadeable Streams	Science to support policy decisions on numeric guidance (i.e. selection of abiotic and/or ecological response indicators, numeric endpoints, and use of models to establish linkage to nutrient management in wadeable streams).
4	Implementation Plan Development	Defines how nutrient objectives will be used in regulatory programs such as 303(d) listing, NPDES compliance, 401 certification, etc.
5	Implementation Plan Technical Support	Provides sufficient method standardization, data transfer formats, documentation and education for widespread, consistent, effective implementation.
6	Rulemaking	The legislatively defined public process of developing, adopting, and implementing objectives

[1] Applicable to all waterbodies

[2] Excluding the San Francisco Bay-Delta ecosystem

6 Specific Approach for Phase I

6.1 Outreach (Task 1)

Outreach will be conducted in accordance with the State Water Boards Public Participation Plan. The goal of this task is to actively reach out to technical, regulatory, regulated, and nongovernmental stakeholders to ensure that their ideas, suggestions, and concerns are fully considered. This task covers three important areas. First, stakeholders need to know about the development of any new objective or policy. Transparency is imperative for a successful process. Second, it is important that the Water Boards give all parties a reasonable and fair opportunity to voice their opinions about the relative merits and preferences regarding alternative approach(es). Third, the technical aspects of the objectives should receive an independent and rigorous technical review to ensure scientific integrity. The intent is that this technical review be ongoing through the program and will not replace the final peer review during amendment development. This task will require the creation of three different committees. These include: 1) Stakeholder Advisory Group: the primary committee that responds to early ideas and concepts, provides recommendations on project development, technical workplan and scope of scientific work, implementation options under consideration, and serves as one of the vehicles for public outreach. Anyone can join the group, but representatives will be chosen to represent different sectors of the community such as regulated dischargers (i.e., wastewater, storm water, industrial, etc.), non-governmental organizations or environmental advocacy groups, other vested parties as needed and interested. 2) Regulatory Advisory Group: the primary committee that responds to regulatory specific issues such as elements of the Implementation Plan under development including compliance/enforcement. Members may include staff from any of the nine Regional Water Boards, staff from each of the major programs at the State Water Board, other state resource agencies such as Fish and Wildlife, and federal agencies such as the US EPA and/or Fish and Wildlife Service. 3) Science Panel: comprised of independent science experts charged with review of all technical aspects of the policy development. The process, desired attributes and candidates for the Panel will be vetted by the two advisory groups. This three-committee system, if started early in the process, will provide tremendous value in terms of communication and policy-building, creating fair and equitable objectives, and minimizing potential road blocks at the end of the objective development process.

A regulatory advisory group for nutrient objectives (the State and Regional Technical Advisory Group or STRTAG, now renamed as the Regulatory Group (RG)) exists. A similar three-committee system has already been established for the creation of estuarine nutrient objectives. The state will consider how to expand or reform these committees to achieve the intended goal.

Products: 1) A Stakeholder Management Plan prepared in accordance with State Water Board public participation guidelines, 2) Creation/reformation and facilitation of three Advisory Groups; Scientific, Stakeholder, and Regulatory, and 3) Meeting agendas, presentation materials and reports related to the convening of these groups.

6.2 Conceptual Approach to Nutrient Objectives, Waterbody Definition and Classification (Task 2)

A strong technical foundation to support policy decisions regarding nutrient objectives has already been drafted (Tetra Tech 2006). This documentation will be updated to provide 1) the environmental problem associated with nutrient pollution and biostimulatory substances and/or conditions that the policy could be crafted to address, 2) a definition and classification of the waterbody types that could be covered

under this policy, and 3) description of the regulatory approaches under consideration by the State Water Board for nutrient objective and their advantages and disadvantages. The product of this task will be a technical report.

Product: Technical report and related appendices.

6.3 Conduct and Synthesize Science to Support Numeric Guidance for Wadeable Streams (Task 3)

The primary goals of this task is conduct analyses of existing data and synthesize science supporting decisions on numeric guidance for California wadeable streams. Documentation will be expanded to: 1) evaluate a wide range of candidate abiotic and ecological response indicators that adequately represent wadeable stream response to nutrient pollution, 2) conduct analyses and summarize published information on levels at which candidate indicators support or adversely affect beneficial uses and articulate how these thresholds link to a gradient of biological condition, 3) summarize the distribution of these indicators in both minimally disturbed "reference" as well as ambient wadeable stream sites across the State of California, 4) develop models using available data to support the linkage of response indicators to nutrient and other watershed management options, and 5) identify key technical considerations for how the above technical information could be used in implementation.

At least three existing or completed studies will contribute to this task. First, the SWAMP program has produced a synthesis of algal abundance indicators in reference and ambient perennial wadeable streams (Fetscher et al. 2013). Second, EPA-ORD has conducted analysis of existing California perennial wadeable stream data to document the statistical relationships between nutrients, algal biomass, algal and benthic macroinvertebrate species composition (Fetscher et al., 2014). Third, a sub-set of the analyses conducted by EPA-ORD will be repeated for southern California only, in order to determine whether numeric endpoints should vary by ecoregion.

A detailed technical workplan will propose additional analyses of existing data and synthesis to be conducted in order to accomplish this task. Advisory groups will have an opportunity to comment on this technical work plan.

Product: 1) Technical workplan, and 2) Technical reports and related appendices.

6.4 Implementation Plan Development (Task 4)

The goal of this task is to define how numeric guidance can be used in regulatory programs such as 303(d) listing, TMDLs, NPDES permits, NPS, etc. The linkage between numeric guidance and compliance should be abundantly clear, convincing, and defensible. Staff recognizes that implementing nutrient controls in the same manner as conventional or toxic pollutants objectives may not result in the attainment of the objectives. Staff envisions the development of alternative approaches to nutrient management and program implementation for implementing narrative objectives on a watershed scale rather than discharger by discharger. However, staff believes that such a regulatory approach must include a backstop that uses traditional regulatory approaches using the numeric guidance to derive limits. The State currently has specific guidance for how multiple site/event data should be compiled to make regulatory assessments. For example, there is an implementation policy for the 303(d) listing/delisting program. However, this guidance is based largely on existing chemical and the policy

may need to be revised to better work with other types of pollutants that don't have the same response characteristics as conventional or toxic chemical pollutants. This task necessitates working with stakeholders, regulators, and external Science Panel members to solicit their feedback on specific elements of the implementation guidance for nutrient objectives which utilize response indicators for assessment.

Product: Implementation guidance to accompany the draft nutrient amendments that includes draft language for a watershed approach along with 303(d) listing, NPDES permit compliance, NPS, and TMDLs.

6.5 Implementation Plan Technical Support (Task 5)

Once nutrient objectives are promulgated by the state, there must be clear and concise guidance to stakeholders on how to collect data with prescribed levels of quality assurance, how to interpret data, how the data will be used in regulation, and what to do if one fails to meet the objectives. Other technical elements may be required, depending on the nature of the implementation guidance to be developed. The purpose of this task is to provide technical products and support for implementation of nutrient objectives.

Products: To be determined, based on implementation plan developed.

6.6 Rulemaking (Task 6)

The goal of this task is to follow the legislatively defined public process of developing, adopting, and implementing objectives. We contemplate documents such as a detailed Staff Report and proposed amendments to the State Water Board's Inland Surface Waters Plan. This task will also include public dissemination, review, and response process such as public workshops, response to comments, informational meeting presentations, State Water Board briefings, and a California Environmental Quality Assessment (CEQA) document, or equivalent, including a discussion of the factors that must be considered when establishing water quality objectives, the program of implementation for attainment of objectives, and various other considerations.

Product: Proposed amendment language, staff report and CEQA documentation with a full and complete administrative record for state and federal approval.

7.0 Schedule

Table 2. Approximate schedule for completion of Phase I tasks.

Number	Task	Description	Targeted Date for Completion
1	Outreach	Actively reaching out to technical, regulatory, regulated, and non-governmental stakeholders to ensure that their ideas, suggestions, and concerns are fully considered	Ongoing throughout 3 yr period
2	Conceptual Approaches, Waterbody Definition and Classification	Provides the problem statement, an overview of conceptual approaches to nutrient objective development, and definitions and classification of waterbodies.	2015
3	Conduct and Synthesize Science to Support Numeric Guidance in Wadeable Streams	Science to support policy decisions on numeric guidance (i.e. selection of abiotic and/or ecological response indicators, numeric endpoints, and use of models to establish linkage to nutrient management in wadeable streams).	2015
4	Implementation Plan Development	Defines how nutrient objectives will be used in regulatory programs such as 303(d) listing, NPDES compliance, 401 certification, etc.	Staff report by 2016
5	Implementation Plan Technical Support	Provides sufficient method standardization, data transfer formats, documentation and education for widespread, consistent, effective implementation.	2017
6	Rulemaking	The legislatively defined public process of developing, adopting, and implementing objectives	2017

8.0 References

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