



Delta RMP Technical Advisory Committee Meeting

Tuesday, June 14th, 2016; 12:30 pm – 4:15 pm

Central Valley Regional Board,
11020 Sun Center Drive #200, Rancho Cordova, CA
Board Room

<https://stateofcaswrcbweb.centurylinkccc.com/CenturylinkWeb/DeltaRMP>
(mobile <tel://1-720-279-0026>, Guest pass code: 514286)

DRAFT Agenda

1.	Introductions and Agenda Review and agree on agenda and desired outcomes		12:30 Stephen McCord
2.	Approve Draft TAC Meeting Summary (March 30, 2016)	DRAFT TAC meeting summary	12:35 Stephen McCord
3.	SC Updates TAC co-Chairs will <ul style="list-style-type: none"> Summarize the outcomes of the 04/25/2016 SC Meeting and recent SC decisions Present TAC co-Chair report <u>Desired Outcome:</u> Inform TAC regarding SC decisions and activities.	Draft SC Meeting Summary Delta RMP Decision Record Draft TAC co-Chair report	12:40 Joe Domagalski Stephen McCord
4.	Mercury: Revised QAPP In FY16/17, the Delta RMP will begin to analyze fish tissue and water samples for mercury. The QAPP has been revised to reflect this change. Next steps are for the QAPP to be approved by signatories (labs, State Board and SWAMP QAOs, SC co-Chairs) <u>Desired Outcome:</u> Recommendation to the SC for approval.	Revised QAPP	12:55 Thomas Jabusch
5.	Overview of Comments on the Revised Sensor Data Synthesis Report Lead authors of the Delta RMP-funded Sensor Data Synthesis will provide a summary of comments received on the draft report and how they were addressed. <u>Desired Outcome:</u> Review of revised report and recommendation to the SC for approval.		1:20 Brian Bergamaschi



6a.	<p>Nutrients: Nutrient Workshop The SC approved a revised workplan for the nutrient synthesis task (FY15/16) that separated the task into two parts: 1) develop recommendations for FY16/17 Detailed Workplan (completed see 6b); and 2) develop a multi-year nutrient monitoring program through a workshop. ASC has developed a possible agenda for the workshop.</p> <p><u>Desired Outcome:</u> TAC to provide feedback on the workshop.</p>	Draft Planning Agenda	1:50 Thomas Jabusch
6b.	<p>Nutrients: Nutrient Synthesis in the FY16/17 Detailed Workplan The SC approved three nutrient tasks for FY16/17: an updated synthesis report; modeling and synthesis; and advanced statistical analyses. The scope of work will be presented and the next steps in each of these tasks will be discussed.</p> <p><u>Desired Outcome:</u> TAC to provide feedback on these elements.</p>	Nutrient Synthesis Scope of Work	2:20 Thomas Jabusch
	Break		2:45
7.	<p>Information: Joint TAC-SC Meeting (October 18th) – Planning for the meeting</p> <p>A joint planning meeting will be held on October 18th to discuss multi-year funding and priorities. A draft agenda for the meeting has been prepared.</p> <p><u>Desired Outcome:</u> TAC to provide feedback to the SC on topics and process.</p>	Joint Planning Meeting Memo Draft Agenda	3:05 Meg Sedlak
8.	<p>Information: Preliminary Pesticide Results to Date and New Analytes</p> <p>Jim Orlando will present preliminary USGS pesticide results as well as present new analytical capacities that the lab has.</p> <p><u>Desired Outcome:</u> Update stakeholders on preliminary results and new analytical capabilities.</p>		3:25 Jim Orlando
9.	<p>Pathogens: Update on YR1 Sampling Activities and the need for a follow up trigger study</p> <p>Based on a review of the YR1 data, Basin Plan trigger values for Cryptosporidium have not been exceeded at the drinking water intakes. The SC has allocated \$20K for a follow up study should a trigger be exceeded. The need for additional studies will be discussed.</p>	YR1 Pathogen Report	3:45 Brian Laurenson

AGENDA 6/14/2016 TAC MEETING



	<u>Desired Outcome:</u> Input on the need for additional studies.		
10.	Updates and wrap-up <ul style="list-style-type: none"> • Status of Power Analyses and External Review by Delta Science Program • Capture TAC recommendations and action items • Address “parking lot” items, as time permits • Confirm the December TAC meeting date and location. Identify topics. 	DSP External Review Schedule Delta RMP Stoplight reports	4:05 Stephen McCord Joe Domagalski Meg Sedlak
11	Adjourn		4:15



Delta RMP Monitoring Highlights TAC Co-Chair Update to SC

[Month YYYY]

TAC Co-Chairs: Stephen McCord, sam@mccenv.com, 530-220-3165
Joe Domagalski, joed@usgs.gov, 916-278-3077

TAC Recommendations and Future Discussion Topics

- Pesticides—**
- Toxicity Testing—**
- Pathogens—**
- Mercury—**
- Nutrients—**

Status of Monitoring Activities

- Current Use Pesticides—Successfully completed 12 months of sampling at 5 sites, per the scope of work. Samples have been shipped to USGS laboratories for analyses.
- Toxicity Testing—**
- Pathogens—**
- Mercury—First annual sportfish and quarterly water sampling event tentatively scheduled for **.
- Nutrients—**

Preliminary Monitoring Results [Not for distribution or citation]

- Current Use Pesticides—Largely ND.
- Toxicity Testing—No toxicity observed to date.
- Pathogens—No trigger levels exceeded.

Upcoming Activities

- Next TAC meeting date: **
- Next SC meeting: July 20
- Joint TAC-SC meeting: Oct. 18
- Bay-Delta Science Conference: Nov. 15-17



Background: The Delta RMP Steering Committee has approved a list of management questions and assessment questions for nutrients in the Delta. The data needed to answer these questions will come from a combination of existing monitoring programs and new data collection to fill data gaps.

Purpose: The purpose of this workshop is to:

- Identify how much of the nutrient monitoring needed to answer the Delta RMP assessment questions is already happening through existing programs
- Identify the most critical data gaps for the Delta RMP
- Develop specific project designs to fill in the priority data gaps
- Agree on a multi-year plan (1-3 years) for Delta RMP nutrient projects

Format: 2-day workshop

Day 1 (late August): review nutrient monitoring done by existing programs, agree on data gaps, prioritize data gaps to be filled by the Delta RMP, and discuss project ideas to fill in priority data gaps.

Day 2 (mid-September): develop specific project designs and cost estimates for the prioritized data gaps; develop a multi-year plan.

Proposed participants: nutrient subcommittee, interested TAC members, and representatives of the Delta Science Program (to ensure linkage to DSP's nutrient workshop). Honoraria may be used to obtain technical peer reviews of monitoring designs and to facilitate attendance by additional experts as needed.

Materials: To prepare for Day 1, ASC will prepare a strawman report that summarizes a) nutrient monitoring done by existing programs relevant to Delta RMP assessment questions, b) data gaps, and c) potential Delta RMP activities to fill critical data gaps.

To prepare Day 2, ASC will synthesize the recommendations from Day 1 into draft study designs for the Delta RMP nutrient monitoring program (1-3 years). The project descriptions will include cost estimates.

The final deliverable will be a workshop summary that synthesizes the workshop findings and recommendations into a draft Multi-Year Plan for nutrients. This plan will be used for the joint SC-TAC multi-year planning meeting in October.

Item 6a Nutrient Workshop

Delta RMP

DRAFT AGENDA FOR NUTRIENT MONITORING WORKSHOP



Workshop Schedule

Task	June				July				August				September				October			Deliverables/desired outcomes	
	Jun 6	Jun 13	Jun 20	Jun 27	Jul 4	Jul 11	Jul 18	Jul 25	Aug 1	Aug 8	Aug 15	Aug 22	Aug 29	Sep 5	Sep 12	Sep 19	Sep 26	Oct 3	Oct 10		Oct 17
1. Schedule, plan, and coordinate workshop																					Feedback on the workshop Additional experts recruited Dates for workshop days 1 and 2
a. TAC: review draft outline (6/14)																					
b. ASC: recruit additional experts																					
c. ASC: schedule workshop																					
2. ASC: Prepare workshop materials																					Strawman for Day 1 Draft project designs for Day 2
a. Day 1 materials																					
b. Day 2 materials																					
3. Workshop																					Goals, an outline, and a timeline for the Delta RMP Nutrient Monitoring Program Specific project designs
a. Day 1 - exact date TBD																					
b. Day 2 - exact date TBD																					
4. Workshop summary report																					Draft summary report/study plan Approved initial nutrient design/study plan
a. ASC: prepare summary report																					
b. SC/TAC MYP meeting: TAC review/SC approval																					

Key:
Milestones/Deliverables (Red vertical bar)
Activity (Grey bar)
Activity (exact window TBD) (Light grey bar)



Day 1

Date TBD

Location TBD

Desired outcomes:

- Review nutrient monitoring relevant to Delta RMP assessment questions already being done by existing programs
- Identify data gaps relative to answering Delta RMP assessment questions
- Agree on priority data gaps to be filled by the Delta RMP

Proposed Agenda

1. Present Workshop objectives and how it fits with the Delta RMP process and other planned workshops (20 min)
2. Review strawman (30 min)
3. Discussion - Designing a Nutrient Monitoring Plan for the Delta (2 hrs)
 - a. Comments on the strawman document. Is anything missing?
 - b. What are the most critical data gaps in terms of scientific understanding?
 - c. What are priority data gaps that the Delta RMP should fill in over the next three years?
 - d. What are initial ideas on how to fill in these priority data gaps?
4. Summarize meeting outcomes and action items (30 min)



Day 2

Date TBD

Location TBD

Desired outcome:

- Develop specific study designs to fill priority data gaps
- Agree on a multi-year plan (1-3 years) for Delta RMP nutrient projects

Proposed Agenda

1. Summarize Day 1 outcomes and goals for Day 2 (15 min)
2. Present specific project designs to fill priority data gaps (3 hrs)
 - a. For each project:
 - i. Technical design
 - ii. Schedule
 - iii. Estimated funding needs
 - iv. Coordination opportunities
 - v. Discussion
3. Develop a Multi-Year Plan for nutrient monitoring and studies for the Delta RMP (30 min)
4. Summarize meeting outcomes and action items (25 min)

Delta Regional Monitoring Program



Signifies that the program collects substantial relevant data. The size of the star indicates the relative importance of the program for addressing the assessment question.

Contributions and Data Gaps from Existing Programs Relative to Answering Delta RMP Nutrient Assessment Questions

	Assessment Questions	Bay RMP	IEP EMP – Continuous	IEP EMP – Discrete	ILRP	MWQI (DWR)	NAWQA	POTWs	Stormwater	Sacramento CMP	USGS Nutrient Sensors	Other	Specific Data Gaps/Comments
ST1	How do concentrations of nutrients vary spatially and temporally?		★	★★			★				★		No stations in eastern Delta; low power to detect trends with monthly grab samples. JUST AN EXAMPLE
ST1A	Are trends similar or different across subregions of the Delta?												
ST1B	How are ambient levels and trends affected by variability in climate, hydrology, and ecology?												
ST1C	Are there important data gaps associated with particular water bodies within the Delta subregions?												
ST2	What is the current status of the Delta ecosystem as influenced by nutrients?												
ST2A	What is the current ecosystem status of habitat types in different types of Delta waterways, and how are the conditions related to nutrients?												

Delta Regional Monitoring Program



	Assessment Questions	Bay RMP	IEP EMP – Continuous	IEP EMP – Discrete	ILRP	MWQI (DWR)	NAWQA	POTWs	Stormwater	Sacramento CMP	USGS Nutrient Sensors	Other	Specific Data Gaps/Comments
SPLP1	Which sources, pathways, and processes contribute most to observed levels of nutrients?												
SPLP1A	How have nutrient or nutrient-related source controls and water management actions changed ambient levels of nutrients and nutrient-associated parameters?												
SPLP1B	What are the loads from tributaries to the Delta?												
SPLP1C	What are the sources and loads of nutrients within the Delta?												
SPLP1D	What role do internal sources play in influencing observed nutrient levels?												
SPLP1E	Which factors in the Delta influence the effects of nutrients?												
SPLP1F	What are the types and sources of nutrient sinks within the Delta?												

Delta Regional Monitoring Program



	Assessment Questions	Bay RMP	IEP EMP – Continuous	IEP EMP – Discrete	ILRP	MWQI (DWR)	NAWQA	POTWs	Stormwater	Sacramento CMP	USGS Nutrient Sensors	Other	Specific Data Gaps/Comments
SPLP1G	What are the types and magnitudes of nutrient exports from the Delta to Suisun Bay and water intakes for the State and Federal Water Projects?												
FM1	How will ambient water quality conditions respond to potential or planned future source control actions, restoration projects, and water resource management changes?												

Item 06b Nutrient Tasks (FY16/17)



To: Delta RMP Technical Advisory Committee
From: Thomas Jabusch, Phil Trowbridge, Meg Sedlak, and David Senn
Re: Nutrient Synthesis Tasks in the FY16/17 Detailed Workplan
Date: June 2, 2016

Introduction

On April 25, 2016, the Delta RMP Steering Committee approved the Delta RMP FY16/17 Detailed Workplan. The Workplan includes three Nutrient Synthesis tasks: 1) Data synthesis report; 2) Modeling and synthesis of results; and 3) Advanced statistical analyses. The total budget for the Nutrient Synthesis tasks is \$120,000.

Some members of the TAC and SC requested additional details about how the Nutrient Synthesis tasks would be completed. Therefore, this memorandum presents: A) the approved scope of work for the FY16/17 Nutrient Synthesis tasks, and B) additional detail on the project elements and their expected outcomes.

A. Approved Scope of Work for the FY16/17 Nutrient Synthesis Tasks

Study Elements

The nutrient study consists of three distinct elements: 1) Data synthesis report; 2) Modeling and synthesis of results; and 3) Advanced statistical analyses. Each element is described in more detail below.

1. *Synthesis report*

The goals of the synthesis report are to:

- a. Summarize status and trends for nutrient-related parameters at IEP-EMP sites and other sites that may inform Delta RMP planning;
- b. Evaluate the results of the data analysis relative to Delta RMP assessment questions; and
- c. Inform the Delta RMP nutrient monitoring design.

Item 06b Nutrient Tasks (FY16/17)

This synthesis report will build upon recent data analysis projects that have used IEP-EMP data. Data analysis and observations from those reports will be extended to include new data (2012-2016) and additional nutrient-related parameters. The synthesis report will distill and integrate data and results from the following, recently completed projects:

- ASC project funded by DWR, synthesizing IEP-EMP data (2000 – 2011); “Characterizing and quantifying nutrient sources, sinks and transformations in the Delta: synthesis, modeling, and recommendations for monitoring”; URL: <http://sfbaynutrients.sfei.org/books/dwr-contract-deliverable>;
- USGS report funded by the Delta RMP, synthesizing high-frequency sensor data; “Planning and operating a high frequency nutrient and biogeochemistry monitoring network: the Sacramento-San Joaquin Delta”; URL: <https://goo.gl/VcDnmw>;
- ASC project funded by DSP (completion by June 2016), analyzing IEP-EMP data (1975-2011) with a focus on spatial variability, potential subregions for nutrient modeling, and assessment, and limited characterization of long-term trends.

The synthesis report will also include the following additional new materials, analyses, and findings:

- An update of the analyses for nitrogen species performed for the DWR report. The additional analyses will include the most recent data available (2011 onwards including drought years through 2016) and additional parameters (e.g., phosphate, total phosphorus, chlorophyll, and dissolved oxygen).
- To the extent possible, adapt and incorporate results from a USEPA-ASC collaborative project, which uses advanced statistical data analysis approaches to evaluate long-term trends (e.g., weighted regression for removing flow effects) in N species.

2. Modeling and synthesis of modeling results

The goals of this task are to

- a. Apply existing hydrodynamic/hydrologic models to evaluate if the current monitoring network adequately covers different regions and habitat types (e.g., deep-water channels, shallow areas, back sloughs), and identify those that are currently under sampled.
- b. Analyze model output to identify cost-effective monitoring options for areas or habitat types that are currently under sampled.

Developing a monitoring design for nutrients is one of the three recommended steps in the nutrients section of the approved Delta RMP Monitoring Design. Assessing the utility of a design with empirical data would require intensive field sampling - and actually oversampling - to thoroughly characterize variability and identify the network needed to capture necessary information. That density of data does not exist, and collecting it would be cost-prohibitive given current funding levels. However, well-designed numerical modeling experiments can be used to simulate the system’s dynamics, and the model outputs can be analyzed to identify the necessary sampling network to answer management questions.

Item 06b Nutrient Tasks (FY16/17)

The proposed work will augment DMS2-based modeling (used in the recent DWR report) with simulated particle tracking and tracer studies. The proposed scope of work will include the following:

- Convening a subcommittee for a conference call to develop metrics for evaluating assessment questions;
- Select appropriate model and design model experiments, including the identification of
 - Simulated particle release locations;
 - Specific years and seasons to be simulated; and
 - Required data output;
- Run simulations; and
- Analyze model output data to assess the suitability of the current network for answering the assessment questions, and options for efficiently augmenting the network to address insufficient density or current “blind spots.”

3. *Advanced Statistical Analyses*

Goals of the advanced statistical modeling task are to:

1. Improve the description of long-term changes in water quality;
2. Characterize the relative importance of contributing factors (flow routing, residence time, and temperature); and
3. Further resolve the responses of nutrient and nutrient-associated parameters (nitrogen species, phosphorus species, and chlorophyll) to natural (climate variability) and anthropogenic drivers (e.g., loadings, land use).

This task will build on work being performed through a recent collaboration between the USEPA Office of Research and Development (ORD) and ASC. Many traditional approaches to analyzing trends over time (e.g., Seasonal Kendall Test) are not able to resolve complex variations, test for causal factors, or account for factors such as interannual differences in flow (e.g., prolonged drought, wet vs. dry years). This task will apply advanced statistical approaches, such as weighted regression on time, discharge, and season (WRTDS) or generalized additive models (GAMs), to evaluate long-term trends in nutrients in the Bay-Delta, and apply the results of these analyses toward addressing Delta RMP assessment questions and informing nutrient monitoring design.

Subcontractors

The particle tracking modeling described in Task 2 will be conducted by Marianne Guerin at RMA Consultants, who has extensive experience with Delta modeling using the DSM2 and RMA models. The specific scope of work for the contract will be developed; however, it will be less than \$50,000 so it will not be necessary to seek approval for a sole source vendor.

Item 06b Nutrient Tasks (FY16/17)

ASC Labor

ASC staff will prepare the data synthesis document, oversee the particle tracking modeling and summarize the findings in a technical report, and assist in the statistical evaluation and write the technical report.

Total Budget

The total budget for the nutrients element is \$120,000. The cost to complete the data synthesis is \$33,000; the modeling \$50,000, and the statistical analyses \$37,000.

Deliverables

The deliverable for Task 1 will be a technical report that synthesizes information from recent studies. Similarly, for Task 2 and 3, technical reports summarizing the findings will be prepared. All technical reports will be completed as drafts by March 31, 2017, and finalized by June 30, 2017.

Item 06b Nutrient Tasks (FY16/17)

B. Additional Details on Tasks, Schedule, and Outcomes***Task 1. Synthesis report****Assessment Questions Applicable*

S&T 1. How do concentrations of nutrients (and nutrient-associated parameters) vary spatially and temporally?

A. Are trends similar or different across subregions of the Delta?

Tasks and Schedule

Task	Schedule (deadlines)
1.1. Additional data analyses	<ul style="list-style-type: none"> • 9/30/16: Download most recent IEP-EMP data • 10/31/16: All analyses complete
1.2. Compile additional data and information	<ul style="list-style-type: none"> • 10/31/16: Compile all of the following: <ol style="list-style-type: none"> 1. IEP-EMP data report (ASC) - <i>done</i> 2. DSP report (ASC) - <i>done</i> 3. Delta RMP Sensor Synthesis (USGS) 4. WRTDS/GAMA results (USEPA/ASC)
1.3. Prepare synthesis report	<ul style="list-style-type: none"> • 11/30/16: Draft outline with example write-ups/graphs/maps to Nutrient Subcommittee/TAC • 12/31/16: Comments due • 1/31/17: Draft report to Nutrient Subcommittee/TAC • 2/28/17: Comments due • 3/31/17: Draft technical report to SC • 6/30/17: Final technical report to SC

Item 06b Nutrient Tasks (FY16/17)

Data Evaluation (IEP-EMP data) - Seasonal and spatial trends

- Updated and additional time series data for visual examination of long-term trends and whether there are any notable changes or other observations in recent data (Figure 1).
- Updated and additional boxplots of concentrations by station and by month to evaluate seasonal and spatial variability. Trends at individual stations, within, and across subregions can be tested with the Kendall suite of tests (Mann-Kendall, Seasonal Kendall, and Regional Kendall tests).
- Updated and additional empirical orthogonal functions (EOFs) to explore the seasonal, interannual, and spatial variability of concentrations across Delta subregions. Patterns in EOFs reveal visually whether there are similarities and differences in factors driving variability across stations/subregions, and changes in the significance of these factors over time.

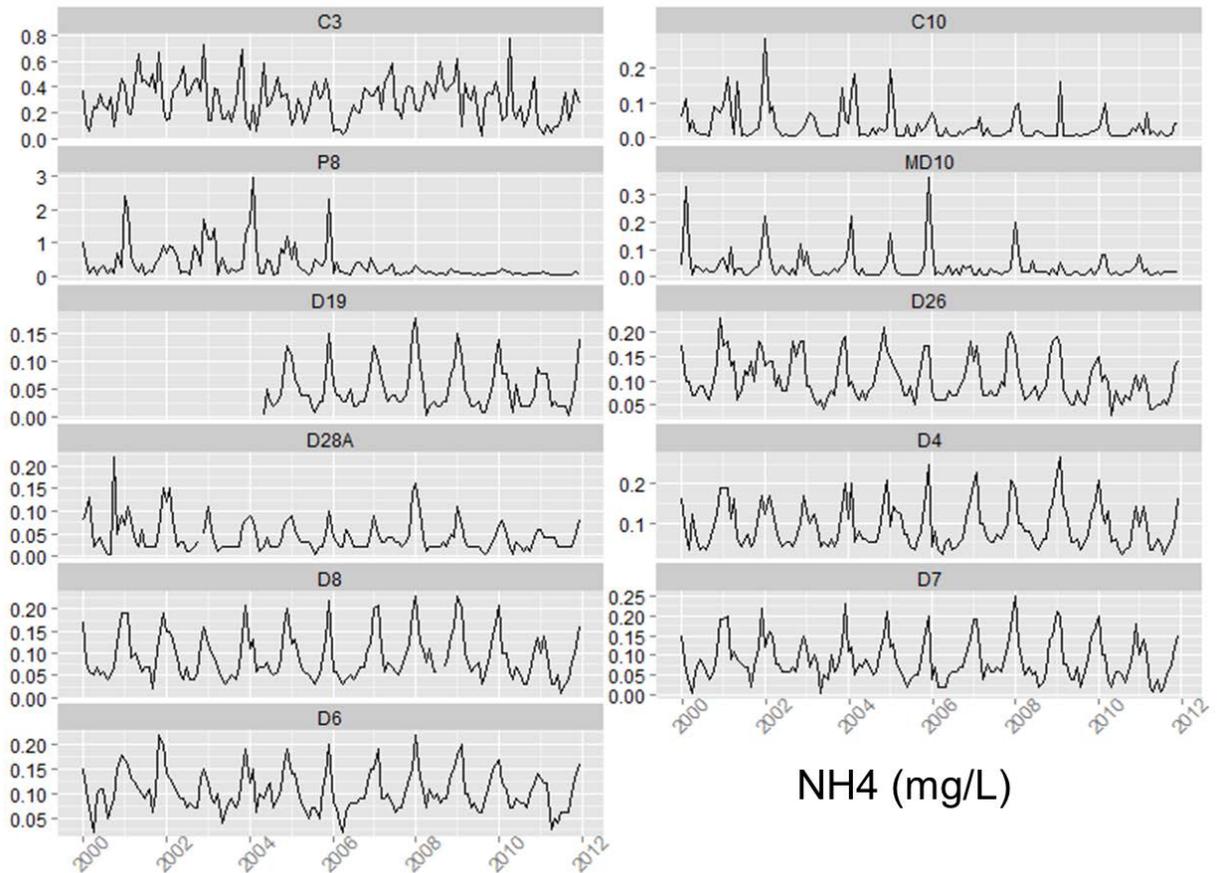
Example Graphs/Outputs

Figure 1. Time-series of NH₄ (mg N/L) at select DWR-IEP water quality monitoring stations, 2000-2011. Note varying y-axis scales

Item 06b Nutrient Tasks (FY16/17)

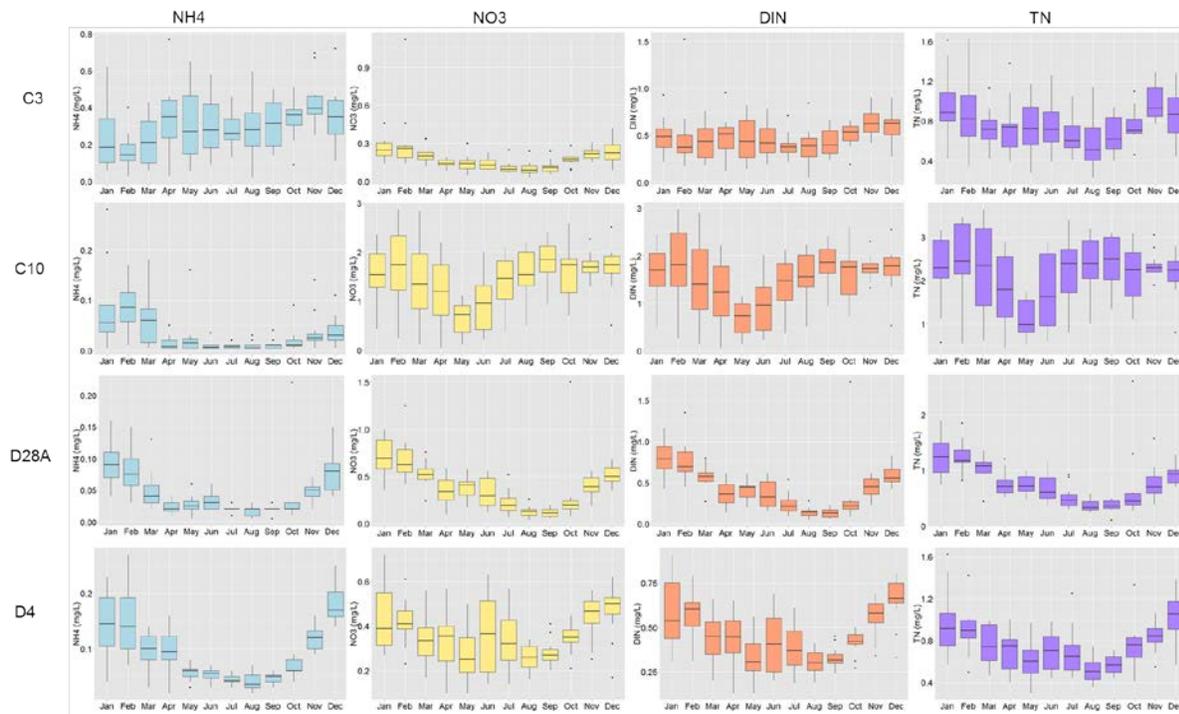


Figure 2. Boxplots on NH₄, NO₃, DIN and TN concentrations at a subset of DWR-IEP stations for the period 2000-2011. The boxes show median concentration and 25th/75th percentiles, and the whiskers extend to 1.5x the interquartile range. Anything beyond that are considered outliers and shown with dots. Note the varying y-axis scales.

Item 06b Nutrient Tasks (FY16/17)

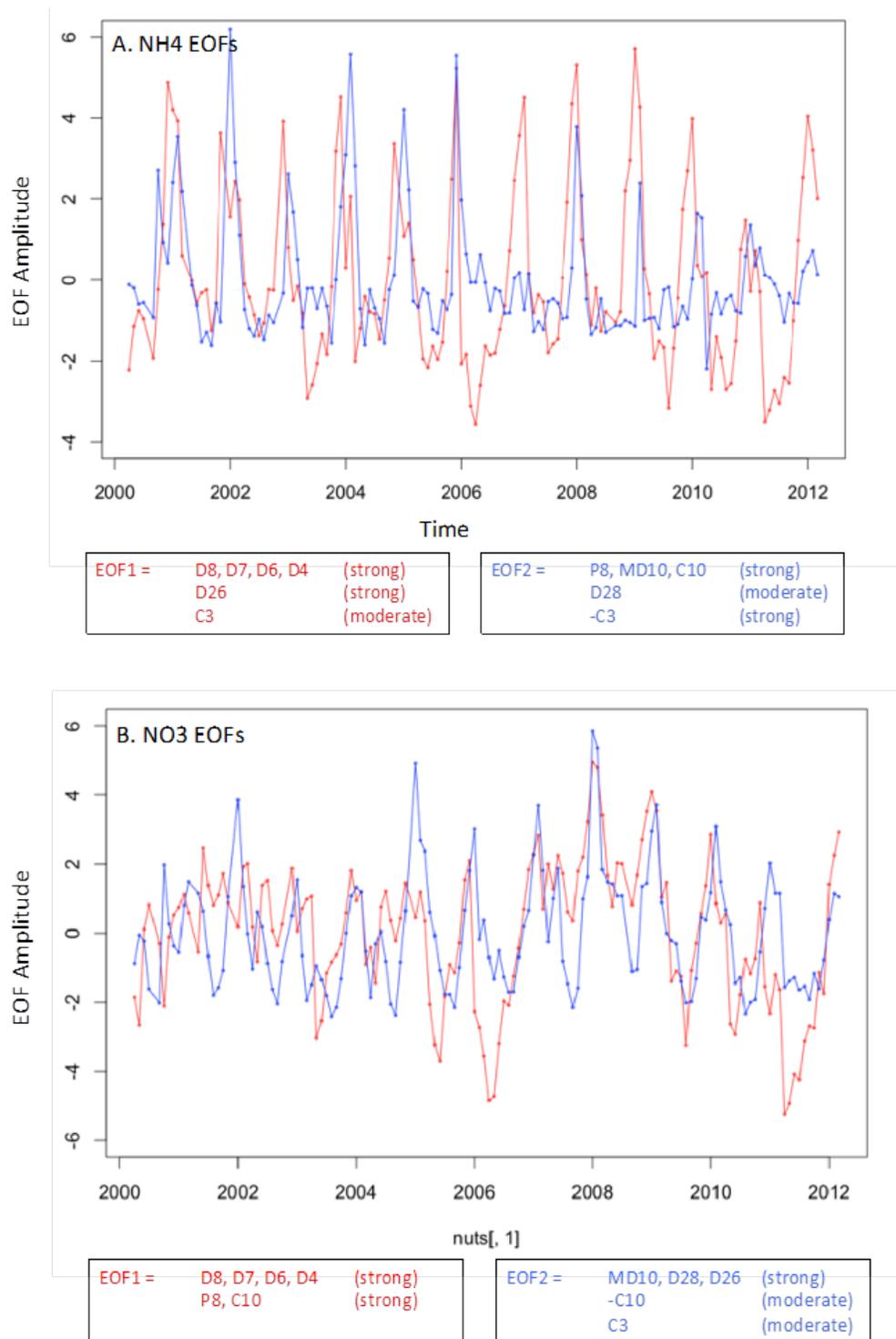


Figure 3. Results of empirical orthogonal function (EOF) analysis, by N species, for A. NH4 and B. NO3 the period 2000-2011.

Item 06b Nutrient Tasks (FY16/17)

Task 2. Modeling and synthesis of modeling results*Assessment Questions Applicable*

- S&T 1. How do concentrations of nutrients (and nutrient-associated parameters) vary spatially and temporally?
- B. Are there important data gaps associated with particular water bodies within the Delta subregions?

Tasks and Schedule

Task	Schedule (deadlines)
2.1. Convene nutrient subcommittee in-person meeting or conference call <i>(One meeting/call will be scheduled to discuss Tasks 2 and 3 at the same time)</i>	<ul style="list-style-type: none"> • 7/15/16: Schedule a meeting or call to <ol style="list-style-type: none"> 1. Select model and metrics/model parameters (Task 2), 2. Selection subregions and habitat classification delineations to be used (Tasks 1 and 2), and 3. Discuss Statistical Modeling (Task 3) • 7/15/16: Develop work materials for call • 7/22/16: Convene conference call
2.2. Select appropriate model and design experiments	<ul style="list-style-type: none"> • 8/8/16: Draft model design to Nutrient Subcommittee • 8/15/16: Comments due • 8/31/16: Model design complete
2.3. Run simulations	<ul style="list-style-type: none"> • 9/30/16: All simulations complete
2.4. Analyze and synthesize model output data	<ul style="list-style-type: none"> • 10/31/16: All output data analyses complete • 11/30/16: Draft outline to Nutrient Subcommittee/TAC • 12/31/16: Comments due • 1/31/17: Draft report to Nutrient Subcommittee/TAC • 2/28/17: Comments due • 3/31/17: Draft technical report to SC • 6/30/17: Final technical report to SC

Item 06b Nutrient Tasks (FY16/17)

Example Model Output

Simulated particle tracking studies with the DSM2 model can be used to identify water bodies where water masses are mixing as well as potential transformation “hot spots”, i.e. potential transition zones with higher residence times where important nutrient processes would be expected to happen but that are currently not monitored. The figures below provide examples for the output from such simulations.

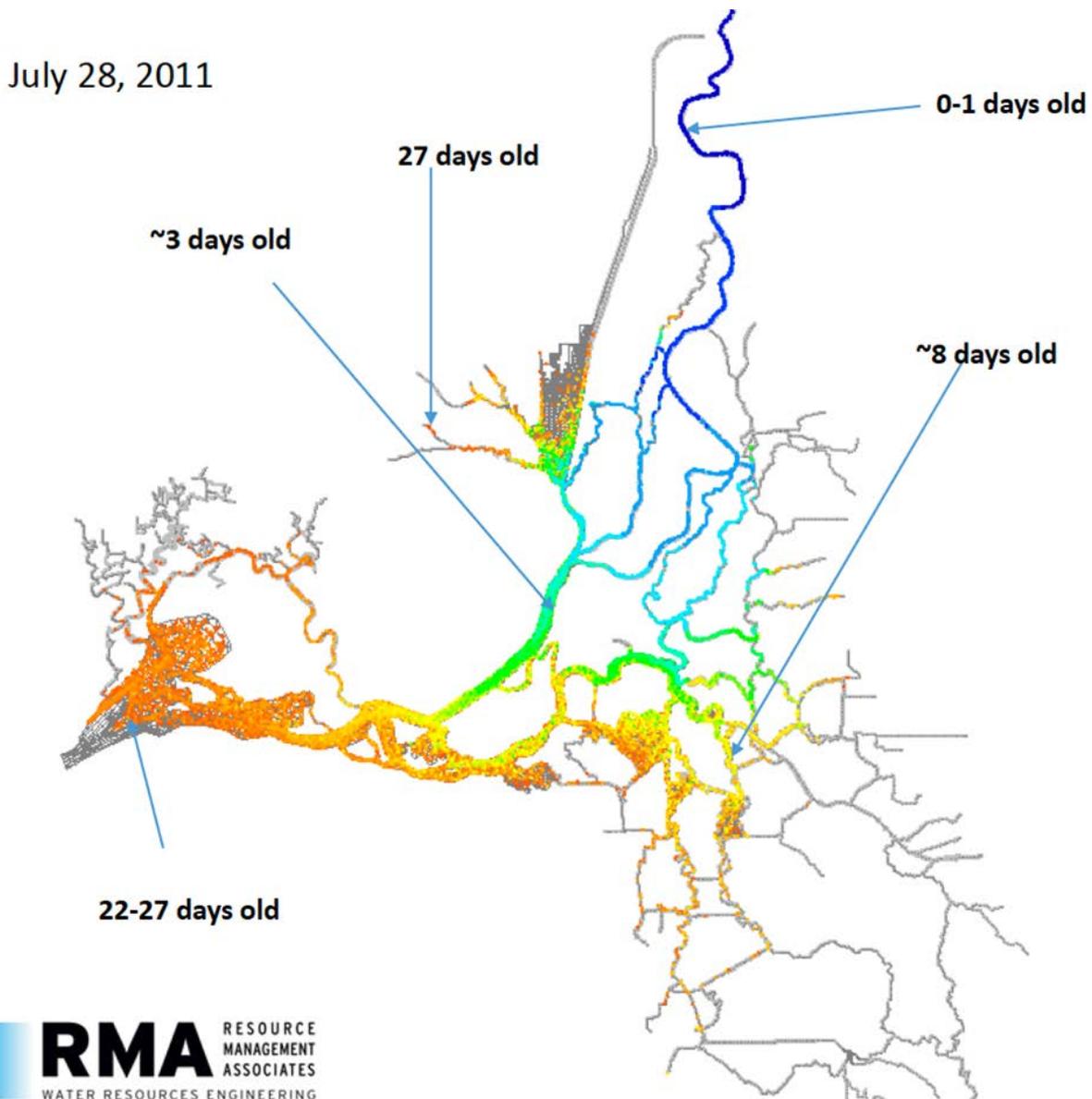


Figure 4. Water parcel “age” modeling can be applied to evaluate residence time and source mixing in different flow scenarios. This type of modeling is based on the DSM2 model and visualizes the simulated dispersion of water parcels, based on the tracking of virtual tracer particles over time from the point of their release. The colors in the map represent the “age” of water parcels. The simulations are for 28 days (representing summer conditions in a year with average flow). The “youngest” particles are those that have been most recently released just before the simulation ended and represent shorter residence and/or travel times. The “oldest” particles are those that have been released at the beginning of the simulation and represent longer residence and/or travel times.

Item 06b Nutrient Tasks (FY16/17)

Task 3. Advanced Statistical Analyses*Assessment Questions Applicable*

- S&T 1. How do concentrations of nutrients (and nutrient-associated parameters) vary spatially and temporally?
- C. How are ambient levels and trends affected by variability in climate, hydrology, and ecology?

Tasks and Schedule

Task	Schedule (deadlines)
3.1. Statistical modeling	<ul style="list-style-type: none"> • 7/22/16: Nutrient subcommittee meeting/call (same meeting/call as in Task 2) • 7/31/16: Comments due • 10/31/16: All additional statistical modeling complete • 11/30/16: Draft outline to Nutrient Subcommittee/TAC • 12/31/16: Comments due • 1/31/17: Draft report to Nutrient Subcommittee/TAC • 2/28/17: Comments due • 3/31/17: Draft technical report to SC • 6/30/17: Final technical report to SC

Item 06b Nutrient Tasks (FY16/17)

Examples for Statistical Modeling Results/Outputs

Advanced statistical approaches such as weighted regression on time, discharge, and season (WRTDS) or generalized additive models (GAMs) can detect changes over time that traditional approaches (e.g., Seasonal Kendall suite of tests) are not able to resolve (see Figure 4 for an example). In WRTDS, flow-adjusted concentrations are defined as residuals that are based on a regression of concentration on some function of flow. Thus, WRTDS avoids the problem of identifying trends in nutrients that may be artifacts of a particular sequence of observed flows (e.g. drought conditions). GAMs were developed as a modification to generalized linear models to model a response variable as the sum of smoothing functions of different predictors. GAMs were not developed specifically for application to water quality problems, but they are less computationally intense and provide more accessible estimates of model uncertainty than WRTDS.

USEPA and ASC are currently collaborating on an evaluation of the IEP-EMP data with the WRTDS trend analysis method to describe variation over time and relationships between key species of dissolved inorganic nitrogen (ammonium, nitrate/nitrite, total). The results of the current collaboration will be incorporated in to the synthesis report (Task 1). For this task, the models will be further developed and applied to a larger dataset. Variation of nutrient parameters will be considered in the context of varying contributions of input flows from the Sacramento and San Joaquin rivers, as well as tidal exchange with the central SFE. Expected outcomes are an improved understanding of variation in flow-normalized concentrations, frequency occurrence of extreme events (see Figure 5 for an example), and response to historical changes in the watershed. In addition, evaluation of co-variation among nutrient variables and additional indicators (chlorophyll, light limitation) can provide mechanistic clues about the effects of both natural and anthropogenic drivers of ecosystem response (see Figure 6 for an example).

GAM was applied in Chesapeake Bay to distinguish climate effects on hydrology and thus variability in nutrient loadings, concentrations, and phytoplankton biomass from changes reflecting anthropogenic eutrophication (see [Harding et al. 2015](#)).

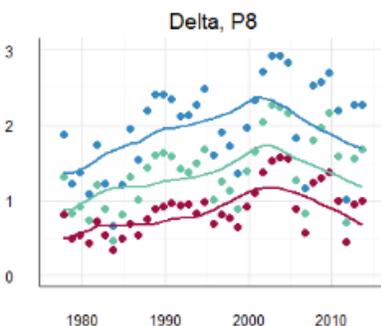


Figure 4. WRTDS resolves the reversal in the DIN trend in the San Joaquin River at Buckley Cove, when the Stockton Wastewater Treatment Plant switched to tertiary treatment in the 2000s.

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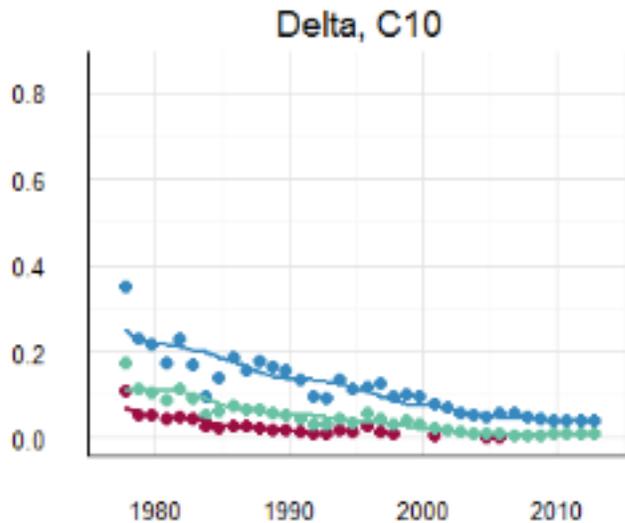


Figure 5. Convergence of the upper (blue) and lower (red) quantile distributions of annual trends in ammonium predicted with WRTDS suggest a reduction of extreme events at Station C10 (San Joaquin River at Vernalis).

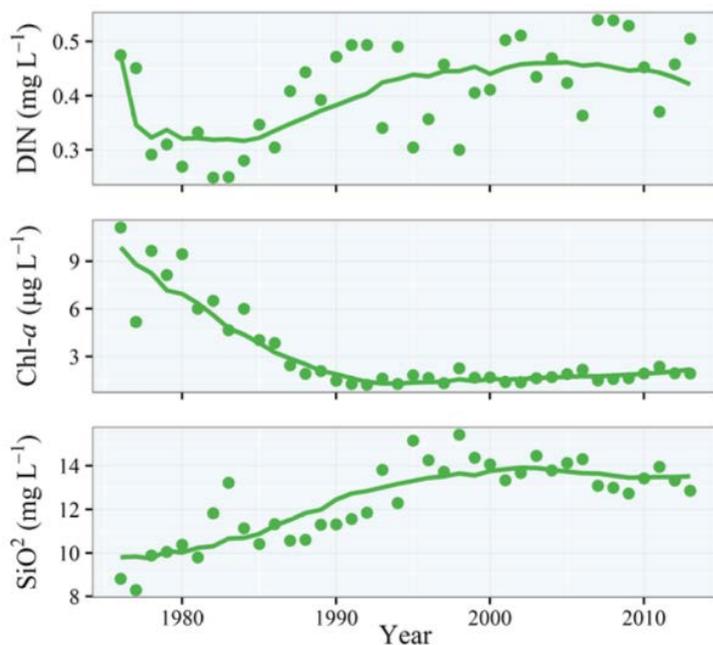


Figure 6. Covariation among dissolved inorganic nitrogen (DIN), chlorophyll, and silicate (SiO_2) at a Suisun Bay station. It is well documented that the invasion of the overbite clam resulted in reduced diatom biomass in Suisun Bay. The graphs illustrate that a reduction in chlorophyll (indicator for phytoplankton biomass) is accompanied by upward trends in both SiO_2 (an important nutrient for diatoms) and DIN. Follow-up evaluations are examining whether a drop in diatom biomass resulted not only in reduced drawdown of SiO_2 but also of DIN, resulting in an overall increase in both SiO_2 and DIN.



Delta RMP Joint Technical Advisory and Steering Committee Meeting October 18th, 10:00 am – 4:30 pm

Central Valley Regional Board, 11020 Sun Center Drive #200, Rancho Cordova, CA

Board Room

Conference video link:

<https://stateofcaswrcbweb.centurylinkccc.com/CenturylinkWeb/DeltaRMP>

Call-in: 1-720-279-0026

Access Code: 514286#

Agenda

1.	<p>Introductions and Review Agenda Introduce TAC and SC members, establish quorum, and explain goals of the meeting</p>		10:00 Brock Bernstein
2.	<p>Report out of Major Findings from DSP External Review The Delta Science Program is coordinating an external review of the Delta RMP. Preliminary findings will be available at the end of September. A brief summary of the findings will be presented and the process for addressing the findings will be outlined.</p>	Summary of preliminary findings	10:15 Meg Sedlak
3a.	<p>Information: Overview of Multi-Year Planning Process An overview of the goals of the MYP process will be given.</p>	Memo describing the multi-year planning process	11:00 Philip Trowbridge
3b.	<p>Discussion: Review and update table of current and anticipated management decisions The SC has identified upcoming management decisions and information needs relevant to these decisions.</p> <p><u>Desired outcome:</u> Review of table and input on whether any revisions are needed.</p>	Attachment 1: Table of Current and Anticipated Management Decisions	11:20 Meg Sedlak
3c.	<p>Action: Confirm Monitoring Design Review Monitoring Design, particularly in light of recommendations made by DSP External Review.</p>		11:50 Phil Trowbridge



	Lunch break – Have lunch/pizza brought in so committees can socialize		12:30
4.	<p>Discussion/Action: Agree on planning budgets for next three years Discuss budget projections and establish planning budgets for FY17/18, FY18/19, and FY19/20 that reflect priorities and available funds. <u>Desired outcome:</u> Agreement on planning budgets and priorities.</p>	Attachments 2-3: Multi-year Planning Budget Tables and Graphs	1:30 Meg Sedlak
5.	<p>Discussion/Action: Recommendations for budget and priorities for FY17/18 Beginning in 2017, the TAC will convene subcommittees to develop program elements for the Detailed Workplan. The SC will need to establish priorities and budgets for each focus area of the Monitoring Design (e.g., pesticides, nutrients, mercury, and pathogens) so the TAC can oversee the development of elements of the Workplan. <u>Desired outcome:</u> Clear direction to the TAC on budgets and priorities for each program element.</p>		2:30 Phil Trowbridge
6.	<p>Discussion: Joint projects between Bay and Delta RMPs There are a number of opportunities for joint projects between the programs. <u>Desired outcome:</u> Identification of potential projects and possible mechanisms to fund them.</p>	Memo on possible projects	3:30 Meg Sedlak
7.	Summarize Outcomes of the Meeting		4:00 Group
8.	Plus/ Delta		4:15 Brock Bernstein



DATE: October ?th, 2016

TO: Delta RMP Steering Committee and Technical Advisory Committee

FROM: Philip Trowbridge

RE: Overview of Multi-Year Planning Process

The purpose of the multi-year planning process is to identify future information needs for management decisions and align budgets with priorities.

Multi-year planning helps the Program to be cost-effective through identifying strategic, long-term partnerships and opportunities to leverage and/or augment existing funding. It keeps the program relevant to upcoming decisions and helps provide direction to the Technical Advisory Committee (TAC) and subcommittees for the development of the annual Detailed Workplan.

As part of the planning process, the Steering Committee (SC) and TAC will identify upcoming management decisions and information needs to inform these decisions. Then, the SC and TAC will determine if any changes to the Monitoring Design are warranted, particularly in light of the recommendations made by the Delta Science Program's External Review Panel. Next, the SC will review predictions of revenue and expenses to implement the Monitoring Design. The SC will confirm the revenue target for FY17/18, establish priorities, and assign planning budgets to the different focus areas within the revenue targets. If time permits, priorities and planning budgets to future years will be discussed.

The budgets set in the multi-year planning process are only for planning purposes. The actual budgets for each year will be in the Detailed Workplan and Budget that is prepared in the spring. However, the planning budgets are helpful to the TAC and ASC staff to understand approximately how much funding might be available for different focus areas.

To assist the SC with this process, the following briefing documents are attached:

- Attachment 1: A table of Current and Anticipated Management Decisions, Policies, and Actions by the Regulatory Agencies that Manage Delta Water Quality
- Attachment 2: Memo of Preliminary Recommendations from DSP External Review Panel
- Attachment 3: Tables showing estimated costs to implement the Monitoring Design and Communications Plan for FY16/17 through FY19/20
- Attachment 4: A table showing options for revenue targets and cost allocation schedules
- Attachment 5: A summary graphic showing the multi-year budgets and revenue options from Attachments 4 and 5.

MEMORANDUM



DATE: June 1, 2016

TO: Delta Regional Monitoring Program (Delta RMP) Technical Advisory Committee (TAC)

CC: Elaine Archibald, Archibald Consulting

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SUBJECT: PATHOGEN STUDY YEAR NO. 1 DATA SUMMARY AND YEAR NO. 2 APPROACH

The Monitoring Design Summary¹ describes the two year pathogen monitoring study developed by the Central Valley Drinking Water Policy Workgroup (Workgroup) in coordination with the Delta RMP. The study coordinates water agency intake sample collection for the Long Term 2 Enhanced Surface Water Treatment Rule (LT2) between April 2015 and April 2017 with ambient sample collection. The Delta RMP collects the ambient samples at 12 locations by the Municipal Water Quality Investigations (MWQI) section of the Department of Water Resources (DWR), with funding from the Delta RMP for analytical services and in-kind contributions from Workgroup members to oversee sample collection and data assessment. All monitoring sites are shown on Figure 1. In preparation for the March 2016 Delta RMP Technical Advisory Committee (TAC) and April Steering Committee meetings, the Workgroup performed an assessment of the data to date, and prepared recommendations for Year No. 2.² This document expands on the preliminary Year No. 1 assesment to include the entire first year's data, and provides additional detail about the process for initiating as-needed Year No. 2 "trigger studies."

¹ Delta Regional Monitoring Program. *Monitoring Design Summary*. Prepared for Delta RMP Steering Committee. November 3, 2014. *Revised June 16, 2015*

² Brian Laurenson and Hope Taylor, Larry Walker Associates. *Pathogen Study Year No. 2 Study Recommendations*. March 2015.

REVIEW OF YEAR NO. 1 (APRIL 2015 – APRIL 2016) DATA

The Workgroup reviewed the Year No. 1 data to date (13 months, from April 2015 through April 2016), including all available LT2 Delta water intake data and ambient data collected by the Delta RMP for *Cryptosporidium* and *Giardia*, which are summarized in Table 2 through Table 5 as provisional data for Delta RMP use only. These data confirm that Basin Plan trigger values for *Cryptosporidium* have not been exceeded at the drinking water intakes during the first part of the study, which included several widespread storm events. The ambient data collected by the Delta RMP supports this finding, though the trigger values are only applicable at the water intake locations.

While some matrix spike levels reported were lower than is typical for analytical chemistry (see Table 6), the analytical laboratory ongoing precision recovery (OPR) values are within acceptable ranges, and the data are considered usable based on LT2 evaluation criteria. The Workgroup, following a review period by the Delta RMP TAC, modified quality control sample collection and sample collection during July 2015 and August 2015 because of a known nationwide analytical method reagent supply quality issue that was subsequently resolved.³ The evaluation determined that both the primary and secondary analytical labs performed similarly for matrix spike recoveries and that LT2-allowed method modifications intended to improve *Cryptosporidium* matrix recovery did not improve performance.

³ Brian Laurenson and Hope Taylor, Larry Walker Associates. *Temporary Variance to Delta Regional Monitoring Program Pathogen Monitoring Schedule to Evaluate Reagent Supply and Method Performance*. August 4, 2015 e-mail to Phil Trowbridge, Aquatic Science Center

YEAR NO. 2 (APRIL 2016 - MARCH 2017) SAMPLE COLLECTION

Because trigger values were not exceeded in Year No. 1 to date and there were no consistent detections of *Cryptosporidium*, the Workgroup determined that specific trigger study activities were not immediately necessary. However, future data may trigger additional study to characterize potential sources if a Basin Plan trigger value is observed.

Based on the Monitoring Design Summary and the findings from Year No. 1, the Workgroup recommended that the Delta RMP proceed as follows to satisfy the intent of the Basin Plan Monitoring and Surveillance program:

1. Continue monthly monitoring at the twelve ambient locations according to the Monitoring and Design Summary mid-range level-of-effort (\$72,000). MWQI received DWR approval of the ongoing additional effort to collect the samples for Year No. 2. Any additional increase in level-of-effort would require additional approval. The Delta RMP has allocated funding for Year 2 monitoring (see Detailed Workplan for FY15-16, p. 17).
2. Request \$47,250 for the Year No. 2 “trigger study” according to the Monitoring and Design Summary. These funds would be used only if necessary to perform trigger follow-up monitoring in coordination with the monthly monitoring. The Delta RMP has set aside \$20,000 in FY 15/16 for a potential trigger study; review and approval from TAC and SC will be necessary prior to commencement.
3. Request the ability for the Workgroup to make as-needed modifications to the quality control and environmental sample collection schedules to perform the trigger studies or to address matrix recovery issues, other data quality or logistical issues that are identified during Year No. 2 of the study. Proposed changes would first be discussed with Aquatic Science Center staff who would make a determination of whether the change was significant enough to require supplemental documentation prepared by the Workgroup and notification and/or review by the Technical Advisory Committee and the Steering Committee. Any modifications would be funded by “not-to-exceed” trigger study funding or through modification of the monthly monitoring schedule of activities. This process would be followed for any special study work recommended by the Workgroup.

The Steering Committee previously approved the monthly ambient sample through March 2017. At the April 25, 2016 the Steering Committee approved as-needed funding for the “trigger study,” through June 2016, but requested additional clarification on the trigger criteria and response approach before approving additional funds through March 2017. The trigger study would only be performed if determined necessary, and would be funded through the approved as-needed funding. The trigger study approach is described in the section below.

Trigger Response

The Basin Plan drinking water intake trigger level is 80% of the Long Term 2 Enhanced Surface Water Treatment Rule bin classification. Since all Delta drinking water intake locations are currently classified as bin 1 (maximum running annual average <0.075 oocysts/L), the trigger value (80% of the bin 2 level) is 0.06 oocysts/L (maximum running annual average). A concentration above the trigger value at a drinking water intake prompts proactive actions to investigate potential contributors to the change in bin level.

If a maximum running annual average in the ambient locations exceeds the trigger value, a follow-up study would only occur if indicated by trigger value exceedance at the drinking water intake or other compelling data (e.g., increasing trend, extreme value).

The Pathogen Subcommittee and the TAC will be notified upon identification of a trigger exceedance, and the Pathogen Subcommittee will determine the trigger study approach within two weeks of the trigger exceedance notification. The trigger study would be initiated within one month.

The Monitoring Design Summary implements the Basin Plan Figure IV-1 trigger response (Figure 2), and identifies several possible tools that can be used for a trigger study. The Pathogen Workgroup will compile the data and compare drinking water intake rolling twelve month averages to the trigger value. Because the water intake data are compiled by other agencies, the Pathogen Workgroup will also evaluate ambient data against the trigger values. The trigger response would involve data and source assessments and associated decision steps: 1) data review, 2) assessment, and 3) investigation. This approach is summarized in Figure 2.

Data review

The Pathogen Workgroup compiles and reviews ambient data monthly to assess data quality and to identify if triggers have been met. The Pathogen Workgroup requests intake data from drinking water agencies quarterly, and recognizes that there is a potential lag in obtaining data promptly following a trigger. If a maximum running annual average exceeds the trigger at a main-stem ambient location, the Pathogen Workgroup will request data from downstream drinking water agencies to evaluate if a trigger was met at an intake location. The main-stem ambient locations are located along the Sacramento and San Joaquin Rivers, and are considered representative of source water for the drinking water intakes.

Ongoing low matrix spike recoveries have previously been assessed through a short-term additional quality control study evaluating laboratory, method, and site-specific sample recovery performance. This data review would be ongoing, and assessments of triggers would include consideration of poor data quality causing an exceedance. Low matrix spike recoveries are acceptable by the LT2 data reporting⁴, and would tend to bias results low.

Assessment

The Steering Committee developed Management Questions that are based on the Basin Plan identified needs, as summarized in the Monitoring Design Summary. The Pathogen Study Design Summary specifies the following management and research questions, which will be considered during the trigger assessment:

- SPLP1 Can any changes in bin level be attributed to an identifiable event, condition, or changes in a source?
- A. What are the concentrations in ambient waters upstream or downstream from intakes with observed changes to bin levels?

⁴ USEPA: <https://safewater.zendesk.com/hc/en-us/articles/211399088-The-recovery-rate-of-a-matrix-spike-sample-is-below-the-quality-control-acceptance-criteria-identified-in-the-analytical-method-13-111-Is-the-corresponding-field-sample-valid-What-steps-should-be-taken->

- B. What is the influence of sources (agriculture, POTWs, urban runoff, upstream tributary, natural, recreation, and other) on pathogen levels at drinking water intakes?
- C. Are there new discharges or changes in sources or conditions that could explain the change in bin level compared to previous LT2 monitoring?

Ambient data upstream and downstream of any intake with an identified trigger will be assessed. Based on the location, magnitude, timing (e.g., storm influence, irrigation season, etc.), and duration of the trigger value, the Pathogen Workgroup will develop a list of possible new sources since the development of the Drinking Water Policy to evaluate individually. The list will be based on known changes to discharges, available modeling information, and pertinent information and reporting from other programs.

Investigation

If a more detailed monitoring investigation is necessary (i.e., identified sources are non-negligible and controllable), the Pathogen Workgroup would develop a specific follow-up monitoring plan. Follow up studies would be performed following a trigger exceedance at a drinking water intake or at a main-stem ambient site. The tools considered in the trigger study and updated unit costs are described in Table 1 below.

The type of trigger study will be selected based on the type of location (intake vs. ambient) and magnitude/persistence of the trigger exceedance, as described in Table 1. For example, infectivity monitoring would be performed at ambient locations, and requires consistent oocyst detection – therefore, infectivity monitoring would be selected as a component of a trigger study if multiple (≥ 2 oocysts) are detected during two consecutive months at an ambient site, and would only be performed at the site with detected oocysts.

It is estimated that a study, if necessary, would be performed at four to six sites for four to six events. While trigger studies could be performed after Year No. 2, the “lost opportunity” cost would likely include the extension of project administration costs and additional sample collection at four to six ambient locations and intakes (approximately \$20,000 to \$25,000). Additionally, it may be more likely that the source or condition that triggered the study will be missed as the study timing is extended beyond the initial sample date.

Table 1. Trigger Study tools

Trigger Follow-up Tool	Description	Quantified Value	Assessment Question	Investigation Criteria	Approach	Unit Cost
Source monitoring	Collected by sources (e.g., stormwater, POTWs)	<i>Cryptosporidium</i> and <i>Giardia</i> concentration to characterize source contributions	SPLP1. Can any changes in bin level be attributed to an identifiable event, condition, or changes in a source? B. What is the influence of sources (agriculture, POTWs, urban runoff, upstream tributary, natural, recreation, and other) on pathogen levels at drinking water intakes?	Drinking water intake trigger value exceeded, OR Trigger value exceeded at main-stem ambient location	<ul style="list-style-type: none"> Sources upstream of the site(s) with the trigger exceedance will be identified. Up to 6 samples will be analyzed per source, over a time period of 4 months, to characterize source contribution. 	\$340/sample
Microbial source tracking (MST)	Polymerase chain reaction (PCR) to detect and quantify specific nucleic acid sequences from intestinal bacteria (<i>Bacteroidales</i>)	Origin of fecal bacteria as percentage in sample (e.g., gull, cow/horse, dog, human sources) and associated pathogenic organisms concentrations	SPLP2 What is the viability and infectivity of pathogens at drinking water intakes?	Drinking water intake trigger value exceeded, OR Trigger value exceeded at main-stem ambient location	<ul style="list-style-type: none"> Locations upstream of the site(s) with the trigger exceedance will be identified. The locations (4-6 total) will be selected to represent potential contributing source types (e.g., stormwater, agriculture, wastewater). Each source location will be sampled monthly over a time period of 4 months. 	\$1075/sample with four strains
Infectivity	A <i>Cryptosporidium</i> cell culture method is used to determine the viability (ability to infect) of the oocysts present in the sample. If no oocysts are present, the assessment is not possible.	Infectivity rate differences between samples	SPLP2 What is the viability and infectivity of pathogens at drinking water intakes?	Trigger value exceeded at main-stem ambient location, with oocysts detected during 2 consecutive months	<ul style="list-style-type: none"> The ambient location(s) with consistent oocyst detection will be sampled monthly over a time period of 4 months. 	\$475/sample
Hydrodynamic fingerprinting	Determine the contributing sources of flow volume to the point of sample collection as in-kind contribution. No additional sample collection	Monthly time-step fingerprinting (volumetric percent contributions from upstream tributaries) at key locations and compilation of flow information at time of	SPLP3 What are the factors affecting decay and growth rates and can they be quantified and characterized for the purpose of modeling?	Drinking water intake trigger value exceeded, OR Trigger value exceeded at main-stem ambient	<ul style="list-style-type: none"> Fingerprinting will be initiated within two months following the trigger exceedance. 	Not Applicable. In-kind task

Trigger Follow-up Tool	Description	Quantified Value	Assessment Question	Investigation Criteria	Approach	Unit Cost
	necessary.	sample collection. Estimate fraction of flow from controllable sources.		location		

REPORTING APPROACH

The Basin Plan specifies that a final study report should be prepared. The Workgroup recommends that a data report be prepared through in-kind contributions from Workgroup participants, likely at the end of FY1617 or during FY1718. The data report would generally report the results, assess the trigger values, and prepare data visualizations as indicated in the Monitoring Design Summary to best address the Delta RMP assessment questions ST1 and SPLP1. The remaining assessment questions may only be addressed if a trigger study is implemented.

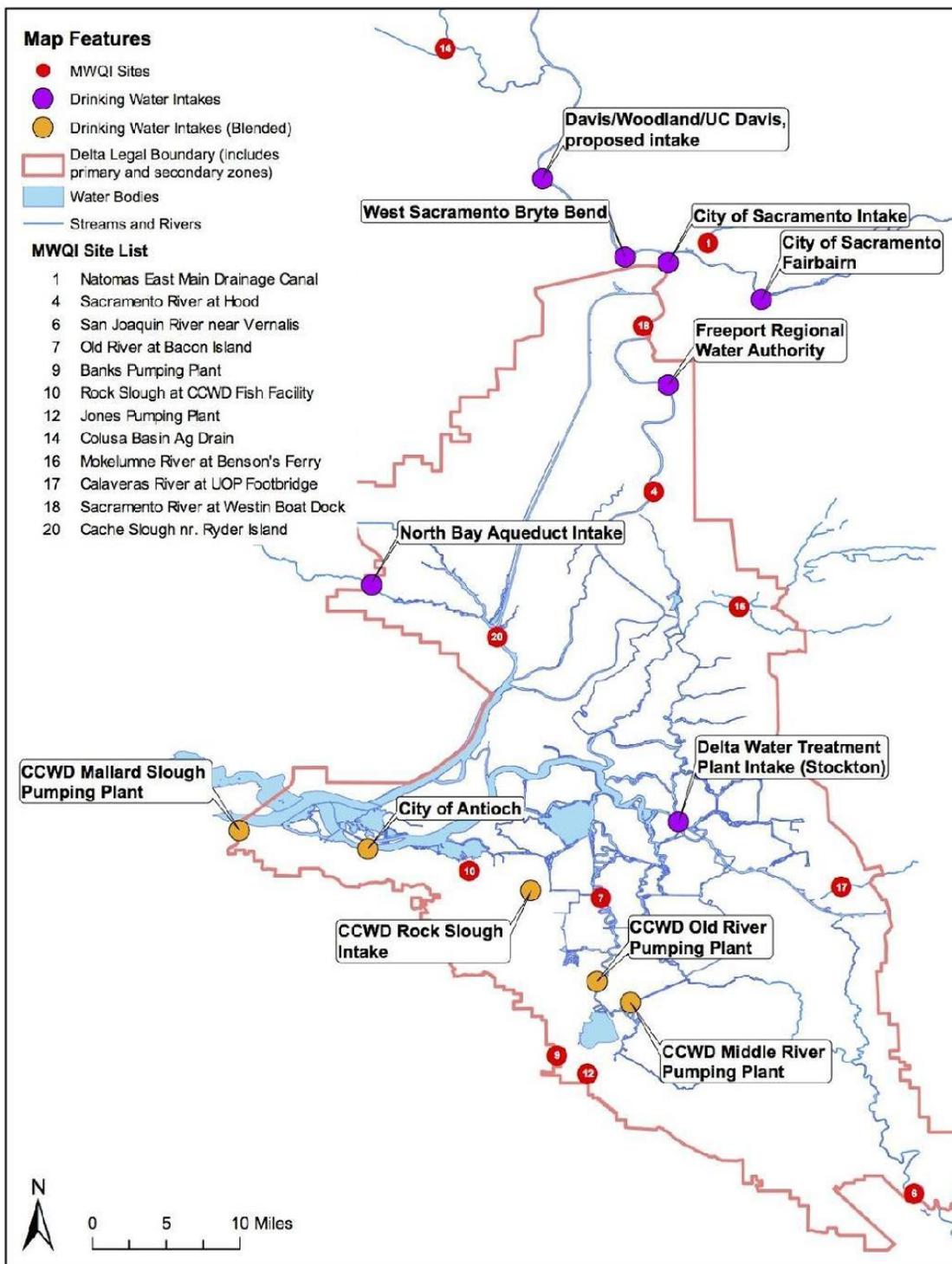


Figure 1. Water Intake, Raw Source, and Ambient (MWQI) Sampling Sites

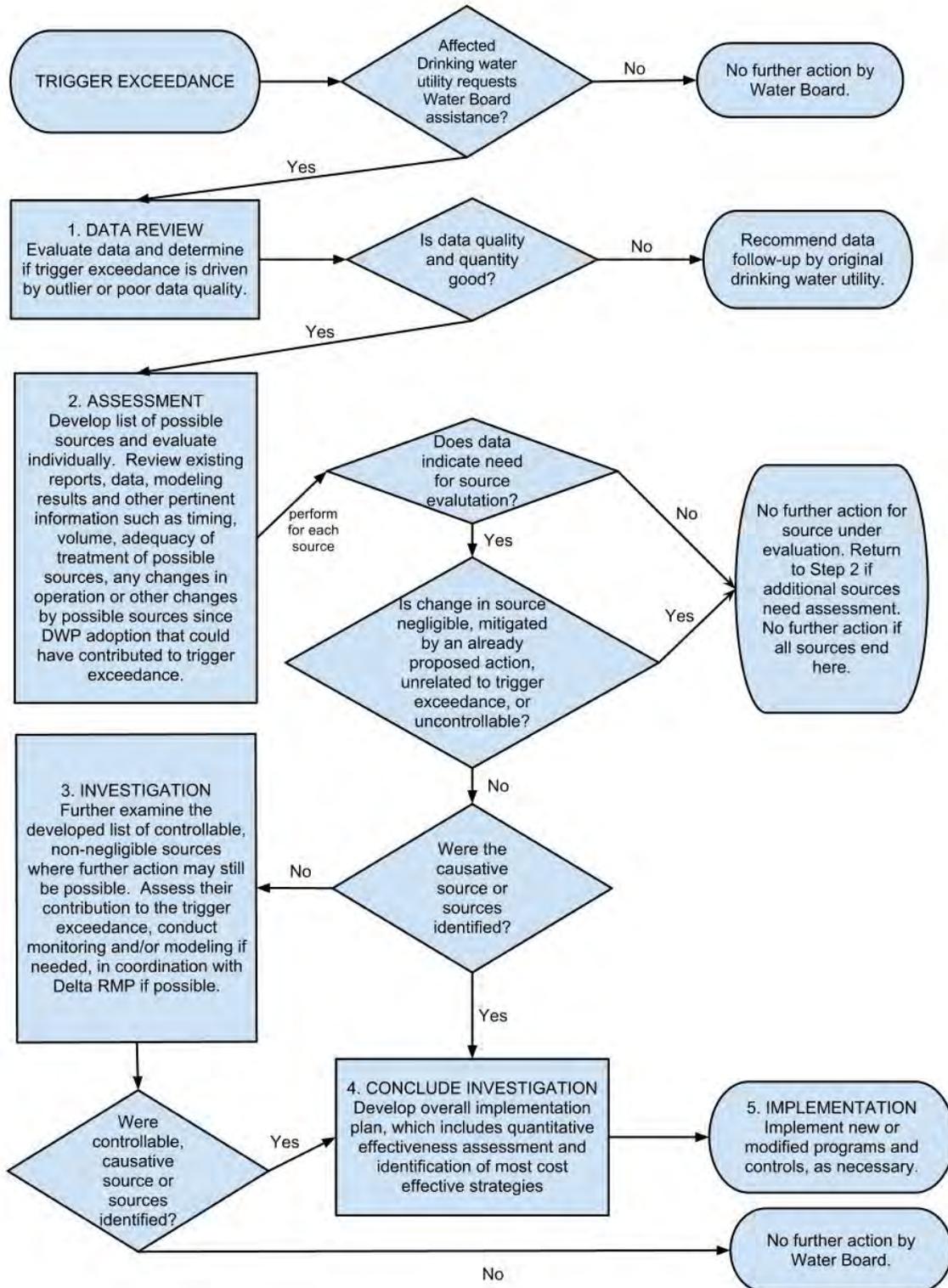


Figure 2. Schematic Overview of Actions -prompted by *Cryptosporidium* Trigger Exceedance (Drinking Water Policy Basin Plan Amendment Figure IV-1)

Table 2. Preliminary Drinking Water Intake Monitoring Results for *Cryptosporidium* (oocysts/L) [Preliminary data for internal distribution - do not cite]

Location ID	Description	Source(s) Represented	Rationale for Inclusion	2015										2016	Average
				April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.		
West Sacramento - Bryte Bend WTP	Sacramento River	Drinking water intake	Upstream of Sacramento urban area	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	<0.1	0
Sacramento – Fairbairn WTP	American River	Drinking water intake	In Sacramento urban area	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0
Sacramento – Sacramento WTP	Sacramento River	Drinking water intake	In Sacramento urban area	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.02
EBMUD – Freeport Intake	Sacramento River	Drinking water intake	Downstream of Sacramento urban area	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	NA	0.022
Solano Irrigation District – North Bay Aqueduct	Barker Slough	Drinking water intake	North Delta water with some local watershed runoff in wet season	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.14	0.02
Stockton – Delta WTP	San Joaquin River	Drinking water intake	In eastern Delta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CCWD – Randall Bold WTP	Western Delta/Los Vaqueros Reservoir	Drinking water intake	In western Delta	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0
Zone 7 Water Agency – Patterson Pass WTP	South Bay Aqueduct	Drinking water intake	100% Delta water in South Bay Aqueduct	Lab failed QC. Resampled in May	<0.08	<0.08	<0.07	<0.07	<0.07	<0.08	Not sampled	Not sampled	Not sampled	Not sampled	0
SCVWD – Penitencia WTP	South Bay Aqueduct	Drinking water intake	Blend of South Bay Aqueduct and Lake Del Valle	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0

Notes: NS = not sampled; NA = not available

Table 3. Preliminary Drinking Water Intake Monitoring Results for *Giardia* (cysts/L) [Preliminary data for internal distribution - do not cite]

Location ID	Description	Source(s) Represented	Rationale for Inclusion	2015										2016	Average
				April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.		
West Sacramento - Bryte Bend WTP	Sacramento River	Drinking water intake	Upstream of Sacramento urban area	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	<0.1	0
Sacramento – Fairbairn WTP	American River	Drinking water intake	In Sacramento urban area	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	NA	NA	NA	NA	NA	0.017
Sacramento – Sacramento WTP	Sacramento River	Drinking water intake	In Sacramento urban area	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	NA	NA	NA	NA	NA	0.017
EBMUD – Freeport Intake	Sacramento River	Drinking water intake	Downstream of Sacramento urban area	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA	NA	NA	NA	0
Solano Irrigation District – North Bay Aqueduct	Barker Slough	Drinking water intake	North Delta water with some local watershed runoff in wet season	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NA
Stockton – Delta WTP	San Joaquin River	Drinking water intake	In eastern Delta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CCWD – Randall Bold WTP	Western Delta/Los Vaqueros Reservoir	Drinking water intake	In western Delta	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zone 7 Water Agency – Patterson Pass WTP	South Bay Aqueduct	Drinking water intake	100% Delta water in South Bay Aqueduct	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
SCVWD – Penitencia WTP	South Bay Aqueduct	Drinking water intake	Blend of South Bay Aqueduct and Lake Del Valle	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0

Notes: NS = not sampled; NA = not available

Table 4. Preliminary Ambient monitoring Results for *Cryptosporidium* (oocysts/L) [Preliminary data for internal distribution - do not cite]

Location ID	Description	Source(s) Represented	Rationale for Inclusion	2015										2016				Average
				April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April		
MWQI #14	Colusa Basin Ag Drain	Agriculture	Source representation	<0.1	<0.1	<0.1	NS	NS	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	
				<0.1												<0.1		
MWQI #1	Natomas East Main Drainage Canal	Stormwater, Agriculture	Source representation	<0.1	<0.1	<0.1	NS	NS	0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.018	
					<0.1													
MWQI #18	Sacramento River at Westin Boat Dock	Stormwater, Combined Sewer System	Proximity to intakes	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	
						<0.1												
MWQI #4	Sacramento River at Hood	Stormwater,Wastewater	General characterization	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.0077	
MWQI #20	Cache Slough near Ryder Island	Wetlands	Source Representation	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NS	<0.1	<0.1	<0.1	<0.1	<0.1	0	
MWQI #16	Mokelumne River at Benson's Ferry		Input to Delta	<0.1	<0.1	<0.1	NS	NS	< 0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.0091	
									< 0.1									
MWQI #17	Calaveras River at UOP Footbridge	Stormwater	Source representation	<0.1	<0.1	<0.1	NS	NS	<0.1	< 0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.0091	
										< 0.1								
MWQI #10	Rock Slough at CCWD Fish Facility		General characterization	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	< 0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	
											< 0.1							
MWQI #7	Old River at Bacon Island		General characterization	<0.1	<0.1	<0.1	NS	NS	<0.1	<0.1	<0.1	< 0.1	<0.1	<0.1	<0.1	<0.1	0	
												< 0.1						
MWQI #9	Banks Pumping Plant		Export from Delta	<0.1	<0.1	<0.1	NS	NS	<0.1	<0.1	<0.1	<0.1	< 0.1	<0.1	<0.1	<0.1	0	
													< 0.1					
MWQI #12	Jones Pumping Plant		Export from Delta	<0.1	<0.1	<0.1	NS	NS	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	
														<0.1				
MWQI #6	San Joaquin River near Vernalis		Input to Delta	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.0077	
															<0.1			

Notes: NS = not sampled; NA = not available

Table 5. Preliminary Ambient Monitoring Results for *Giardia* (cysts/L) [Preliminary data for internal distribution - do not cite]

Location ID	Description	Source(s) Represented	Rationale for Inclusion	2015										2016				Average
				April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April		
MWQI #14	Colusa Basin Ag Drain	Agriculture	Source representation	<0.1	<0.1	<0.1	NS	NS	<0.1	<0.1	0.1	0.9	1.2	<0.1	0.2	<0.1	0.22	
				<0.1												<0.1		
MWQI #1	Natomas East Main Drainage Canal	Stormwater, Agriculture	Source representation	<0.1	0.4	0.3	NS	NS	21.5	5.8	7.9	5.9	0.4	1.4	0.5	0.3	4.04	
					0.3													
MWQI #18	Sacramento River at Westin Boat Dock	Stormwater, Combined Sewer System	Proximity to intakes	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.02	
						0.1												
MWQI #4	Sacramento River at Hood	Stormwater, Wastewater	General characterization	<0.1	0.6	<0.1	<0.1	0.2	0.1	<0.1	<0.1	0.8	0.4	<0.1	<0.1	<0.1	0.16	
MWQI #20	Cache Slough near Ryder Island	Wetlands	Source Representation	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NS	<0.1	<0.1	<0.1	<0.1	<0.1	0	
MWQI #16	Mokelumne River at Benson's Ferry		Input to Delta	<0.1	<0.1	<0.1	NS	NS	0.3	<0.1	0.1	0.6	<0.1	0.2	0.3	0.1	0.15	
									0.3									
MWQI #17	Calaveras River at UOP Footbridge	Stormwater	Source representation	0.4	<0.1	<0.1	NS	NS	<0.1	<0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.1	0.055	
											<0.1							
MWQI #10	Rock Slough at CCWD Fish Facility		General characterization	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	
												<0.1						
MWQI #7	Old River at Bacon Island		General characterization	0.1	<0.1	<0.1	NS	NS	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.027	
												<0.1						
MWQI #9	Banks Pumping Plant		Export from Delta	<0.1	<0.1	<0.1	NS	NS	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0	
													<0.1					
MWQI #12	Jones Pumping Plant		Export from Delta	<0.1	<0.1	<0.1	NS	NS	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.009	
														<0.1				
MWQI #6	San Joaquin River near Vernalis		Input to Delta	0.2	<0.1	0.5	0.1	0.9	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.14	
																0.2		

Notes: NS = not sampled; NA = not available

Table 6. Ambient Monitoring - Matrix Spike Recovery and Laboratory Ongoing Precision and Recovery (OPR) Percentages [Preliminary data for internal distribution - do not cite]

Year	Month	Method	MS Sample Location	MS Recovery		OPR Recovery	
				<i>Cryptosporidium</i>	<i>Giardia</i>	<i>Cryptosporidium</i>	<i>Giardia</i>
2015	April	1623	Colusa Basin Ag Drain	1%	1%	69%	62%
	May	1623	Natomas East Main Drainage Canal	0%	3%	22%	66%
	June	1623	Sacramento River at Westin Boat Dock	27%	1%	54%	84%
	July	1623	Sacramento River at Westin Boat Dock	0%	11%	53%	69%
		1623	Sacramento River at Hood	1%	15%	53%	69%
		1623.1	Sacramento River at Hood	0%	11%	68%	55%
	August	1623	Sacramento River at Hood	11%	74%	79%	90%
		1623	San Joaquin River near Vernalis	17%	72%	79%	90%
		1623.1	San Joaquin River near Vernalis	21%	64%	72%	81%
		1623 by Eurofins	San Joaquin River near Vernalis	32%	71%	57%	47%
	September	1623	Mokelumne River at Benson's Ferry	32%	87%	82%	80%
	October	1623	Calaveras River at UOP Footbridge	41%	70%	77%	81%
November	1623	Rock Slough @ CCWD Fish Facility	76%	83%	71%	86%	
December	1623	Old River at Bacon Island	76%	81%	74%	85%	
2016	January	1623	Banks Pumping Plant	1%	20%	75%	71%
	February	1623	Jones Pumping Plant	65%	47%	79%	61%
	March	1623	San Joaquin River near Vernalis	0%	0%	74%	62%
	April	1623	Colusa Basin Ag Drain	2%	3%	67%	82%

Item 10 DSP External Review Schedule

Delta Regional Monitoring Program Monitoring Design Independent Review Schedule*Please note some dates are not chronological*

Action	Deadline
1. Planning team conference call to finalize planning members, review schedule, obtain additions to panel candidate list	April 4, 2016
2. Delta Science Program Lead Scientist ranks panelists	April 4 – 11 th , 2016
3. Delta Science Program staff begin contacting panelists to check availability, finalize panel membership, initiate contracting.	April 11 th – 29, 2016
4. First in-person DRMP planning meeting <ul style="list-style-type: none"> a. Review Scope of Work b. Draft charge, review materials c. Desired dates for review 	May 5, 2016
5. Determine panel meetings date(s)	End of May 2016
6. Finalize Charge, questions, and list of review materials for panel for DSP Lead Scientist review	Mid-June 2016
7. Prepare draft panel meeting agenda, determine technology requirements	Early July 2016
8. Provide review panel members with materials	Week of July 18th 2016
9. Finalize review panel meeting agenda	Early August 2016
10. Prepare review panel meeting presentations <ul style="list-style-type: none"> a. Conduct dry-run presentations (optional) 	August 8-19 th 2016
11. Provide Delta Science Program with panel meeting presentations	1 business day prior to meeting
12. Teleconference panel meeting	August 23rd, 2016
13. DRMP Technical Advisory Committee Meeting	September 20 th 2016
14. Review panel submits initial review of Monitoring Design to Delta Science Program (30 days post teleconference)	Week of September 19 th 2016
15. Delta Science Program editorial review	Within 1 wk after receiving panel report
16. Provide copy of review to DRMP	Within 1 wk after receiving panel report
17. DRMP Steering Committee Meeting	October 18 th 2016
18. DRMP submits response to initial review of Monitoring Design	Late December 2016
19. Review panel submits final review document of DRMP Monitoring Design	Late January 2016

*This is flexible. The current potential format of the meeting is a 3-4 hour teleconference.

Delta RMP Stoplight Report



Project	Primary	Deliverable	Assigned To	Due Date	Status	Comments
1 Delta RMP (FY14/15)	Pathogens Monitoring	Set up contracts with BioVir and Eurofins	Thomas Jabusch	04/06/15	Complete	
2 Delta RMP (FY14/15)	Data Management	Prepare QAPP for FY14/15	Thomas Jabusch	04/15/15	Complete	QAPP completed and sent to SWAMP QAO for review.
3 Delta RMP (FY14/15)	Pesticide/Toxicity Monitoring	Set up contract with USGS for pesticide analyses	Thomas Jabusch	04/30/15	Complete	
4 Delta RMP (FY14/15)	Pesticide/Toxicity Monitoring	Arrange for UCD/ATL to participate in SCCWRP Interlaboratory Calibration Study	Thomas Jabusch	04/30/15	Complete	APHL will participate in the study without funding from the Delta RMP.
5 Delta RMP (FY14/15)	Nutrient Synthesis	Set up contract with USGS for synthesis of high-frequency sensor data	Thomas Jabusch	05/15/15	Complete	
6 Delta RMP (FY14/15)	Program Management	Revised Monitoring Design	Thomas Jabusch	05/22/15	Complete	The Monitoring Design has been revised and was sent to the TAC and SC on 6/8/15 for review.
7 Delta RMP (FY14/15)	Program Management	FY15-16 Annual Program Workplan	Philip Trowbridge	05/22/15	Complete	FY15/16 Budget and Workplan sent to SC on 6/9/15.
8 Delta RMP (FY14/15)	Program Management	Framework for Interpretation of Monitoring Results	Thomas Jabusch	05/22/15	Complete	An outline for the Communications Plan was included in the revised Monitoring Design sent on 6/8/15 and will be discussed at the 6/16/15 SC meeting.
9 Delta RMP (FY14/15)	Program Management	FY15/16 Revenue Projections and Plan for Efficiently Invoicing Participants	Philip Trowbridge	05/22/15	Complete	
10 Delta RMP (FY14/15)	Program Management	Quarterly financial reports	Lawrence Leung	05/31/15	Complete	
11 Delta RMP (FY14/15)	Program Management	System for tracking deliverables and action items	Philip Trowbridge	05/31/15	Complete	For June SC meeting
12 Delta RMP (FY14/15)	Data Management	Set up templates and EDD reports for the pesticide/toxicity and pathogen laboratories	Amy Franz	05/31/15	Complete	EDDs for pathogens labs have been created. EDDs for pesticide/toxicity labs has been deferred to FY15/16.
13 Delta RMP (FY14/15)	Pesticide/Toxicity Monitoring	Collect two rounds of samples and analyze the samples for pesticides and toxicity	Contractors	06/30/15	Complete	This task has been deferred to FY15/16 workplan.
14 Delta RMP (FY14/15)	Nutrient Synthesis	Final report on high-frequency sensor data nutrient synthesis	Brian Bergamashi	12/31/15		
15 Delta RMP (FY14/15)	Pathogens Monitoring	Pathogens Year 1 Final report	Contractors	06/30/16		
16 Delta RMP (FY15/16)	Program Management	Supplemental Budget Request to analyze split samples for CUPs	Thomas Jabusch	08/31/15	Complete	
17 Delta RMP (FY15/16)	Program Management	Prop 1 Application	Jennifer Sun	09/16/15	Complete	An application for 2 years of mercury monitoring (\$640k) was submitted in response to the DFW solicitation.
18 Delta RMP (FY15/16)	Governance	TAC Meeting #1 and Summary	Thomas Jabusch	09/30/15	Complete	
19 Delta RMP (FY15/16)	Communications	Communications Plan	Thomas Jabusch	09/30/15	Complete	The draft Communications Plan and Program Planning Outline were sent to the TAC on 9/17/15 and the Steering Committee on 10/15/15.
20 Delta RMP (FY15/16)	Governance	Steering Committee Meeting #1 and Summary	Philip Trowbridge	10/30/15	Complete	
21 Delta RMP (FY15/16)	Governance	TAC Meeting #2 and Summary	Thomas Jabusch	12/31/15	Complete	
22 Delta RMP (FY15/16)	Governance	Steering Committee Meeting #2 and Summary	Philip Trowbridge	01/31/16	Complete	

	Project	Primary	Deliverable	Assigned To	Due Date	Status	Comments
23	Delta RMP (FY15/16)	Communications	Communications Product	Meg Sedlak	01/31/16		Draft distributed at 12/18/15 SC meeting. Will be discussed at July SC meeting.
24	Delta RMP (FY15/16)	Program Management	MOU for financial management and invoicing	Philip Trowbridge	03/31/16	Complete	MOU was discussed at the 4/25/16 SC meeting. The SC recommended changing the document to be a contract template for entities that need a contract to pay their fees. The MOU was sent to those entities to consider for a template.
25	Delta RMP (FY15/16)	Governance	TAC Meeting #3 and Summary	Thomas Jabusch	03/31/16	Complete	
26	Delta RMP (FY15/16)	Governance	Steering Committee Meeting #3 and Summary	Philip Trowbridge	04/29/16	Complete	
27	Delta RMP (FY15/16)	Nutrients Synthesis	Nutrient Synthesis - Preparation of a memorandum summarizing recommendations for FY16/17	Thomas Jabusch	04/30/16	Complete	A draft of the report will be prepared by April 30, 2016 so that the recommendations can be considered for funding in the FY16/17 Workplan. The final report will be completed by June 30, 2016.
28	Delta RMP (FY15/16)	Program Management	FY16/17 Annual Workplan and Budget	Philip Trowbridge	05/13/16	Complete	Draft in May 2016. Final by June 30, 2016.
29	Delta RMP (FY15/16)	Governance	Steering Committee Meeting #4 and Summary	Philip Trowbridge	06/30/16	Complete	
30	Delta RMP (FY15/16)	Governance	TAC Meeting #4 and Summary	Thomas Jabusch	06/30/16		
31	Delta RMP (FY15/16)	Quality Assurance	QAPP Update	Thomas Jabusch	06/30/16		Original QAPP has been approved by SWAMP and SB QAO. The QAPP is being revised to reflect the addition of mercury monitoring.
32	Delta RMP (FY15/16)	Pathogens Study	Data Management of Year 1 Pathogens Data	Amy Franz	07/31/16		Data from BioVir and Eurofins. Formatting, transcribing field collection information, performing QA/QC review, and uploading field and analytical results to SFEI's RDC database and replicating to CEDEN.
33	Delta RMP (FY15/16)	Pathogens Study	Quality Assurance Report on Year 1 Pathogens Data	Don Yee	09/30/16		QAO report. Funded from Data Management budget.
34	Delta RMP (FY15/16)	CUP Monitoring	Field Sampling Report for FY15/16 CUP Monitoring	Thomas Jabusch	09/30/16		
35	Delta RMP (FY15/16)	Nutrients Synthesis	Nutrient Synthesis - Convene 2-day workshop with expert panel in October 2016.	Thomas Jabusch	10/31/16		
36	Delta RMP (FY15/16)	CUP Monitoring	Data Management of FY15/16 CUP Data	Amy Franz	12/31/16		Pesticide, toxicity, copper, carbon, SSC. Labs: USGS and UCD and a second pesticide lab to be named later.
37	Delta RMP (FY15/16)	CUP Monitoring	Quality Assurance Report for FY15/16 CUP Monitoring	Don Yee	12/31/16		QAO report. Funded from Data Management budget.
38	Delta RMP (FY15/16)	Nutrients Synthesis	Nutrient Synthesis - Based on workshop, prepare draft report summarizing recommendations for on-going monitoring plan development. Draft 12/31/2016. Final 3/31/2017	Thomas Jabusch	12/31/16		
39	Delta RMP (FY15/16)	CUP Monitoring	Annual Monitoring Report for FY15/16 CUP Monitoring	Thomas Jabusch	02/28/17		
40	Delta RMP (FY15/16)	Pathogens Study	Data Management of Year 2 Pathogens Data	Amy Franz	07/31/17		Data from BioVir and Eurofins. Formatting, transcribing field collection information, performing QA/QC review, and uploading field and analytical results to SFEI's RDC database and replicating to CEDEN.
41	Delta RMP (FY15/16)	Pathogens Study	Quality Assurance Report on Year 2 Pathogens Data	Don Yee	07/31/17		QAO report. Funded from Data Management budget.

Delta RMP TAC Action Items Report



	Primary	Deliverable	Due Date	Assigned To	Status	Comments
1	TAC Action Items from 9/24/15	Follow-up with Jamie Anderson at DWR regarding funding for mercury monitoring to calibrate the DWR mercury model	10/23/15	Philip Trowbridge	Complete	
2	TAC Action Items from 9/24/15	Research options for collecting samples at Buckley Cove in the middle of the channel and report back to the TAC	11/01/15	Joe Domagalski	Complete	On the agenda for the Nov 16 TAC mtg.
3	TAC Action Items from 9/24/15	Search for modeling information about lateral mixing at Buckley Cove	11/01/15	Stephen McCord	Complete	
4	TAC Action Items from 9/24/15	Organize a teleconference of the TIE subcommittee to discuss further edits to the TIE guidance, the TIE treatment list, an update on the Ceriodaphnia issue at AHPL, and the cost per treatment for TIEs so that the group can manage its budget of \$40,000 for the year	10/16/15	Thomas Jabusch	Complete	
5	TAC Action Items from 9/24/15	Modify the Supplemental Budget Request with a required matrix spike sample, the schedule, and locations of the sampling	10/09/15	Thomas Jabusch	Complete	
6	TAC Action Items from 5/27/15	Mike Johnson and Karen Ashby will provide comments on the Monitoring Design by June 1st. Debra Denton and Tessa will provide comments by June 4th.	06/04/15	TAC members	Complete	Debra Denton provided comments on June 1, 2015.
7	TAC Action Items from 5/27/15	ASC will revise the Design document and send it back out the TAC with 5 business days for review.	06/08/15	Thomas Jabusch	Complete	
8	TAC Action Items from 5/27/15	Stephen McCord will convene a conference call or online polling method before June 16th so that he can report to the SC whether the TAC recommends approval or provisional approval of the revised Monitoring Design.	06/15/15	Stephen McCord	Complete	
9	TAC Action Items from 5/27/15	Adam agreed to follow up with Rich Breuer to learn if the requirement for State Board approval of the QAPP only applied to SWAMP-funded part of the work or the full QAPP.	06/03/15	Adam Laputz	Complete	
10	TAC Action Items from 5/27/15	ASC should make sure the QAPP data management provisions are SWAMP compatible. Phil agreed to check with Cristina Grosso about this.	06/03/15	Philip Trowbridge	Complete	SFEI data management procedures are SWAMP compatible.

	Primary	Deliverable	Due Date	Assigned To	Status	Comments
11	TAC Action Items from 5/27/15	After receiving comments from the laboratories by June 1st, ASC will revise the QAPP and send it back out to the TAC with 5 business days to review.	06/08/15	Thomas Jabusch	Complete	
12	TAC Action Items from 5/27/15	Stephen McCord will schedule a conference call or online polling tool before June 16th in order to determine whether the TAC recommends approval of the QAPP or provisional approval. Stephen McCord will provide a verbal report to the SC on June 16th.	06/15/15	Stephen McCord	Complete	
13	TAC Action Items from 5/27/15	Discuss with the SC co-chairs about having a joint meeting of the SC and TAC to decide about the funding allocations for FY15/16	06/03/15	Philip Trowbridge	Complete	Recommendation added the FY15/16 workplan report to the SC.
14	TAC Action Items from 5/27/15	Revise the budget for the SC to show the available funding relative to the "bare bones" Monitoring Design funding levels so the SC can make the trade-off decisions.	06/05/15	Philip Trowbridge	Complete	
15	TAC Action Items from 5/27/15	Stephen McCord will send an email to the TAC with the proposal to officially approve the TIE subcommittee members as discussed in the May 27 meeting	06/03/15	Stephen McCord	Complete	
16	TAC Action Items from 5/27/15	ASC will receive comments on the TIE process memo. When all the comments have been received, ASC will send them to the TIE subcommittee to review and incorporate into the memo, which will be shared with the whole TAC.	06/10/15	Thomas Jabusch	Complete	
17	TAC Action Items from 5/27/15	Mike Johnson agreed to send Stephen McCord his notes with questions about the Hyalella test.	06/03/15	Mike Johnson	Complete	
18	TAC Action Items from 5/27/15	Stephen Clark agreed to send Stephen McCord information about possible special studies that could be done to resolve questions about the Hyalella test.	06/03/15	Stephen Clark	Complete	
19	TAC Action Items from 5/27/15	Brian Laurenson agreed to send Stephen McCord his comments on the last set of slides for the SC which had information on possible special studies.	06/03/15	Brian Laurenson	Complete	

	Primary	Deliverable	Due Date	Assigned To	Status	Comments
20	TAC Action Items from 5/27/15	Stephen McCord agreed to write a memo to the SC with options regarding the Hyallella test.	06/09/15	Stephen McCord	Complete	
21	TAC Action Items from 5/27/15	Provide an update on any nexus between Delta RMP and Central Valley Pyrethroids TMDL	06/14/16	Tessa Fojut		
22	TAC Action Items from 4/22	Thomas and Stephen will develop a develop a full chronology of TAC decisions, in a format similar to Delta RMP Record of Decisions (SC).	05/22/15	Thomas Jabusch	Complete	
23	TAC Action Items from 4/22	Thomas will distribute SCCWRP study objectives and protocol to the TAC, when available	05/22/15	Thomas Jabusch	Complete	On agenda for 5/27/15
24	TAC Action Items from 4/22	Thomas and Stephen will compare and contrast study objectives to Delta RMP's interests and concerns regarding Hyalella, especially regarding the issue of environmental relevance	05/22/15	Thomas Jabusch	Complete	To be completed with Stephen McCord
25	TAC Action Items from 4/22	Thomas: Consider adding phenotype testing and supplying Delta environmental samples for 2nd round of testing	05/22/15	Thomas Jabusch	Complete	Re phenotype testing: Can create a running wish list of special studies such as the phenotype testing.
26	TAC Action Items from 4/22	Coordinate the TIE subcommittee	05/22/15	Thomas Jabusch	Complete	
27	TAC Action Items from 4/22	Linda (AHPL) will generate a treatment template to clearly describe TIE treatments to be performed	05/22/15	Linda Deanovic	Complete	
28	TAC Action Items from 4/22	Stephen will articulate a question to SC asking whether TIE's should track down non-pesticide causes of toxicity, if funds allow	06/16/15	Stephen McCord	Complete	To be discussed at SC meeting on 6/16/15.
29	TAC Action Items from 4/22	Cam will draft a document to accompany the TIE decision flow chart	05/22/15	Cam Irvine	Complete	Include communications protocols and additional insight on decision process. To be completed with Thomas Jabusch
30	TAC Action Items from 4/22	Joe and Jim will clean up the USGS pesticide sampling triggers	05/22/15	Joe Domagalski	Complete	Edits were provided by Stephen McCord and discussed at the TAC meeting
31	TAC Action Items from 4/22	Jim will add "alert" levels for the USGS to use to alert AHPL of possible events	05/22/15	Jim Orlando	Complete	In QAPP.

	Primary	Deliverable	Due Date	Assigned To	Status	Comments
32	TAC Action Items from 4/22	Jim and Joe will add a field to the field log to document sampling conditions	05/22/15	Jim Orlando	Complete	Part of USGS standard practice. The sampling conditions log will be used to improve event triggers based on experience.
33	TAC Action Items from 4/22	Thomas will provide a clean draft final monitoring design to the TAC for review	05/22/15	Thomas Jabusch	Complete	On agenda for 5/27/15
34	TAC Action Items from 4/22	Review the draft QAPP	05/01/15	TAC members	Complete	Notify Thomas Jabusch of any delays
35	TAC Action Items from 4/22	Identify points in data flow chart when TAC members can access data, and clarify frequency of QA review for monthly sampling events	05/22/15	Cristina Grosso	Complete	In QAPP.
36	TAC Action Items from 4/22	Set up a password-protected space for provisional data on the CA Estuaries Workgroup portal	05/22/15	Stephanie Fong	Complete	SFEI-ASC will make provisional data files available by posting them to the TAC website, from where they can be viewed and downloaded by TAC members and transferred to the worker bee space of the Estuaries portal.
37	TAC Action Items from 3/30/15	Confirm that the Delta RMP website is up to date	06/14/16	Selina Cole	Complete	
38	TAC Action Items from 3/30/15	Send out to the TAC the consensus-based option for FY16/17 studies	04/01/16	Meg Sedlak	Complete	
39	TAC Action Items from 3/30/15	Revise scope of work for nutrient study for FY16/17 and send back to TAC	04/14/16	Thomas Jabusch	Complete	
40	TAC Action Items from 3/30/15	Trouble-shoot PDF printing problems at Regional San (Agenda package does not print correctly)	04/14/16	Meg	Complete	
41	TAC Action Items from 11/16/15	Draft strawman for the charge of the expert panel and distribute to the planning subcommittee	12/18/15	Philip Trowbridge	Complete	Charge drafted and distributed to planning committee.
42	TAC Action Items from 11/16/15	Convene planning subcommittee in the week after Thanksgiving	12/04/15	Philip Trowbridge	Complete	Meeting scheduled for 12/7/15.
43	TAC Action Items from 11/16/15	Present draft charge for the expert panel to the SC	12/18/15	Philip Trowbridge	Complete	Charge drafted and on SC agenda.
44	TAC Action Items from 11/16/15	Bring outline for the Nutrient Synthesis Workgroup to the SC and clarify that the proposed target date will be adjusted as needed to allow sufficient time for the development process	12/18/15	Philip Trowbridge	Complete	Workplan updated and on SC agenda.

	Primary	Deliverable	Due Date	Assigned To	Status	Comments
45	TAC Action Items from 11/16/15	Plan a future discussion with the TAC to outline the process for updating the target analyte list and defining how risk should be considered	04/01/16	Thomas Jabusch	Complete	On March TAC meeting
46	TAC Action Items from 11/16/15	Distribute W. Fleenor's paper to the TAC	11/20/15	Stephen McCord	Complete	
47	TAC Action Items					