



**DRAFT Delta RMP Steering Committee Meeting  
May 11, 2018 10:00 am – 4:00 pm**

**Location**

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

**Remote Access**

Call-in: 415-594-5500, Access Code: 238-626-034#

Online: <https://join.me/sfei-conf-cw2>

<b>1</b>	<p><b>Introductions and Review Agenda</b> Introduce TAC and SC members, establish quorum, and explain goals of the meeting.</p>		10:00 Adam Laputz
<b>2</b>	<p><b>Decision:</b> Approve meeting summary from past meetings held on February 5, 2018 and March 2, 2018 and confirm/set upcoming meeting dates.</p> <p><u>Desired outcomes:</u></p> <ul style="list-style-type: none"> <li>• Approve meeting summaries</li> <li>• Select a date for SC meeting in late July or early August 2018</li> <li>• Select a date for the joint SC/TAC meeting in the fall.</li> </ul> <p><b>(Please bring your calendar to the meeting!)</b></p>	<p>Draft Summary of 2/5/2018 SC Teleconference</p> <p>Draft Summary of 3/2/2018 SC Meeting</p>	10:05 Adam Laputz
<b>3</b>	<p><b>Information: Technical Advisory Committee Update</b> Updates on TAC meetings held in March and April 2018.</p> <p><u>Desired outcome:</u></p> <ul style="list-style-type: none"> <li>• Inform committee on monitoring activities and proposals for the upcoming fiscal year.</li> </ul>	<p>Summary of March 15, 2018 TAC Meeting</p> <p>Draft Summary of April 23, 2018 Meeting</p>	10:05 – 10:30 Stephen McCord

4	<p><b>Information: Delta RMP Finances</b> The Finance Update memo summarizes Delta RMP revenues, expenses, and the status of the reserve fund.</p> <p><u>Desired outcomes:</u></p> <ul style="list-style-type: none"> <li>• Informed committee</li> </ul>	Finance Update Memo	10:30 – 10:45 Matthew Heberger
5	<p><b>Information: Financial Subcommittee Report</b> The Financial Subcommittee will report on their findings and recommendations.</p> <p><u>Desired outcomes:</u></p> <ul style="list-style-type: none"> <li>• Informed committee</li> </ul>		10:45 – 11:00 Dalia Fadl
	<b>Short refresher break</b>		11:00
6	<p><b>Decision: Draft FY18/19 Workplan and Budget</b> The FY18/19 workplan and budget includes the Core Programmatic Tasks plus technical projects for mercury and nutrients. The technical projects have been reviewed by their technical subcommittees and the TAC. Reviews of the projects by TAC members are summarized in a separate document.</p> <p><u>Desired outcome:</u></p> <ul style="list-style-type: none"> <li>• Approval of the FY18/19 Workplan and Budget</li> </ul>	<p>FY18/19 Workplan and Budget</p> <p>Summary of TAC comments on technical projects.</p>	11:05 – 12:30 Matthew Heberger
	<b>Lunch</b>		12:30 – 1:30
7	<p><b>Information: Progress update on proposed monitoring designs for Pesticides, Toxicity, and Contaminants of Emerging Concern (CECs)</b> The technical subcommittees on Pesticides and CECs have met several times this spring and are close to a finalizing proposed monitoring designs. The designs will be presented to the TAC in June and come to the SC for a decision in July. If approved, the monitoring work would begin in early fall.</p> <p><u>Desired Outcome:</u></p> <ul style="list-style-type: none"> <li>• Inform SC members of progress and outline of monitoring proposals.</li> <li>• Feedback on the draft monitoring designs.</li> </ul>		1:30 – 2:00 Matt Heberger Brian Laurenson

8	<p><b>Decision: Approve contractor for Pesticides Interpretive Report</b></p> <p>We received several strong proposals for the Pesticide Interpretive Report. The Pesticides Subcommittee and the TAC have reviewed the proposals and will share their recommendations with the Steering Committee.</p> <p><u>Desired outcome:</u></p> <ul style="list-style-type: none"> <li>• Selection of a contractor for the pesticides interpretive report.</li> </ul>	<p>Memo on the RFP and contractor selection process</p> <p>Proposals from the top 2 nominees</p>	<p>2:00 – 2:30 Matt Heberger</p>
9	<p><b>Decision: Framework for Fee Increases</b></p> <p>In March 2018, the SC discussed the need to increase participants’ fees to keep pace with inflation. The Finance Committee met to discuss options in April, and will report out on its recommendations.</p> <p><u>Desired outcome:</u></p> <ul style="list-style-type: none"> <li>• SC agreement on a framework for fee increases.</li> </ul>	<p>Memo on Proposed process and timeline for setting Delta RMP fees</p>	<p>2:30 – 3:15 Adam Laputz</p>
	<p>Break</p>		<p>3:15 – 3:30</p>
10	<p><b>Decision: Science Advisors</b></p> <p>The FY17/18 Workplan included \$10,000 to pay honoraria and travel for 2 – 4 independent science advisors. The advisors would be selected by the Steering Committee with input from the TAC and would commit to a 3 – to 4 – year term. At its March 15, 2018, the TAC made recommendations for experts in the areas of statistics/monitoring design and pesticides/toxicity.</p> <p><u>Desired outcome:</u></p> <ul style="list-style-type: none"> <li>• Approval of nominated advisors</li> </ul>	<p>Memo on Science Advisor Nomination</p> <p>Curriculum Vitae (CV) for nominees</p>	<p>3:30 – 3:45 Matthew Heberger</p>
11	<p><b>Information: Status of RMP Deliverables and Action Items</b></p> <p><u>Desired outcomes:</u></p> <ul style="list-style-type: none"> <li>• Informed committee regarding the status of Delta RMP deliverables.</li> <li>• Confirmation of action items from this meeting</li> </ul>	<p>Delta RMP Stoplight Reports</p>	<p>3:45 – 3:55 Matthew Heberger</p>
12	<p><b>Plan Agenda Items for Next Meeting</b></p>		<p>3:55 Adam Laputz</p>
	<p>Adjourn</p>		<p>4:00</p>

# Meeting Materials for Item 4



DATE: April 29, 2018 (revised May 2, 2018)  
TO: Delta RMP Steering Committee  
THROUGH: Delta RMP Finance Committee  
FROM: Matthew Heberger, Program Manager, Aquatic Science Center  
RE: Summary of Delta RMP Financials for the period ending March 31, 2018

This memorandum provides an update of budgets and expenses for the Delta RMP and the balance of the Undesignated Reserve Fund. The figures in this memo are current through March 31, 2018.

Last quarter's finance memo described the period ending in November 2017. This memo adds new information on revenue and expenses for the 4-month period from December 2017 through March 2018.

### **Snapshot of Current Financial Position**

Overall, the Delta RMP's financial position is strong and stable. We have sufficient funds on hand to meet all of our financial obligations. Further, we are closely watching expenses to stay on budget and we expect to end the fiscal year with a surplus.

The overall financial standing of the Delta RMP is shown here, and an explanation of the financial terms below.

Financial Assets	\$534,613
Receivables	\$80,000
Encumbered Funds	\$377,132

**Financial assets** are “cash on hand”. This includes the balance of the Undesignated Reserve Fund. In practice, we do not have a dedicated Delta RMP bank account. Funds are pooled with all other SFEI-ASC funds in accounts at Wells Fargo Bank or in the Local Agency Investment Fund (LAIF) managed by the State Treasurer's Office. We use our accounting system to keep track of “restricted” funds for how much is available for different projects, including the Delta RMP.

**Receivables** are all debts and other “monetary obligations” owed to the Delta RMP, even if they are not currently due. In our case, it represents expected financial contributions from RMP participants that have not yet been paid.

**Encumbered funds** are restricted for a given purpose, either subcontracts or honoraria. These funds must be restricted and held in reserve so we can make payouts to subcontractors when they invoice us.

## Delta RMP Budget

### Revenue

Forecasted revenue for FY17/18 was **\$997,256**. To date, we have received **\$917,256**. Expected and received revenue is summarized below in Table 1.

**Table 1 Delta RMP FY17/18 Revenue through 3/3/2018 by participant group**

<b>Participant Category</b>	<b>Expected</b>	<b>Received</b>	<b>Total</b>
Dredgers		\$60,000	\$60,000
ILRP		\$148,780	\$148,780
MS4 Phase 1		\$181,400	\$181,400
MS4 Phase 2		\$309,999	\$309,999
POTW		\$197,077	\$197,077
Water Supply	\$80,000	\$20,000	\$100,000
<b>Total</b>	<b>\$80,000</b>	<b>\$917,256</b>	<b>\$997,256</b>

We expect to receive \$80,000 from one Delta RMP participant, the State and Federal Contractors Water Agency (SFCWA). Most Delta RMP contributors pay in one lump sum in the beginning of the fiscal year. The arrangements with SFCWA, however, are slightly different. ASC is under contract to SFCWA to provide professional services, and payments are tied to the completion of deliverables. The payment schedule shown in Table 2 below (Source: SFCWA Contract with Aquatic Science Center, Contract #18-14, Appendix B, page 14). To date, we have invoiced SFCWA for item #1 and received payment for \$20,000.

**Table 2 Deliverables and payment schedule for ASC's contract with SFCWA**

<b>Item</b>	<b>Description</b>	<b>Due Date</b>	<b>Payment</b>
1.	Meeting summaries (2) from Steering Committee and Technical Advisory Committee meetings	06/30/2018	\$20,000
2.	Draft Pesticide Interpretive Report	12/31/2018	\$60,000
3.	Draft Pesticide Monitoring Design	04/30/2019	\$20,000
<b>Total</b>			<b>\$100,000</b>

Last month, we received news that SFCWA is dissolving. However, their staff have informed us that their existing contracts are being transferred to another organization, the State Water Contractors (SWC). They have also assured us that all of SFCWA's existing contract obligations will be met and all payments made. SWC is a nonprofit association representing 25 water agencies, with headquarters in Sacramento. We will be working to make sure that the revised contract is put in place, that its terms are acceptable, and that payments are made in return for the promised deliverables. I will be working with our financial staff on this, and our legal counsel if necessary.

There are no updates to in-kind contributions from the previous quarter. For a detailed report on in-kind contributions for the current and past fiscal years, see last quarter's finance memo.

### **Planned Expenses**

The planned expenses in the original FY17/18 workplan totaled **\$863,165**. Since then, ASC and the Finance Committee have made several changes to the workplan based on updated plans and priorities. A summary of these changes is shown in Table 3 below. The net fiscal impact has been to add \$23,000 in new expenses. In addition, we have rolled over several incomplete tasks from previous fiscal years into the current workplan. After these two changes, the total planned expense for FY17/18 is **\$1,158,660**. Planned expenses in current budget are:

FY17/18 Workplan Planned Expenses	\$863,165
Amendments to the FY17/18 Workplan (net)	\$23,000
Rollover Tasks from FY15/16 and FY16/17	\$272,495
<b>Total planned expenses</b>	<b>\$1,158,660</b>

Table 3 Changes to the FY17/18 Workplan budget lines.

	Budget in Workplan	New Budget amount	Description
*Task 3D, Data Management Subcommittee  *new this quarter	--	\$5,000	<b>New budget line created in Apr 2018.</b> The Steering Committee requested the creation of a new subcommittee covering data management and quality assurance. This new subtask covers ASC staff time to plan and coordinate meetings, respond to requests from stakeholders for information, and plan and document new data management procedures.
Task 4C, Data Assessment Framework Workshop	--	\$5,000	<b>New budget line added in Dec 2017.</b> Created at the request of the coordinating committee. This subtask is intended for ASC staff time to help plan and coordinate the upcoming Data Assessment Framework Workshop requested by the Steering Committee
Task 8A, Pesticides Interpretive Report	\$60,000	\$80,000	<b>Budget amount increased in Jan 2018.</b> To be used entirely to hire a subcontractor to ASC perform analyses and write the Pesticides Interpretive Report.
Task 8B, Contract Management (NEW)	--	\$8,000	<b>New budget line created in Jan 2018.</b> 10% of contract -- covering ASC staff time to help write and issue the request for proposals (RFP), select a contractor, and contract administration for the Pesticides Interpretive Report.
Task 176E, Reporting	\$20,000	\$5,000	<b>Budget amount decreased in Jan 2017.</b> The Year 2 pesticides data report was cancelled by the Steering Committee. However, ASC is still obligated to produce a QA memo and to distribute draft data to the TAC and coordinate feedback on the toxicity lab report produced by the Aquatic Health Program Laboratory at UC Davis.
<b>Total</b>	<b>\$80,000</b>	<b>\$103,000</b>	Net fiscal impact: Added \$23,000 in new expenses.

**Actual Expenses Year-to-Date**

In the current fiscal year, the program has spent **\$516,222** through March 31, 2018.

**Table 4** shows a summary of the FY17/18 budget and year-to-date (YTD) expenses **by category**.

**Figure 1** shows budget and expenses **by task** for the first two months of the fiscal year.

**Table 8**, at the end of this memo, shows more detailed information on the budget and expenses at the **subtask** level. This table also provides details on expenses for the period since the last report in terms of labor (hours spent), invoices paid, and outputs and deliverables.

**Table 4 Summary of the FY17/18 budget and year-to-date (YTD) expenses by category**

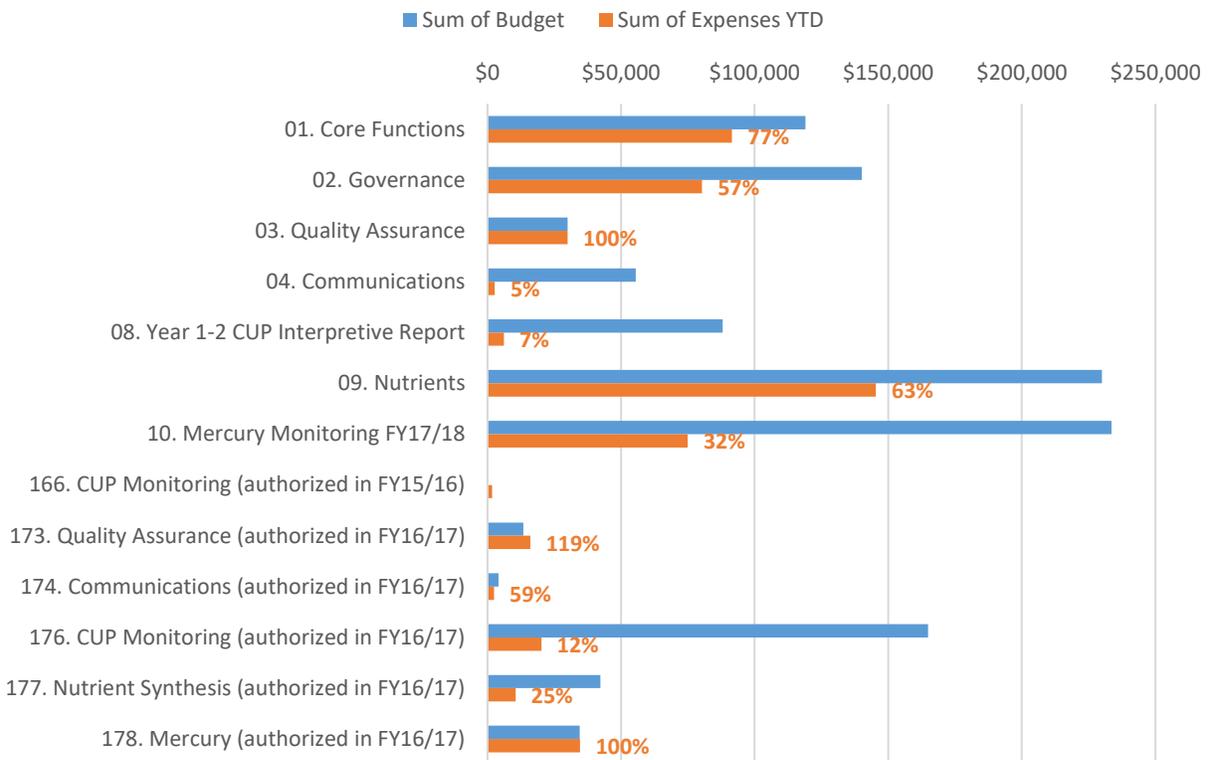
	<b>Budget</b>	<b>YTD Expense</b>	<b>Budget remaining</b>	<b>Percent spent</b>
Direct Cost	\$2,500	\$163.07	\$2,337	7%
Labor (ASC)	\$444,987	\$286,064	\$155,723	65%
Subcontracts	\$711,174	\$334,042	\$377,132	47%
<b>Total</b>	<b>\$1,158,661</b>	<b>\$620,269</b>	<b>\$535,192</b>	<b>54%</b>

One conclusion from looking at Table 4 is that the “burn rate” appears to be low – we are 75% into fiscal year, but have only spent 54% of the overall budget.

In particular, less than half of the amount budgeted for subcontractors has been spent. About 60% of the Delta RMP budget is for subcontractors. Many of these subcontractors have not invoiced us yet for their work. (In particular, we are working with USGS to have them submit invoices in a more timely manner in the future.) There is little risk of a “surprise” cost overrun with subcontractors, as all of the subcontracts with to ASC are “not to exceed.” However, there is also little opportunity for cost savings, as we expect that all subcontractors will eventually invoice us for 100% of the amount in their contract.

Labor expenses (65% of budget) appear low for two main reasons. First, some of the tasks in the workplan are planned to be completed after end of the fiscal year. For example, Task 10B for mercury data management is budgeted at \$19,545. Most of this work will take place in the second half of 2018, after the mercury data is submitted to us by the lab, and after the end of the

current fiscal year. Second, ASC staff make an effort to work quickly and efficiently, and we watch expenses carefully.



**Figure 1** Delta RMP budget, showing budget and expenses (staff and subcontractors billing to date) from through 3/31/2018 by task.

**Discussion of Expenses**

Expenses for most tasks is in roughly line with our expectations. Notes on tasks and subtasks requiring special attention are included below.

**Task 174. Communications** was used to create a color factsheet for the program. As a small amount of budget remains. We propose to use this to cover some of the costs of preparing and printing a poster for the Bay Delta Science Conference in Fall 2018.

**Task 177 Nutrients Synthesis-** As noted in the previous quarter’s memo, one of the two nutrients synthesis tasks, 177A, is over budget (by \$4,692). However this is partially offset by savings on task 177B which finished under budget (by \$3,136). As a whole, we expect to finish Task 177, Nutrients Special Studies, with a surplus of around \$30,000, largely because Task 177C, statistical analysis, was done by an EPA scientist as an in-kind contribution. See Table 6 for more details on expenses by subtask.

For **Task 2D, Science Advisors**, ASC staff have billed a few hours to this budget line, to manage the nomination process. In retrospect, this was a mistake. I believe it is best reserved for travel and honoraria for advisors. We suggest transferring hours billed to date to 2B TAC meetings, which we expect to be completed below budget. (Science advisors are intended to help give input to the TAC and its subcommittees, so this makes sense.)

**Task 4C, Pulse of the Delta draft.** We planned to spend \$40,000 this fiscal year planning and writing a major publication, the *Pulse of the Delta*. The Steering Committee has not yet scheduled a discussion of this or approved the outline, giving ASC the effective “notice to proceed.” Further, in the last few months, we lost one of our senior scientists most familiar with the Delta, who left to take another job. These funds can easily be rolled over to next year. In fact, my colleagues and I think this is preferable, as we will have more interesting material to include in the report next year, following the analysis of pesticides and toxicity data and nutrients synthesis reports.

**Task 8A, Pesticides Interpretive Report** - We propose to move all job-to-date labor expenses (\$3,045) to Task 1A, Program Planning, so that the full \$80,000 can be used to pay the subcontractor. **Explanation:** ASC staff had begun limited billing to this budget line planning the pesticides interpretive report before the SC decided that the work should be put out to bid. Before the last finance subcommittee meeting, where \$8,000 was authorized for contract management, we billed several hours to this task for writing and coordinating the RFP.

**Task 166E. FY15/16 Current Use Pesticide Monitoring – Reporting** was originally part of the FY15/16 workplan budgeted at \$15,000 and intended to be a simple report describing the pesticides data deliverable. This budget line was rolled over to the current year as this deliverable was not yet complete, as the report had not yet been approved by the SC. We carried over this budget line to the FY17/18 budget, even though it has a deficit, to track the hours needed to finalize report. This task was rolled over with a balance of **-\$1,745**. We spent an additional \$1,686 to finalize the report. Therefore, this report ended \$3,431 (or 16%) over budget.

**Task 176C, FY16/17 Pesticides Data Management and Quality Assurance** continues to be a challenge. This task was budgeted in FY16/17 at \$37,400. A total of \$30,249 was spent in the previous fiscal year, and \$7,151 was rolled over to the current year's budget. To date, ASC staff have spent 160 hours managing these data from two USGS labs in Sacramento and Denver. This task is currently \$4,212 over budget and poised to go higher, as the work is not quite complete. In brief, we encountered problems with missing and incorrect data that has required All of this has required a great deal of troubleshooting and correspondence with the labs. In addition, some work has had to be repeated with corrected data, for example the database queries that we run as a part of the QA process.

Despite these challenges, I believe that it was a good decision, both scientifically and financially, to contract with the USGS labs. Their lab has a unique capability of analyzing over a hundred compounds, with lower detection limits than commercial labs. Hiring a commercial lab would

have cost more, and we would get a smaller suite of compounds with higher detection limits. In addition, USGS is providing a partial cost share as an in-kind contribution, using federal funds to cover a portion of the cost of pesticides laboratory analysis.

Despite the steps we have taken to minimize the blow to our budget, additional funds are needed to complete the data management and QA of the FY16/17 pesticides data. I am requesting the Finance Committee authorize ASC to spend up to an additional \$7,500 to finalize and publish these data to the Regional Data Center (RDC) and the California Environmental Data Exchange Network (CEDEN). We estimate that an additional 55 hours are needed, at an average rate of \$115 per hour, equal to \$6,325. A detailed estimate is shown here, based on the need to intake corrected data and redo the QA checks:

<b>Task Description</b>	<b>Estimated hours required</b>
Make a table with RDC data before deleting it/Delete data from RDC database that are in our working Access database. Check for possible missed from the same time period from the RDC	2.5
Update incorrect MDLs for pyrethroids, troubleshoot with USGS chemist	1
Check Jira (our internal tracking software) for updates that were made to RDC after data was pulled into Access	1.5
Format missing data	10
Make updates to data	8
Send to USGS for review of the updates	2
Repeat QA review on newly-submitted data	10
Upload data to RDC/CEDEN	20
<b>Total</b>	<b>55</b>

## **Undesignated Reserve Fund**

The current balance of undesignated funds is \$133,579. On March 2, 2018, the Steering Committee voted to unencumber the \$25,910 FY15/16 surplus and the \$8,097 FY16/17 surplus and transfer the amount of \$34,007 to the Reserve Fund.

Table 5 shows a running list of deposits and withdrawals into the Undesignated Reserve Fund.

Table 5 Delta RMP Undesignated Reserve Fund ledger.

Budget Year	Deposit or Withdrawal	Authorized by	Date	Amount	Running Total	Comment
FY14/15	Deposit	Steering Committee	6/16/2015	\$41,000	\$41,000	Release funds allocated for CUP monitoring in FY14/15 budget in order to re-allocate these funds into the FY1516 budget for CUP monitoring.
FY15/16	Withdrawal	Steering Committee	6/16/2015	(\$41,000)	--	Released funds allocated for CUP monitoring in FY14/15 budget in order to re-allocate these funds into the FY1516 budget for CUP monitoring.
FY14/15	Deposit		10/15/2015	\$51,903	\$51,903	Extra revenue received in FY14/15. Actual revenue minus budgeted expenses for FY14/15.
FY15/16	Withdrawal	Steering Committee	4/25/2016	(\$20,000)	\$31,903	Allocate funding to FY15/16 for possible pathogen trigger study (TBD).
FY15/16	Deposit	Steering Committee	4/25/2016	\$100,000	\$131,903	SC directed that SFCWA funding of \$100,000 (contribution for FY15/16) be transferred to reserve.
FY 16/17	Withdrawal	Steering Committee	4/25/2016	(\$100,000)	\$31,903	SC directed that \$100,000 be withdrawn from the reserve to be reallocated as revenue for FY16/17. SFCWA contribution in March 2017 (\$100K) will be allocated to FY17/18 revenue.
FY15/16	Deposit	Steering Committee	7/20/2016	\$84,444	\$116,347	SC approved that \$84,444 be transferred from FY15/16 revenue to the reserve as undesignated funds.
FY16/17	Withdrawal	Steering Committee	10/18/2016	(\$10,000)	\$106,347	SC approved up to \$10,000 for coordinating and drafting a response to the External Panel Review.
FY16/17	Withdrawal	Finance Committee	5/23/2017	(\$7,500)	\$98,847	Finance Subcommittee approved transfer of funds to cover final phase of External Review.
FY14/15	Deposit	Steering Committee	7/28/2017	\$725	\$99,572	SC directed that \$725 surplus from FY14/15 budget be transferred to the reserve as undesignated funds.
FY17/18	Deposit	Steering Committee	3/2/2018	\$34,007	\$133,579	SC voted to unencumber the \$25,910 FY15/16 surplus and the \$8,097 FY16/17 surplus and transfer the amount of \$34,007 to the Reserve Fund
<b>TOTAL</b>				<b>\$133,579</b>		<b>Undesignated funds balance</b>

## Revenue Forecast for FY18/19

In 2017, the SC elected not to increase fees for existing participants for FY18/19. Expected contributions from continuing participants amount to **\$900,256**.

The number of Delta RMP participants has steadily grown over the life of the program, as shown below. New participants may join the program during the next year. However, these contributions are uncertain, and we have chosen to forecast conservatively to avoid taking financial risks. Table 6 shows the how the number of Delta RMP participants has evolved, along with their financial contributions. Revenue has grown every year of the program's existence until this year, in which we expect a decline in revenue due to the loss of funding by the State and Federal Contractors Water Agency (SFCWA). This organization has announced that it is dissolving, resulting in a loss of \$100,000 in revenue compared to previous years.

**Table 6 History of Delta RMP participation and revenue**

<b>Fiscal Year</b>	<b>Number of Participants</b>		<b>Contributions by Participants</b>	
FY 15/16	33		\$751,733	
FY 16/17	35	+6%	\$862,082	+15%
FY 17/18	49	+40%	\$997,356	+16%
FY 18/19(anticipated)	49	-	\$900,256	-10%

Below, Table 7 summarizes the expected revenue for FY18/19 summarized by category of participant. **Error! Reference source not found.** shows revenue growth by participant category, showing actual revenue for the past three fiscal years and expected revenue for FY18/19.

**Table 7 Delta RMP FY17/18 Revenue Schedule**

<b>Participant</b>	<b>FY15/16</b>	<b>FY16/17</b>	<b>FY17/18</b>	<b>FY18/19</b>	<b>Comment</b>
	<b>Actual</b>	<b>Actual</b>	<b>Actual</b>	<b>Forecast</b>	
Agriculture	\$113,780	\$148,780	\$148,780	\$148,780	
Dredgers		\$60,000	\$60,000	\$63,000	Sacramento Yacht Club joining program in FY18/19, expected contribution \$3,000.
Stormwater (MS4 Phase 1)	\$158,200	\$158,200	\$181,400	\$181,400	
Stormwater (MS4 Phase 2)	\$169,999	\$189,999	\$309,999	\$309,999	12 new participants joined in FY17/18.
Wastewater	\$209,754	\$205,103	\$197,077	\$197,077	The City of Discovery Bay did not participate in the RMP in FY16/17, but did in FY17/18.  By approval of the CV Water Board, the City of Stockton contributed \$24,777 in FY16/17, but is permitted to pay \$12,100 in other years.
Water supply	\$100,000	\$100,000	\$100,000		SFCWA announced it is dissolving in 2018.
<b>Total</b>	<b>\$751,733</b>	<b>\$862,082</b>	<b>\$997,256</b>	<b>\$900,256</b>	

## Invoices

Please follow this link to download the invoices covered by this memo:

<https://drive.google.com/drive/folders/0B8LZA-e4CFNIUVN2SjJCNGFnBTg?usp=sharing>

## Appendix – Detailed Expense Tables

See the following pages for this table.

**Table 8 Delta RMP FY17/18 budget and expenses through 3/31/2018 by task and subtask, with details on expenses for the period since the last report (4-month period from Dec 2017 to Mar 2018).**

Table 6. Delta RMP FY17/18 budget and expenses through 3/31/2018 by task and subtask, with details on expenses for the period since the last report (4-month period from Dec 2017 to Mar 2018).

Task	Subtask	Budget	New expenses in this report	Total expenses to date	Budgeted funds remaining	Percent of budget spent	Staff and subcontractors billing	Description
01. Core Functions	A. Program Planning	\$65,000	\$38,313	\$48,152	\$16,848	74%	Jay Davis (23 hrs) Amy Franz (25 hrs) Matthew Heberger (159 hrs) John Ross (3 hrs) Micha Salomon (14.5 hrs) Philip Trowbridge (22.25 hrs) Rebecca Sutton (8 hrs) Anthony Hale (10 hrs)  AMS Invoice #385-18/01: \$3,640 (from Applied Marine Sciences, consulting statistician Dr. Aroon Melwani)	<b>Outputs:</b> Internal coordination, staff meetings, labor planning, oversight and management. Phone meetings and correspondence with external partners (DSP and NOAA fisheries) re: funding and in-kind contributions. <b>Mercury:</b> Coordination of subcommittee and proposal writing. Coordination with Moss Landing Marine Laboratory. <b>CECs:</b> Lead scientist review of the CEC monitoring pilot study workplan. Development of budgets and staffing plan for data management updating the QAPP. <b>Pesticides:</b> Planning and coordination of proposal development. Paid consulting statistician Dr. Aroon Melwani for power analysis and input on monitoring design options. <b>Data Management &amp; QA:</b> Drafted a Data Management & Quality Assurance Standard Operating Procedures document.  <b>Deliverables completed:</b> Monitoring proposals for mercury monitoring and nutrients special studies presented to TAC. Draft proposals for pesticides and CECs under development.
	B. Contract and Financial Management	\$54,000	\$14,870	\$43,341	\$10,659	80%	Matthew Heberger (29.5 hrs) Frank Leung (20 hrs) Meredith Lofthouse (96 hrs) Philip Trowbridge (0.75 hrs)	<b>Outputs:</b> Internal accounting; subcontract management; checked and approved internal and external invoices; tracked expenses by task; labor planning and project management. Prepared financial summary memo and tables. Finance subcommittee meeting on Jan 12, 2018. Correspondence with RB5 staff re: SFCWA contribution and "adequate participation." Checking invoice dates and payment details for RB5 staff request.  <b>Deliverables Completed:</b> Quarterly Financial Report and Finance Subcommittee call. New subcontract executed with AMS to provide statistical consulting on pesticides proposals.
02. Governance	A. SC meetings	\$48,484	\$11,629	\$32,192	\$16,292	66%	Matthew Heberger (83 hrs) Philip Trowbridge (1.5 hrs)  Daphne Orzalli Invoice: 1/14/2018, \$835 (applied 50% of invoice to 2A)	<b>Outputs:</b> Meeting summary for fall 2017 SC meeting. Planned January Steering Committee which was postponed to March; held an interim phone meeting in January to deal with urgent business (approving Pesticides Report RFP); planned and compiled agendas, prepared materials, communicated with participants in advance of the meeting. Held planning meetings with the Coordinating Committee before and after the SC meeting. Updated roster, voting record, and action item tracking sheet.  <b>Deliverables Completed:</b> 3 of 4 planned Steering Committee meetings held to date plus one extra phone meeting. SC meetings on 3/2/2018. Draft meeting summaries circulated to SC members.

Task	Subtask	Budget	New expenses in this report	Total expenses to date	Budgeted funds remaining	Percent of budget spent	Staff and subcontractors billing	Description
	B. TAC meetings	\$61,620	\$18,664	\$33,400	\$28,220	54%	Matthew Heberger (69 hrs) Philip Trowbridge (8 hrs)  Stephen McCord Invoices: 12/31/2017, \$1,920 1/31/2018, \$1,800 2/28/2018, \$1,680 3/31/2018, \$3,000  Daphne Orzalli Invoice: 1/14/2018, \$835 (applied 50% of invoice to 2B)	<b>Outputs:</b> TAC meetings held on 12/12/2017 and 3/15/2018. For each meeting prepared agendas, meeting materials, and summaries. Coordination meetings held with co-chairs and facilitator.  <b>Deliverables Completed:</b> 3 of 4 TAC planned TAC meetings held. Meeting summaries distributed to TAC members. Summary of past meetings finalized and posted to project website. Scheduled April 23 and June 12, 2018 meetings and sent invitations.
	C. Technical Subcommittees	\$20,000	\$4,710	\$14,180	\$5,820	71%	Matthew Heberger (36 hrs) Philip Trowbridge (3 hrs)	<b>Outputs:</b> Planning and coordination for technical subcommittees. Distributed agendas, prepared slide presentations and background materials. For pesticides subcommittee included maps and technical memoranda.  <b>Deliverables completed:</b> Pesticides Subcommittee met 5 times in Q1 of 2018.
	D. Science Advisors	\$10,000	\$348	\$522	\$9,478	5%	Matthew Heberger (3 hours)	<b>Outputs:</b> Added nominated science advisors to list. Collected and reviewed CVs and publications by nominees.  <b>Note:</b> No future billing to this budget line. Reserved henceforth for travel and honoraria for advisors. Suggest transferring JTD hours billed to 2B TAC meetings before next finance report so full amount is available.
03. Quality Assurance	A. Quality Assurance System	\$15,000	\$5,646	\$17,192	(\$2,192)	115%	Amy Franz (1.5 hrs) Matthew Heberger (11 hrs) Thomas Jabusch (14 hrs) Donald Yee (14 hrs)	<b>Outputs:</b> Finalized the program Quality Assurance Program Plan (QAPP) and gathered signatures. Some hours were billed to this budget line to begin drafting the Data Management and QA SOP, an element required by the SWAMP QA Officer, and which was not originally included in the workplan.  <b>Deliverables completed:</b> none this quarter. QAPP revisions finalized and awaiting final review by SWAMP QA Officer.
	B. Technical Oversight and Coordination	\$15,000	\$6,230	\$12,754	\$2,246	85%	Matthew Heberger (48.5 hrs) Steven Hagerty (7.5 hrs)	<b>Outputs:</b> Many miscellaneous technical issues related to running a multi-faceted monitoring program. Assisted Data Management team to review contract and communicate with mercury team on expeted analytes list. Reviewed DSP report and wrote summary for SC. Correspondence with labs to collect field data sheets and Chain of Custody forms. Compiling information for distribution to TAC. Phone call with MLJ staff to discuss ILRP data needs for their reporting. Reviewed and posted draft pathogens data report. Correspondence with Brian Ogg (SWAMP) and investigation of issue of high RPD on duplicate samples observed in tox data, but not in pesticide chemistry data.
04. Communications	A. Stakeholder Board Meetings	\$10,500	\$0	\$0	\$10,500	0%		

Task	Subtask	Budget	New expenses in this report	Total expenses to date	Budgeted funds remaining	Percent of budget spent	Staff and subcontractors billing	Description
	B. Pulse of the Delta Draft	\$40,000	\$116	\$1,178	\$38,822	3%	Matthew Heberger (1 hrs)	<p><b>Outputs:</b> Prepared presentation on planning the Pulse for Jan 23 SC meeting. This meeting was cancelled and this item was removed from the agenda of the March meeting.</p> <p><b>Deliverables completed:</b> Outline and presentation for the SC.</p>
	C. Data Assessment Framework Workshop	\$5,000	\$522	\$1,508	\$3,492	30%	Matthew Heberger (4.5 hrs)	<p><b>Note:</b> This new budget line created at the request of the Coordinating Committee in Nov 2017, to enable ASC to help plan and coordinate the upcoming Data Assessment Framework Workshop.</p> <p><b>Outputs:</b> Phone meeting to begin planning Data Assessment Framework Workshop held on 12/11/2018. Compiled brief literature review.</p> <p><b>Deliverables:</b> None to date. State Board staff have backed off their commitment to plan and host the workshop planned for spring 2018.</p>
08. Year 1-2 CUP Interpretive Report	A. Report (subcontract)	\$80,000	\$812	\$3,045	\$76,955	4%	Matthew Heberger (7 hrs)	<p>No further billing by ASC staff. Earmarked to pay the consultant for the Pesticides Interpretive Report.</p> <p><b>Note:</b> ASC staff had begun limited billing to this budget line planning the pesticides interpretive report before the SC decided that the work should be put out to bid. Before the last finance subcommittee meeting, where \$8K was authorized for contract management, Matt billed several hours for writing and coordinating the RFP. We propose to move JTD labor expense to 1A, program planning before the next finance update, so that the full \$80K can be used to pay the subcontractor.</p>
	B. Contract Management (Pesticides Report)	\$8,000	\$3,074	\$3,074		38%	Matthew Heberger (26.5 hrs)	<p><b>Outputs:</b> Conducted second meeting of the RFP working group. Revisions to the Pesticides Interpretive Report RFP in response to comments. Published RFP and advertised via newsletters, email, and informal networks. Posted announcement to website. Responded to questions by potential bidders. Sent confirmation emails to proposers. Created scoresheets for proposals. Read proposals and entered rankings. Answered questions about the proposal ranking process. Summarized scoresheets for review by the Pesticides Subcommittee members.</p> <p><b>Deliverables completed:</b> RFP issued. 8 proposals received and shared with pesticides subcommittee. Ranking questionnaires created, and results of rankings summarized. Memo to the TAC and SC on the selection process.</p>
09. Nutrients	A. Cross-Delta Monitoring Using High Frequency Tools	\$195,000	\$5,966	\$63,926	\$131,074	33%	USGS Invoices: #90603748 - \$5,966.36	<p><b>Note:</b> All funds in this budget line are for a subcontract with USGS.</p> <p><b>Outputs:</b> First data-gathering cruise conducted over 3 days in September 2017. Next cruises planned for spring/summer 2018. Invoice for 2017 Q4 covers equipment and supplies, for repairing faulty instrumentation.</p>

Task	Subtask	Budget	New expenses in this report	Total expenses to date	Budgeted funds remaining	Percent of budget spent	Staff and subcontractors billing	Description
	B. Nutrient Data Synthesis and Reporting	\$20,000	\$7,041	\$17,723	\$2,277	89%	Philip Trowbridge (39.5 hrs)	<p><b>Outputs:</b> This budget line supports planning work with the nutrients subcommittee and proposal development. Preparation and background materials for nutrients subcommittee meetings on Dec 1, Jan 18, and Feb 21. ASC developed a list of 20 "proposal concepts" based on the last meeting and showed how they were aligned with the Nutrient Research Plan. The subcommittee decided which concepts should be developed into proposals. Writing and editing nutrients proposals. Discussed DSP MOU funding for nutrient workshop with colleagues. Phone meeting with RB5 staff on FY18/19 projects.</p> <p><b>Deliverables completed:</b> Preparation of 4 proposals. Held 3 meetings of the Nutrients Subcommittee.</p>
	C. Chlorophyll Sensor Intercalibration	\$15,000	\$4,452	\$12,379	\$2,621	83%	Matthew Heberger (8 hrs) Philip Trowbridge (19.75 hrs)	<p><b>Outputs:</b> Planned and held second workshop on chl-a intercalibration study on 12/5/2018. Discussions with technical staff on elements of proposal for Phase II of the study. Wrote proposal and gathered feedback from the Nutrients Subcommittee.</p> <p><b>Deliverables completed:</b> Meetings held. Finalized proposal for Phase II of the study.</p>
10. Mercury Monitoring FY17/18	A Data Collection and Analysis	\$209,016	\$24,383	\$67,517	\$141,499	32%	SJSURF Invoice dated 4/5/2018 \$24,383.	<p><b>Outputs:</b> Sampling for water and sediment conducted on Oct 18-19, 2017. Laboratory analysis of samples for mercury and other water quality parameters.</p> <p><b>Note:</b> Invoices are from "San Jose State University Research Foundation," the parent organization for the Marine Pollution Studies Laboratory at Moss Landing, the subcontractor performing field and lab work for the mercury monitoring study.</p>
	B. RMP Data Management	\$19,545	\$6,006	\$6,006	\$13,539	31%	Amy Franz (5 hrs) John Ross (12 hrs) Michael Weaver (24.5 hrs) Adam Wong (0.75 hrs) Donald Yee (10 hrs)	<p><b>Outputs:</b> Processing and QA of annual sportfish data collected during annual sampling on Aug 14-18, 2017. Created contract analyte list (which allows our data management team to know what type of samples to expect and to check that submitted data are complete) for analyte, matrix, and fraction. Developed new database controlled vocabulary (pre-populates database with standardized entries, a key component in ensuring data quality).</p> <p><b>Deliverables completed:</b> Provisional fish mercury data uploaded to CEDEN. Not released pending review by TAC and approval by SC.</p>
	C. Technical Oversight	\$5,000	\$1,433	\$1,433	\$3,567	29%	Jay Davis (7 hrs)	<p><b>Outputs:</b> Coordination with field and lab staff on the selection of sampling dates and times. Created new data report template. Coordinated with Mercury Subcommittee.</p>
166. CUP Monitoring (authorized in FY15/16)	E. Reporting	(\$1,745)	\$812	\$1,686	(\$3,431)		Matthew Heberger (7 hrs)	<p><b>Outputs:</b> Finalized year 1 pesticides report for publication. Compiled hundreds of pages into PDF appendices, including all field data sheets, chain of custody forms, lab reports, and bench sheets.</p> <p><b>Deliverables completed:</b> Year 1 pesticides data report finally published.</p> <p><b>Closed for further billing.</b></p>

Task	Subtask	Budget	New expenses in this report	Total expenses to date	Budgeted funds remaining	Percent of budget spent	Staff and subcontractors billing	Description
173. Quality Assurance (authorized in FY16/17)	A. Quality Assurance System	\$6,311	\$0	\$7,868	(\$1,557)	125%		<b>Closed for further billing.</b>
	B. Technical Oversight	\$7,123	\$130	\$8,106	(\$983)	114%	Thomas Jabusch (1 hrs)	<b>Outputs:</b> QAPP edits. (This 1 hour should have been billed to budget line 3A and will be fixed in the next finance update.) <b>Closed for further billing.</b>
174. Communications (authorized in FY16/17)	A. Factsheet	\$4,084	\$0	\$2,412	\$1,672	59%		Note: a small amount of budget remains. We propose to use this to cover some of the costs of preparing and printing a poster for the Bay Delta Science Conference.
176. CUP Monitoring (authorized in FY16/17)	B. Pesticide Laboratory Work	\$154,029	\$51,375	\$51,375	\$102,654	33%	USGS Invoices: 2017 Q2, #90616317, \$39,904.69 2017 Q3, #90616324, \$8,811.71 2017 Q4, #90616326, \$2,658.83	<b>Note:</b> All funds in this budget line are for a subcontract with USGS. No invoices received this quarter. Lab analysis of samples collected July 2016 to June 2017 is complete but has not been invoiced. We are working with USGS to have them submit invoices in a more timely manner in the future.
	D. Data Management	\$7,151	\$4,715	\$11,363	(\$4,212)		Amy Franz (23.5 hrs) John Ross (3 hrs) Michael Weaver (40 hrs) Adam Wong (10.5 hrs) Donald Yee (12 hrs)	<b>Note:</b> Budgeted in FY16/17 at \$37,400. A total of \$30,249 was spent in the previous fiscal year, and \$7,151 was rolled over to the current year's budget. <b>Outputs:</b> Reviewing and formatting data on copper and conventional water quality parameters from USGS Denver lab. QA Officer review of this data. Completeness review conducted 3 times, each time we discovered that labs did NOT submit all of the data required in their contract. Troubleshooting and correspondance with two different USGS labs (Sacramento and Denver) regarding missing data. Data that was provided contained errors and swapped entries. Great deal of work had to be repeated with corrected data. <b>Deliverables completed:</b> Data uploaded to CEDEN but not made public pending SC approval. As of 4/27/2018, we are working to correct the data errors noticed by USGS staff after the initial data upload.
	E. Reporting	\$3,748	\$2,987	\$3,799	(\$51)	101%	Amy Franz (0.25 hrs) Matthew Heberger (6 hrs) John Ross (5 hrs) Donald Yee (10 hrs)	<b>Outputs:</b> Reviewed AHPL year-end toxicology report; distributed to TAC and Pesticides Subcommittee for comments. Sent provisional toxicity data to TAC for review. Edits to QA memo -- adding additional details and editing more carefully as it is the only documentation the TAC and SC will receive on year 2 pesticides monitoring since the Year 2 data report was cancelled. <b>Note:</b> Originally budgeted at \$20,000. Some billing occurred in FY16/17, and \$18,748 was carried over to FY17/18. The Year 2 pesticides data report was then cancelled by decision of the Steering Committee. However, ASC is still obligated to produce a QA memo and to distribute the lab report produced by AHPL. Therefore, the budget was adjusted downward to \$5,000, for a carryover amount of \$3,748.

Task	Subtask	Budget	New expenses in this report	Total expenses to date	Budgeted funds remaining	Percent of budget spent	Staff and subcontractors billing	Description
177. Nutrient Synthesis (authorized in FY16/17)	A. Nutrient Synthesis	\$8,670	\$653	\$5,534	\$3,136	64%	Matthew Heberger (1 hrs) Philip Trowbridge (3 hrs)	<b>Outputs:</b> Revisions to Nutrients Synthesis report based on one last set of comments. Final formatting of PDF and published on the web.  <b>Deliverables completed:</b> Report published.
	B. Nutrient Modeling	(\$1,034)	\$116	\$3,658	(\$4,692)		Matthew Heberger (1 hrs)	<b>Outputs:</b> Final formatting of PDF and published on the web.  <b>Deliverables completed:</b> Report published.
	C. Nutrient Statistical Analyses	\$34,601	\$178	\$1,302	\$33,299	4%	Philip Trowbridge (1 hrs)	<b>Outputs:</b> Reviewed of Marcus Beck's revised manuscript.
178. Mercury (authorized in FY16/17)	A. Data Collection	\$19,224	\$19,224	\$19,224	(\$0)	100%	SJSURF Invoice dated 12/18/2017: \$19,224.46	<b>Note:</b> The data collection and lab analysis is complete and the subcontractor (Moss Landing Marine Lab) has now invoiced ASC for the full amount.  <b>Closed to further billing.</b>
	B. Data Management	\$10,546	\$0	\$9,361	\$1,185	89%		<b>Closed to further billing.</b>
	D. Reporting	\$4,787	\$1,093	\$6,011	(\$1,224)	126%	Jay Davis (4 hrs) Amy Franz (1.25 hrs) Shira Bezalel (1 hrs)	<b>Outputs:</b> Proofreading and copyediting of the Mercury data report. Distribution to TAC, and response to comments. Coordination with authors to revise figures and text based on TAC feedback.  <b>Deliverables:</b> Final report recommended for publication by the TAC at its 3/15 meeting, forwarded to SC for approval at its 5/11 meeting.  <b>Note:</b> Overage in Task D offset by savings in Task B.
<b>TOTAL</b>		<b>\$1,153,660</b>	<b>\$235,498</b>	<b>\$511,222</b>	<b>\$637,512</b>	<b>44%</b>		

# Meeting Materials for Item 6

## Workplan



## **Delta Regional Monitoring Program FY18/19 Workplan and Budget**

For consideration by the Delta RMP Steering Committee on May 11, 2018



## Contents

Introduction .....	3
Revenue Forecast .....	4
Program Core Function Expenses .....	7
Expenses for Monitoring and Special Studies.....	12
Mercury .....	12
Nutrients .....	12
Summary .....	14
Subcontractors .....	17
In-Kind Contributions .....	18
Overall Delta RMP FY18/19 Budget .....	19
Undesignated Funds Reserve Balance .....	20

## Tables and Figures

Table 1 History of Delta RMP participation and revenue .....	4
Table 2 Delta RMP FY17/18 Revenue Schedule .....	5
Table 3 Delta RMP FY18/19 core function budget with comparison to previous fiscal year .....	9
Table 4 Delta RMP FY17/18 Programmatic Task Descriptions, Budget Justifications, and Deliverables.....	10
Table 5 Summary of Delta RMP FY17/18 Monitoring and Special Studies .....	14
Table 6 Budget details for monitoring and special studies .....	15
Table 7 Subcontractors .....	17
Table 8 Planned in-kind contributions to the Delta RMP in FY18/19.....	18
Table 9 Delta RMP FY17/18 Overall Budget.....	21
Figure 1 Bar chart of revenue growth by participant category, showing actual revenue for the past 3 fiscal years and expected revenue for FY18/19.....	6
Figure 2 Bar chart of budgeted expenses for the Delta RMP over last 4 fiscal years. ....	19

## Introduction

The purpose of this document is to provide the Delta RMP Steering Committee (SC) with a detailed workplan and budget for Fiscal Year 2018-2019 (FY18/19), covering the period from July 1, 2018 to June 30, 2019. This workplan covers the core functions of administration, finance, and governance, monitoring for mercury, and special studies for nutrients. The SC may decide to add monitoring for pesticides, toxicity, and contaminants of emerging concern (CECs) during the upcoming fiscal year, but that can be a separate action that draws upon funds from the Reserve. If the SC approves these projects, this workplan will be amended to add these studies.

For the upcoming year, the overall budget is **\$839,710**. Forecast revenue from Delta RMP participants is **\$900,256**, enough to cover all planned expenses and to create a surplus which can be added to the Reserve. Planned expenses are slightly lower than the previous fiscal year. Planned expenses in the FY17/18 budget were \$863,165. One reason for this decrease is that some tasks from FY17/18 will have unspent funds that will be carried over to FY18/19. Therefore, we do not need to allocate new funding for these tasks. For example, we budgeted for honoraria and travel for science advisors, but have not used any of these funds to date. Further, we had budgeted to produce a draft of the program's flagship publication, *The Pulse of the Delta*. Staff and the Steering Committee have not prioritized this project, so most of the budget is unspent.

In addition, the workplan leverages \$153,947 in in-kind contributions from other agencies, including the U.S. Geological Survey (USGS), Department of Water Resources (DWR), U.S. Bureau of Reclamation (USBR), and Moss Landing Marine Laboratory (MLML). The proposed studies also take advantage of and build off several projects funded by other agencies with a total value of \$883,000.

Staff of the Aquatic Science Center (ASC) have worked with technical subcommittees to develop study proposals for mercury and nutrients that are consistent with planning budgets set by the Steering Committee. The FY18/19 study proposals were vetted by the respective subcommittees and brought to the Technical Advisory Committee (TAC) on March 15, 2018. The subcommittees worked to develop proposals that are consistent with feedback received by the 2016 External Review Panel.

In the spring of 2018, the TAC reviewed and prioritized the scientific studies based on the planning budgets for each focus area. Detailed workplans for these studies and proposed multi-year plans for the focus areas are provided as attachments to this workplan. ASC then prepared this detailed workplan for the recommended studies and core functions of the program. This document summarizes the:

- Expected revenue for FY18/19;
- A detailed budget and workplan for the core functions of the program;
- A detailed budget and workplan for monitoring and special studies;

- The overall FY17/18 Delta RMP budget;
- The balance of Undesignated Funds Reserve.

This Detailed Workplan will be submitted for approval by the Steering Committee on May 11, 2018.

## Revenue Forecast

In 2017, the SC elected not to increase fees for existing participants for FY18/19. Expected contributions from continuing participants amount to **\$900,256**.

The Delta RMP has access to some in-kind funds that we can use at our discretion, such as a State Board contract with UC-Davis for toxicity testing (the “SWAMP Contract”). These funds are not “fungible.” In other words, they cannot be used for any purpose other than toxicity testing, nor can they be used with a different vendor. Our budgeting and financial reporting for the Delta RMP only includes funds that we manage. However, we carefully track in-kind contributions to the program. See **In-Kind Contributions** on page 18.

The number of Delta RMP participants has steadily grown over the life of the program, as shown below. New participants may join the program during the next year. However, these contributions are uncertain, and we have chosen to forecast conservatively to avoid taking financial risks. Table 1 shows the how the number of Delta RMP participants has evolved, along with their financial contributions. Revenue has grown every year of the program’s existence until this year, in which we expect a decline in revenue due to the loss of funding by the State and Federal Contractors Water Agency (SFCWA). This organization has announced that it is dissolving, resulting in a loss of \$100,000 in revenue compared to previous years.

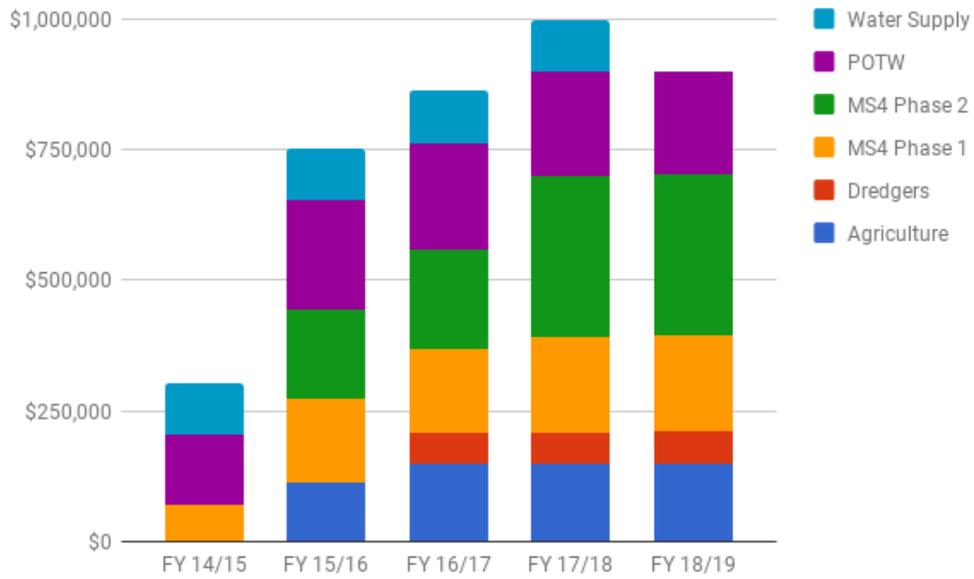
**Table 1 History of Delta RMP participation and revenue**

Fiscal Year	Number of Participants		Contributions by Participants	
FY 15/16	33		\$751,733	
FY 16/17	35	+6%	\$862,082	+15%
FY 17/18	49	+40%	\$997,356	+16%
FY 18/19(anticipated)	49	-	\$900,256	-10%

Below, Table 2 summarizes the expected revenue for FY18/19 summarized by category of participant. Figure 1 shows revenue growth by participant category, showing actual revenue for the past three fiscal years and expected revenue for FY18/19.

**Table 2 Delta RMP FY17/18 Revenue Schedule**

<b>Participant</b>	<b>FY15/16 Actual</b>	<b>FY16/17 Actual</b>	<b>FY17/18 Actual</b>	<b>FY18/19 Forecast</b>	<b>Comment</b>
Agriculture	\$113,780	\$148,780	\$148,780	\$148,780	
Dredgers		\$60,000	\$60,000	\$63,000	Sacramento Yacht Club joining program in FY18/19, expected contribution \$3,000.
Stormwater (MS4 Phase 1)	\$158,200	\$158,200	\$181,400	\$181,400	
Stormwater (MS4 Phase 2)	\$169,999	\$189,999	\$309,999	\$309,999	12 new participants joined in FY17/18.
Wastewater	\$209,754	\$205,103	\$197,077	\$197,077	The City of Discovery Bay did not participate in the RMP in FY16/17, but did in FY17/18.  By approval of the CV Water Board, the City of Stockton contributed \$24,777 in FY16/17, but is permitted to pay \$12,100 in other years.
Water supply	\$100,000	\$100,000	\$100,000		SFCWA announced it is dissolving in 2018.
<b>Total</b>	<b>\$751,733</b>	<b>\$862,082</b>	<b>\$997,256</b>	<b>\$900,256</b>	



**Figure 1** Bar chart of revenue growth by participant category, showing actual revenue for the past 3 fiscal years and expected revenue for FY18/19.

## Program Core Function Expenses

Delta RMP expenses fall into two categories: core function expenses associated with administering a multi-faceted, stakeholder-driven monitoring program; and special studies and monitoring to answer Delta RMP assessment questions. This section details the core function expenses for FY18/19. The core function budget includes the following categories of tasks:

- Preparation of Program Planning Documents (e.g., Workplan, Monitoring Design)
- Contracts and Financial Management
- Governance
- Quality Assurance

In addition, Table 3 shows how the planned core function budget for FY18/19 compares to the previous fiscal year, both in terms of the number of hours of staff time and total expense. The planned budget for core functions is \$291,700, somewhat smaller than the budgeted and projected expenses for core functions in FY17/18. Certain tasks have slightly higher budgets than last year, due to cost increases from inflation. However, the reason for the overall decrease is that this year's budget does not contain certain items that were in last year's budget. Some of these tasks from the last fiscal year are unfinished. We anticipate rolling over any remaining funds following the close of the fiscal year and the reconciling of accounts. Below are notes on certain tasks:

- **Travel expenses** are no longer included under any task. Due to a change in SFEI-ASC's policies and accounting practices, travel expenses are not charged to the Delta RMP.
- **Task 2A, Steering Committee Meetings (\$38,400)**. This budget line is lower this year as we have decided that the SC co-chairs will run meetings and we can do without the services of a paid facilitator, resulting in a savings of over \$10,000.
- **Task 2C, Technical Subcommittees (\$37,000)**. This task is intended to cover ASC staff time to organize and participate in technical subcommittee meetings. This is an important part of program planning and monitoring design, and a key part of our strategy to respond to the critiques of the 2016 External Review Panel. This task was increased by \$17,000 compared to last year as we have added 2 new subcommittees covering Contaminants of Emerging Concern (CECs) and Data Management. In addition, the costs for running the Nutrients Subcommittee were not part of this budget in FY17/18<sup>1</sup> but will be for FY18/19. Organizing and preparing for these committee meetings is critical for the success of the Program. The meetings are where scientific work products are reviewed, new study ideas are developed, and coordination with other stakeholders occurs. Staff time is needed for the following tasks: preparing agendas, agenda materials and presentations; participating

---

<sup>1</sup> These costs were charged to a separate budget line (FY17/18 Task 9B).

in meetings; writing meeting summaries; following up on action items; and discussions with participants and stakeholders outside of meetings.

There are a number of tasks which we did **not** include in the FY18/19 budget because either there will be carry-over funds from the FY17/18 budget or no activity is planned for this year.

- **FY17/18 Task 2E, Science Advisors (\$10,000)** will pay the honoraria and travel for 2 to 4 independent science advisors. The advisors would be selected by the Steering Committee with input from the TAC and would commit to a 3 to 4 year term. These funds went unspent in the previous fiscal year due to the long process of nominating and selecting advisors, and we propose to carry over these funds over for use in FY18/19.
- **FY17/18 Task 4B Draft the Pulse of the Delta (\$40,000)** was meant to begin drafting the *Pulse of the Delta* report. In the Communications Plan, the *Pulse of the Delta* is described as the flagship publication of the Delta RMP. ASC did not spend much time on this task in FY17/18 because the Steering Committee did not have the opportunity to provide direction on this important document. Therefore, most of the allocated funds are unspent. A *Pulse* document typically requires having 3-4 technical reports completed and approved by the Steering Committee a 9-12 months in advance, after which the Steering Committee works on high-level messaging. A number of technical reports will be completed by the end of FY18/19, most significantly an interpretive report of the Delta RMP pesticide and toxicity data. Therefore, ASC recommends carrying over the unspent funds to do planning in FY18/19 and producing the report in 2020.
- **Factsheets and Outreach Products** – not essential as we have created a new factsheet in FY17/18 that should serve the program for at least a year.
- **Workshops and Technical Meetings** – While there are no workshops planned at the moment, the Steering Committee may wish to revisit this following the scoping of work related to Contaminants of Emerging Concern (CECs) or as other needs arise.

Full details about the labor, subcontract, and direct costs as well as the deliverables to be accomplished for each of the core functions tasks are provided in Table 4.

**Table 3 Delta RMP FY18/19 core function budget with comparison to previous fiscal year.**

	<u>FY17/18 Projected Staff Hours*</u>	<u>FY18/19 Budgeted Staff Hours*</u>	<u>FY17/18 Budgeted Expenses</u>	<u>FY17/18 Projected Expenses*</u>	<u>FY18/19 Budgeted Expenses</u>
<b>1. Program Management</b>					
A. Program Planning	438	420	\$65,000	\$64,980	\$68,250
B. Contract and Financial Management	509	480	\$54,000	\$53,870	\$56,150
			<b>\$138,000</b>	<b>\$118,850</b>	<b>\$124,400</b>
<b>2. Governance</b>					
A. SC meetings	284	320	\$48,484	\$46,379	\$38,400
B. TAC meetings	293	320	\$61,620	\$58,220	\$59,400
C. Technical Subcommittees	163	260	\$20,000	\$19,888	\$37,000
D. Science Advisors	-	-	\$10,000	\$10,000	-
			<b>\$140,104</b>	<b>\$134,487</b>	<b>\$134,800</b>
<b>3. Quality Assurance</b>					
A. Quality Assurance System	90	128	\$15,000	\$17,250	\$17,500
B. Technical Oversight and Coordination	110	80	\$15,000	\$13,392	\$15,000
C. Data Management Subcommittee	44	-	\$5,000		
			<b>\$30,000</b>	<b>\$30,642</b>	<b>\$32,500</b>
<b>4. Communications</b>					
A. Stakeholder Board Meetings	40	-**	\$10,000	\$10,000	-**
B. Delta RMP Update Draft	175	-**	\$40,000	\$40,000	-**
C. Data Assessment Framework Workshop	43	-**	\$5,000	\$5,000	-**
			<b>\$55,000</b>	<b>\$55,000</b>	<b>\$0</b>
<b>Total</b>	<b>2,189</b>	<b>1,948</b>	<b>\$363,104</b>	<b>\$338,979</b>	<b>\$291,700</b>

\*FY17/18 projected staff hours and expense includes hours billed to date plus our best estimate of the number of hours to complete tasks.

\*\*Most hours unspent in FY17/18. Anticipated to be rolled over and spent in FY18/19 according to project needs.

**Table 4 Delta RMP FY17/18 Programmatic Task Descriptions, Budget Justifications, and Deliverables.**

Task	Subtask	Budget	Description	Budget Justification	Deliverables
01. Core Functions	A. Program Planning	\$68,250	Planning, preparing annual workplans and budgets, including technical proposals for monitoring and special studies. Tracking deliverables and action items. Updating foundational documents including Charter, Multi-Year Plan, Communications Plan, and Monitoring Design as needed.	40 hours for Program Manager to produce the Annual Workplan and Budget. 100 hours (2 hrs/wk) for Program Manager to track and execute deliverables/ action items. 280 hours (5.6 hr/wk) for technical staff to develop study designs and monitoring designs, contribute to workplan, complete project management tasks, and update program documents. (420 hours total.)	FY19/20 Annual Workplan and Budget (May 2019). Technical study proposals for the technical subcommittees. Quarterly reports on deliverables and action items provided in the SC agenda package. Updates to foundational documents such as Charter, Monitoring Design, and Communications Plan as necessary.
	B. Contract and Financial Management	\$56,150	Tracking expenditures versus budget. Providing quarterly financial updates to the Steering Committee. Developing contracts and managing subcontractors. Invoicing program participants.	240 hours for Contracts Manager/Finance Associate and 60 hours for accountant (1.5 hr/\$5000 budget). 40 hours for Program Manager and 40 hours for technical staff to draft and negotiate contracts and compile legal advice. 50 hours for Program Manager (1 hr/wk) and 50 hours (1 hr/wk) for Environmental Analyst for monitoring program subcontracts and finances weekly. (480 hours total). \$500 for shipping, postage, office supplies.	Quarterly updates on budget and expenses provided in the SC agenda package. Contract management.
02. Governance	A. SC meetings	\$38,400	Preparing agendas, agenda packages, participating in meetings, editing meeting summaries, following up on action items, meeting with Co-Chairs and stakeholders outside of meetings.	4-5 meetings per year. For each meeting: 40 hours for Program Manager, 20 hours for Lead Scientists, 20 hours for Environmental Analyst. Facilitation by the co-chairs at no additional cost to the program. \$2,400 for note taking and meeting summaries by Daphne Orzalli.	4 Steering Committee meetings and meeting summaries, and 1 shorter (1-3 hour) phone meeting
	B. TAC meetings	\$59,400	Preparing agendas, agenda packages, participating in meetings, writing meeting	4-5 meetings per year. For each meeting: 20 hours for Program Manager, 40 hours	4 Technical Advisory Committee meetings

			<p>summaries, following up on action items, meeting with Co-Chairs and stakeholders outside of meetings. The cost for this function assumes that MEI and USGS continue to serve as co-chairs of the TAC, with ASC serving in a coordination role. The alternative is to have volunteer TAC co-chairs from the Program Participants with ASC providing leadership and support. The cost for this option would be \$42,000.</p>	<p>for Lead Staff, 20 hours for Environmental Analyst. TAC Co-Chair services provided by MEI (quote: \$19,200) and USGS. The USGS Co-Chair provides \$36,000 in in-kind support in this role.</p> <p>Total of 80 hours for Stephen McCord: Facilitation of 4 TAC meetings (24 hrs), participate in SC meetings (16 hrs), review documents and coordinate with Delta RMP participants and leadership (40 hrs).</p> <p>\$2,400 for taking and meeting summaries by Daphne Orzalli.</p>	<p>and meeting summaries, and 1 shorter (1-3 hour) phone meeting</p>
	C. Technical Subcommittees	\$37,000	<p>Preparing agendas, agenda materials and presentations, participating in meetings, writing meeting summaries, following up on action items, discussion with participants and stakeholders outside of meetings.</p>	<p>16 meetings per year. For each meeting: 4 hours for Program Manager, 12 hours for Lead Staff, 4 hours for Environmental Analyst. Increased over FY17/18 as we have added 2 new subcommittees covering CECs and Data Management. (256 hours total)</p>	<p>Agendas and informal summaries for up to 10 subcommittee meetings.</p>
03. Quality Assurance	A. Quality Assurance	\$17,500	<p>Updating the Quality Assurance Project Plan, writing Quality Assurance Reports for datasets, coordinating interlaboratory comparison tests (as needed), researching analytical methods, maintaining laboratory SOP file system.</p>	<p>40 hours for ASC QA Officer. 16 hours for ASC senior chemist, 16 hours for chief data scientist, 16 hours for GIS specialist, 40 hours for RMP technical staff. (128 hours total)</p>	<p>Revisions to QAPP (Fall 2018).</p>
03. Quality Assurance	B. Technical Oversight and Coordination	\$15,000	<p>Covers a variety of issues related to running a multi-faceted monitoring program. Coordination with subcontractors and field crews, reviewing reports, troubleshooting.</p>	<p>64 hours for technical staff (16 hours per quarter). 16 hours for ASC Senior Scientists (4 hours per quarter). (80 hours total)</p>	

## **Expenses for Monitoring and Special Studies**

This workplan contains monitoring and special studies for mercury and nutrients. The process for developing these studies and TAC comments on the proposed work is described in a memo to the Steering Committee dated May 2, 2018. Monitoring designs for pesticides and toxicity are still being developed by the Pesticide Subcommittee. The SC will decide whether to fund the pesticide/toxicity studies as a separate action in July. No further studies are proposed for pathogens.

The total cost for the monitoring programs and special studies amounts to \$548,010. This cost is broken down as \$277,210 for mercury and \$270,800 for nutrients. At the October 2017 Joint SC and TAC meeting, the subcommittees were charged with developing proposals with approximate budgets of \$250,000 for each focus area. Therefore, the proposals developed by the subcommittees are close to the planning budgets set by the SC. Summary

Table 5 summarizes the budgeted cost of each of the planned monitoring programs. Table 6 shows more details of the budget by task for monitoring and special studies. The tasks to be completed, subcontractors, and deliverables for these tasks are described briefly below and in detailed monitoring proposals attached as appendices to this document:

Appendix A: Nutrients

Appendix B: Mercury

### **Mercury**

Mercury monitoring in FY18/19 will collect samples of sport fish, water, and sediment in order to address the highest priority information needs related to implementation of the Methylmercury TMDL. The program extends upon FY17/18 by monitoring 8 times per year, sampling sport fish and water at the same 6 sites as in previous years. Monitoring will provide essential evidence for regulators implementing the TMDL and contribute to ongoing analytical work by the California Department of Water Resources (DWR), and which will be used to guide regulations and operational decisions related to farming, flood control, and wetland management.

Funding Requested: \$277,210

### **Nutrients**

The Nutrients Subcommittee is proposing two special studies for FY18/19. The two projects are:

- Merging High-Frequency Water Quality Data and Models to Gain Insights into the Factors Regulating Phytoplankton Blooms in the Delta in WY2016
- Intercalibration Study for Chlorophyll Fluorescence Sensors in the Bay-Delta, Phase II

Short summaries of these special studies are listed below. The full proposals are included in Attachments to this workplan.

#### Merging High-Frequency Water Quality Data and Models to Gain Insights into the Factors Regulating Phytoplankton Blooms in the Delta in WY2016

For this study, we propose to combine a hydrodynamic-biogeochemical model of the Delta in WY2016 with water quality measurements in order to understand what caused large phytoplankton blooms in this year. The approach will be to apply a biogeochemical model developed for WY2011 to WY2016 and then to compare the model predictions to measurements made throughout the Delta. Comparisons between the model and observations will provide insight into important mechanisms for phytoplankton productivity including physical and other influencing factors. The study will be a first step toward implementing priority research recommendations in the Delta Nutrient Research Plan. The study design leverages \$24,000 of in-kind modeling resources from the Department of Water Resources and takes advantage of \$900,000 of studies that are funded by other parties. Finally, this project implements a recommendation to increase data sharing among different models and monitoring programs.

Funding Requested: \$186,000

This study will be lead by ASC with assistance from USGS through a subcontract. Additional subcontracts will needed with Deltares for model code development and external experts to either contribute to the final report or review it. The specific expertise needed to evaluate the results is not known at this time so these subcontractors are not explicitly listed. All subcontracts will be reviewed by the Financial Subcommittee before being executed.

#### Intercalibration Study for Chlorophyll Fluorescence Sensors in the Bay-Delta, Phase II

Chlorophyll is an important water quality parameter for assessing the effects of nutrients and for fisheries management in the Bay-Delta. This study is the second phase of a multi-year effort to improve the accuracy, precision, and comparability of chlorophyll data collected in the Bay-Delta. Phase I planning has shown that variability in the methods used for measurement chlorophyll across the Bay-Delta is significant and that reducing this variance is of interest to a wide variety of monitoring agencies. In FY18/19, we propose to tackle a portion of the problem with a series of tasks to help understand and reduce the variance in the measurements of chlorophyll by in-situ sensors and laboratory methods. The proposed tasks include: (1) assessing methods used by different monitoring programs; (2) performing field intercalibration exercises between programs; (3) organizing a laboratory intercalibration study; and (4) preparing a summary report through technical workgroup discussion. Funding is requested for

SFEI-ASC and USGS to lead the study. The study leverages \$105,000 of in-kind support from the Department of Water Resources and the US Bureau of Reclamation.

Funding Requested: \$84,800

This study will be lead by ASC with assistance from USGS through a subcontract. All subcontracts will be reviewed by the Financial Subcommittee before being executed. The Department of Water Resources and the U.S. Bureau of Reclamation will implement aspects of the project with in-kind resources.

## Summary

**Table 5 Summary of Delta RMP FY17/18 Monitoring and Special Studies**

Project	Cost
<b>Mercury</b>	
Monitoring of water and sportfish	\$277,210
<b>Nutrients</b>	
1. WY2016 Modeling and Monitoring Synthesis	\$186,000
2. Chlorophyll Sensor Intercalibration, Phase II	\$84,800
<b>Nutrients subtotal</b>	<b>\$270,800</b>
<b>Total</b>	<b>\$548,010</b>

\*Represents the cost to the Delta RMP. Moss Landing Marine Laboratory (MLML) has pledged \$25,000 to \$30,000 as in-kind services for mercury field sampling and analytical work.

**Table 6 Budget details for monitoring and special studies**

Task	Subtask	Expense Type	Budget	Description	Budget Justification	Deliverables
04. Nutrients	A. Nutrients Modeling Study	Labor	\$101,000	SFEI-ASC staff time for analyst and modeler to initialize and run the biogeochemical model for WY2016, to handle data, collaborate with project partners, write and edit project report, and present findings.	80 hours for Lead Staff, 40 hours for Program Manager, 40 hours for Program Director, 32 hours for Environmental Analyst, and 40 hours for technical staff.	Final report on the Nutrients Modeling Study. Semi-annual progress reports to Delta RMP stakeholders.
		Sub-contracts	\$85,000	Deltares: write code to convert DWR's SCHISM model output to the Deltares Flexible Mesh (DFM) format USGS: analysis of modeled versus monitored data, and co-authorship of the final report Honoraria for consultants and external reviewers for peer review of the report.	Deltares (\$35,000); USGS (\$40,000); honoraria for consultants and external reviewers (\$10,000)	
	B. Chlorophyll Inter-calibration Study	Labor	\$48,750	SFEI-ASC staff time for study coordination and analysis. Tasks include assessment of methods, field intercalibration exercises, lab study, workgroup meetings, and writing a summary report.	80 hours for Lead Staff, 40 hours for Program Manager, 40 hours for Program Director, 32 hours for Environmental Analyst, and 40 hours for technical staff.	Task 1 deliverable: short report on the methods used to measure in-situ chlorophyll by different programs in the Bay-Delta. Task 2 deliverable: presentation to the workgroup on the intercalibration exercise to document intercomparability among chl-a measurement among different programs.
		Sub-contracts	\$36,050	USGS subcontract for managing field data collection, analysis, collaboration through meeting attendance, and report writing.		Task 1: Assessment of in-situ chlorophyll methods in use Task 2: Presentation to workgroup on field intercalibration exercises Task 3: Report on laboratory

						intercalibration study Task 4: Summary report with recommendations for next steps
05. Mercury Monitoring FY18/19	A Data Collection and Analysis	Sub-contracts	\$242,130	Field collection of fish and water samples and laboratory analyses by the Moss Landing Marine Laboratory (MLML).	Includes a \$30,000 in-kind contribution from MLML	Year 3 Mercury Data Report
	B. Mercury Data Management and Quality Assurance	Labor	\$29,930	Project Management and Coordination: setting up internal tracking system, communicate with DS team, PIs and labs on deliverables and issues. Data Management: manage collection info, create electronic data deliverable (EDD) templates, populate data into CEDEN templates from lab spreadsheet, log in Data sets, format data; Data Validation: Conduct data quality assurance procedures outlined in the Quality Assurance Project Plan (QAPP), data storage and release, upload final data CEDEN. Create summary tables for reporting.	Includes 45 hours for Data Manger, 92 hours for Technology Specialists, and 70 hours for Quality Assurance Officer	Mercury Fish and Water QA Summary Technical Memo
	C. Technical Oversight and Coordination	Labor	\$5,150	Scheduling and coordinating field sampling activities, communication with lab staff, coordination with Mercury Subcommittee	24 hours for Lead Scientist	
<b>Total</b>			<b>\$548,010</b>			

## Subcontractors

Table 7 lists the subcontractors included in the Delta RMP FY18/19 workplan. The contractors and service providers listed below are experienced and familiar with the Delta RMP and the Program's needs. Per the Delta RMP Charter, sole source justifications are provided in Appendix E for the subcontracts greater than \$50,000, Moss Landing Marine Laboratory and the U.S. Geological Survey.

**Table 7 Subcontractors**

<b>Contractor</b>	<b>Budget Amount</b>	<b>Services</b>
Moss Landing Marine Laboratory	\$209,016	Mercury Monitoring – field data collection and laboratory analysis
U.S. Geological Survey	\$76,050	Nutrient Special Studies. See cost break down between projects in detailed study descriptions.
Deltares	\$35,000	Nutrient Special Studies. Developing specialized modeling software.
McCord Environmental	\$19,200	TAC Co-Chair, meeting facilitation, coordination with stakeholders
Daphne Orzalli	\$4,800	SC and TAC meeting notes and summaries

## In-Kind Contributions

Financial reporting for the Delta RMP only includes funds managed by ASC. However, we make an effort to track in-kind contributions to the program. The success of the program relies on leveraging valuable contributions from partner agencies. Table 8 shows the value of planned in-kind contributions to the Delta RMP during FY18/19.

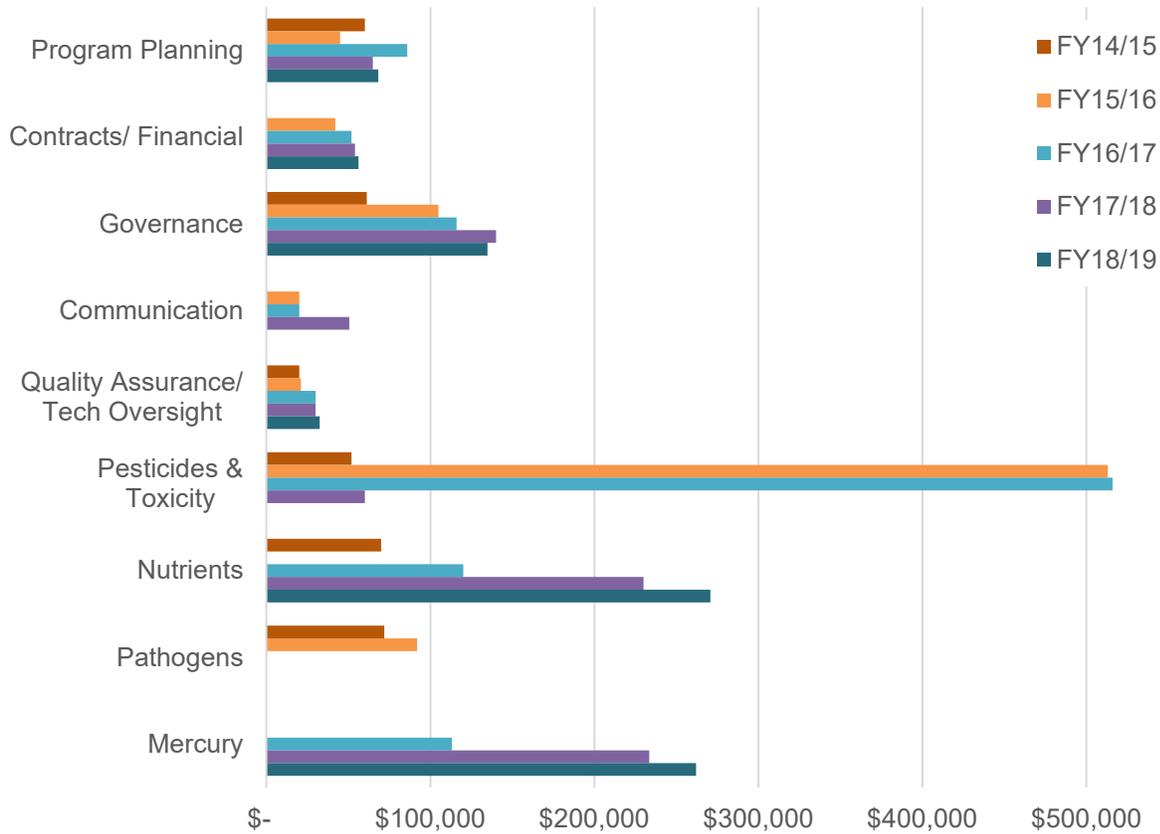
**Table 8 Planned in-kind contributions to the Delta RMP in FY18/19**

<b>Agency</b>	<b>Description</b>	<b>Value</b>
Department of Water Resources (DWR)	In-kind contribution of WY2016 hydrodynamics model output	\$24,000
Department of Water Resources (DWR) Office of Water Quality and Estuarine Ecology	6 staff to participate in the chlorophyll sensor intercalibration study (chl-a study)	\$33,939
DWR North Central Regional Office	2 staff to participate in the chl-a study	\$19,400
DWR Bryte Lab	Will analyze 9 water samples for the chl-a study. Each analysis has a value of \$150/sample	\$1,350
U.S. Bureau of Reclamation (USBR) Bay Delta Office	2 staff to participate in the chl-a study and purchase of needed equipment/supplies	\$20,238
U.S. Geological Survey (USGS)	Laboratory study of fluorescence sensors	\$30,000
Moss Landing Marine Laboratory	Cost share for mercury field sampling and laboratory analysis to cover staff time, equipment, and supplies	\$25,020
<b>Total</b>		<b>\$153,947</b>

## Overall Delta RMP FY18/19 Budget

The programmatic and scientific budgets for the Delta RMP are shown together in Table 9 on the next page. The total planned expenses for the program in FY18/19 are \$839,710.

The bar chart in Figure 2 shows how the proposed program budget for FY18/19 compares to budgets for the past three fiscal years.



**Figure 2** Bar chart of budgeted expenses for the Delta RMP over last 4 fiscal years.

## Undesignated Funds Reserve Balance

The current balance for the Reserve is **\$133,579**.

We expect to end the fiscal year FY17/18 on-budget overall. The expected revenue during the previous year minus exceeds planned expenses in the FY17/18 workplan by \$111,091. In addition, we expect to complete on of the nutrient synthesis tasks at least \$30,000 under budget. As a result, we expect a **\$141,091** surplus after closing the books on FY17/18. At the end of this fiscal year, any surplus for completed tasks can be added to the reserve fund or allocated to next year's budget.

For the fiscal year covered by this workplan, forecast revenue (\$900,256) exceeds planned expenses (\$839,710) by **\$60,546**. After all participants have been invoiced and their contributions received, this surplus can be moved into the reserve.

Based on this, we project that the reserve fund at the turn of the fiscal year will be equal to **\$335,216**.

Reserve balance as of 5/1/2018	\$133,579
Expected surplus for FY17/18	+ \$141,091
Expected surplus for FY18/19	+ \$60,546
Projected reserve fund balance as of July 1, 2018	<u>= \$335,216</u>

This represents available funds that the SC can allocate to other projects at its discretion. The Finance Subcommittee has recommended maintaining a balance of \$100,000 in the reserve.

The SC can use these funds for pesticides/toxicity monitoring. We are close to finalizing proposed monitoring designs to present for TAC review in June and approval by the SC in July, with monitoring to begin as early as this fall. The subcommittee is planning a study to fit within the planning budget of \$250,000 set by the SC.

Note: These projections are based on the low-cost option for the mercury study, which includes 8 water monitoring sites. Adding an additional water site adds an additional \$23,294. Therefore, the projected reserve fund balance would be:

8 Hg water sites	\$335,216
9 Hg water sites	\$311,922
10 Hg water sites	\$288,628

**Table 9 Delta RMP FY17/18 Overall Budget**

Task	Subtask	Direct			Grand Total
		Cost	Labor	Subcontracts	
01. Core Functions	A. Program Planning		\$68,250		\$68,250
	B. Contract and Financial Management	\$500	\$55,650.00		\$56,150
01. Core Functions Total		\$500	\$123,900.00		\$124,400
02. Governance	A. SC meetings		\$36,000	\$2,400	\$38,400
	B. TAC meetings		\$37,800	\$21,600	\$59,400
	C. Technical Subcommittees		\$37,000.00		\$37,000
02. Governance Total			\$110,800	\$24,000	\$134,800
03. Quality Assurance	A. Quality Assurance		\$17,500		\$17,500
	B. Technical Oversight and Coordination		\$15,000		\$15,000
03. Quality Assurance Total			\$32,500		\$32,500
04. Nutrients	A. Nutrients Modeling Study		\$101,000	\$85,000	\$186,000
	B. Chlorophyll Intercalibration Study		\$48,750	\$36,050	\$84,800
04. Nutrients Total			\$149,750	\$121,050	\$270,800
05. Mercury Monitoring FY18/19	A Data Collection and Analysis			\$242,130	\$242,130
	B. Mercury Data Management and Quality Assurance		\$29,930		\$29,930
	C. Technical Oversight and Coordination		\$5,150		\$5,150
05. Mercury Monitoring FY18/19 Total			\$35,080	\$242,130	\$277,210
<b>Grand Total</b>		<b>\$500</b>	<b>\$452,030</b>	<b>\$387,180</b>	<b>\$839,710</b>

## **Attachment A Nutrients Proposals**

## Summary of Proposals for FY18/19 Delta RMP Special Studies for Nutrients

Title	Summary	Funding Request	Leveraged Resources	Ranking
Merging High-Frequency Water Quality Data and Models to Gain Insights into the Factors Regulating Phytoplankton Blooms in the Delta in WY2016	For this study, we propose to combine a hydrodynamic-biogeochemical model of the Delta in WY2016 with water quality measurements in order to understand what caused large phytoplankton blooms in this year. The approach will be to apply a biogeochemical model developed for WY2011 to WY2016 and then to compare the model predictions to measurements made throughout the Delta. Comparisons between the model and observations will provide insight into important mechanisms for phytoplankton productivity including physical and other influencing factors. The study will be a first step toward implementing priority research recommendations in the Delta Nutrient Research Plan. The study design leverages \$24,000 of in-kind modeling resources from the Department of Water Resources and takes advantage of \$900,000 of studies that are funded by other parties. Finally, this project implements a recommendation to increase data sharing among different models and monitoring programs.	\$186,000	\$24,000 (in-kind) \$900,000 (related projects)	3.4 of 4
Intercalibration Study for Chlorophyll Fluorescence Sensors in the Bay-Delta, Phase II	Chlorophyll is an important water quality parameter for assessing the effects of nutrients and for fisheries management in the Bay-Delta. This study is the second phase of a multi-year effort to improve the accuracy, precision, and comparability of chlorophyll data collected in the Bay-Delta. Phase I planning has shown that variability in the methods used for measurement chlorophyll across the Bay-Delta is significant and that reducing this variance is of interest to a wide variety of monitoring agencies. In FY18/19, we propose to tackle a portion of the problem with a series of tasks to help understand and reduce the variance in the measurements of chlorophyll by in-situ sensors and laboratory methods. The proposed tasks include: (1) assessing methods used by different monitoring programs; (2) performing field intercalibration exercises between programs; (3) organizing a laboratory intercalibration study; and (4) preparing a summary report through technical workgroup discussion. Funding is requested for SFEI-ASC and USGS to lead the study. The study leverages \$105,000 of in-kind support from the Department of Water Resources and the US Bureau of Reclamation.	\$84,800	\$105,000 (in-kind)	3.3 of 4
	<b>TOTAL</b>	<b>\$270,800</b>	<b>\$129,000</b>	

Two other projects were considered by the Nutrients Subcommittee. These projects are not recommended for FY18/19 but remain on the multi-year plan (see next page).

- Sediment Nutrient Inventories, Availability, and Fluxes in the Delta. \$113,000-\$200,000. Rank 2.3 of 4.
- Nutrients Workshop and Summary Article. \$46,000. Rank 0.8 of 4.

## Multi-Year Plan for Delta RMP Nutrients Subcommittee Projects

Project Type	Project	FY16/17	FY17/18	<b>Requested Funding</b>	<i>Planning Ideas for Out-Years. Funding Not Requested.</i>	
				FY18/19	FY19/20	FY20/21
Status and Trends	Status and Trends Synthesis Reports	\$120k				
	High Frequency Monitoring		\$195k			
	Chlorophyll Intercalibration		Phase I: \$15k	Phase II: \$85k	Phase III: \$50k	
	Workshop & Summary Article				\$50k	
Sources, Pathways, Loadings, and Processes	WY2016 Water Quality Modeling			\$186k	\$60k	
	Model parameter characterization				\$150k	TBD
	Special Studies for Delta Nutrient Research Plan				\$100k	\$300k
Forecasting Scenarios <sup>1</sup>						
<b>Total</b>		<b>\$120</b>	<b>\$210k</b>	<b>\$271k</b>	<b>\$410k</b>	<b>\$300k</b>

1. Modeling work for SPLP is building capacity for forecasting scenarios.

## Delta RMP Special Study Proposal

### Merging High-Frequency Water Quality Data and Models to Gain Insights into the Factors Regulating Phytoplankton Blooms in the Delta in WY2016

**Summary:**

For this study, we propose to combine a hydrodynamic-biogeochemical model of the Delta in WY2016 with water quality measurements in order to understand what caused large phytoplankton blooms in this year. The approach will be to apply a biogeochemical model developed for WY2011 to WY2016 and then to compare the model predictions to measurements made throughout the Delta. Comparisons between the model and observations will provide insight into important mechanisms for phytoplankton productivity including physical and other influencing factors. The study will be a first step toward implementing priority research recommendations in the Delta Nutrient Research Plan. The study design leverages \$24,000 of in-kind modeling resources from the Department of Water Resources and takes advantage of \$900,000 of studies that are funded by other parties. Finally, this project implements a recommendation to increase data sharing among different models and monitoring programs.

Estimated Cost: \$186,000

Oversight Group: Delta RMP Nutrients Technical Subcommittee

Proposed by: SFEI-ASC, USGS, DWR

### Background

Nutrient management is high-profile issue in the Delta. Nutrients are among the first-order factors that shape phytoplankton productivity, which is important for understanding pelagic organism decline. The Sacramento Regional County Sanitation District is already investing over \$1 billion in wastewater treatment upgrades to manage nutrients. The Central Valley Regional Board recently completed a draft Delta Nutrient Research Plan which listed harmful algal blooms, increased aquatic macrophytes, and low dissolved oxygen as other water quality concerns associated with nutrients (Cooke et al., in review).

For this study, we are proposing a synthesis of monitoring and modeling tools to better understand the linkage between nutrients and the phytoplankton blooms that occurred in WY2016 taking into account physical and other factors. The approach is directly relevant to Research Recommendation MON1 from the Delta Nutrient Research Plan. This recommendation calls for monitoring to assess “physical, chemical, and biological factors affecting phytoplankton abundance and growth” (Cooke et al., in review). The combination of data synthesis and modeling proposed for this project will provide insight

into all of these factors.

The proposed project is designed to take advantage of two existing efforts that are funded by other parties. The Regional Water Control Boards (RB2 and RB5), Sacramento Regional County Sanitation District, Delta Stewardship Council, and Central Contra Costa Sanitary District are funding a project to develop, calibrate, and validate a biogeochemistry model for the Delta-Suisun in WY2011 (a year with low productivity). SFCWA is funding a project to synthesize data related to phytoplankton blooms in the Delta in WY2016 (a year with higher productivity) and prior years. The total investment for these two projects is nearly \$900,000.

The study design is to apply the WY2011 biogeochemical model to WY2016 to allow for comparison between model predictions and observations of phytoplankton during this year of lower rainfall and higher productivity (see Figures 1 and 2). The comparison between the model and observations will provide insight into important mechanisms for phytoplankton productivity. Finding a mutual set of model parameters that work for both ends of the spectrum in terms of productivity (i.e., years with low or high productivity) will also help to narrow down the choice of biogeochemical model parameters for the Delta, from which the WY2011 Delta-Suisun modeling effort can also benefit.

Finally, this project implements a recommendation from the white paper on modeling that was prepared for the Delta Nutrient Research Plan (Trowbridge et al, 2016). One concept from that report was that being able to share information between different modeling groups “would be economical, lead to more efficient model applications (shorter project timelines), and increase opportunities innovation because more resources would be available for modeling” (p.24-25). This study will put this concept into action by using hydrodynamics from DWR’s SCHISM finite element platform and biogeochemistry from the Deltares Flexible Mesh finite volume platform. The project will develop code to facilitate future data sharing across these two platforms. Further, it will promote the sharing of information between modeling efforts, monitoring and research to help streamline the integration of new findings in biogeochemical models.

## Study Objectives and Applicable RMP Management Questions

The objectives of the project and how the information will be used relative to the RMP's high-level management questions are shown in Table 1.

**Table 1.** Study objectives and questions relevant to RMP management questions.

Delta RMP Management Question & Assessment Question	Study Objectives	Example Information Application
<p>Management Question: Which sources and processes are most important to understand and quantify?</p> <p>Assessment Questions: SPLP1- "Which sources, pathways, and processes contribute most to observed levels of nutrients?"</p> <p>SPLP2 - "How are nutrients linked to water quality concerns such as harmful algal blooms, low dissolved oxygen, invasive aquatic macrophytes, low phytoplankton productivity, and drinking water issues?"</p> <p>A. "Which factors in the Delta influence the effects of nutrients on the water quality concerns listed above?"</p>	<p>Set up and run a coupled hydrodynamic and biogeochemical model to simulate the nutrients and phytoplankton in the Delta in WY2016 by combining WY2016 hydrodynamics with a biogeochemical model developed for WY2011.</p> <p>Compare the modeled results for nutrient concentrations and phytoplankton with the measured observations for WY2016.</p> <p>Synthesize important differences between the model and observations to understand the processes that need to be improved in the model.</p> <p>Analyze the modeled results for WY2016 to identify the major factors that caused the observed phytoplankton blooms in that year.</p> <p>Demonstrate data sharing between different model platforms.</p>	<p>This project will accelerate biogeochemical model development in the Delta. If predictions match reality, then modelers will have confidence that the model parameterization is broadly applicable. If not, then modelers will have insights into what processes need to be improved in the model.</p> <p>Managers and researchers will know more about process and factors (especially physical factors) that resulted in the large algae blooms in WY2016.</p> <p>Data collection agencies and modelers will know more about which monitoring stations are useful for validating models.</p> <p>Managers and modelers will gain experience and know the pros/cons of sharing data between model platforms.</p>

## Approach

### Task 1: Obtain hydrodynamic model input and output files for the Delta in WY2016.

DWR will provide input and output files for WY2016 hydrodynamics from the SCHISM model. The hydrodynamics will be validated at multiple locations in the Delta for the following parameters: flow, water level, temperature and salinity. SFEI will work with Deltares to write code to translate the output files to match the requirement of Deltares DWAQ model input. This code is an investment because it can later be used to translate SCHISM output files for other water years.

This approach combines the extensive expertise from DWR on Delta hydrodynamic modeling as well as the power of Deltares Water Quality model (DWAQ) to predict sophisticated biogeochemical cycling processes in aquatic systems. Developing systems for sharing data across model platforms is consistent with the “community modeling” approach outlined in the Modeling Strategy White Paper (Trowbridge et al., 2016).

Due to the differences in the model platforms, there is a small amount of risk that the SCHISM model output cannot be translated to the Deltares DWAQ format. As a backup, if it is not possible to use the SCHISM model output, the funds can be redirected to a subcontractor to develop the WY2016 hydrodynamics for the Deltares Flexible Mesh model. Therefore, a first step for this task will be for DWR to provide the SCHISM model output for an earlier year (e.g., WY2011) so that Deltares can identify any major barriers right away.

### Task 2: Prepare boundary condition and validation data for the WY2016 biogeochemical model

Measurements of nutrients and nutrient-related parameters in WY2016 are needed to evaluate the model predictions for this year. Fortunately, with funding from SFCWA, USGS is already compiling much of the data that are needed for the modeling. Therefore, for this task, USGS will provide the WY2016 data from USGS and DWR stations that they have compiled for their other project and SFEI will gather other relevant data not already in the USGS database. These data will be formatted to match the input needs for the model and reconciled among data sources, which is not part of the SFCWA effort.

The parameters of interest for discrete grab samples include: chlorophyll-a, ammonia, nitrate, phosphate, turbidity, and dissolved oxygen (and potentially others such as zooplankton biomass, benthic grazer data, silica, and organic nitrogen if available). These data will be formatted and incorporated into the database for Delta/Suisun Bay modeling.

The parameters of interest for high frequency, in-situ sensor data are: nitrate, turbidity, chlorophyll fluorescence, and dissolved oxygen. High frequency data collected by the USGS, DWR, USBR, and other agencies will be compiled. The quality of the high frequency data will be checked by comparing the measured high frequency data with the discrete sampling data at the same or nearby location or reviewing metadata on datasets that have already gone through this step.

The geographic focus of this project is the whole Delta (see Figure 3 for a map of stations that will be included in the study). Much of the data needed, especially in the North Delta, including Cache Slough, and the Central Delta, are already being compiled by USGS through the SFCWA-funded study. For that study, data will be aggregated from the following sources: (a) USGS continuous monitoring stations and underway measurements; (b) DWR continuous monitoring stations; (c) discrete sampling and analysis programs of USGS, IEP, DWR, USBR and RTC; (d) other data as suggested by the community. Data types include temperature, conductivity, pH, turbidity, dissolved oxygen nutrients, chlorophyll fluorescence, chlorophyll concentration, dissolved organic matter fluorescence, phytoplankton abundance, zooplankton abundance, stage, discharge, velocity, precipitation, PAR,  $K_d$  and others.

Task 3: Apply the biogeochemical model that has been calibrated/validated for WY2011 to hydrodynamics in WY2016.

A complete biogeochemical model<sup>1</sup> for WY2011 will be developed with funding from other sources by December 2018 (see timeline in Table 3). This model can be applied to WY2016 using the SCHISM hydrodynamic output (Task 1) and data prepared in Tasks 2. This application will not attempt to fully validate<sup>2</sup> the model for WY16 but rather provide some initial evaluation on the performance of the model by comparing the model results to what was observed (see Task 4).

Task 4: Compare model predictions of biogeochemistry in WY2016 to observations.

The water quality data compiled in Task 2 will be compared to the model predictions for WY2016 (Task 3). *The comparisons will be made at stations in all areas of the Delta using a similar approach as the Delta-Suisun modeling project.* In addition, the project will take advantage of the large quantity of new, high-frequency data that is available for the North Delta and Central Delta that is being synthesized for the SFCWA-funded project. The deliverable for this task will be a technical report with:

- Results from data quality checks and other QA/QC on the datasets
- Plots and statistics (e.g., correlation coefficients, root-mean-square-error, and bias) of the performance of the model compared to the observations for dissolved nutrient concentrations and chlorophyll concentrations at various locations throughout the Delta, such as:
  - Concentrations of dissolved nutrients and chlorophyll
  - Spatial distribution of dissolved nutrients and chlorophyll
  - Zones of bloom inception
  - Timing of bloom inception and senescence
- Plots of modeled results for WY2016
- Hypotheses to explain the differences between the biogeochemical model output and observed water quality. The explanations will consider mechanistic relationships between physical factors (such as flow), nutrients, grazers, and chlorophyll. The topics on this list can be investigated in more depth with

<sup>1</sup> Including all the modules for biogeochemical cycling (nutrient cycling, phytoplankton dynamics, benthic grazing, zooplankton, mineralization, and sediment fluxes, and empirical light field).

<sup>2</sup> Data from the boundary conditions will be used to initialize the model; data from interior Delta stations will be used to evaluate and validate the model performance.

- scenario tests using a fully calibrated model in a second phase of the study.
- Insights from the model about processes and factors (especially physical factors) that resulted in the large algae blooms in WY2016 as well as inferred rates of nutrient transformation and uptake.
- The monitoring stations that appear to be especially useful for validating biogeochemical models.
- Lessons learned and the advantages and disadvantages of sharing data between model platforms.
- Code to translate the SCHISM hydrodynamics output files to match the requirement of Deltares DWAQ model input.

The final report for this study will benefit from, not overlap with, the related SFCWA-funded effort. The SFCWA-funded report (due in February 2019) will contain insights into factors that caused the WY2016 phytoplankton blooms based on statistical relationships between phytoplankton abundance and community structure with (a) nutrient concentrations, forms and ratios; (b) temperature; (c) light availability; (d) water source and history; (e) water velocity and wind (as a proxy for turbulence) and discharge; (e) estimated residence time; and (d) events such as stormflows, Yolo bypass outflows and water releases. In practical terms, these insights will give direction on where to look and what to look for in terms of model validation and dominant processes (Tasks 3 and 4). Similarly, the mechanistic modeling work will provide insights into processes that could not be determined from the statistical analysis. In this way, the two projects are complementary and synergistic.

For information on progress reporting, see the “Reporting” section later in this proposal.

## Proposed Deliverables and Timeline

**Table 2.** Deliverables

<b>Deliverable</b>	<b>Due Date</b>
Task 1: Obtain and format WY2016 Hydrodynamics input and output files	December 31, 2018
Tasks 2 and 3: Progress reports (written) and verbal updates to Delta RMP Nutrient Subcommittee members and other stakeholders at quarterly meetings for the Delta-Suisun modeling project.	July 2018 January 2019 July 2019 January 2020
Task 4: Final Technical Report/Manuscript	March 31, 2020 (draft) June 30, 2020 (final)

**Table 3. Timeline**

Task	2018												2019												2020					
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
Task 1 - Hydrodynamics												X																		
Task 2 - Model Set Up																														
Task 3 - Model Application																														
Task 4 - Reporting							X																							
<b>Related Studies</b>																														
SFCWA Study																														
Data aggregation																														
Data analysis																														
Reporting																														
<b>Delta-Suisun WY2011 Modeling</b>																														
Stage 2																														
Stage 3																														
Stage 4																														
Stage 5																														
Stage 6																														

X = Deliverable due

= Activity

**Delta-Suisun Modeling Stages**

Stage 2: Building a complete biogeochemical modeling framework that includes nitrogen cycling, phytoplankton dynamics, grazing behavior, mineralization, and benthic processes.

Stage 3: Test runs with Stage 2 model. Identifying dominant processes. Refining input data and model structure.

Stage 4: Improve model performance by tuning biogeochemical coefficients.

Stage 5: Adding dissolved oxygen. Scenario testing to answer management questions.

Stage 6: Final reporting.

## Budget

Table 4 shows the estimated costs for this proposed special study.

**Table 4.** Proposed Budget

Task	Funding Requested for USGS	Funding Requested for SFEI-ASC	Funding for Contractors	Total Funding Requested	In-Kind Contributions
Task 1 - Hydrodynamics	\$0	\$5,000	\$35,000	\$40,000	\$24,000
Tasks 2 & 3 - Biogeochemical Model Set Up and Application	\$20,000	\$66,000	\$0	\$86,000	\$0
Task 4 - Report	\$20,000	\$30,000	\$10,000	\$60,000	\$0
<b>Total Funding Requested</b>	<b>\$40,000</b>	<b>\$101,000</b>	<b>\$45,000</b>	<b>\$186,000</b>	
<b>Leveraged In-Kind Contributions</b>					<b>\$24,000</b>

### Budget Justification

#### Task 1

- DWR will provide the WY2016 hydrodynamics model in-kind.
- The funding requested is for a \$35,000 subcontract with Deltares to write code to convert DWR's SCHISM model output to the Deltares Flexible Mesh (DFM) format and \$5,000 SFEI-ASC labor (40 hours of SFEI-ASC modeler time) to handle data transfers and contribute to the coding.

#### Tasks 2 & 3

- For SFEI-ASC: The funding requested is for 3 months of SFEI modeler time (\$51,000) and 1 month of Environmental Analyst time (\$15,000) to initialize and run the biogeochemical model for WY2016. This step will also include generating plots of model output versus observations.
- For USGS: The funding requested includes \$20,000 to support participation in meetings to plan and evaluate integration of high-frequency data with model output, trouble shoot WY2016 data transfer issues, and assist with additional data compilation.

#### Task 4

- The final report will be a collaboration between SFEI, USGS, and DWR. SFEI-ASC will be the lead author.
- For SFEI: \$30,000 is requested for 130 hours of SFEI-ASC technical staff time and 75 hours of Program Manager/Senior Scientist time.
- For USGS: \$20,000 is requested for analysis of modeled versus monitored data, and co-authorship of the final report including time to present the findings to Delta RMP committees and respond to up to two rounds of comments. Funding

- will also support USGS participation in two project meetings: (1) Meeting to compare monitored and modeled results and plan final steps; and (2) Meeting to finalize main conclusions for final report.
- An additional \$10,000 is requested for honoraria for consultants and external reviewers of the final report. The specific expertise needed to evaluate the results of this study is not known at this time. These funds would make it possible to bring in experts in phytoplankton, zooplankton, benthic grazers, or another discipline on an as-needed basis. In addition, the funds could be used for expert reviewers of the final report. Potential reviewers could be: Stephen Monismith from Stanford University, Jim Cloern from USGS, Fei Chai from University of Maine, Wim Kimmerer from San Francisco State University, and Lisa Lucas from USGS. Obtaining an in-kind peer-review through CWEMF will also be pursued. Plans for the use of these funds will be discussed with the Delta RMP Nutrients Subcommittee in advance.

### *Leveraged Funds and In-Kind Contributions*

Leveraged funds are cash contributions from another source that pay for a part of the scope of work. In-kind contributions are staff time or resources (e.g., boat time, lab analyses) that are contributed to the project to complete the scope of work.

- DWR will contribute the WY2016 hydrodynamic model output from SCHISM as well as input files with an approximate value of \$24,000.

While not strictly “leveraging”, the project will use outputs from two other highly-complementary and well-timed studies as an effective launch pad to maximize the impact of this work.

- Delta-Suisun Modeling with funding from Regional Boards (RB2 and RB5), Central Contra Costa Sanitary District, Sacramento Regional County Sanitary District, and Delta Science Program (\$800,000 in total).
- WY2016 Algal Bloom Analysis with funding from the State and Federal Contractors Water Agency (\$83,700).

## **Optional Tasks for Future Funding**

The proposed project will initiate the process of gaining understanding on the mechanisms behind phytoplankton productivity in the Delta. For FY19/20, a second phase of the study could be conducted to:

- Fully validate the WY16 biogeochemistry model.
- Perform alternative hypothetical scenario runs to isolate the contribution from each forcing factor on causing the bloom event in 2016.

## Reporting

The final report will be prepared in a format such that it can be submitted for publication as a manuscript. This manuscript will be reviewed by the Delta RMP committees following the protocols in the Delta RMP Communications Plan. If the manuscript is delayed, a stand-alone technical report will be prepared for the Delta RMP.

Progress reports (written and verbal) will be provided at semi-annual meetings for the Delta-Suisun modeling project. The Delta RMP Nutrients Subcommittee will be invited to these meetings. Similarly, participants from other, related studies (Operation Baseline, SFCWA study, Delta Smelt Resiliency Study) will be invited to these meetings.

The project will be overseen by the Delta RMP Nutrients Subcommittee so there will be regular updates on progress in that forum.

## References

Cooke, J., C. Joab, and Z. Lu. In review. Delta Nutrient Research Plan, Draft Report. Central Valley Regional Water Quality Control Board, Rancho Cordova, CA. January 2018.

Trowbridge, P.R, M. Deas, E. Ateljevich, E. Danner, J. Domagalski, C. Enright, W. Fleenor, C. Foe, M. Guerin, D. Senn, and L. Thompson. 2016. Recommendations for a Modeling Framework to Answer Nutrient Management Questions in the Sacramento-San Joaquin Delta. Report prepared for: Central Valley Regional Water Quality Control Board, Rancho Cordova, CA. San Francisco Estuary Institute-Aquatic Science Center, Richmond, CA. Published online:  
[https://www.waterboards.ca.gov/centralvalley/water\\_issues/delta\\_water\\_quality/delta\\_nutrient\\_research\\_plan/science\\_work\\_groups/2016\\_0301\\_final\\_modwp\\_w\\_appb.pdf](https://www.waterboards.ca.gov/centralvalley/water_issues/delta_water_quality/delta_nutrient_research_plan/science_work_groups/2016_0301_final_modwp_w_appb.pdf).

# WY11 vs WY16: Lower Flow

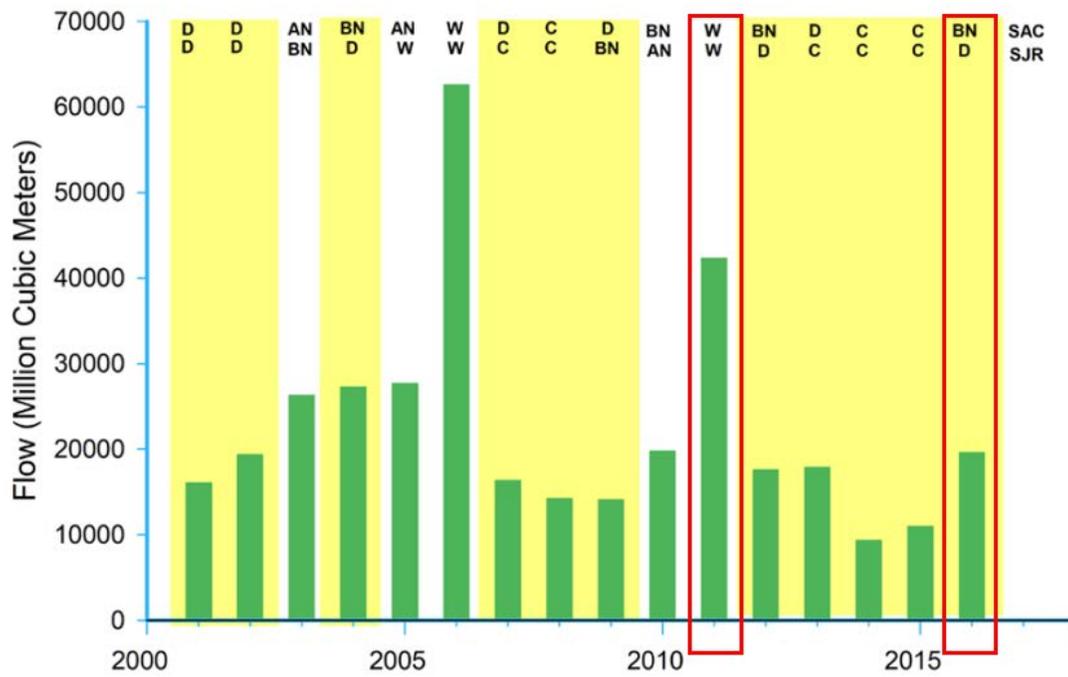


Figure 1: Total flow into the Delta. WY2011 and WY2016 are indicated with red boxes. WY2011 was characterized as a “wet” year. WY2016 was characterized as a “below normal” or “dry” year.

# WY11 vs WY16: More Blooms

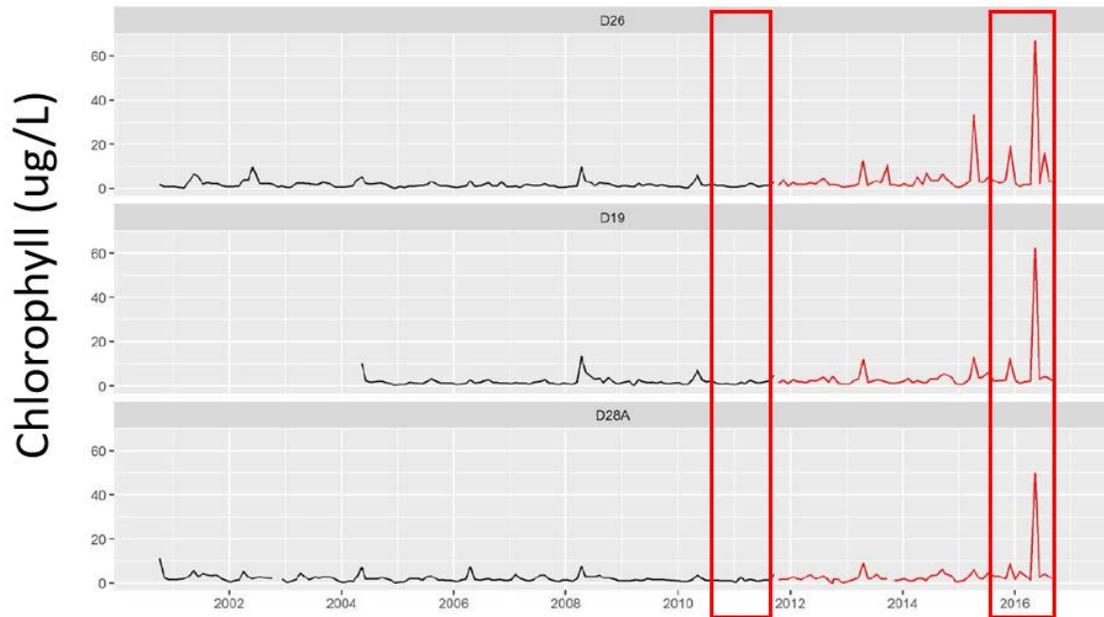
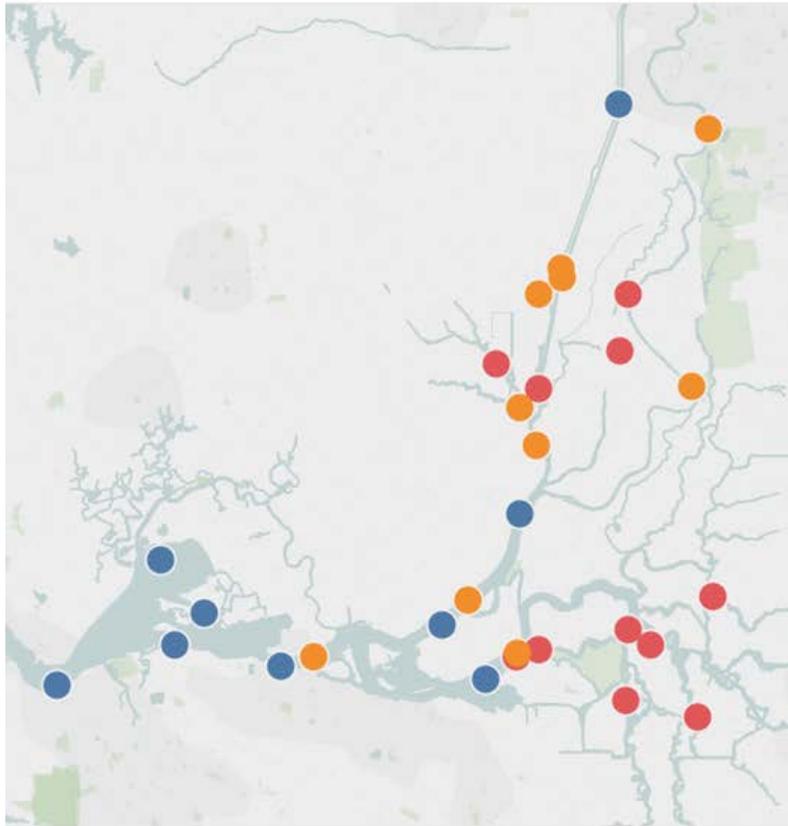


Figure 2: Timeseries of chlorophyll-a concentrations at DWR Environmental Monitoring Program stations in the Central Delta. WY2011 and WY2015 are indicated with with red boxes. WY2016 had significantly higher chlorophyll-a concentrations, indicative of algae blooms, than WY2011.

# Stations for Model Assessment

Stations with High-Frequency Data



Stations with Grab Sample Data

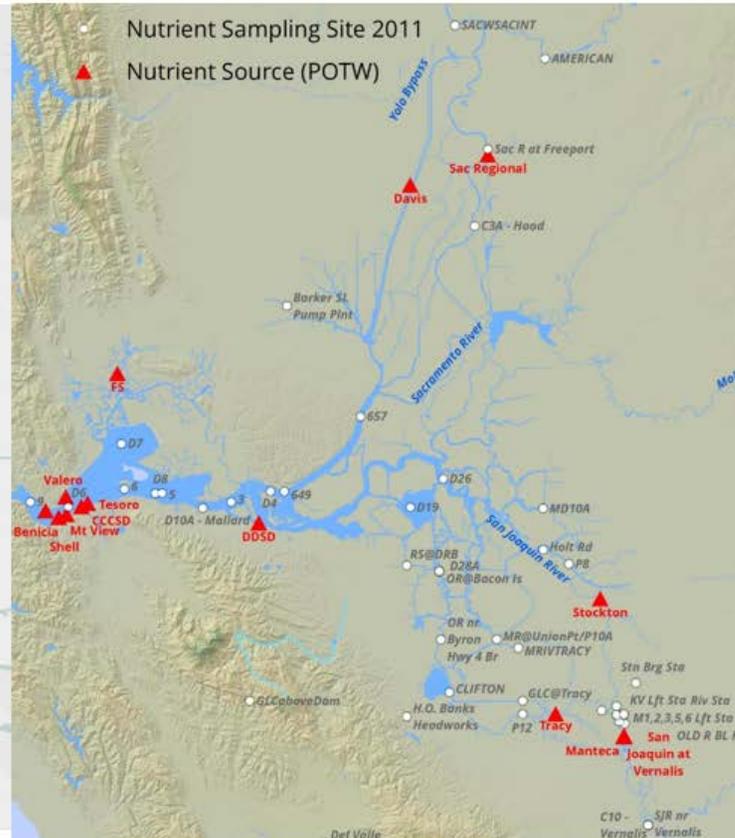


Figure 3: Stations with data that will be used for the modeling analysis. Model verification plots will be made for a subset of these stations covering all areas of the Delta.

## Delta RMP Special Study Proposal

### Intercalibration Study for Chlorophyll Fluorescence Sensors in the Bay-Delta, Phase II

**Summary:**

Chlorophyll is an important water quality parameter for assessing the effects of nutrients and for fisheries management in the Bay-Delta. This study is the second phase of a multi-year effort to improve the accuracy, precision, and comparability of chlorophyll data collected in the Bay-Delta. Phase I planning has shown that variability in the methods used for measurement chlorophyll across the Bay-Delta is significant and that reducing this variance is of interest to a wide variety of monitoring agencies. In FY18/19, we propose to tackle a portion of the problem with a series of tasks to help understand and reduce the variance in the measurements of chlorophyll by in-situ sensors and laboratory methods. The proposed tasks include: (1) assessing methods used by different monitoring programs; (2) performing field intercalibration exercises between programs; (3) organizing a laboratory intercalibration study; and (4) preparing a summary report through technical workgroup discussion. Funding is requested for SFEI-ASC and USGS to lead the study. The study leverages \$105,000 of in-kind support from the Department of Water Resources and the US Bureau of Reclamation.

Estimated Cost: \$84,800

Oversight Group: Delta RMP Nutrients Technical Subcommittee

Proposed by: SFEI-ASC, USGS, DWR, and USBR

### Background

Accurate, precise measurements of phytoplankton biomass are critical to inform important management questions about productivity, nutrient management, and fisheries. Chlorophyll concentration is a widely-accepted proxy for phytoplankton biomass. There are presently more than 50 moored chlorophyll sensors using in-situ fluorescence in the Bay-Delta, belonging to networks maintained by the U.S. Geological Survey (USGS), Department of Water Resources (DWR), and others (Figures 1, 2, and 3). Prior to now there has been no effort to ensure that the groups making these measurements are using calibrations, sampling methods, and data processing techniques that ensure comparable results. Ensuring data comparability will save money and time, and will provide managers with better, high-resolution data for the entire estuary.

Therefore, to increase the utility and improve our return on the considerable effort to produce these data, the Delta Regional Monitoring Program and the San Francisco Bay Nutrient Management Strategy Science Program are jointly funding a project with the

goal of improving the comparability of the chlorophyll data collected by different programs across the region. While a seemingly simple task, achieving this goal requires overcoming several technical barriers to apply common approaches for sensor acceptance and performance criteria, sensor calibration, performance validation, data collection, data quality assurance, data management, and data access.

In FY17/18, the Delta RMP and the Nutrient Management Strategy each contributed \$15,000 for SFEI-ASC to organize the stakeholders, conduct some initial analyses, and to develop a detailed workplan for FY18/19.

The stakeholder outreach process revealed a broad interest from many agencies in:

- Standardizing, improving processes
- Having data from different programs be interoperable
- Improving relationship between in-situ and lab chlorophyll-a
- Coordination
- Improving data accessibility

The survey of 13 monitoring programs found that a variety of methods are being used by the different programs especially in the areas of sensor settings, calibration procedures, sensor cleaning, and QA/post-processing. The method differences were significant enough to make comparing data from different programs difficult. For example, some of the programs conduct 2-point calibrations, others perform a single point test at zero, and others do no calibration check. The laboratories performing extracted chlorophyll-a analyses use two fundamentally different methods (spectrophotometry and fluorometry).

Finally, analysis of measurements from the different programs data showed a large amount of variability in chlorophyll fluorescence response (differences as much as a factor of two) between regions of the Bay-Delta and between programs (Figure 4). Variability of this magnitude impedes synthesis of data from across the Bay-Delta without using site-specific calibrations.

Overall, the effort in FY17/18 has shown that variability in the methods used for measurement chlorophyll across the Bay-Delta is significant and that reducing this variance is of interest to a wide variety of monitoring agencies. A conceptual model for variability in the chlorophyll fluorescence (Figure 5) provides a way to break this challenging problem into smaller tasks. In FY18/19, we propose to tackle a portion of the problem with a series of tasks to help understand and reduce the variance in the measurements of chlorophyll by in-situ sensors and laboratory methods.

This proposal was developed and reviewed by a workgroup with representatives from SFEI-ASC, USGS, DWR, US Bureau of Reclamation (USBR), and the Central Valley Regional Water Quality Control Board.

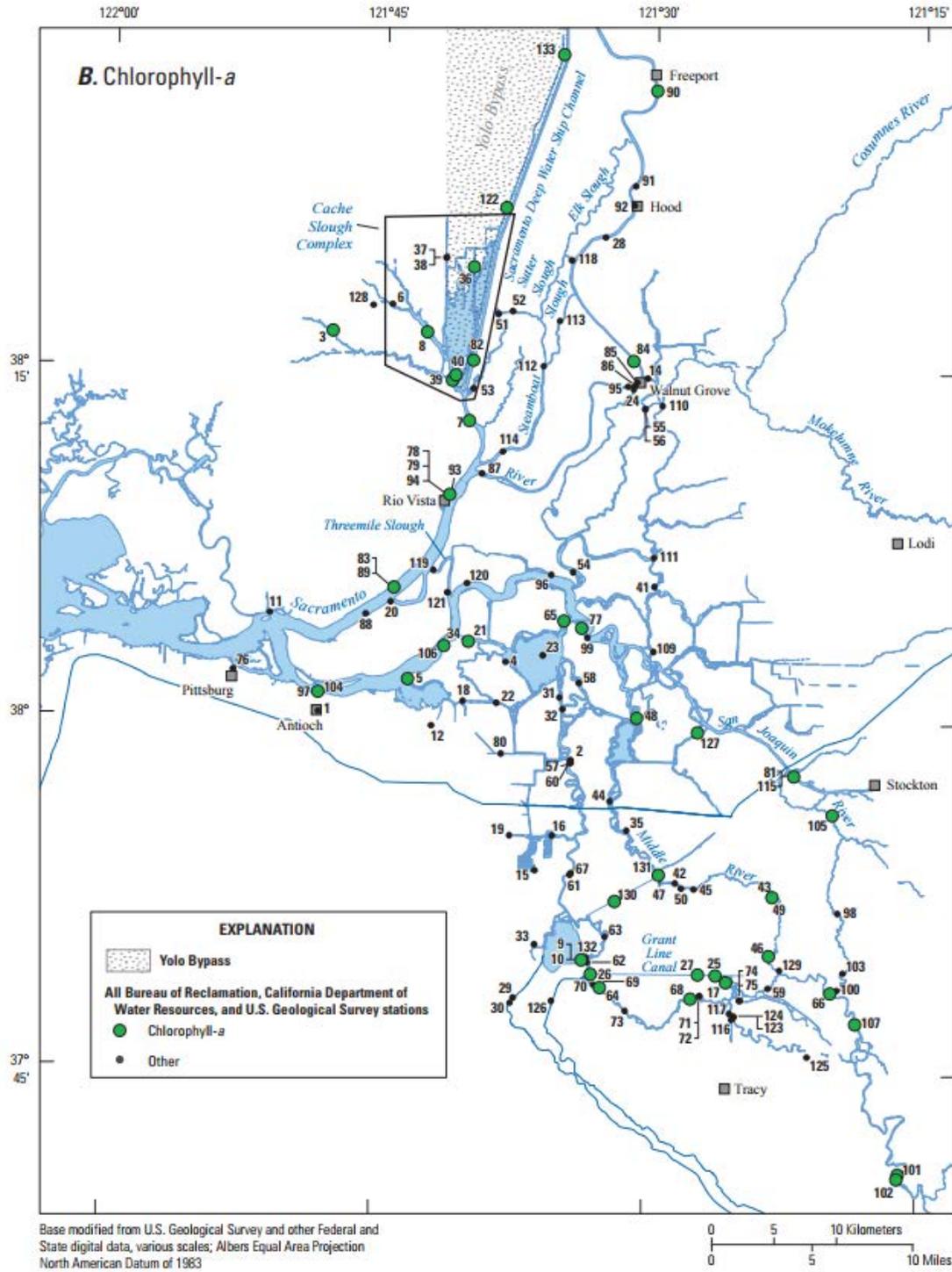


Figure 1: Chlorophyll fluorescence sensors in the Delta (from Bergamaschi et al., 2017)

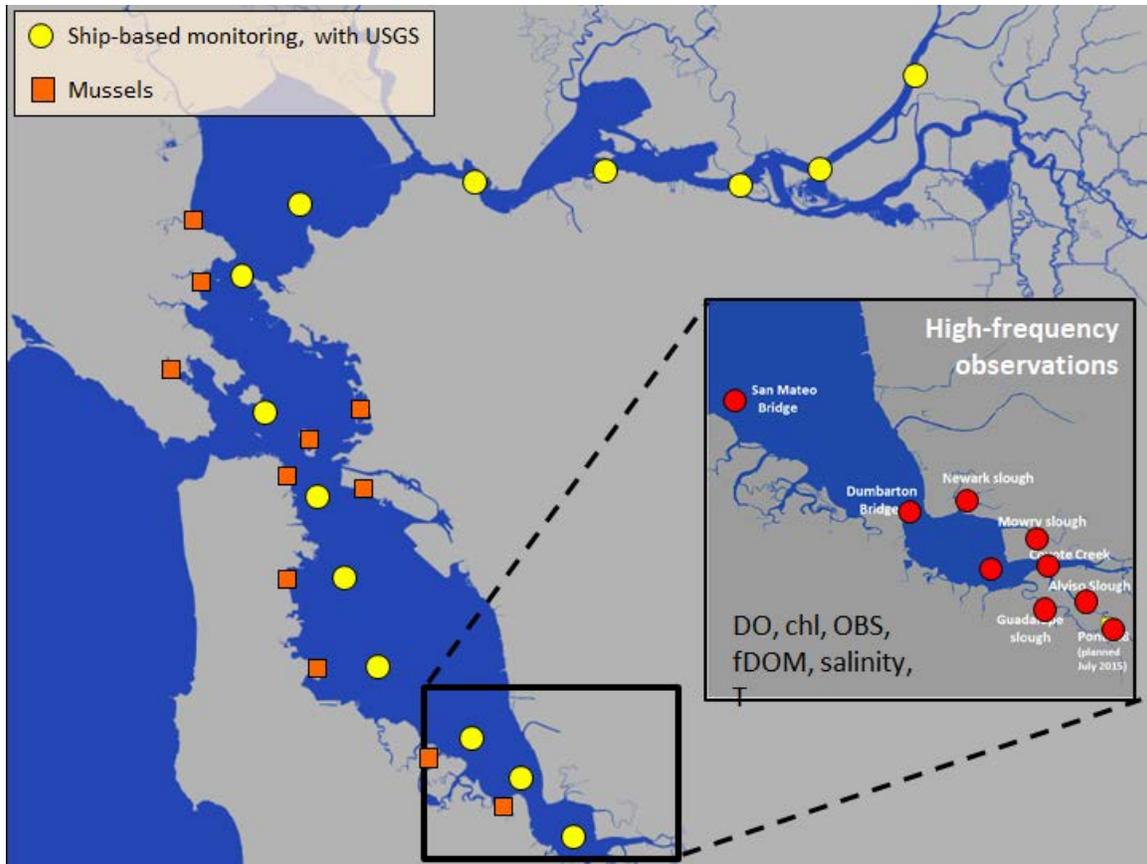


Figure 2: Chlorophyll fluorescence monitoring stations in the Bay. Continuous monitoring with moored sensors is performed at the red stations. Discrete measurements with sensors are made at ship-based monitoring sites (yellow) and mussel sites (orange). The graphic does not show all stations where chlorophyll fluorescence is monitored in the Delta, the Bay, and the coastal ocean.

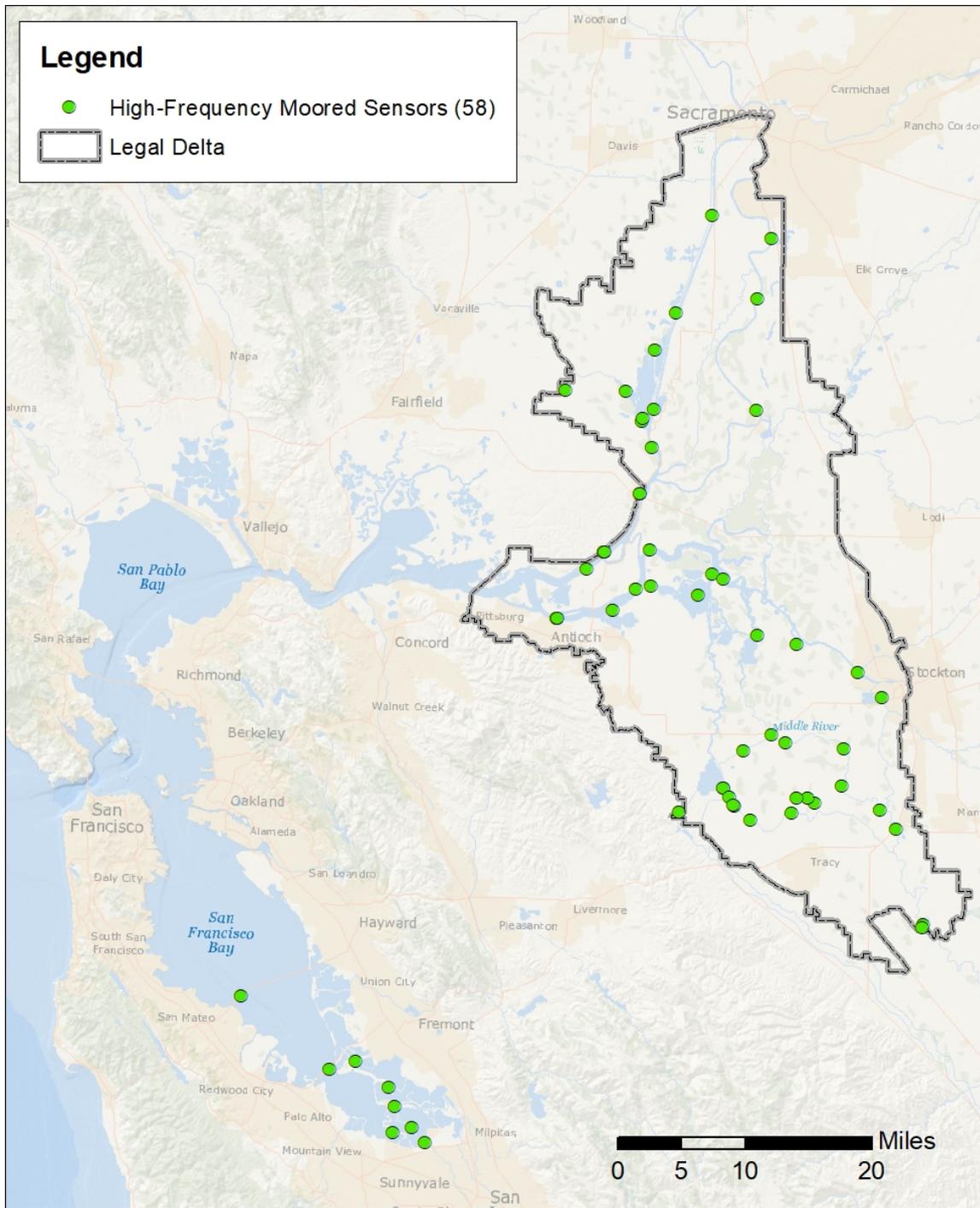


Figure 3: Stations with high-frequency moored sensors for chlorophyll that are managed by organizations that have agreed to participate in this study. Additional organizations will be invited to join the study.

## RFU-Chla Ratio Varies With Program and Station

Ratio of Discrete Chl-a Lab Measurement in  $\mu\text{g/L}$  to Sonde Fluorescence in RFU

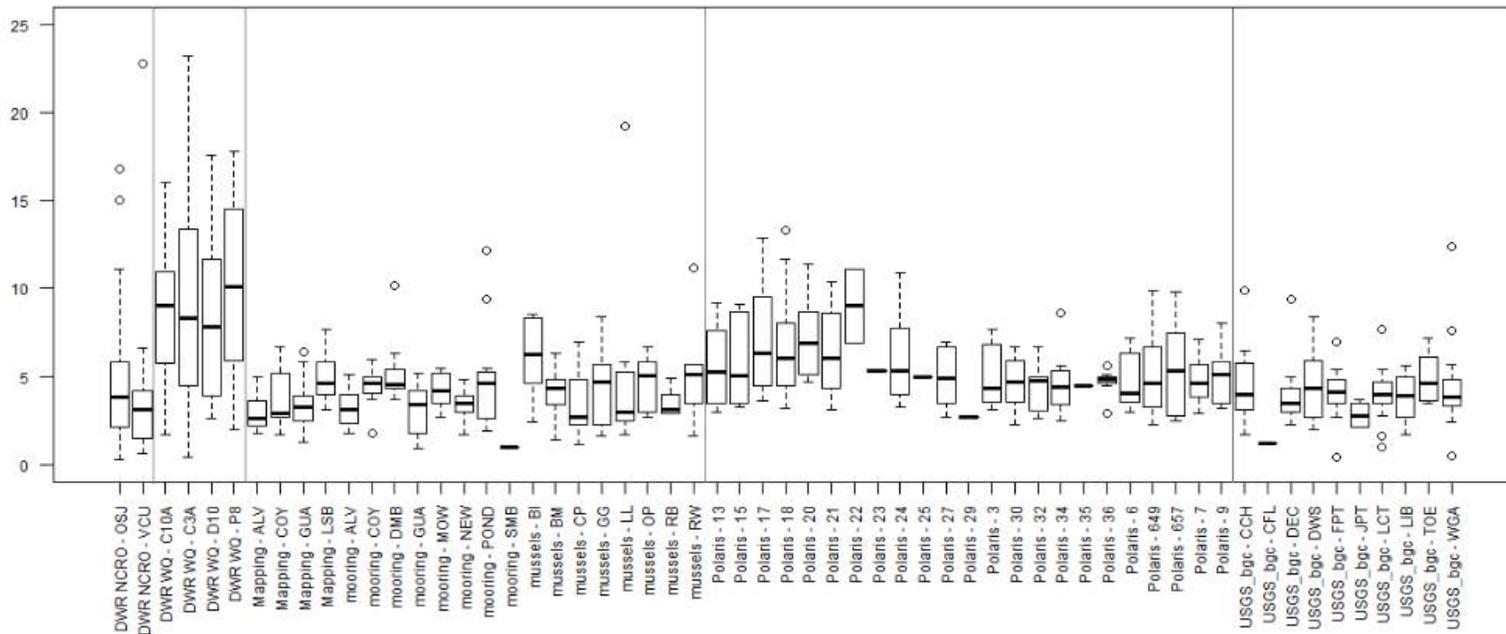


Figure 4: Ratio of sonde relative fluorescence units (RFU) from YSI EXO sondes to extracted chlorophyll measured in the laboratory across multiple programs and multiple locations in the Bay-Delta. The variance shown on this figure is from a combination of factors (see Figure 4). Natural variability among sites is evident when comparing different sites monitored by the same program. There can be natural differences between stations due to differences in salinity, tidal influence, and phytoplankton community. However, this graphic illustrates that some of the variance observed could be due to different protocols used by different programs.

## Conceptual Model

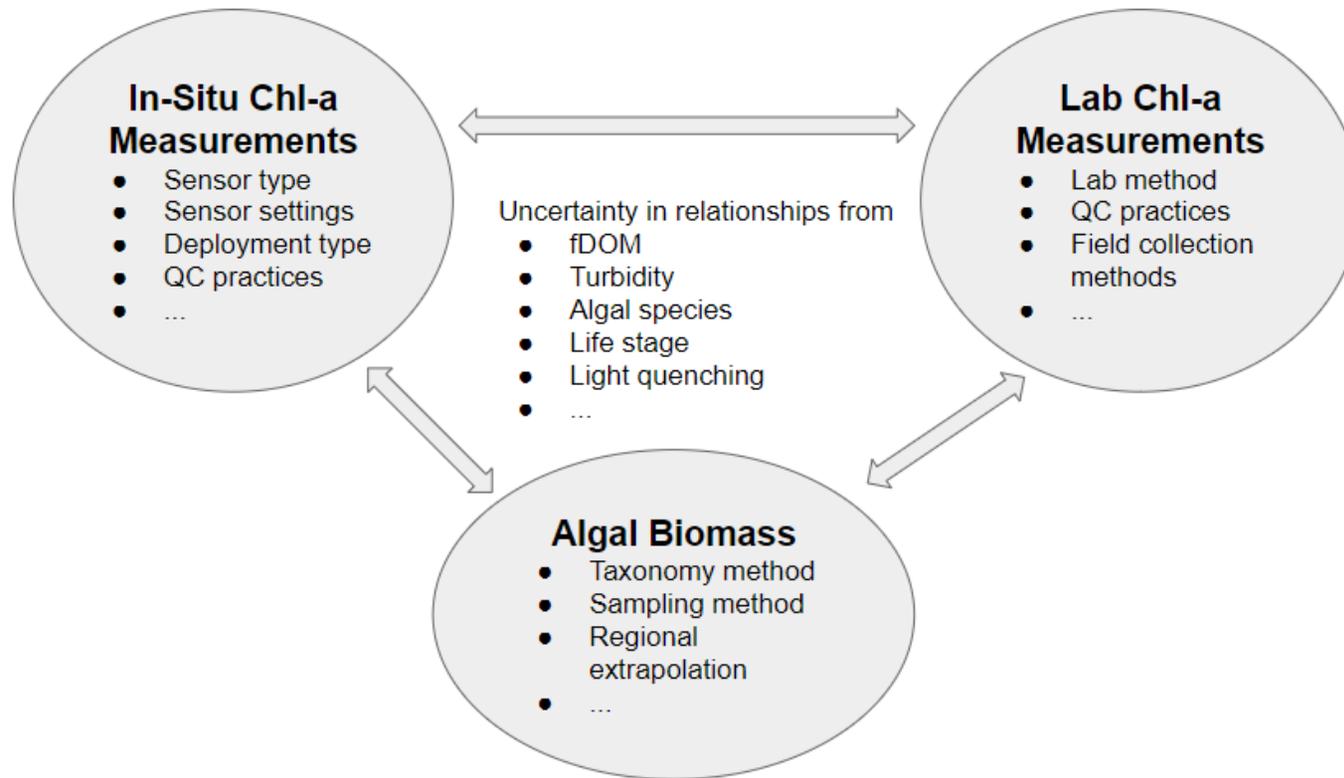


Figure 5: Conceptual model developed in FY17/18 for variance in extracted chlorophyll-a, in-situ chlorophyll fluorescence, algal biomass, and the relationships between these related parameters.

## Study Objectives and Applicable RMP Management Questions

The objectives of the project and how the information will be used relative to the Delta RMP’s management and assessment questions are shown in Table 1.

**Table 1.** Study objectives and questions relevant to Delta RMP management questions

Delta RMP Management Questions & Assessment Questions	Study Objectives	Example Information Application
<p>Management Question: Is there a problem or are there signs of a problem?</p> <p>Assessment Question: How do concentrations of nutrients (and nutrient-associated parameters) vary spatially and temporally? (S&amp;T1)</p> <p>This study is relevant to these questions because it will improve our ability to discern spatial and temporal trends in chlorophyll using data from multiple programs operating in the Bay-Delta.</p>	<p>Assess the differences in methods used by each program to measure chlorophyll.</p> <p>Determine whether differences in methods between programs result in significant variability in sensor and lab results for chlorophyll.</p>	<p>Water quality and resource managers will know the comparability of chlorophyll-a data from the major monitoring programs in the Bay-Delta.</p> <p>Data collection agencies will know which methods are important to address to improve the accuracy and precision of sensor and lab chlorophyll-a data in the Bay-Delta.</p>

## Approach

### **Task 1: Assessment methods used to measure in-situ chlorophyll fluorescence by different monitoring programs in the Bay-Delta**

A small group of experts from the major programs (USGS, DWR, USBR, and SFEI-ASC) will summarize current practices for chlorophyll fluorescence measurements. At a minimum, the assessment will cover the following topic areas:

- Types of sensors and sonde equipment used
- Sensor settings
- Calibration
- Deployment and retrieval protocols
- Sensor servicing and cleaning
- Quality assurance
- Post-processing and data correction
- Reporting

The assessment will only cover current methods in use by programs; it will not survey past methods. Understanding the comparability of past methods to current methods is a priority for some agencies (e.g., DWR that has been monitoring since the 1980s) but it is beyond the scope of this effort.

A brief literature review will be conducted to ensure that this regional effort is informed by national and other relevant guidance. This review will not be exhaustive. It will focus on reports such as recent guidance/protocols for chlorophyll fluorescence sensors, previous intercalibration exercises with chlorophyll fluorescence sensors, and key foundational literature.

The deliverable for this task will be a short report on the results of the assessment, highlighting differences in methods for in-situ chlorophyll fluorescence between the major monitoring programs in the Bay-Delta, and the literature review. The report will become part of the final report for the overall project to be completed by the workgroup (Task 5)

For a schedule, the first step of this task will be prioritized to occur in July 2018. DWR has plans to deploy multiple new chlorophyll fluorescence sensors in the summer of 2018. Having initial information from the first step of this task will be helpful for setting up these sensors to be compatible with other major programs. The rest of the task will be completed during the first six months of the project.

### **Task 2: Coordinate intercalibration exercises that can be used to show the effects of different methods on sensor results**

USGS will organize a series of field tests to measure chlorophyll fluorescence using different equipment and methods. Participants in these field tests will include at a minimum USGS, SFEI-ASC, DWR and USBR. The deliverable for this task will be a presentation to the workgroup.

### Proposed Field Tests

- Side-by-side deployments by all programs that want to participate. Deployments would be in two locations that span a range of chlorophyll fluorescence and fDOM conditions (Mosssdale and Montezuma Slough tentatively). Deployments would be during the summer and fall bloom period in 2018. A minimum of 4-6 weeks of side-by-side data will be collected. All sondes would be installed at the same depth in a common location and, at a minimum, will collect data on water temperature, specific conductance, dissolved oxygen, pH, turbidity, and chlorophyll fluorescence (and BGA and fDOM, if possible). The sondes will be serviced at whatever frequency each program normally uses. At the conclusion of the first side-by-side deployment, the organizers will decide if additional side-by-side deployments or a reproducibility study (described below) should be performed next.

### Other Possible Field Studies

- Reproducibility study. This type of study tests for how much variance is due to operator, sonde type, or program protocols. Each program will send up to three technicians with their own calibrated sondes out on a boat together (USGS vessel). The boat will stop at a variety of sites. At each site, each technician will measure chlorophyll fluorescence (averaged over a duration of 10 minutes to reduce noise). Statistical analysis will be used to estimate the 95% confidence intervals (error bars) within and between technicians and programs.

### **Task 3: Intercalibration study for laboratory chlorophyll-a measurements**

Laboratory measurements of extracted chlorophyll-a are used to calibrate and validate in-situ chlorophyll fluorescence measurements. Therefore, any effort to improve comparability in chlorophyll data needs to address variance in both in-situ and laboratory measurements. The proposed intercalibration study would show whether the laboratories in the region report similar results when given a split sample of the same water. Significant differences in the results between labs would trigger troubleshooting by chemists to find and fix the source of the variance.

- A. Inventory of the methods used by the major laboratories measuring chlorophyll-a in the Bay-Delta and secure their participation.
  - a. The known laboratories for major programs are DWR's Bryte Lab, USGS National Lab, SFSU Romberg Tiburon Center, and UC Davis. All laboratories will be allowed to be anonymous for the purposes of the study.
  - b. A standardized survey instrument will be used to capture information on the field and analytical methods used and quality assurance procedures.
- B. Implement a "pre-coordination" round of analysis by participating laboratories.
  - a. For intercalibration study, the field samples will be collected by USGS during an opportunistic cruise.
  - b. Samples will be collected during the summer growth period (July-Oct) at stations where chlorophyll-a concentrations are expected to exceed 5 ug/L.

- c. A total three sampling rounds will be conducted. For each sampling round, one large sample will be collected by peristaltic pump from 1 meter below the surface. This large sample will be delivered to DWR to be split between the participating laboratories using a churn splitter. Each laboratory will receive triplicates of the sample in whatever format they usually require (e.g., a filter, a whole water sample, or something else). Each participating laboratory will receive three replicates of each sample.
  - d. For quality assurance, laboratories will also receive samples spiked with known concentrations of an algal culture. This process of “standard addition” will provide information on the accuracy of the methods used.
- C. Analyze and report the results of the “pre-coordination” sampling round.
- a. Results of the study will be evaluated by comparing the mean and range of the triplicate samples from each laboratory. For a statistical evaluation of all the data across the three sampling days, the overall mean of all chlorophyll-a measurements from the same day will be subtracted from each individual result from the same day as a measure of deviation from the expected result. One-Way ANOVA will be used to determine whether there are any laboratories with statistically significant differences in the deviations.
  - b. Quality Assurance. The measurement quality objectives for chlorophyll-a results by a single lab is presumed to be +/-30%. The goal of the study is to have the between-laboratory variance in this same range. A power analysis indicates that a sample size of 8 for each laboratory is needed to detect 50% differences between laboratories (e.g., for lab means of 10, 10, 10, and 5 ug/L with assumed error of 3 ug/L). Therefore, collecting 3 rounds of triplicate samples (9 samples total for each lab) will have sufficient sample size to detect between laboratory differences of management interest.
- D. Organize coordination meeting with laboratories. Hold a meeting with representatives from the participating laboratories to discuss the results and coordinate regarding methods.
- E. Prepare final report. The final report will summarize the results of the test, lessons learned, and recommendations.

#### **Task 4: Convene a workgroup to summarize findings and recommendations**

A workgroup of key practitioners will meet quarterly in FY18/19 to review the findings from the field and laboratory intercalibration studies. The workgroup meetings in FY17/18 have been highly productive and valued by the participants as a forum to learn from each other and to discuss important issues. The workgroup will review outcomes from the Tasks 1-3 and be responsible for developing a short report with conclusions and recommendations for next steps. Participants in the workgroup will include USGS-WSC, DWR, USBR, and SFEI/ASC at a minimum. At least one person who also sits on the Delta RMP Nutrients Subcommittee will be part of the workgroup. Participation will be open to any other interested parties.

The deliverable for this task will be a summary report with recommendations for next steps taking into account results from Tasks 1-4. The report will be submitted to the Delta RMP committees but is expected to be shared widely among Bay-Delta monitoring program once it is published.

## Proposed Deliverables and Timeline

**Table 2.** Deliverables

Deliverable	Due Date
Task 1: Assessment of in-situ chlorophyll methods in use	Dec. 31, 2018 (final)
Task 2: Presentation to workgroup on field intercalibration exercises	Dec. 31, 2018
Task 3: Report on laboratory intercalibration study	March. 31, 2019
Task 4: Summary report with recommendations for next steps	April 30, 2019 (draft) June 30, 2019 (final)

**Table 3.** Timeline

Task	2018						2019					
	J	A	S	O	N	D	J	F	M	A	M	J
Task 1 - Assessment of Methods						X						
Task 2 - Field IC Exercises						X						
Task 3 - Lab IC study									X			
Task 4 - Workgroup Meetings			X			X			X			X
Task 4 - Summary Report										X		X

X = Deliverable due  
 = Activity

## Budget

Table 4 shows the estimated costs for this proposed special study.

**Table 4.** Proposed Budget

Task	Funding Requested for USGS	Funding Requested for SFEI-ASC	Total Funding Requested	In-Kind Contributions (details in justification)
Task 1 - Assessment of Methods	\$5,000	\$0	\$5,000	DWR, USBR
Task 2 - Field IC Exercises	\$6,750	\$5,250	\$12,000	DWR, USBR
Task 3 - Lab IC Study	\$4,300	\$13,500	\$17,800	DWR, USBR
Task 4 - Workgroup Meetings	\$10,000	\$20,000	\$30,000	DWR, USBR
Task 4 – Summary Report	\$10,000	\$10,000	\$20,000	DWR, USBR
<b>Total Funding Requested</b>	<b>\$36,050</b>	<b>\$48,750</b>	<b>\$84,800</b>	
<b>Leveraged In-Kind Contributions</b>				<b>\$104,927</b>

### Budget Justification

#### *Project Costs*

##### Task 1

- USGS will manage this task and prepare a summary report. The cost for this effort is \$5,000 (60 hours, mostly project manager time).

##### Task 2

- USGS will manage the field data collection for this task. The cost for this effort is: \$5,750 (56 hours, mostly technician time) + \$1,000 for boat, vehicle, and fuel expenses.
- SFEI-ASC will analyze the data from the field exercises and prepare a presentation with the results. The cost for this effort is \$5,250 (48 hours of effort, mostly technician time).

##### Task 3

- SFEI-ASC will coordinate the laboratory intercalibration study and prepare a short summary report with the results. The cost for this effort is \$10,000 (70 hours of effort, mostly technician time).
- Up to \$3,500 of direct costs are budgeted for sample shipping, supplies, and lab fees. If laboratories agree to participate for free, costs will be reduced.

- USGS will collect the field samples for the field study and be responsible for shipments to the laboratories. The cost for their participation is \$3,300 (40 hours mostly project manager time) +\$1,000 for boat, vehicle, and fuel expenses.

#### Task 4

- SFEI-ASC will organize and facilitate 4 quarterly meetings of the workgroup. Assuming 20 hours to prepare and run each meeting (80 hours) plus 40 hours for project management for a total cost of \$20,000.
- SFEI-ASC will also contribute to, edit, and ensure completion of the final report (40 hours) for a total cost of \$10,000.
- USGS will participate in 4 quarterly meetings and be the lead author in the final report. Total funding required for these tasks is \$20,000 (combination of senior scientist and project manager time). This total cost has been split as \$10,000 for the workgroup meetings and \$10,000 for the report.

#### *Leveraged Funds and In-Kind Contributions*

Leveraged funds are cash contributions from another source that pay for a part of the scope of work. In-kind contributions are staff time or resources (e.g., boat time, lab analyses) that are contributed to the project to complete the scope of work.

- The DWR Office of Water Quality and Estuarine Ecology has authorized 6 staff to participate in the study, which is an in-kind contribution of \$33,939.
- The DWR North Central Regional Office has authorized 2 staff to participate in the study, which is an in-kind contribution of \$19,400.
- The DWR Bryte Lab will analyze 9 water samples for Task 4. Each analysis has a value of \$150/sample. Therefore, this service is an in-kind contribution of \$1,350.
- The USBR Bay Delta Office has authorized 2 staff to participate in this study and purchase of needed equipment/supplies. This is an in-kind contribution of \$20,238.

USGS is also funding a laboratory study on “Developing corrections for observed biases on in situ chlorophyll fluorometers used in real time monitoring”. This study is directly related to the objectives of this study. Therefore, its value of \$30,000 is also considered leveraged funds.

In FY17/18, the Nutrient Management Strategy for San Francisco Bay contributed \$15,000 to Phase I of this effort. This program will likely be willing to contribute a similar amount in FY18/19 but the amount and the type of tasks it will choose to fund are not yet known. The Steering Committee will decide on budgets for FY18/19 in June.

## Reporting

The final deliverable from this project will be a technical report to the Delta RMP with the results from FY18/19 tasks and recommendations for future work. The lead author for

the study will be USGS but the report will be *published* by SFEI-ASC. Representatives from other participating organizations will be co-authors. The report will be prepared in the form of a manuscript to facilitate publication of some or all of the findings in the peer-reviewed literature.

## Optional Tasks for Future Funding

Achieving the high level goals of this study is expected to take several years. Accordingly, the proposed tasks for FY18/19 do not cover the full range of effort that is needed. The FY18/19 tasks will be useful to understand the scope of the problem, not necessarily to diagnose its causes. The project team anticipates the following tasks will be needed in FY19/20 plus recommendations that come out of the FY18/19 tasks. Furthermore, maintaining consistency and compatibility of water quality monitoring methods in the Delta must be an ongoing effort if it is to succeed. We envision an annual “Bay-Delta Monitoring Training Academy” where technicians can maintain proficiency in standard methods and share innovations.

Extension of Task 2: Coordinate intercalibration exercises that can be used to show the effects of different methods on sensor results

- Share equipment between programs, e.g., exchange of sensors and calibration check standards.
- Embed field crews from different programs to help identify where field methods differ and to share knowledge.
- Purchase 3 probes (sequential serial numbers) for all programs to check for variance in identical sensors and to remove variance from sensors of different ages.

Extension of Task 3: Intercalibration study for laboratory chlorophyll-a measurements

- Implement a “post-coordination” round of analysis by participating laboratories. The approach for this study would be the same as for the “pre-coordination” round. The samples will be collected in April and May 2019. The purpose of the post-coordination sampling round is to show improved correspondence between laboratories after coordination.

Analyze existing data to understand the magnitude of factors affecting chlorophyll fluorescence measurements

- For this task, existing data will be analyzed to understand the magnitude of the impact of other factors on chlorophyll fluorescence measurements. The effects that will be investigated are deployment depth, non-photochemical quenching, fDOM, and turbidity. The deliverable for this task will be a presentation to the workgroup.
- To understand if there is a large offset in chlorophyll fluorescence depending on the depth of the sensor, analyze profile data at sonde locations collected by USBR in the Deep Water Ship Channel (5 years of data). This dataset spans the range of vertical mixing conditions that are likely to be encountered in the Delta. The question to be addressed is: Do measurements of chlorophyll fluorescence at the surface or at the bottom need to be adjusted to be representative of the

overall water column in Bay-Delta channels? At all sites? At certain types of sites?

- To understand if non-photochemical quenching (NPQ) is an important factor, analyze data collected during the day and the night (including grab samples for laboratory analysis from USBR) within the same 24-hour period and with tidal correction. The question to be addressed is: Does NPQ cause enough of an effect in the Bay-Delta that chlorophyll fluorescence data needs to be correct for this factor? If there is an important effect, one solution is to only use data collected at night.
- Analyze historic datasets where fDOM and turbidity have been measured to determine the size of the effect that these water quality parameters have on the measurement of chlorophyll fluorescence. It has already been established that these parameters do affect chlorophyll fluorescence measurements. In some cases, fDOM sensors have direct interference with fluorometers. However, the magnitude of this effect and recommendations for correcting for it need to be determined. The question to be addressed is: How large of an effect do fDOM and turbidity have on chlorophyll fluorescence measurements in the Bay-Delta? Laboratory experiments are needed to investigate direct “cross talk” between fluorometers and fDOM sensors. That type of experiment is not proposed for this study.

Develop standardized methods for in-situ fluorometers

- Standardized methods would improve the consistency of data collection across the Bay-Delta. If the methods assessment (Task 1) and side-by-side deployments (Task 2) indicate the need for standardization and the major monitoring programs are willing to change their protocols, then a methods manual could be developed.

Training for water quality monitoring technicians

- Hold a training for larger audience of technicians to disseminate the lessons learned and common field protocols.

Analyze and collect data to relate chlorophyll fluorescence data to phytoplankton biomass

- A long-term goal is to be able to use chlorophyll measurements to make accurate assessments of phytoplankton biomass to inform important management questions about productivity, nutrient management, and fisheries. The FY18/19 workplan is focused on improving the comparability of just the chlorophyll measurements. In order to be ready for the next phase of the study, data to relate chlorophyll to actual phytoplankton biomass should be analyzed. Some data are already being collected as part of other studies (e.g., picoplankton and taxonomy at some USGS stations). Additional data may need to be collected in other locations to round out the dataset. Adding more sensors to some moored stations to create “superstations” where the relationships between these sensors and chlorophyll fluorescence is another option. Interpretation of phytoplankton taxonomy data will require expanding the expertise in the workgroup to cover this discipline.

## References

Bergamaschi, B.A., Downing, B.D., Kraus, T.E.C., and Pellerin, B.A., 2017, Designing a high-frequency nutrient and biogeochemical monitoring network for the Sacramento–San Joaquin Delta, northern California: U.S. Geological Survey Scientific Investigations Report 2017–5058, 40 p., <https://doi.org/10.3133/sir20175058>.

## **Attachment B Mercury Monitoring Proposal**

# Summary of Mercury Proposal for FY18/19 Workplan

Continued monitoring of sport fish and water is proposed to address the highest priority information needs related to implementation and revision of the Methylmercury TMDL (re-opening of the TMDL is tentatively scheduled for 2020). Annual monitoring of sport fish will firmly establish baseline concentrations and interannual variation in support of monitoring of long-term trends as a critical performance measure for the TMDL. Monitoring of water on a near-monthly basis will solidify the linkage analysis (the quantitative relationship between methylmercury in water and methylmercury in sport fish) in the TMDL and be valuable in verifying trends and patterns predicted by a numerical model of methylmercury transport and cycling being developed for the Delta and Yolo Bypass by the California Department of Water Resources (DWR) - this model will allow testing of various water management scenarios.

The cost for the full proposal for mercury monitoring, with 10 water sampling events, is \$323,798.

Reduced cost options:

- 10 water sampling events: \$323,798
- 9 water sampling events: \$300,504
- 8 water sampling events: \$277,210

If a reduced cost option is selected, the Mercury Subcommittee will discuss how to spread the events throughout the months of the year.

## Management Drivers Addressed

Mercury monitoring addresses the Delta Methylmercury TMDL, which establishes goals for cleanup and calls for a variety of control studies and actions.

## Assessment Questions Addressed

Two tiers of assessment questions have been defined for the mercury monitoring program. **Primary** assessment questions are those that are explicitly addressed by the monitoring and drive the monitoring design. **Secondary** assessment questions are addressed to some extent by the monitoring, but are not drivers of the monitoring design. The monitoring will contribute some information on but will not fully answer the secondary assessment questions.

### Primary Assessment Questions

#### Status and Trends

ST1. What are the status and trends in ambient concentrations of methylmercury and total mercury in sport fish and water, particularly in subareas likely to be affected by major existing or new sources (e.g., large-scale restoration projects)?

ST1.A. Do trends over time in methylmercury in sport fish vary among Delta subareas?

#### Sources, Pathways, Loadings & Processes

SPLP1. Which sources, pathways and processes contribute most to observed levels of methylmercury in fish?

SPLP1.A. What are the loads from tributaries to the Delta (measured at the point where tributaries cross the boundary of the legal Delta)?

#### Fish-Water Linkage Analysis

(new priority question articulated by Mercury Subcommittee)

FWLA1. Are there key datasets needed to strengthen the technical foundation of contaminant control programs?

## Secondary Assessment Questions

### Status and Trends

- ST1. What are the status and trends in ambient concentrations of methylmercury and total mercury in sport fish and water, particularly in subareas likely to be affected by major existing or new sources (e.g., large-scale restoration projects)?
- ST1.B. How are ambient levels and trends affected by variability in climate, hydrology, and ecology?

### Sources, Pathways, Loadings & Processes

- SPLP1. Which sources, pathways and processes contribute most to observed levels of methylmercury in fish?
- SPLP1.B. How do internal sources and processes influence methylmercury levels in fish in the Delta?
- SPLP1.C. How do currently uncontrollable sources (e.g., atmospheric deposition, both as direct deposition to Delta surface waters and as a contribution to nonpoint runoff) influence methylmercury levels in fish in the Delta?

### Forecasting Scenarios

- FS1. What will be the effects of in-progress and planned source controls, restoration projects, and water management changes on ambient methylmercury concentrations in fish in the Delta?

### Data Quality Objectives/Null Hypothesis

The initial and preliminary data quality objective (DQO) is the ability to detect a trend of mercury in fish tissue of 0.040 ppm/yr. This DQO can be refined when additional data are available. The null hypothesis is that there is no trend. MQOs are identical to those used in other mercury studies throughout the state and the country for determinations of impairment and trend detection. These MQOs generally call for indices of accuracy and precision to be within 25% to 30% of expected values.

# Monitoring to Support Implementation of the Methylmercury TMDL

## Executive Summary

Continued monitoring of sport fish and water is proposed to address the highest priority information needs related to implementation and revision of the Methylmercury TMDL (re-opening of the TMDL is tentatively scheduled for 2020). Annual monitoring of sport fish will firmly establish baseline concentrations and interannual variation in support of monitoring of long-term trends as a critical performance measure for the TMDL. Monitoring of water on a near-monthly basis will solidify the linkage analysis (the quantitative relationship between methylmercury in water and mercury in sport fish) in the TMDL and be valuable in verifying trends and patterns predicted by a numerical model of methylmercury transport and cycling being developed for the Delta and Yolo Bypass by the California Department of Water Resources (DWR) - this model will allow testing of various land and water management scenarios.

## Background and Motivation

Concentrations of methylmercury in fish from the Delta exceed thresholds for protection of human and wildlife health. The Methylmercury TMDL (Wood et al. 2010) is the driver of actions to control methylmercury in the Delta, establishing water quality goals and directing various discharger groups to conduct monitoring and implement measures to minimize methylmercury impairment of beneficial uses.

The TMDL established three water quality objectives for methylmercury in fish tissue: 0.24 ppm in muscle of large, trophic level four (TL4) fish such as black bass; 0.08 ppm in muscle of large TL3 fish such as carp; and 0.03 ppm in whole TL2 and TL3 fish less than 50 mm in length. Furthermore, the TMDL established an implementation goal of 0.24 ppm in largemouth bass at a standard size of 350 mm as a means of ensuring that all of the fish tissue objectives are met. Largemouth bass are widely distributed throughout the Delta and are excellent indicators of spatial variation due to their small home ranges. Past data for largemouth bass were a foundation for the development of the TMDL, including the division of the Delta into eight subareas. Monitoring of largemouth bass in these subareas therefore provides the most critical performance measure of progress in addressing methylmercury impairment in the Delta.

The TMDL describes a statistically significant relationship between the annual average concentration of methylmercury in unfiltered water and average mercury in 350 mm largemouth bass when data are organized by subarea. This linkage provides a connection, essential for management, between methylmercury inputs from various pathways (e.g., municipal wastewater, municipal stormwater, agricultural drainage, sediment flux in open waters, and wetland restoration projects) and impairment of beneficial uses. Because of this linkage, the TMDL established an implementation goal of 0.06 ng/L of unfiltered aqueous methylmercury. In response to TMDL control study requirements, the Department of Water Resources (DWR) is leading development of numerical methylmercury transport and cycling simulation models for the Delta and Yolo Bypass. Monitoring of aqueous methylmercury is therefore needed to:

- 1) better quantify the fish-water linkage that is the foundation of the TMDL,
- 2) evaluate attainment of the TMDL implementation goal,
- 3) support calculations of mercury and methylmercury loads and mass balances,
- 4) support development of mercury models for the Delta and Yolo Bypass, and
- 5) support evaluation of the fish data by providing information on processes and trends.

In FY 2016/2017 the Delta RMP initiated a methylmercury monitoring program for fish and water. Largemouth bass were collected in late summer 2016 (September) from six locations distributed across the subareas. Quarterly sampling of methylmercury and mercury (and ancillary parameters) in water at five locations began in August 2016.

In FY 2017/2018, methylmercury monitoring of fish and water continued. Funding was allocated to sample fish at six locations and water at six locations for eight months. The eight months to be sampled were to be the March-October period used for the linkage analysis in the TMDL. In late 2017, the Mercury Subcommittee decided that a more optimal use of the available funds would be to shift to sampling water at eight locations (adding locations in the West Delta and at the export pumps) and to add sampling in January and February (Table 1). The FY 2017/2018 plan also included funds for quarterly sediment sampling to support the DWR methylmercury modeling effort, and any future methylmercury modeling.

## Applicable Management Decisions and Assessment Questions

The Delta Methylmercury TMDL is the embodiment of management decisions for methylmercury in the Delta, establishing goals for cleanup and calling for a variety of control studies and actions. With providing information to support TMDL implementation in mind, the Mercury Subcommittee carefully considered, refined, and prioritized the assessment questions articulated by the Steering Committee and Technical Advisory Committee for mercury.

Two tiers of assessment questions have been defined for the mercury monitoring program.

**Primary** assessment questions are those that are explicitly addressed by the monitoring and drive the monitoring design. Secondary assessment questions are addressed to some extent by the monitoring, but are not drivers of the monitoring design. The monitoring will contribute some information but will not fully answer the secondary assessment questions.

### Primary Assessment Questions

One priority question for this initial phase of methylmercury monitoring is from the Status and Trends category of the DRMP management and assessment questions:

#### Status and Trends

ST1. What are the status and trends in ambient concentrations of methylmercury and total mercury in sport fish and water, particularly in subareas likely to be affected by major existing or new sources (e.g., large-scale restoration projects)?

ST1.A. Do trends over time in methylmercury in sport fish vary among Delta subareas?

Question 1A is a high priority for managers that relates to the TMDL, and is a primary driver of the sampling design for fish monitoring. Annual monitoring of fish mercury is urgently needed to 1) firmly establish a baseline for each Delta subarea and 2) to characterize the degree of interannual variation, which is essential to designing an efficient monitoring program for detection of long-term trends. In addition to addressing status and trends, this monitoring will establish a foundation for tracking the effectiveness of management actions - another category of the Delta RMP core management questions.

#### Sources, Pathways, Loadings and Processes

SPLP1. Which sources, pathways and processes contribute most to observed levels of methylmercury in fish?

SPLP1.A. What are the loads from tributaries to the Delta (measured at the point where tributaries cross the boundary of the legal Delta)?

A mass budget for methylmercury in the Delta is a critical element of the TMDL. The mass budget provides essential context for understanding the importance of inputs from discharges and internal sources and processes. Obtaining data to expand and update the dataset on methylmercury inputs to the Delta is a high priority to support TMDL refinement and implementation. Methylmercury export from the Delta is similarly an important component of the mass budget and a high priority information need.

### **Fish-Water Linkage Analysis**

(new priority question articulated by Mercury Subcommittee)

FWLA1. Are there key datasets needed to strengthen the technical foundation of contaminant control programs?

Another priority question that will be addressed by this proposal relates to the linkage analysis discussed in the previous section, which is a key element of the technical basis for the TMDL. This question was not articulated in the core management questions and assessment questions established by the Steering Committee, but was nevertheless identified as a priority by the Mercury Subcommittee. Additional data on methylmercury in water is one of the key datasets needed to strengthen the technical foundation of the TMDL.

### **Secondary Assessment Questions**

ST1. What are the status and trends in ambient concentrations of methylmercury and total mercury in sport fish and water, particularly in subareas likely to be affected by major existing or new sources (e.g., large-scale restoration projects)?

ST1.B. How are ambient levels and trends affected by variability in climate, hydrology, and ecology?

The time series for methylmercury in fish and water that are created to answer the primary assessment questions will also be influenced by variation in climate, hydrology, and ecology, and will provide information on the role of these factors. For example, the first two years of monitoring have already spanned the end of a prolonged drought and a high flow year, providing an opportunity to examine the impact of extreme variation in flow on methylmercury concentrations in fish and water.

### **Sources, Pathways, Loadings and Processes**

- SPLP1. Which sources, pathways and processes contribute most to observed levels of methylmercury in fish?
- SPLP1.B. How do internal sources and processes influence methylmercury levels in fish in the Delta?
- SPLP1.C. How do currently uncontrollable sources (e.g., atmospheric deposition, both as direct deposition to Delta surface waters and as a contribution to nonpoint runoff) influence methylmercury levels in fish in the Delta?

### **Forecasting Scenarios**

- FS1. What will be the effects of in-progress and planned source controls, restoration projects, and water management changes on ambient methylmercury concentrations in fish in the Delta?

These secondary assessment questions relating to Sources, Pathways, Loadings, and Processes and Forecasting Scenarios for this initial phase of methylmercury monitoring relate to one of the major control studies called for in the TMDL: an effort to combine modeling, field data, and laboratory studies to evaluate the potential effects of water project operational changes on methylmercury in Delta channels. The Department of Water Resources (DWR) is currently developing two mathematical models, one each for the Delta and Yolo Bypass, that will allow testing of various water management scenarios (DiGiorgio et al. 2016). These models will be useful in addressing this set of Delta RMP management questions. The opportunity to inform these models, which are being developed with a considerable investment of funding from the California Department of Water Resources (DWR), makes monitoring to address these questions a near-term priority for the Delta RMP. The water monitoring included in this proposal will generate data that are valuable for verifying trends and patterns predicted by the methylmercury models.

## Approach

### Fish Sampling

<b>Design</b>	7 fixed sites (Figure 1), largemouth bass only - adding a site in the West Delta in this round
<b>Key Indicator</b>	Annual average methylmercury in muscle fillet of 350 mm largemouth bass (or similar predator species), derived through analysis of 16 individual bass or other predator species at each location
<b>Parameters</b>	Total mercury*, Total length, Fork length, Weight, Sex, Moisture, Estimated age
<b>Frequency</b>	Annual
<b>Schedule</b>	Monitor through 2025 and then re-evaluate. Sample in summer or early fall.
<b>Co-location</b>	Water MeHg and Hg Other water parameters
<b>Contractors</b>	SFEI (design, data management, reporting), MLML (sample collection, chemical analysis, reporting)
<b>Coordination</b>	DWR, USGS (sampling of flow monitoring stations)

\* Total mercury measured as proxy of methylmercury because methylmercury comprises more than 90% of the total mercury in fish.

### Summary of Results to Date

Results from the first year of DRMP methylmercury monitoring are presented in the Year One Data Report (Davis et al. 2018). The report provides details on the sample collection and processing, chemical analysis, quality assurance, and the results. Highlights of the results are briefly discussed here.

Results from the first round of DRMP fish monitoring are presented in Figure 2, with data from prior fish sampling in or near these stations provided for context. Time series with more than three observations are available for four of the six locations. The existing time series are characterized by a high degree of inconsistency in locations, species, and sampling approach over time, highlighting the need to build a consistent dataset for trend evaluation. The data do suggest a preliminary answer to management question 1A. The data suggest a decline in concentrations at the San Joaquin River at Vernalis over the period of record, while concentrations appeared to be stable at the other three locations. Therefore, the data give a

preliminary indication that trends do vary among the Delta subareas. Additional rounds of consistent sampling are needed to confirm this preliminary interpretation.

## Water Sampling

<b>Design</b>	8 fixed sites ( <b>Figure 1</b> ) - adding sites for export from the Delta in this round (Mallard Island in the west Delta and the Delta Mendota Canal for a water project export site)
<b>Key Indicator</b>	March-October average total (unfiltered) methylmercury at each location
<b>Parameters</b>	Total (unfiltered) methylmercury, filtered methylmercury, unfiltered total mercury, filtered total mercury, suspended solids, chlorophyll a, dissolved organic carbon (field filtered), volatile suspended solids. Field measurements will include dissolved oxygen, pH, and specific conductance.
<b>Other Important Parameters</b>	Nutrients (ALK, NH <sub>3</sub> , CL, DOC, HARD, NO <sub>3</sub> /NO <sub>2</sub> , N (total), OPO <sub>4</sub> , TPPOS, SiO <sub>2</sub> , SO <sub>4</sub> , TDS, TOC), grain size. Budget assumes these are covered by other studies.
<b>Frequency</b>	10 events per year (8 monthly events + 2 storm or winter events)
<b>Schedule</b>	Monitor through 2020 and then re-evaluate
<b>Co-location</b>	Sport fish sampling (at 7 of the sites, excluding Delta Mendota Canal) Other water parameters
<b>Coordination</b>	DWR, USGS (sampling of flow monitoring stations)

## Summary of Results to Date

Results for March-October average total (unfiltered) methylmercury at each location for the first year of sampling are briefly summarized here. Data for the other water parameters are presented in the Year One Data Report (Davis et al. 2018).

Figure 3 presents long-term time series of March to October annual averages of total unfiltered MeHg concentrations for Delta RMP sites. Sacramento River concentrations have remained constant with good agreement between historic data and current data. Cache Slough 2016 concentration was lower than what was reported previously but the 2017 concentration was within historic ranges. No historic data are available for Little Potato Slough. Middle River MeHg concentrations were highly variable with 2016–17 concentrations within the range of historic data. The San Joaquin River 2016 MeHg concentration was lower than previously reported values. However, the 2017 measurement was the highest concentration ever reported for this site.

## Data Quality

The measurement quality objectives (MQOs) for measurements of methylmercury and mercury in fish and water are shown in Appendix 1. These MQOs are the same as MQOs used in mercury studies throughout California, with statewide fish monitoring by the Surface Water Ambient Monitoring Program as a prominent example. The MQOs generally call for indices of accuracy and precision to be within 25% to 30% of expected values. Data of this quality are routinely used for determinations of impairment and trend detection throughout the state and the country. The variance attributable to the analytical process is one of the contributors to the overall variance observed in the data. This variance is therefore accounted for in the power estimates provided in the next section.

## Power to Detect Long-term Trends - Fish Sampling

The power to detect interannual trends in largemouth bass mercury on a per site basis was evaluated using existing data. Even the best existing time series for the Delta have low statistical power to detect trends due to infrequent sampling and varying sampling designs of studies performed over the years (Figure 2). One of the goals of the initial phase of Delta RMP fish mercury monitoring is to obtain robust information on interannual variation to support future power analysis. As part of the mercury proposal for FY 2017/2018 we conducted a power analysis on the small amount of information presently on hand. Appendix 2 provides the methods and details on the results. This analysis will be updated after a few years of new data have accumulated.

### Power analysis summary

Power for trend detection at a single site based on grand mean estimates of observed variance across sites. Pink shading indicates scenarios with greater than 80% power.

Trend	N Fish/Yr	10 Years		20 Years		30 Years	
		Annual	Biennial	Annual	Biennial	Annual	Biennial
0.010 ppm/yr	12	0.11	0.09	0.20	0.15	0.40	0.27
0.020 ppm/yr	12	0.13	0.13	0.44	0.27	0.81	0.60
0.030 ppm/yr	12	0.21	0.17	0.69	0.45	0.99	0.85
0.040 ppm/yr	12	0.29	0.19	0.88	0.61	1.00	0.98
0.010 ppm/yr	16	0.21	0.19	0.33	0.27	0.55	0.44
0.020 ppm/yr	16	0.27	0.24	0.65	0.46	0.93	0.77
0.030 ppm/yr	16	0.36	0.32	0.86	0.64	1.00	0.96
0.040 ppm/yr	16	0.47	0.36	0.97	0.82	1.00	1.00

These preliminary results indicate that increasing the number of fish per site would be effective in increasing power. With 16 fish per site and annual sampling, 80% power would be expected for several of the 20-year scenarios. Beginning with year 2 (FY 2017/2018) the design for fish monitoring was therefore being modified to include 16 fish per site. The monitoring results for the San Joaquin at Vernalis suggest that trends of up to 0.040 ppm/yr are possible. The results highlight the importance of initiating consistent time series.

### Power Analysis - Water Sampling

Not applicable. The primary objectives of the water sampling are to strengthen the linkage analysis and support model development. The water monitoring is not intended as a tool for long-term trend monitoring.

### Reporting/Deliverables

Deliverable	Due Date
Draft Data Report on Year 2 (FY 17/18)	December 2018
Final Data Report on Year 2 (FY 17/18)	February 2019
Draft Data Report on Year 3 (FY 18/19)	December 2019
Final Data Report on Year 3 (FY 18/19)	February 2020

## Budget

		Actual	Actual	Old Plan	Proposed: 10	Proposed: 9	Proposed: 8	Planned	Planned
	Fiscal Year	2016/17	2017/18	2018/19	2018/19	2018/19	2018/19	2019/20	2020/21
	Fish Sampling Year	2016	2017	2018	2018	2018	2018	2019	2020
Fish	Bass Monitoring at Six Sites: Sampling and Analysis (DRMP)	\$45,344	\$51,804	\$53,358	\$53,358	\$53,358	\$53,358	\$54,959	\$56,608
Fish	1 Site Add on				\$7,521	\$7,521	\$7,521	\$7,747	\$7,979
	MLML In-Kind	(\$8,262)	(\$5,100)	(\$5,100)	(\$5,100)	(\$5,100)	(\$5,100)	(\$5,100)	(\$5,100)
Water	Water Monitoring at <b>Five</b> Sites, Quarterly: Sampling and Analysis (DRMP)	\$65,310							
	MLML In-Kind	(\$12,392)							
	Water Monitoring at <b>Six</b> Sites, 8 months: Sampling and Analysis		\$152,952	\$157,541	\$154,703	\$154,703	\$154,703	\$159,344	\$164,124
	Water 2 site 8 month add on				\$51,568	\$51,568	\$51,568	\$53,115	\$54,708
	Water, 2 winter event, 8 sites				\$51,568	\$25,784	\$0	\$53,115	\$54,708
	MLML In-Kind		(\$16,700)	(\$16,700)	(\$24,900)	(\$22,410)	(\$19,920)	(\$24,900)	(\$24,900)
Sediment	Sediment Monitoring at Six Sites, Quarterly: Sampling and Analysis		\$29,260	\$30,138	\$0	\$0	\$0	\$0	\$0
	MLML In-Kind		(\$3,200)	(\$3,200)	\$0	\$0	\$0	\$0	\$0
Data Management, Oversight, Reporting	SFEI Data Management and QA Review	\$15,000	\$19,545	\$20,131	\$29,930	\$29,930	\$29,930	\$30,828	\$31,753
	SFEI Oversight and Coordination	\$3,000	\$5,000	\$5,150	\$5,150	\$5,150	\$5,150	\$5,305	\$5,464
	Interpretive Report							\$20,000	
	Total	\$128,654	\$258,561	\$266,318	\$353,798	\$328,014	\$302,230	\$384,412	\$375,345
	MLML In-Kind	(\$20,654)	(\$25,000)	(\$25,000)	(\$30,000)	(\$27,510)	(\$25,020)	(\$30,000)	(\$30,000)
	<b>Total Cost to RMP</b>	<b>\$108,000</b>	<b>\$233,561</b>	<b>\$241,318</b>	<b>\$323,798</b>	<b>\$300,504</b>	<b>\$277,210</b>	<b>\$354,412</b>	<b>\$345,345</b>

Table 1. *Sampling schedule for Delta RMP mercury monitoring. The March-October period used for the linkage analysis in the TMDL is indicated in bold font.*

	FY 2016/17						FY 2017/18						FY 2018/19						FY 2019/20																
	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	11	12	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	11	12	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	11	12	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Fish (6 sites)</b>		X												X																					
<b>Fish (7 sites)</b>																																			
<b>Water (5 sites)</b>		X			X																														
<b>Water (6 sites)</b>												X																							
<b>Water (8 sites)</b>																			X	X	X	X	X	X	X	X	X	X							
<b>Sediment (6 sites)</b>														X																					

Figure 1. Planned sampling sites for methylmercury in FY18/19.

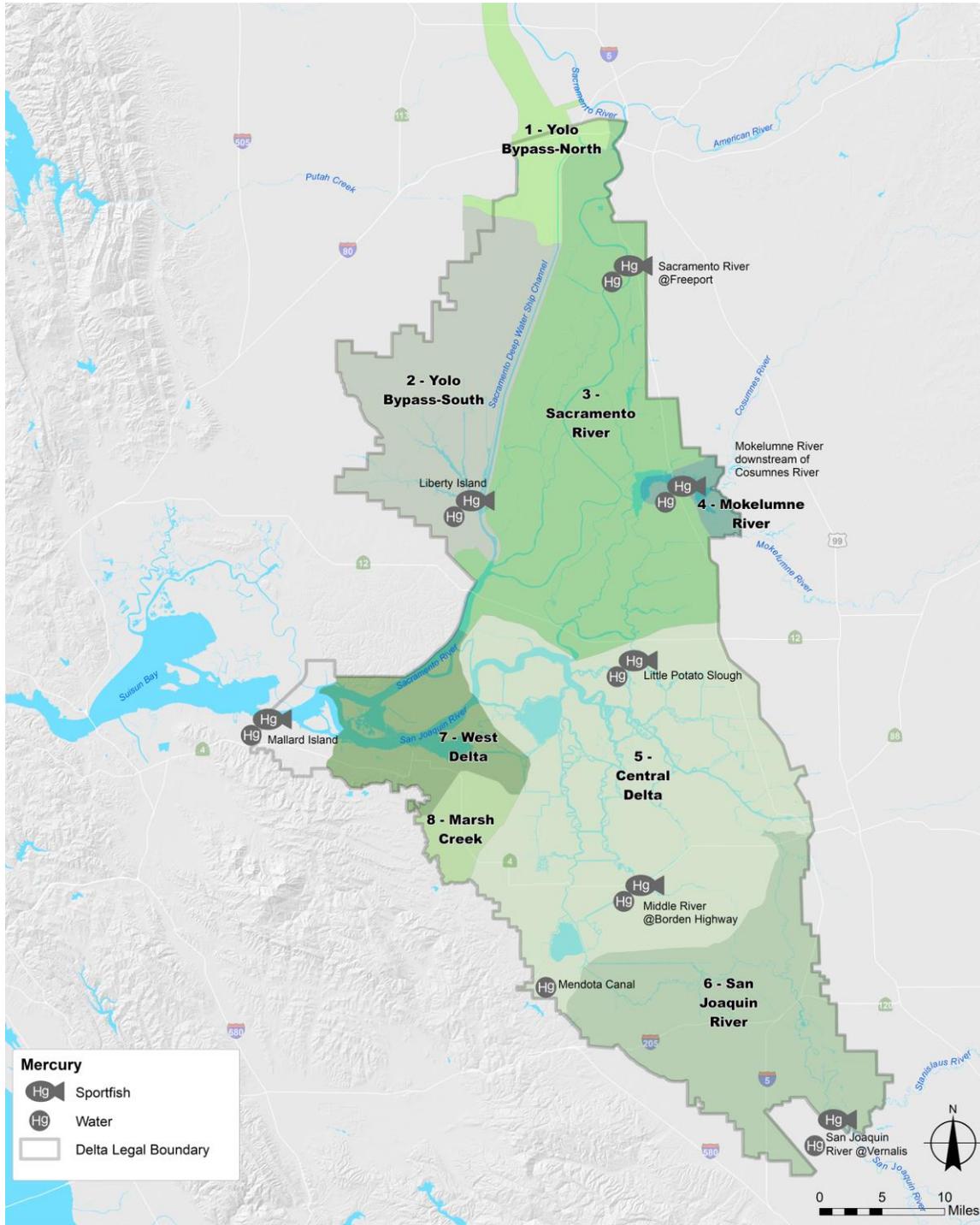
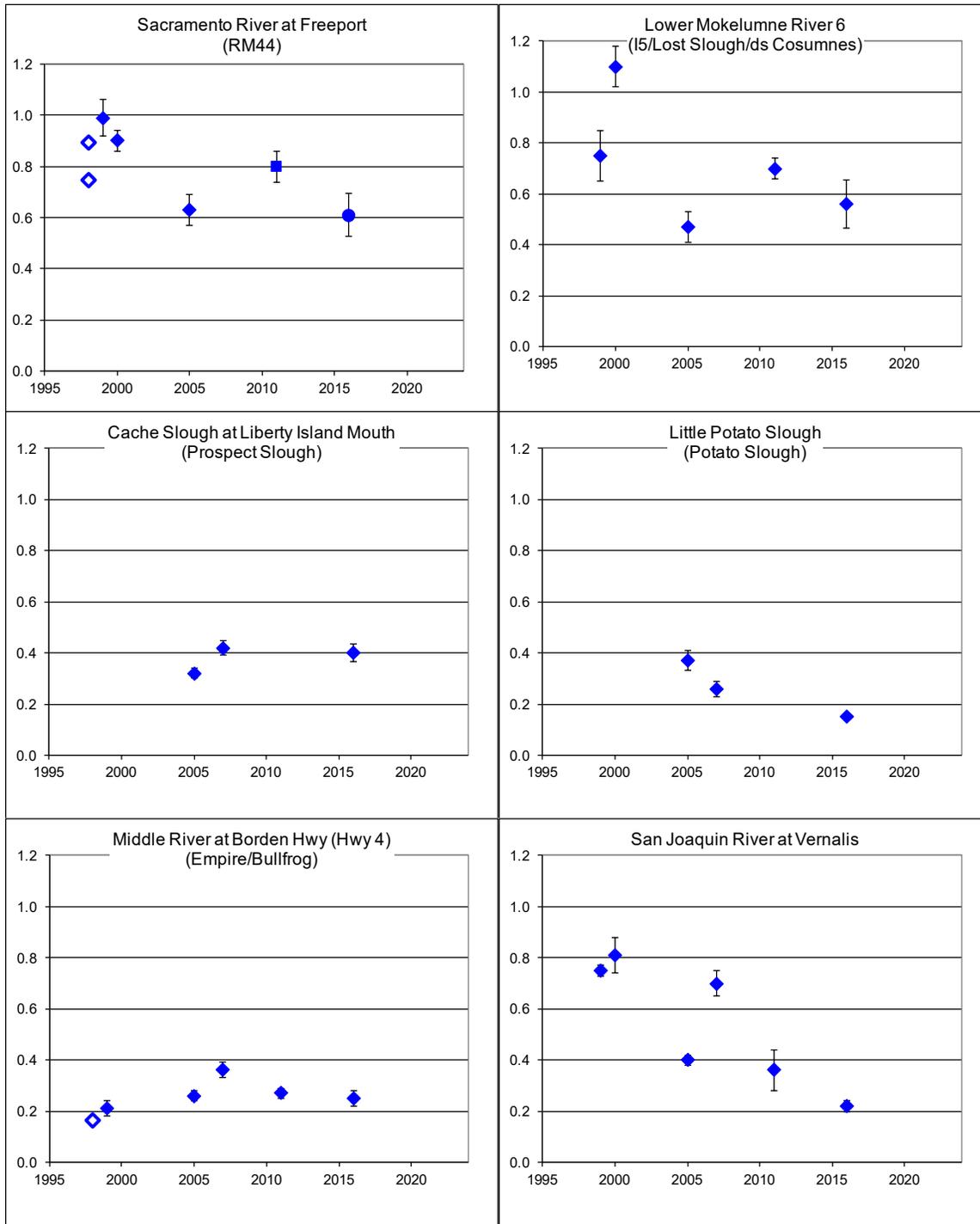


Figure 2. Long-term time series of mean mercury (ppm wet weight) in black bass for Delta RMP stations and nearby stations sampled historically. Details on following page.



## Figure 2 Details

Points generally show 350 mm length-adjusted means (exceptions to this noted in plot details below) and error bars indicate two times the standard error. Filled symbols indicate 350 mm length-adjusted means, hollow symbols indicate individual composite samples or arithmetic means when the station did not have a significant length:mercury correlation. Diamonds indicate largemouth bass; squares are spotted bass; circles are smallmouth bass. Data sources: Delta RMP - 2016; the Surface Water Ambient Monitoring Program (Davis et al. 2013) - 2011; the Fish Mercury Project (Melwani et al. 2009) - 2005-2007; the CALFED Mercury Project (Davis et al. 2003) - 1999-2000; the Delta Fish Study (Davis et al. 2000) - 1998; and the Sacramento River Watershed Program (2002) - 1998.

### **Sacramento River at Freeport**

Stations - Freeport: 2016; RM44: All other years

Statistics - Individual composite results: 1998; 350 mm length adjusted mean: all other years

### **Lower Mokelumne River 6**

Stations - Lower Mokelumne River 6: 2016; Mokelumne River near I-5: 2011; Lost Slough: 2005; Mokelumne River downstream of the Cosumnes River: 1999, 2000

### **Cache Slough at Liberty Island Mouth**

Stations - Cache Slough at Liberty Island Mouth: 2016; Prospect Slough: 2005, 2007

### **Little Potato Slough**

Stations - Little Potato Slough: 2016; Potato Slough (aka San Joaquin River at Potato Slough): 2005, 2007

### **Middle River at Borden Hwy (Hwy 4)**

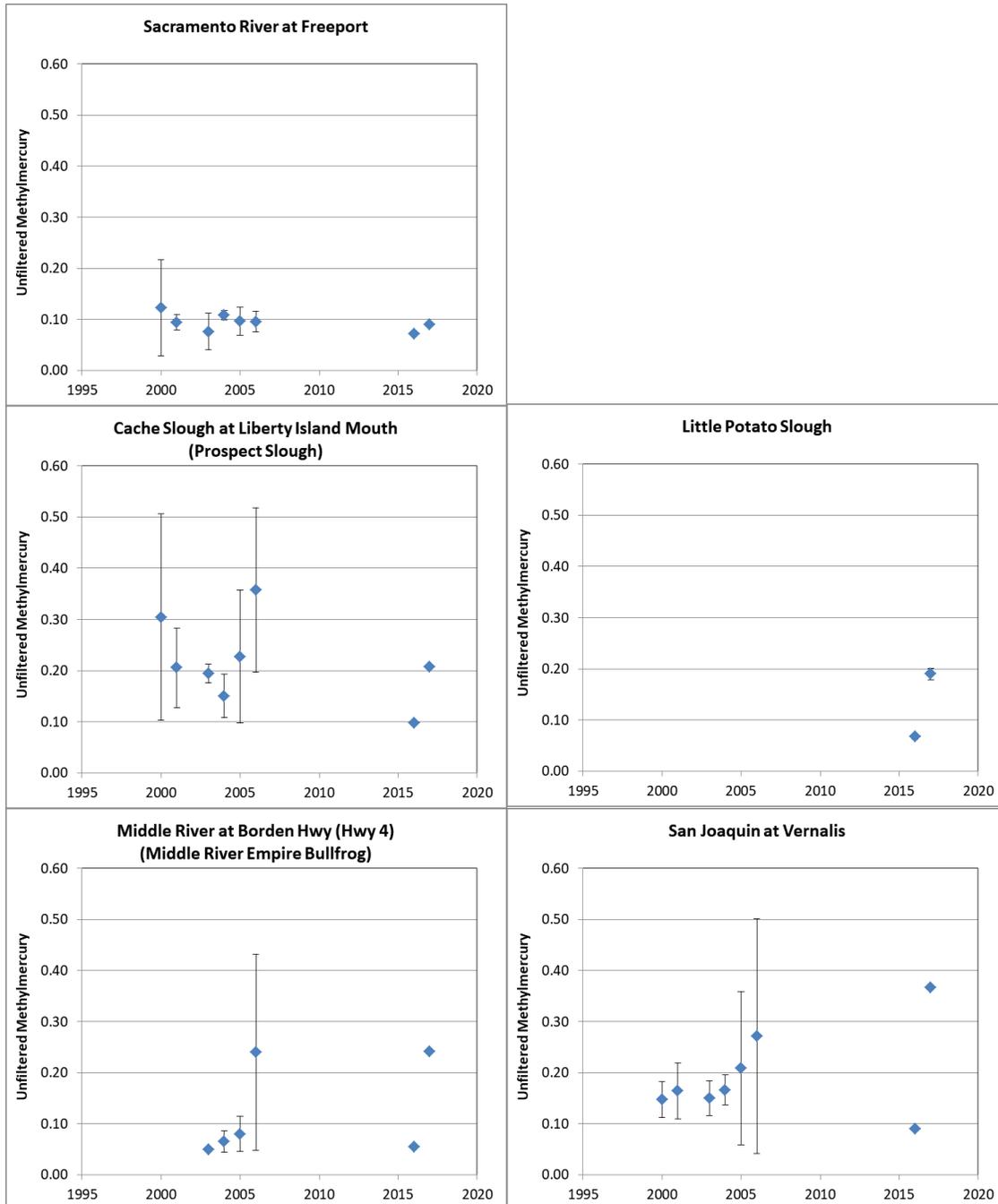
Stations - Middle River at Borden Hwy (Hwy 4): 2016; Middle River near Empire Cut: 2011; Middle River at Bullfrog: 1998, 1999, 2007; Middle River at HWY 4: 2005

Statistics - Individual composite result: 1998; 350 mm length adjusted mean: all other years

### **San Joaquin River at Vernalis**

Stations - Same station all years

Figure 3. Annual mean aqueous unfiltered methylmercury concentration at each Delta RMP monitoring station sampled from August 2016 through April 2017. Plots based on March-October data.



## References

DiGiorgio, Carol, Helen Amos, Jamie Anderson, Maninder Bahia, Cody Beals, Don Beals, David Bosworth, et al. "Creation of Mercury Models for the Delta and Yolo Bypass: Linking Modeling and Delta Regulatory Decisions." Sacramento, California, 2016.  
<http://scienceconf2016.deltacouncil.ca.gov/content/creation-mercury-models-delta-and-yolo-bypass-linking-modeling-and-delta-regulatory>.

Wood, Michelle L., Chris G. Foe, Janis Cooke, and Stephen J. Louie. "Sacramento – San Joaquin Delta Estuary TMDL for Methylmercury: Staff Report." Sacramento, California: Central Valley Regional Water Quality Control Board, 2010.  
[http://www.waterboards.ca.gov/rwqcb5/water\\_issues/tmdl/central\\_valley\\_projects/delta\\_hg/april\\_2010\\_hg\\_tmdl\\_hearing/apr2010\\_tmdl\\_staffrpt\\_final.pdf](http://www.waterboards.ca.gov/rwqcb5/water_issues/tmdl/central_valley_projects/delta_hg/april_2010_hg_tmdl_hearing/apr2010_tmdl_staffrpt_final.pdf).

# Meeting Materials for Item 6

## Proposal Rankings by TAC members

## Memo

To: Delta RMP Steering Committee

From: Matthew Heberger, Aquatic Science Center

Date: April 30, 2018

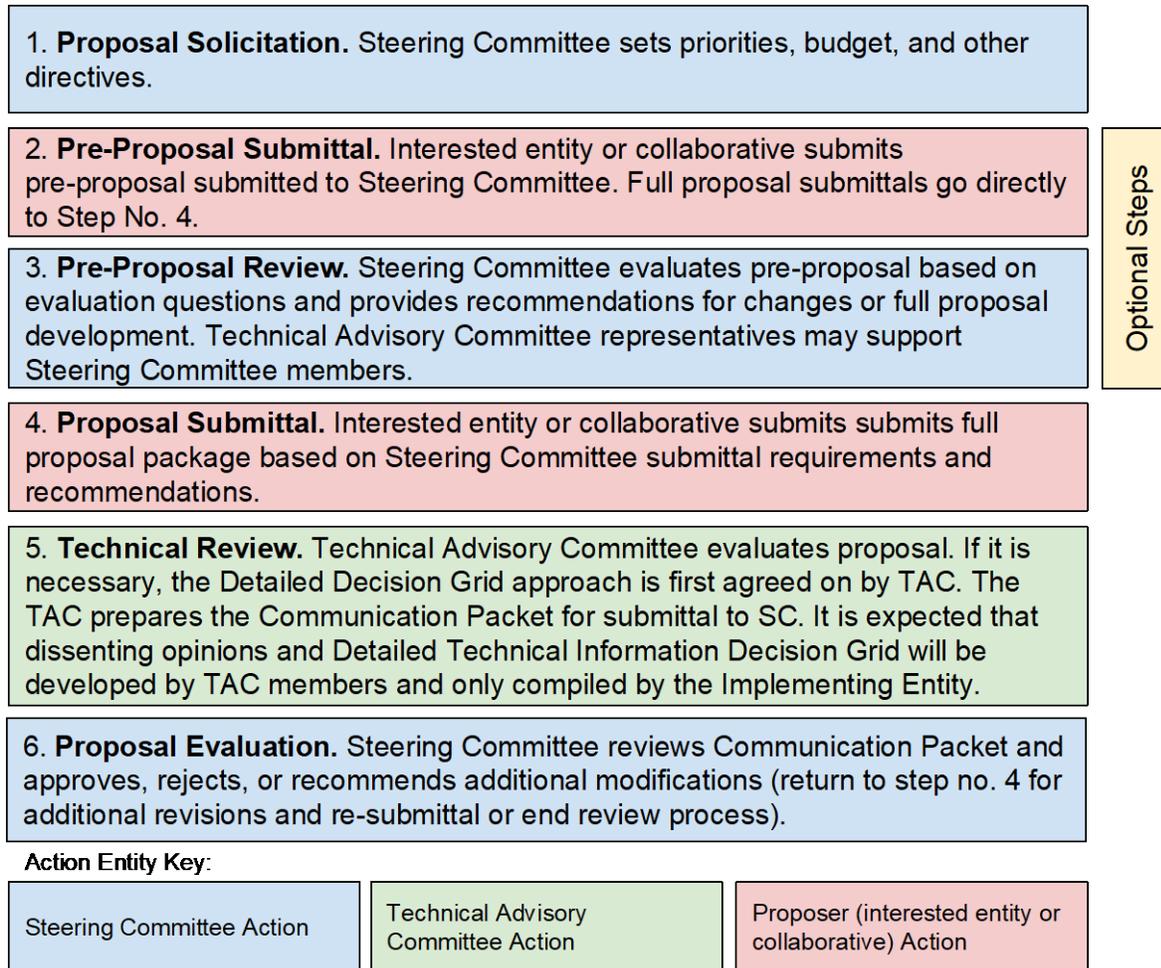
Re: Description of this year's proposal development, selection, and ranking process

---

This memo provides a description of the process followed by ASC and the TAC in developing, selecting, and ranking proposals for monitoring and special studies for FY18/19. The purpose of the review process was to:

- Identify any areas where proposals should be improved or strengthened.
- Recommend to the SC which proposals merit funding.
- Document the level of support for proposals among TAC members and any dissenting opinions.

We developed this ranking process in collaboration with stakeholders in response to direction from the Steering Committee to better capture the range of opinions and level of support among TAC members. As this is our first year using this approach, it is somewhat of an experiment. We welcome your feedback as we continue to improve and streamline the process. Overall, we sought to follow the proposal review process as it was outlined by the ad hoc Decision Grid Working Group in 2017 as shown in Figure 1 below. For more information, see the [agenda package for the 10/24/2017 Delta RMP Joint TAC-SC Meeting, Item 8](#).



v.20180307

**Figure 1. Proposal review process steps**

**Proposal development**

Technical study proposals were developed in close collaboration with the technical subcommittees. For example, the Nutrients Subcommittee met 5 times in the fall of 2017 and winter 2018. Here is an abbreviated description of the process we followed:

- 8/30/17: Nutrients Subcommittee meeting. Discussed the types of projects, in general, that they would like to do in the future.
- 9/29/17: Nutrients Subcommittee meeting. ASC asked the subcommittee to prioritize the types for projects into short-term and long-term priorities.

- 12/1/17: Nutrients Subcommittee meeting. ASC asked the subcommittee to brainstorm specific ideas for the short-term priorities. ASC also asked the subcommittee if they wanted to issue any RFPs.
- 1/18/18: Nutrients Subcommittee meeting. ASC provided a list of 20 “proposal concepts” based on the last meeting and showed how they were aligned with the Nutrient Research Plan. The subcommittee decided which concepts should be developed into proposals.
- 2/21/18: Nutrients Subcommittee meeting. ASC presented 4 proposals. The subcommittee went through a formal voting process in a closed session and recommended 2 of them to go to the TAC.

The mercury subcommittee followed a shorter process and held fewer meetings, largely because this year’s monitoring design is a continuation of last year’s and subcommittee members reached consensus that the design is a good one for answering the Delta RMP assessment questions.

The Pesticides Subcommittee is working through a similar process, but took longer to come to consensus on a design. We expect to deliver a set of options for pesticide/toxicity monitoring to the TAC at its June 12, 2018 meeting, and to the SC at its July 2018 meeting.

### **Proposal template**

Each proposal follows a roughly similar template and includes:

- Title
- Executive summary
- Background and motivation
- Applicable management decisions and assessment questions
- Study approach
- Map(s) of proposed monitoring locations (if applicable)
- Data Quality Objectives, including a statement of the null hypothesis, planned analytical methods, and tolerable limits on decision errors (if applicable)
- Schedule of deliverables
- Budget

Proposals were included in the agenda package for the TAC meeting on March 15, 2018. At this meeting, the Principal Investigators gave an overview of each proposal and answered questions. About an hour of time was allocated for each study for presentations and for discussion of the proposals by TAC members.

### **Ranking Questionnaire**

Following the meeting, TAC members had the opportunity to rank and provide feedback on proposed monitoring and special projects for nutrients and mercury. We created a standardized questionnaire for each proposal using Google Forms, and invited all TAC members to fill in the questionnaire for each proposal. The questionnaires were based on the “Decision Grid” developed by a working group in 2017 and consisted of a series of questions. Some questions asked for a numerical ranking (1 to 5, with 5 being the highest score), and other questions asked for a written response. The numeric responses represented the level of agreement with a statement such as “The proposal demonstrates how the results will be presented.” We instructed respondents to interpret the responses as follows:<sup>1</sup>

1. Strongly disagree
2. Disagree
3. Neutral (neither agree nor disagree)
4. Agree
5. Strongly agree.

At the March TAC meeting, we demonstrated the use of the questionnaire, and also reminded committee members of the conflict of interest COI policy in the Delta RMP Charter (i.e. the duty to *disclose* any COI and to *recuse* oneself from discussion and decision making on any item where an individual may have a conflict).

TAC members had from March 26 to April 23, or 4 weeks, to fill out the 3 questionnaires one for each of the two nutrients special studies, and 1 for the mercury monitoring). In total, 8 TAC members filled in the questionnaires. We summarized the results of these questionnaires, and included the summary in the agenda package for the April 23, 2018 TAC meeting. The summaries included the average score for questions with a numeric reply, and the distribution of scores.

At the April TAC meeting, members discussed and reviewed those rankings and comments with a view toward finalizing the proposals and making recommendations to the SC. The tables show the number of respondents who gave each score from 1 to 5. In the example below, for the first question, 3 people gave a “4,” and 5 people gave a “5.” The weighted average score was 4.6.

<sup>1</sup> This 5-point scale is known as the Likert Scale, and is widely used in survey research. I discovered that there is a vast literature on how to use the Likert Scale and analyze its statistics, with Google Scholar returning over half a million hits.

	1	2	3	4	5	Average Score	
<b>A. Study Plan Responsiveness</b>							
1. Does the study proposal identify the management question addressed?	-	-	-	3	5	4.6	
2. Are the Data Quality Objectives (DQOs; EPA 2006) clearly defined?	-	1	3	1	1	3.3	
3. Does the study provide testable hypotheses (written as assessment questions or otherwise)?	-	-	4	1	2	3.7	
4. Does the proposal demonstrate how the results will be presented?	-	1	1	3	2	3.9	

The little graph is a “sparkline” histogram showing the distribution of scores. Anytime we see a low score (a 1 or a 2), it is cause for concern, and we would like to follow up and find out the reason for it. It turns out some TAC members did not realize you could “pass” on a question, and clicked 1 when they felt the question did not apply. We agreed it would be appropriate to add “n/a” as an option in the form in the future.

In addition, we compiled the written comments into a single document. The responses are anonymous in the sense that we did not attribute the comments to individuals.

Some comments pointed to desired changes in the proposals, or identified areas where more information could be provided. In these cases, we (ASC) have written a short response to several comments. We have also made minor changes to each of the proposals. However, they are not materially different from the versions reviewed the TAC. For example, on the nutrients modeling study, one commenter asked how we can interpret the quality output from model simulations. We have added some information about how modelers assess model skill, or the accuracy of its predictions, and included examples of the types of goodness of fit measures that will be used.

In summary, we have gone to lengths to provide the Steering Committee a packet of information that will allow them to gage the level of support for proposals among TAC members, and any perceived strengths and weaknesses. Further, where possible, we have amended the proposals in response to feedback from TAC members. The packet of information for each focus area being forwarded to the SC includes:

1. Summary tables
2. Multi-Year Plan for the Focus Area
3. Proposal(s)
4. Summary of numeric ranking by TAC members
5. Compilation of comments by TAC members

<b>#1: Nutrients Modeling Study</b>							
	1	2	3	4	5	Average Score	
<b>A. Study Plan Responsiveness</b>							
1. Does the study proposal identify the management question addressed?	-	-	-	3	5	4.6	
2. Are the Data Quality Objectives (DQOs; EPA 2006) clearly defined?	-	1	3	1	1	3.3	
3. Does the study provide testable hypotheses (written as assessment questions or otherwise)?	-	-	4	1	2	3.7	
4. Does the proposal demonstrate how the results will be presented?	-	1	1	3	2	3.9	
5. Does the proposal adequately demonstrate how the results will be interpreted?	-	-	3	3	1	3.7	
6. Does does the proposal contribute to a larger body of data that can be used to answer Management Questions in the future?	-	-	-	2	6	4.8	
7. Does the proposed study plan include an estimated budget that is responsive to Steering Committee guidance?	-	-	1	4	2	4.1	
<b>B. Technical Foundation</b>							
1. Geographic scope. Does the location selection support the study objectives?	-	-	-	1	6	4.9	
2. Geographic scope. Does the study adequately characterize an area relevant to the Delta RMP?	-	-	-	1	6	4.9	
4. Temporal resolution. Is the temporal scope and resolution of the study justified based on available data?	-	-	-	4	3	4.4	
5. Temporal resolution. Does the study clearly define the conditions of interest (e.g. high flows)?	-	-	1	4	2	4.1	
6. Temporal resolution. Can the results of the study be used to evaluate trends over the timescale of interest or target magnitude of change?	-	-	2	2	2	4.0	
8. Sample collection. Does the proposed data collection method introduce biases or errors that are not adequately mitigated or measured?	1	-	3	-	2	3.3	
9. Monitoring tools. Where do the analytical tools fit on the 'established methods' spectrum? (1 = experimental, 5 = long-established, known, reliable)	2	1	2	-	1	2.5	
12. Interpretation. Are study condition controls adequately considered given the study timeframe, data collection frequency, and proposed interpretation to answer study hypotheses reliably?	-	-	2	4	2	4.0	

<b>#1: Nutrients Modeling Study</b>							
13. Interpretation. Does the study have statistical power sufficient to answer study hypotheses reliably during the study timeframe?	-	1	4	1	2	3.5	
14. Interpretation. Is the basis for outcome assessments technically supported?	-	-	1	5	2	4.1	
15. Interpretation. Does the proposed study create new information to evaluate beneficial use attainment?	-	1	2	2	3	3.9	
16. Interpretation. Do the proposed study's research questions and outputs address specified management questions?	-	1	1	2	4	4.1	
<b>C. Budget, Priority, and Coordination Considerations</b>							
1. Budget. Is the proposed budget scalable in size?	-	1	5	2	-	3.1	
4. Priority. Is there urgency to conducting the monitoring, such as to inform planned policies or regulations?	1	-	2	1	2	3.5	
5. Priority. Does the study timeframe allow it to inform time-sensitive decisions?	1	2	1	3	-	2.9	
7. Coordination. Can the monitoring be coordinated with other efforts to increase they study's power or to reduce overall cost or duration?	1	-	1	1	4	4.0	

# Delta RMP Monitoring Proposal

## Questionnaire

### #1: Nutrients Modeling Study

8 responses

#### 8. Comments on the overall study plan responsiveness:

4 responses

Question 2: This proposal does not involve new monitoring or data collection, so USEPA's DQO (2006) not directly applicable. However, the SFEI modeling team has goals and methods for assessing model performance. These could be added to the scope of work. Questions 4 and 5: marked "4 and "3" respectively because deliverables lack detail.

*RESPONSE: Details on statistics that will be used to assess model performance were added to the scope.*

Specifications for deliverable details and more reporting/interaction with Nutrients Subcommittee should be included in scope of work.

*RESPONSE: Details on interactions with the Delta RMP Nutrients Subcommittee were added to the scope.*

Question 7: Taking into account unspent funds designated for nutrients work, the 2 nutrients proposals are within Steering Committee's target allocation.

as we discussed, being unfamiliar with much of the background, I will not provide scores for many questions. Proposal does not state how the information could be used for future monitoring plans.

dependence on SFCWA study is tenuous

#### 3. Comments on the geographic scope:

2 responses

The project's geographic emphasis is the North Delta because of greater data availability (than east and south Delta) and complementary USGS/SFCWA project. There is broad scientific interest in North Delta because it is important habitat for delta smelt. Note, though that separately funded project, Delta Science Program's "Operation Baseline" is also focused on nutrients and primary production in the North Delta. Given that there are management needs elsewhere in the Delta, I strongly recommended these amendments to this proposal: 1) In Task 4 comparisons of model predictions with data, the project should maximize the amount

of information that can be gained about the subareas other than the North Delta. This isn't changing the focus because there is less high frequency data outside the North and Central Delta. 2) Semi- annual progress meetings should be open for information exchange with complementary projects (SFCWA data evaluation; Operation Baseline conceptual model; Delta Smelt Resiliency Strategy).

*RESPONSE: 1) Scope has been edited to emphasize assessments in the whole Delta, not just the North Delta. 2) Description of the semi-annual progress meetings has been edited to include invitations to the other groups mentioned.*

## 7. Comments on temporal scope:

3 responses

The temporal focus of water year 2016 is appropriate because an existing modeling effort is focused on a year with different phytoplankton production and (WY2011). Model development for years representing both conditions will allow comparison of factors affecting phytoplankton productivity.

The study plan is for modeling WY 2016 and does not discuss any other time period. 2016 simulations will be combined with 2018 measurements--not ideal

*RESPONSE: The WY2016 model results will be compared with data from WY2016, not 2018 as mentioned in this comment.*

## 8.5. Comments on sample collection:

4 responses

Project involves use of sample data already collected.

there appears to be no actual sample collection involved with this study, so no response

No additional samples are proposed to be collected, rather the study will evaluate 2016 model simulation results corroborate with 2016 water quality data.

Answered the sample collection method based on how they plan to obtain and utilize data from different sources.

## 11. Comments on monitoring tools:

3 responses

No new monitoring is proposed. Monitoring tools (grab samples, high frequency sensors at fixed stations and mounted on the USGS boat) have been used previously. Most data already available, but need to be compiled and checked for consistency before use in the

model.

although modeling is commonly used in water related studies, it sounds like this particular model may be somewhat new.

*RESPONSE: Neither of the models involved (DWR's SCHISM or Deltares DWAQ) are new. Both have been used successfully for years.*

Monitoring tool questions 9 and 10 don't seem to apply to the Nutrient #1 proposal since it is focused on modeling. Also, should the ranking on #9 be switched where 1 = reliable and 5 = experimental?

## 17. Comments on interpretation:

4 responses

Interpretation questions 12-14 as phrased are not directly applicable to a modeling project. Based on my experience with progress of the Suisun-Delta modeling effort, the modelling proposed is technically appropriate. The project will create new information to evaluate beneficial uses, particularly in the North Delta (WARM, COLD, and WILD) and will address specified management questions.

the research questions seem to address management questions indirectly, but provide a model that may be useful in addressing those questions

Study seeks to verify a biogeochemical model using existing data collected in 2016. For future decision grids we may need to include an option of Not Applicable.

## 3. Comments on budget:

4 responses

Budget is somewhat modular. The translation code (Task 2) has value separately from comparison of predicted and actual WY2016 data.

Tasks 2 and 3 have no deliverables listed. To justify the expenditures for these tasks, I recommend we consider requiring brief quarterly progress reports from the funded entities describing their work. The Nutrients Subcommittee would be interested in and the natural recipient of such reports.

*RESPONSE: Quarterly written progress reports have been added to the proposal.*

"scalable" is unclear, does this mean, can we increase or decrease the scope to cover larger area/longer analysis timeline I don't think it applies. It appears that the study could be broken in to parts, which seems to be addressed in the 2nd question.

there are no options to consider but the proposed budget is in line with the expectations. For future decision grids, we may want to add something for budgets to indicate "Unsure"

## 6. Comments on priority:

2 responses

Development of biogeochemical modeling capabilities for the Delta is a high priority for the Delta Nutrient Research Plan (management driver for Delta RMP's nutrient efforts). This project is a significant addition to the currently fledgling capabilities.

Not knowing the entire history of this project, yet, it is difficult to make a determination about this but it seems to push the ability to make policy decisions off rather than informing anything in the short term

## 8. Comments on coordination:

4 responses

The project is coordinated with USGS data compilation and analyses efforts being funded by SFCWA. Utilizing the USGS work is cost-saving. See comment in B3 for additional coordination with recommended during progress reporting.

coordination seems to well documented

Coordination with complementary studies is incorporated in the proposal.

The question doesn't seem phrased correctly. It's a yes/no question with a 1-5 response options

## Overall comments:

4 responses

Because this proposal would provide \$101,000 directly to SFEI, I recommend that representatives of the Delta RMP nutrients subcommittee be involved in project oversight and tracking.

*RESPONSE: Quarterly written progress reports have been added to the proposal. Delta RMP Nutrients Subcommittee members will be invited to attend the semi-annual progress report meetings. Updates will be given at any stand-alone Nutrient Subcommittee reports.*

Deliverables and final product should include more than a manuscript for publication. Data quality checks (Task 2 comparisons of high-frequency and discrete data), all tests of model predictions vs data (Task 3 and 4), translation code (Task 1), data compilation (Task 2) and hydrodynamic model inputs for WY2016 (Task 1) are all valuable products that should be available to the RMP as the funding entity.

*RESPONSE: The following elements have been added to the final report deliverable:*

- *Results from data quality checks and other QA/QC on the datasets*
- *Statistics from model predictions versus data*
- *Plots of modeled results*

- *Translation code*

Comment on survey format: Survey anticipates a monitoring proposal. Consider rephrasing to fit proposals that involve data evaluation and modeling.

What modules will be included in the Deltares Water Quality (DWAQ) biogeochemical model, and what output factors will be generated for comparison to the field data compiled by USGS? Will the model output focus on dissolved nutrient concentrations (ammonia and nitrate?) and chlorophyll-a concentrations, or will it include predictions for other factors such as changes in water residence times, turbulence (stratification), temperature, light availability, or regional flow rates? Overall, it would help the proposal to further describe the functionality of the biogeochemical model.

*RESPONSE: The modules for the model are listed in the proposal. They are all the modules for biogeochemical cycling (nutrient cycling, phytoplankton dynamics, benthic grazing, zooplankton, mineralization, and sediment fluxes, and empirical light field).*

*The proposal also lists the specific model outputs that will be compared to measured data. They are:*

- *Concentrations of dissolved nutrients and chlorophyll*
- *Spatial distribution of dissolved nutrients and chlorophyll*
- *Zones of bloom inception*
- *Timing of bloom inception and senescence*

This seems like a good potential study to merge data from modeling and high frequency monitoring, well designed models can be a big help in answering water related questions.

Since this is a modeling proposal, i have left the questions related to monitoring without responses.

<b>#2: Chlorophyll-a Intercalibration</b>							
	1	2	3	4	5	Average Score	
<b>A. Study Plan Responsiveness</b>							
1. Does the study proposal identify the management question addressed?	-	-	-	3	5	4.6	
2. Are the Data Quality Objectives (DQOs; EPA 2006) clearly defined?	-	-	2	3	3	4.1	
3. Does the study provide testable hypotheses (written as assessment questions or otherwise)?	-	-	-	4	4	4.5	
4. Does the proposal demonstrate how the results will be presented?	1	-	2	3	2	3.6	
5. Does the proposal adequately demonstrate how the results will be interpreted?	-	-	2	3	3	4.1	
6. Does does the proposal contribute to a larger body of data that can be used to answer Management Questions in the future?	-	-	2	1	5	4.4	
7. Does the proposed study plan include an estimated budget that is responsive to Steering Committee guidance?	-	-	-	1	7	4.9	
<b>B. Technical Foundation</b>							
1. Geographic scope. Does the location selection support the study objectives?	-	-	-	2	5	4.7	
2. Geographic scope. Does the study adequately characterize an area relevant to the Delta RMP?	-	-	-	1	6	4.9	
3. Comments on the geographic scope:	-	-	-	1	7	4.9	
4. Temporal resolution. Is the temporal scope and resolution of the study justified based on available data?	1	-	1	3	3	3.9	
5. Temporal resolution. Does the study clearly define the conditions of interest (e.g. high flows)?	1	-	1	1	5	4.1	
7. Comments on temporal scope:	2	-	2	1	1	2.8	
8.5. Comments on sample collection:	1	-	2	1	3	3.7	
11. Comments on monitoring tools:	-	-	-	2	6	4.8	

<b>#2: Chlorophyll-a Intercalibration</b>							
12. Interpretation. Are study condition controls adequately considered given the study timeframe, data collection frequency, and proposed interpretation to answer study hypotheses reliably?	-	1	1	1	4	4.1	
13. Interpretation. Does the study have statistical power sufficient to answer study hypotheses reliably during the study timeframe?	-	-	-	3	4	4.6	
14. Interpretation. Is the basis for outcome assessments technically supported?	-	-	2	3	2	4.0	
15. Interpretation. Does the proposed study create new information to evaluate beneficial use attainment?	-	-	4	3	1	3.6	
<b>C. Budget, Priority, and Coordination Considerations</b>	-	-	-	-	-		
1. Budget. Is the proposed budget scalable in size?	3	-	3	-	2	2.8	
4. Priority. Is there urgency to conducting the monitoring, such as to inform planned policies or regulations?	-	-	1	4	3	4.3	
5. Priority. Does the study timeframe allow it to inform time-sensitive decisions?	-	1	1	4	2	3.9	
7. Coordination. Can the monitoring be coordinated with other efforts to increase the study's power or to reduce overall cost or duration?	-	-	2	-	6	4.5	

# Delta RMP Monitoring Proposal Questionnaire

## #2 Chlorophyll Intercalibration

### 8. Comments on the overall study plan responsiveness:

3 responses

Reliable and comparable high-frequency Chlorophyll-a data would support many nutrient, ecological, and modeling studies in the Delta.

The study addresses a crucial need for more coordination among various monitoring groups to improve chlorophyll data comparability.

### 3. Comments on the geographic scope:

3 responses

Chlorophyll sensors included in the study span the Delta. The proposal's scope also increases our understanding of data

comparability and cooperation with Bay monitoring efforts. Sites of field side-by-side comparisons (Task 2) are appropriate.

There is an impressive amount of chl-a meters in the Delta this section does not seem relevant to this proposal

### 7. Comments on temporal scope:

5 responses

Field side-by-side and collections for lab intercalibration should occur during bloom periods, which is why they are scheduled for summer/fall.

Hi-frequency meters provide great temporal resolution, so long as they keep running. again, this section does not seem relevant

The study appropriately only targets current monitoring methodologies rather than past methodologies.

question 6 and others need a "N/A" response option

### 8.5. Comments on sample collection:

4 responses

Sensor deployment (Task 2) and sample collection/splitting/distribution (Task 3) are carefully designed to reveal biases in sensors and lab analyses. Any differences will be quantified and investigated.

This project aims to reduce errors.

this does not seem relevant

How are labs selected for the intercalibration study?

*RESPONSE: The laboratories selected are the major labs for the Bay-Delta to provide a foundation. If the project is funded, we will solicit participation by any other laboratories who want to join. Having more laboratories would strengthen the study but we could not solicit participation widely without assurance that the study would be funded.*

### 11. Comments on monitoring tools:

5 responses

Monitoring tools (chlorophyll sensors and laboratory analyses for chlorophyll) are well-established.

standard chlorophyll sensors are well established, I am surprised calibration between agencies/sensors has not been done previously. I would like to see satellite imagery included if this is possible, LandSat satellites should be high enough resolution and often enough that data would be very helpful.

*RESPONSE: The planning group discussed that issue and agreed that we needed to get coordinated with the in-situ measurements first before we added the complication of remote sensing. Maybe it can added for Phase III.*

Includes lit. review to include past chlorophyll intercal. studies and current recommendations on best practices in using insitu chlorophyll sensors.

#9 isn't exactly fair here--the study is needed because methods aren't established

Sample and monitoring tool questions do not seem applicable.

### 17. Comments on interpretation:

4 responses

Question 15: the study creates information that will allow us to appropriately use and interpret data. Thus it is valuable even if the study itself does not help understand beneficial use attainment.

This study should help us utilize existing chl-a meters in the Delta, to better understand phytoplankton trends in future modeling and synthesis projects.

this study seems that it indirectly addresses management questions

Does not address specific management questions per se, but provides necessary first steps to reduce inter-program variability in chlor. Measurements

### 3. Comments on budget:

2 responses

Dollar amounts are reasonable. As this also benefits the Bay Nutrient Management Strategy, the Bay NMS should contribute proportionally.

*RESPONSE: See response below.*

The task scopes and budgets are such that they could be implemented independently and still achieve useful information is one or more tasks were not completed or attempted.

### 6. Comments on priority:

1 response

It seems that having systems calibrated would be a high priority in getting usable data for decision making.

### 8. Comments on coordination:

4 responses

The project already relies on significant in-kind contributions from USBR and DWR. I don't see other opportunities to coordinate.

this seems to outline good coordination It is already coordinated!

The study already involved coordination with all the major chlorophyll monitoring groups so that further coordination is not applicable.

### Overall comments:

5 responses

The proposal and scope of work should include maps and/or list of sensors included in the project. Fig 2 legend stating "graphic does not show all stations where chlorophyll fluorescence is monitored" is not helpful. I'd like a commitment of ~40% funding from the Bay NMS.

*RESPONSE: Figures 1 and 2 have been combined to show all the stations on one map.*

*In terms of NMS funding, the wording in the proposal reflects all that we can safely say at this point:*

*"In FY17/18, the Nutrient Management Strategy for San Francisco Bay contributed \$15,000 to Phase I of this effort. This program will likely be willing to contribute a similar amount in FY18/19 but the amount and the type of tasks it will choose to fund are not yet known. The Steering Committee will decide on budgets for FY18/19 in June."*

*RB5 and other Delta RMP stakeholders can advocate for NMS funding through the NMS Steering Committee.*

Although this project will not directly assess the influence of nutrients on chl-a concentrations, it should increase the accuracy, precision, comparability, and reliability of chl-a measurements among multiple organizations, monitoring locations throughout the Bay-Delta system, which will aid many future projects investigating potential interactions between nutrients and chl-a concentrations.

I would like to reiterate that satellite data could be a useful add to this analysis and could inform management decisions in shorter term than sensor data.

*RESPONSE: The planning group discussed that issue and agreed that we needed to get coordinated with the in-situ measurements first before we added the complication of remote sensing. Maybe it can added for Phase III.*

The study will provide very useful and germane information to improve data comparability of existing monitoring efforts; and furthermore will initiate increased coordination, collaboration, and sharing by monitoring groups. This increased collaboration will perhaps in turn encourage a long-term culture shift benefitting future monitoring efforts.

Questions don't fit well for this intercalibration exercise.

#3: Mercury Monitoring							
	1	2	3	4	5	Average Score	
<b>A. Study Plan Responsiveness</b>							
1. Does the study proposal identify the management question addressed?	-	-	-	2	5	4.7	
2. Are the Data Quality Objectives (DQOs; EPA 2006) clearly defined?	-	-	1	1	5	4.6	
3. Does the study provide testable hypotheses (written as assessment questions or otherwise)?	-	-	1	4	2	4.1	
4. Does the proposal demonstrate how the results will be presented?	-	-	-	1	6	4.9	
5. Does the proposal adequately demonstrate how the results will be interpreted?	-	-	1	3	3	4.3	
6. Does does the proposal contribute to a larger body of data that can be used to answer Management Questions in the future?	-	-	-	-	7	5.0	
7. Does the proposed study plan include an estimated budget that is responsive to Steering Committee guidance?	-	-	2	3	1	3.8	
<b>B. Technical Foundation</b>							
1. Geographic scope. Does the location selection support the study objectives?	-	-	-	-	7	5.0	
2. Geographic scope. Does the study adequately characterize an area relevant to the Delta RMP?	-	-	-	2	5	4.7	
3. Comments on the geographic scope:	-	-	1	3	3	4.3	
4. Temporal resolution. Is the temporal scope and resolution of the study justified based on available data?	-	-	1	4	2	4.1	
5. Temporal resolution. Does the study clearly define the conditions of interest (e.g. high flows)?	-	-	-	5	2	4.3	
7. Comments on temporal scope:	-	1	-	3	1	3.8	
8.5. Comments on sample collection:	-	-	-	3	3	4.5	
11. Comments on monitoring tools:	-	-	-	5	2	4.3	

<b>#3: Mercury Monitoring</b>							
12. Interpretation. Are study condition controls adequately considered given the study timeframe, data collection frequency, and proposed interpretation to answer study hypotheses reliably?	-	1	2	3	1	3.6	
13. Interpretation. Does the study have statistical power sufficient to answer study hypotheses reliably during the study timeframe?	-	-	-	6	1	4.1	
14. Interpretation. Is the basis for outcome assessments technically supported?	-	-	-	1	6	4.9	
15. Interpretation. Does the proposed study create new information to evaluate beneficial use attainment?	-	-	-	2	4	4.7	
<b>C. Budget, Priority, and Coordination Considerations</b>	-	-	-	-	-		
1. Budget. Is the proposed budget scalable in size?	-	-	3	3	1	3.7	
4. Priority. Is there urgency to conducting the monitoring, such as to inform planned policies or regulations?	-	-	-	3	4	4.6	
5. Priority. Does the study timeframe allow it to inform time-sensitive decisions?	-	1	-	4	2	4.0	
7. Coordination. Can the monitoring be coordinated with other efforts to increase they study's power or to reduce overall cost or duration?	-	-	3	1	3	4.0	

# Delta RMP Monitoring Proposal Questionnaire #3 MERCURY

7 responses

## 8. Comments on the overall study plan responsiveness:

3 responses

The proposal budget is \$80K over the SC guidance amount of \$250K. However, the Mercury subcommittee has planned two monitoring reduction options that will bring the proposal cost to the SC's recommended amount and will have minimal impact on the study design. The more robust Mercury monitoring design was proposed with the hope that there will be excess program funding available for FY 2018-19 that could supplement the additional \$80K. If not, then the additional monitoring and cost could be written as a SEP project.

This proposal seems to meet needs of DRMP, although I not fully understand some of the background associated with this proposal Was the new linkage analysis assessment question approved by Steering Committee? How do other important parameters affect the analyses of mercury in fish?

## 7. Comments on temporal scope:

1 response

Ultimately, the Delta RMP will need long-term monitoring to answer the management questions, but this data will supplement the current data and provide useful information.

## 11. Comments on monitoring tools:

3 responses

not completely sure what "analytical tools" this is referring to

It would be useful to pool this data with other data that is collected to further our understanding and interpret the data.

Expects DWR model to be working and available

## 17. Comments on interpretation:

2 responses

I don't think that the study fully answers the primary management questions, but it supplements current data and helps us understand the ambient condition so it is very useful.

The TMDL could be revised substantially after 2020, but fish tissue Hg levels will be a concern regardless.

### 3. Comments on budget:

2 responses

Although the proposal does not identify the specifics of the modular monitoring options, the subcommittee discussed and agreed on a couple. The options could be one or more of the following: reducing the frequency of water sampling from every 4 weeks to every 6 weeks or every 8 weeks, reducing two winter water sampling events.

Budget does not seem to be scalable, but I may be missing something.

*Response by ASC: This proposal was scaled up in response to requests from staff at the Central Valley Regional Water Quality Control Board, in an effort to help update of the Central Valley Mercury TMDL. While we always conceived of this design as scalable, we wished to keep the proposal simple rather than presenting too many options. We have added more information to the proposal to reflect different budget levels. We can scale down the proposal by reducing the number of water sampling events. In brief, At the \$323K level would have 10 sampling events for water, for \$300K we would have 9 events for water, and for \$277K we would have 8 events for water.*

### 6. Comments on priority:

0 responses

### 8. Comments on coordination:

2 responses

This proposal leverages almost \$72,000 in in-kind from MLML over the next 3 fiscal years.

Get some related information from USGS flux stations.

## Overall Comments

Jay Davis has been very responsive in accommodating recommendations from RB5 staff in the development of this proposal. We feel that it will provide valuable information for the implementation and revision of the Methylmercury TMDL in the near future.

I support this monitoring design.

# Meeting Materials for Item 9



DATE: July 19, 2017

TO: Delta RMP Steering Committee

FROM: Matt Heberger, Program Manager

RE: Proposed process and timeline for setting Delta RMP fees

### **Purpose**

For its first three years, the Delta RMP has been able to grow despite flat fees and inflation because new participants have joined. However, fewer new participants will join over time. The effect of inflation on the RMP's budget is equivalent to a loss of \$14,000 each year in purchasing power (assuming 2% inflation). At some point, the Program will need to increase fees to maintain the purchasing power of its core funding. At its January 26, 2017 meeting, the Steering Committee requested ASC to prepare a memo outlining options for setting fees and pros/cons of different approaches. The purpose of this memo is to present these options. In preparing these options, we have drawn upon the experiences and lessons learned from the Bay RMP in setting fees.

### **Lessons Learned from the Bay RMP for Setting Fees**

#### **Have a Schedule to Set Fees 2-Years in Advance**

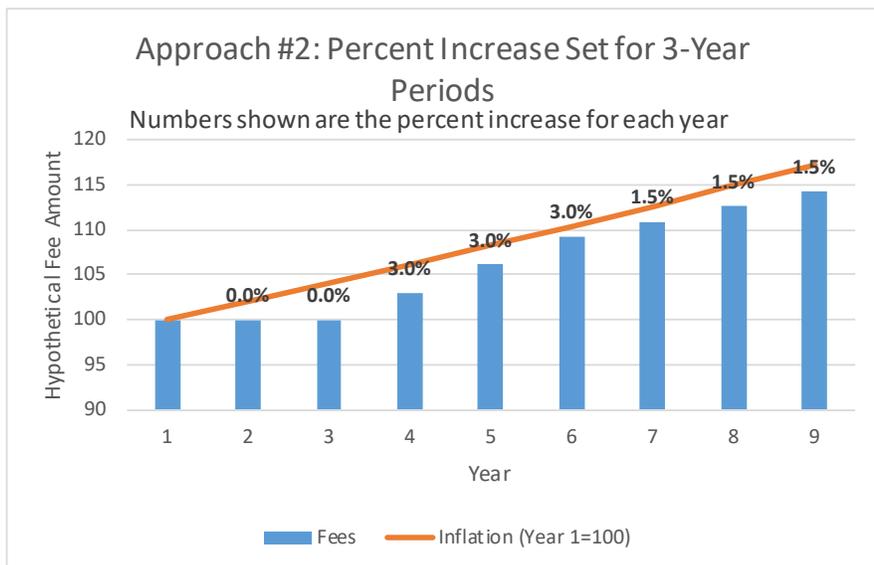
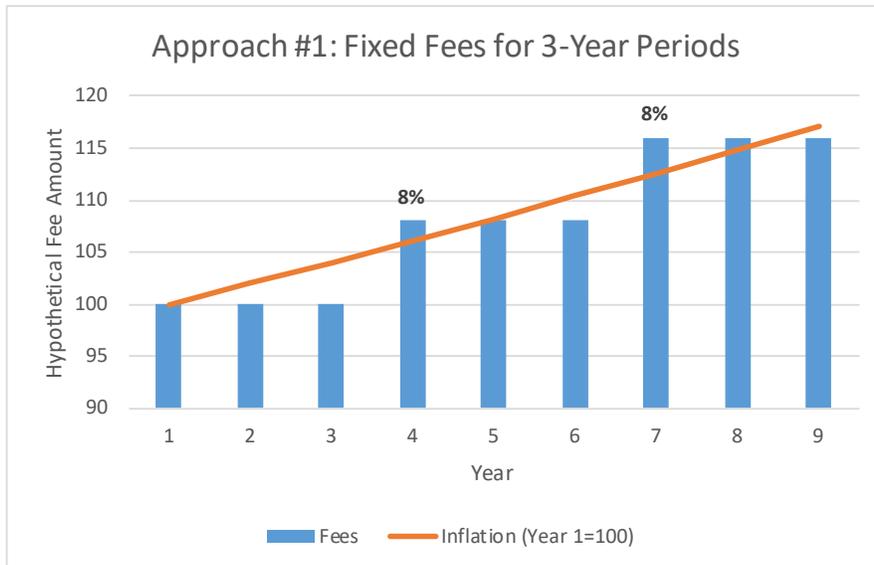
It is important to have an annual calendar that sets the time to discuss fees and to provide enough lead time for participants to consult with their boards and to incorporate fee increases into budgets. The schedule that has worked well for the Bay RMP is as follows:

- Mid-year meeting: Nonbinding discussion of fees for the year after next
- End-of-year meeting: Decision on fees for the year after next

This schedule gives participants at least 3 months to discuss proposed fees with their constituents before voting and 18 months to incorporate fee increases into their budgets.

### Set Fees for 3-Year Periods

It has also worked well for the Bay RMP to set fees for three years at a time. The fees can be held constant for the 3-year period or a percent increase per year can be assigned. Both of these approaches have downsides. The first approach requires large step increases every 3 years to account for accumulated inflation. The second approach requires staff to estimate the inflation rate multiple years in the future.



Setting fees every three years does not obviate the need to have a discussion of fees annually. Rather, if a decision on fees is not needed that year, the agenda item serves a reminder that the decision is coming up in the future and to get ready. It is also an opportunity to remind Steering Committee members of the previous agreement and the expected fees for the year after next.

### **Have a Multi-Year Plan to Achieve Program Objectives**

Some members of the Delta RMP Steering Committee were interested in linking the fee amounts to the expected cost to implement monitoring and special studies needed to answer the management questions. In reality, the funding needed to fully answer all of these questions will always exceed the available fees. A better approach is to develop a multi-year plan for how the questions will be answered over time to inform the management decision. This plan will highlight opportunities to sequence projects to keep costs steady. It will also show times when additional funding will be needed either from reserves, grants, or other sources.

## Proposed Schedule for Delta RMP Fee Decisions

The table below outlines the schedule for fee decisions if the Delta RMP decides to follow a similar schedule as the Bay RMP.

<b>Meeting Date</b>	<b>Decision</b>
January 2018 SC Meeting	Nonbinding discussion of fees for the 3-year period FY20/21, FY21/22, and FY22/23
April 2018 SC Meeting	Decision on fees for the 3-year period FY20/21, FY21/22, and FY22/23
Meetings in 2019 and 2020	Confirm previous fee decisions.  Advance warning of upcoming decision on FY23/24-FY25/26 fees.
January 2021 SC Meeting	Nonbinding discussion of fees for the 3-year period FY23/24, FY24/25, and FY25/26
April 2021 SC Meeting	Decision on fees for the 3-year period FY23/24, FY24/25, and FY25/26

It is already too late to follow this process for decisions about FY18/19 and FY19/20 fees. Therefore, the Steering Committee will need to follow an accelerated process for those budget years. One option for this accelerated process is listed below.

<b>Meeting Date</b>	<b>Decision</b>
October 2017 SC Meeting	Nonbinding discussion of fees for FY18/19 and FY19/20
January 2018 SC Meeting	Decision on fees for FY18/19 and FY19/20

# Meeting Materials for Item 11

# Delta RMP Deliverables Stoplight Report

## Delta RMP Deliverables Scorecard Report

### Key to Status Colors:

Green indicates greater than 90 days until the deliverable is due.

Yellow indicates a deliverable due within 90 days.

Red indicates a deliverable that is overdue.

Project	Primary	Deliverable	Assigned To	Due Date	Status	Comments
1 Delta RMP (FY15/16)	Pathogens Study - Year 2	Sample Collection and Data Management of Year 2 Pathogens Data	Amy Franz	07/31/17	Complete	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. Expected to be complete by June 15, 2017.
2 Delta RMP (FY15/16)	Pathogens Study - Year 2	Quality Assurance Report on Year 2 Pathogens Data	Don Yee	07/31/17	Complete	QAO report. Funded from Data Management budget.
3 Delta RMP (FY16/17)	Governance	Steering Committee Meeting #4 and Summary	Matthew Heberger	05/05/17	Complete	
4 Delta RMP (FY16/17)	Governance	TAC Meeting #4 and Summary	Matthew Heberger	06/14/17	Complete	
5 Delta RMP (FY16/17)	Quality Assurance	QAPP Update	Thomas Jabusch	06/14/17		As of April 2018, we have finalized the QAPP and are collecting signatures.
6 Delta RMP (FY16/17)	Communications	Preparation of a Factsheet	Thomas Jabusch	06/30/17	Complete	The draft factsheet was discussed at SC meetings in Jan and May 2017. The final draft is out for comments now and will be presented for approval at the Jul 28 meeting.
7 Delta RMP (FY16/17)	Communications	Technical Workshop / summary memorandum of findings	Philip Trowbridge	06/30/17	Complete	SC decided not to hold a technical workshop in FY16/17.
8 Delta RMP (FY16/17)	CUP Monitoring	6. Field Sampling Report for FY16/17 CUP Monitoring	Philip Trowbridge	09/29/17	Complete	The Steering Committee decided at its July 28, 2017 meeting that this report was not necessary and should be cancelled.
9 Delta RMP (FY16/17)	CUP Monitoring	6. Data Management of FY16/17 CUP Data	Amy Franz	12/31/17	Complete	Electronic data delivered by USGS in October 2017. ASC staff have finalized provisional data upload but data will not be made public until reviewed by TAC and approved by SC.
10 Delta RMP (FY16/17)	CUP Monitoring	6. Quality Assurance Report for FY16/17 CUP Monitoring	Don Yee	12/31/17		As of May 1, 2018 this is still in progress. We are following up with the labs on some missing records and typos in the data and need to redo some of the QA checks after we receive the revised data.
11 Delta RMP (FY16/17)	Mercury	8. Mercury YR1 report summarizing fish and water analyses	Matthew Heberger	12/31/17		Draft report distributed to Mercury Subcommittee in December 2017, recommended by the TAC for publication on March 15, 2018, and will be presented to the SC for approval on May 11, 2018.
12 Delta RMP (FY16/17)	Nutrients Synthesis	7A1.3 Status and Trends Synthesis Report - Prepare synthesis report	Thomas Jabusch	01/31/18	Complete	Draft report has been distributed to the Nutrients Subcommittee and the TAC. We will be requesting approval from SC to publish at Jan 2018 meeting.
13 Delta RMP (FY16/17)	Nutrients Synthesis	7B2.5 Modeling Synthesis Report - Prepare technical report.	Thomas Jabusch	01/31/18	Complete	Draft report has been distributed to the Nutrients Subcommittee and the TAC. We will be requesting approval from SC to publish at Jan 2018 meeting.

Delta RMP Steering Committee Agenda Package 2018-05-11, page 200

Project	Primary	Deliverable	Assigned To	Due Date	Status	Comments	
14	Delta RMP (FY16/17)	Nutrients Synthesis	7C3.1 Nutrients- Advanced Statistical Modeling	Thomas Jabusch	01/31/18		Marcus Beck of SCCWRP (formerly USEPA) is preparing this manuscript in-kind. Funding allocated is for ASC review of the manuscript. The manuscript was submitted to ES&T in May 2017, but it was rejected. The manuscript has been revised and resubmitted to ECSS. The submitted manuscript was shared with the Nutrients Subcommittee.
15	Delta RMP (FY16/17)	CUP Monitoring	6. Permit Compliance Data for ILRP	Amy Franz	02/01/18	Complete	Not necessary in FY18, per agreement with ag coalitions
16	Delta RMP (FY16/17)	CUP Monitoring	6. Annual Monitoring Report for FY16/17 CUP Monitoring	Thomas Jabusch	02/28/18	Complete	The SC voted on 7/28 that this was no longer necessary, and that funds for this task should be reallocated to the Interpretive Report.
17	Delta RMP (FY17/18)	Contract and Financial Management	Quarterly Financial Update #1	Matthew Heberger	07/15/17	Complete	
18	Delta RMP (FY17/18)	SC Meetings	Steering Committee Meeting #1 and Summary	Matthew Heberger	08/11/17	Complete	
19	Delta RMP (FY17/18)	Continued Nutrient Data Analysis and Biennial Reporting	Design additional statistical analyses to be completed in FY17/18	Philip Trowbridge	09/30/17	Complete	
20	Delta RMP (FY17/18)	TAC Meetings	TAC Meeting #1 and Summary	Matthew Heberger	10/06/17	Complete	
21	Delta RMP (FY17/18)	Contract and Financial Management	Quarterly Financial Update #2	Matthew Heberger	10/10/17	Complete	
22	Delta RMP (FY17/18)	SC Meetings	Steering Committee Meeting #2 and Summary	Matthew Heberger	10/31/17	Complete	
23	Delta RMP (FY17/18)	TAC Meetings	TAC Meeting #2 and Summary	Matthew Heberger	11/07/17	Complete	
24	Delta RMP (FY17/18)	Technical Reports	RFP for Pesticides/Toxicity Interpretive Report	Matthew Heberger	11/15/17	Complete	RFP issued in in spring 2018, proposals due March 16.
25	Delta RMP (FY17/18)	Science Advisors	Recruit 2-4 science advisors	Matthew Heberger	12/31/17		CVs have been collected and candidates screened based on qualifications and willingness to volunteer. For discussion by the TAC in spring 2018 then approval by SC.
26	Delta RMP (FY17/18)	Continued Nutrient Data Analysis and Biennial Reporting	Complete additional statistical analyses and prepare technical report	Philip Trowbridge	12/31/17	Complete	\$27,000 of funds are available for this task.
27	Delta RMP (FY17/18)	Contract and Financial Management	Quarterly Financial Update #3	Matthew Heberger	01/09/18	Complete	
28	Delta RMP (FY17/18)	SC Meetings	Steering Committee Meeting #3 and Summary	Matthew Heberger	01/31/18	Complete	
29	Delta RMP (FY17/18)	TAC Meetings	TAC Meeting #3 and Summary	Matthew Heberger	04/15/18	Complete	

# Delta RMP Action Items Stoplight Report

## Key to Status Colors:

Green indicates greater than 90 days until the deliverable is due.

Yellow indicates a deliverable is due within 90 days.

Red indicates a deliverable that is overdue.

	Primary	Meeting Date	Deliverable	Assigned To	Due Date	Status	Comments
1	TAC Action Items 4/23/2018	04/23/18	Correct attendance roster for past TAC meeting to add Steve Louie.	Matthew Heberger	04/30/18	Complete	
2	TAC Action Items 4/23/2018	04/23/18	Request our consulting statistician to pass on pertinent files to contractor for pesticides interpretive report.	Matthew Heberger	04/30/18	Complete	
3	TAC Action Items 4/23/2018	04/23/18	Move recommendation for the contractor forward to the steering committee.	Matthew Heberger	05/05/18	Complete	
4	TAC Action Items 4/23/2018	04/23/18	Add "n/a" as a response option on future decision grid questionnaire surveys	Matthew Heberger	05/15/18		
5	TAC Action Items 4/23/2018	04/23/18	Follow up with SFEI staff to find out if we are calculating mercury loading at Mallard Island.	Matthew Heberger	04/30/18	Complete	
6	TAC Action Items 4/23/2018	04/23/18	Add a cover sheet to the monitoring proposals which shows the rankings and summarizes the process (explains how the numbers were derived/what they mean)	Matthew Heberger	05/05/18	Complete	Drafted a 5-page memo which describes this year's proposal development, selection, and ranking process. Includes passages from the Decision Grid materials developed last year by a stakeholder-led working group.
7	TAC Action Items 4/23/2018	04/23/18	Schedule a meeting for mercury subcommittee to develop a more detailed plan about when to sample high flows/storms etc.	Jay Davis	05/30/18		
8	TAC Action Items 4/23/2018	04/23/18	Provide additional detail on what a scaled down Mercury proposal might look like (if only spending 250k)	Jay Davis	04/30/18	Complete	
9	TAC Action Items 4/23/2018	04/23/18	Pesticides project planning. Evaluate the costs of running fathead minnow, rainbow trout, and Chironomus. And confirm with AHPL and USGS on feasibility of running tests on both test species and collecting the large volumes of sample water required.		05/15/18	Complete	Have confirmed with Jim Orlando and Marie Stillway that it is NOT feasible to run both fish species at once. Physical limitations based on the water volumes required, bench space, refrigeration, power load.
10	TAC Action Items 4/23/2019	04/23/18	Extend deadline for submission of comments on the AHPL Toxicity Report beyond May 10th.		04/30/18	Complete	
11	TAC Action Items 4/23/2020	04/23/18	Schedule a meeting of an ad hoc toxicity working group to discuss issue regarding the toxicity data interpretation (high variability, low EC samples). Work with Cam and Debra to figure out materials for meeting.		05/15/18		
12	TAC Action Items 4/23/2021	04/23/18	Provide update on status of selection of science advisors at next TAC mtg.		06/01/18		
13	TAC Action Items from 3/15/2018	03/15/18	Set April 23, 2018 and September 21, 2018 meeting locations and announce to TAC	Matthew Heberger	04/15/18	Complete	
14	TAC Action Items from 3/15/2019	03/15/18	Revise the December 12, 2017 TAC Summary to clarify the edit which was made to the Current Use Pesticides Data Report.	Matthew Heberger	04/15/18	Complete	
15	TAC Action Items from 3/15/2020	03/15/18	Revise the decision grid survey as appropriate for ranking monitoring proposals and forward a link for completing the surveys to TAC members for each proposal to be rated.	Matthew Heberger	03/21/18	Complete	
16	TAC Action Items from 3/15/2021	03/15/18	Develop the modified versions of the proposed pesticides monitoring designs and have them ready for review by the Pesticides Subcommittee	Matthew Heberger	03/21/18	Complete	

## Delta RMP Steering Committee Agenda Package 2018-05-11, page 202

	Primary	Meeting Date	Deliverable	Assigned To	Due Date	Status	Comments
17	TAC Action Items from 3/15/2022	03/15/18	Set the next Pesticide Subcommittee meeting date based on the Doodle Poll, closing March 16, 2018, and notify committee members of the meeting date.	Matthew Heberger	03/21/18	Complete	
18	TAC Action Items from 3/15/2022	03/15/18	Reconfirm their interest and availability of our science advisor nominees, and determine whether an honorarium can be paid to each; federal employees are typically not eligible to receive honoraria	Matthew Heberger	04/30/18	Complete	Emails sent the first week of May, awaiting confirmation from some.
19	TAC Action Items from 3/15/2022	03/15/18	Look into revising the Draft Mercury Data Report to use Liberty Island (instead of Prospect Slough) data for reporting conditions at Cache Slough.	Jay Davis	04/30/18	Complete	Changes to the report were made by the Principal Investigators, Jay Davis at SFEI and Wes Heim at the Moss Landing Marine Laboratory. The changes only affect the historic data shown in Figure 4 of the report.
20	SC Action Items 3/2/2018	03/02/18					
21	SC Action Items 3/2/2019	03/02/18	Finalize the October 24, 2017 Joint Meeting Summary and post to the website.	Matthew Heberger	03/31/18	Complete	
22	SC Action Items 3/2/2020	03/02/18	Schedule additional 1 to 1.5 hr. Steering Committee conference call as needed to cover agenda items that we did not have time to cover at the March SC meeting	Matthew Heberger	04/30/18	Complete	
23	SC Action Items 3/2/2021	03/02/18	Form a data management subcommittee	Matthew Heberger	04/30/18	Complete	
24	SC Action Items 3/2/2022	03/02/18	Adam Laputz, Greg Gearheart, Sam Safi, and Debbie Webster will meet and compile feedback from committee members on the draft Delta Science Plan and forward to Yumiko Henneberry.	Adam Laputz	04/30/18	Complete	Email reminder sent on 4/27. From Sam Safi: "Regional San staff attended the April 6 Delta Science Plan amendment workshop. Our overall feedback at the workshop was that Delta Science Program should collaborate with Regional Board and Delta RMP. There will be a public comment period when the draft plan along with public feedback released in summer 2018. So I believe the opportunity is still there."
25	SC Action Items 3/2/2022	03/02/18	Update the Monitoring Design to include recommended changes to the Nutrients Assessment Questions approved by the Steering Committee	Matthew Heberger	05/30/18		
26	SC Action Items 3/2/2022	03/02/18	The SC requested that ASC and the Finance Subcommittee begin considering options for the upcoming fiscal year's work plan that are in line with possible funding scenarios	Matthew Heberger	04/30/18	Complete	This is a regular part of our revenue forecasting and budgeting process.
27	SC Action Items 3/2/2022	03/02/18	The Finance Subcommittee was asked to develop some "out of the box" options for addressing the need to maintain purchasing power but the unwillingness of participants to vote for a fee increase at their next meeting	Finance Subcommittee		Complete	Discussed the week of April 23, 2018.
28	SC Action Items 3/2/2022	03/02/18	Schedule a conference call for committee discussion of the fee increase issue	Matthew Heberger	04/30/18	Complete	To discuss during the next regularly scheduled Finance Subcommittee meeting.
29	SC Action Items 2/5/18	02/05/18	Circulate the revised RFP document to SC members and asked them to share it widely with their professional networks.	Matthew Heberger	02/28/18	Complete	
30	TAC Action Items from 12/12/2017	12/12/17	Data Assessment Framework Workshop: Greg Gearheart will have OIMA staff draft a white paper. The ad hoc workgroup will hold a conference call in mid-January and the item will be included in the January 23, 2018 Steering Committee agenda, with a workshop tentatively planned for February.	Greg Gearheart	01/23/18		Update: Some initial planning had been done, but OIMA has informed us that they are no longer willing to pay for this workshop. To be discussed by the SC to determine whether this is still a priority, and whether they wish to allocate funding to cover it.
31	TAC Action Items from 12/12/2017	12/12/17	Schedule a Pesticides Subcommittee meeting in the first half of January	Matthew Heberger	12/15/17	Complete	
32	TAC Action Items from 12/12/2017	12/12/17	Edit the proposed changes to Delta RMP Assessment Questions for Nutrients memo as described above	Philip Trowbridge	12/31/17	Complete	
33	TAC Action Items from 12/12/2017	12/12/17	Re: Science Advisors, Screen CVs based on the above criteria and bring results back to the March 15, 2018 TAC Meeting; (2) draft the job description, including \$2K/year stipend, one in-person meeting (with expenses paid), review reports, and provide guidance on monitoring designs.	Matthew Heberger	02/15/18	Complete	

Delta RMP Steering Committee Agenda Package 2018-05-11, page 203

	Primary	Meeting Date	Deliverable	Assigned To	Due Date	Status	Comments
34	TAC Action Items from 12/12/2017	12/12/17	Summarize the Technical Advisory Committee's understanding of the use of Reporting Limits and Method Detection Limits for inclusion in the Reporting Section of the QAPP	Matthew Heberger	07/31/18		To be done for the FY18/19 QAPP
35	SC Action Items 10/24/2017	10/24/17	Finalize the 7/28/17 Meeting Summary and post to the	Matthew Heberger	11/30/17	Complete	
36	SC Action Items 10/24/2017	10/24/17	Email the Science Advisor Form to Steering Committee members, as well as a reminder to TAC members to continue to submit additional nominations by the end of the year	Matthew Heberger	11/30/17	Complete	
37	SC Action Items 10/24/2017	10/24/17	Forward the Delta Science Plan questionnaire to Steering Committee members in advance of the January 23, 2018 meeting	Matthew Heberger	01/15/18	Complete	Included in agenda package.
38	SC Action Items 10/24/2017	10/24/17	Tom Grovhaug will work with Linda Dorn and Greg Gearheart to fund and host a half-day workshop to further develop the Assessment Framework.	Tom Grovhaug	02/28/18		Initial planning meetings have taken place. Coordinating Committee directed ASC to help facilitate and to budget up to \$5K for this task. Subsequently, State Board staff backed off their commitment to fund this workshop and asked that if it continues to be an SC priority, that they should fund it.
39	SC Action Items 10/24/2017	10/24/17	Revised grid and trial run results will be reviewed at the December TAC meeting	Brian Lauerson	12/12/17	Complete	
40	SC Action Items 10/24/2017	10/24/17	Decision grid results should be presented to the SC in its January 2018 meeting	Brian Lauerson	01/23/17	Complete	Pre-proposal for CECs is on the agenda.
41	SC Action Items 10/24/2017	10/24/17	Greg Gearheart and Adam Laputz will work on the clarifying language on Conflict of Interest for inclusion in the Charter, consulting State Board legal counsel as needed.	Adam Laputz	12/31/17		Email reminder sent March 2018.
42	SC Action Items 10/24/2017	10/24/17	A workgroup will be formed to support Greg's staff to draft data visualization products for TAC and SC review	Matthew Heberger	12/31/17	Complete	Team participants include: Selina Cole, Melissa Turner, Vyomini Upadhyay, Stephen McCord, and Matthew Heberger.
43	TAC Action Items from 9/21/2017	09/21/17	Prepare draft summary for 9/21 TAC meeting and distribute to TAC members for comments	Matthew Heberger	10/07/17	Complete	
44	TAC Action Items from 9/21/2017	09/21/17	Set 3/15/18 meeting location and announce to TAC	Matthew Heberger	10/15/17	Complete	
45	TAC Action Items from 9/21/2017	09/21/17	Add a presentation on USGS high frequency monitoring to 12/12/17 TAC Agenda	Matthew Heberger	11/15/17	Complete	
46	TAC Action Items from 9/21/2017	09/21/17	Include a last updated time stamp on monitoring table data in future reports	Matthew Heberger	11/15/17	Complete	
47	TAC Action Items from 9/21/2017	09/21/17	Revise the Year 1 CUP data report incorporating TAC comments and distribute final draft to TAC members for approval	Matthew Heberger	10/15/17	Complete	September discussion was tabled pending further review. To be discussed by TAC on 12/12/2017.
48	TAC Action Items from 9/21/2017	09/21/17	Decision Grid Small Group: Revise the grid per discussion and conduct trial run and provide feedback on the process	Brian Lauerson	10/13/17	Complete	
49	TAC Action Items from 9/21/2017	09/21/17	Design an online form for collecting potential science advisors	Matthew Heberger	10/15/17	Complete	
50	TAC Action Items from 9/21/2017	09/21/17	Send comments or suggested edits to the draft Nutrients Synthesis reports to ASC	TAC members	10/05/17	Complete	
51	SC Action Items 7/28/2017	07/28/17	Finalize the 5/3/2017 SC Meeting Summary and post to the program website	Matthew Heberger	08/10/17	Complete	
52	SC Action Items 7/28/2017	07/28/17	Check on how TAC meetings are staffed and determine whether ASC hours are warranted	Matthew Heberger	10/01/17	Complete	We will be bringing fewer ASC staff to meetings going forward. For example, only when necessary to present on a special topic. Having a note-taker
53	SC Action Items 7/28/2017	07/28/17	Revise the charter to require Finance Committee approval for switching money between tasks. Up to \$5,000 at discretion of the Implementing Entity, more than \$5,000 shall require FC approval, and more than \$25,000 shall require approval by the Steering Committee.	Matthew Heberger	10/01/17	Complete	Draft charter language to be voted on in October

## Delta RMP Steering Committee Agenda Package 2018-05-11, page 204

	Primary	Meeting Date	Deliverable	Assigned To	Due Date	Status	Comments
54	SC Action Items 7/28/2017	07/28/17	OIMA staff to prepare a visualization of Delta RMP pesticides/toxicity data using Tableau, to include various water quality standards, benchmarks and thresholds for aquatic toxicity...	Greg Gearhart	10/24/17	Complete	Greg will present the data viz at the 10/24/2017 SC meeting.
55	SC Action Items 7/28/2017	07/28/17	For the Decision Grid for ranking monitoring proposals, consider (1) assigning points, (2) assigning weights, and (3) adding something related to statistical expertise in the experimental design.	Matthew Heberger	09/21/17	Complete	Two Workgroup meetings have been held. To be discussed at the 9/21 TAC meeting.
56	SC Action Items 7/28/2017	07/28/17	Provide comments on the Year 1 Pesticides Data Report by end of August. Any suggestions that are interpretive in nature will NOT be included in this report, but rather forwarded to the authors of the forthcoming Interpretive Report.	Steering Committee	08/31/17	Complete	
57	SC Action Items 7/28/2017	07/28/17	Put together SEP proposal for CEC monitoring	Matthew Heberger	11/30/17	Complete	ASC has provided expert review of the draft monitoring plan jointly developed by the Central Valley Regional Water Quality Control Board and the POTW and MS4 communities.
58	TAC Action Items from 6/13/2017	06/13/17	Draft and distribute for review "Highlights" with the most important outcomes (action items, recommendations, etc.) of the meeting that would be presented to the Steering Committee.	Stephen McCord	06/30/17	Complete	
59	TAC Action Items from 6/13/2018	06/13/17	Set 12/12/17 meeting location and announce to TAC	Matthew Heberger	07/14/17	Complete	
60	TAC Action Items from 6/13/2019	06/13/17	Review the revised pesticides data report and submit any final comments by June 30 to Thomas Jabusch (ASC). Email the TAC (delta-rmp-tac@sfei.org) if you have major concerns that would prevent recommending to the Steering Committee that the report be approved	TAC members	06/30/17	Complete	
61	TAC Action Items from 6/13/2020	06/13/17	Send out the next version of the FY15/16 Pesticides Data Report when any remaining comments and edits are incorporated, including both "clean" and "tracked changes" versions	Thomas Jabusch	07/10/17	Complete	
62	TAC Action Items from 6/13/2021	06/13/17	Convene a meeting of the Pesticides Subcommittee for the week of July 12	Matthew Heberger	07/07/17	Complete	
63	TAC Action Items from 6/13/2021	06/13/17	Develop a "strawman" set of options for the report, including staffing and cost	Matthew Heberger	07/07/17	Complete	
64	TAC Action Items from 6/13/2021	06/13/17	Work with the permittees subgroup to further develop the evaluation criteria, and distribute it to TAC members for comments/editing	Brian Lauerson	06/25/17	Complete	
65	TAC Action Items from 6/13/2021	06/13/17	Pesticides Subcommittee: Discuss the draft evaluation criteria	Matthew Heberger	07/12/17	Complete	
66	TAC Action Items from 6/13/2021	06/13/17	With Brian Laurenson (LWA), compile optional processes for the TAC to make consensus decisions	Matthew Heberger	08/31/17	Complete	
67	SC Action Items 5/3/2017	05/03/17	Finalize the 1/26/2017 SC Meeting Summary and post to the program website	Matthew Heberger	05/11/17	Complete	
68	SC Action Items 5/3/2017	05/03/17	Determine the date and location for the Fall 2017 Steering Committee meeting and send invitation to the SC	Matthew Heberger	05/25/17	Complete	Set for Oct 24
69	SC Action Items 5/3/2017	05/03/17	Update the Financial Memo with minor edits	Matthew Heberger	05/11/17	Complete	
70	SC Action Items 5/3/2017	05/03/17	Send out revised draft Fact Sheet to the SC to review with deadline for comments	Matthew Heberger	05/11/17	Complete	
71	SC Action Items 5/3/2017	05/03/17	Finalize minor portions of the FY17/18 Workplan that require changes in response to input received at the meeting and the decision of the Steering Committee	Matthew Heberger	05/15/17	Complete	Pesticides question still outstanding.
72	SC Action Items 5/3/2017	05/03/17	Present the SC with information from the TAC related to the pesticides proposals: TAC meeting summary, pros/cons of the two approaches, slides showing how data from the proposed approaches would be interpreted to answer management questions, and how the costs of the Delta RMP might change with external funding for certain aspects of the projects	Matthew Heberger	07/21/17	Complete	The TAC requested additional guidance on how to evaluate competing proposals, and has begun a process for developing this, with the approval of SC co-chairs.

Delta RMP Steering Committee Agenda Package 2018-05-11, page 205

	Primary	Meeting Date	Deliverable	Assigned To	Due Date	Status	Comments
73	SC Action Items 5/3/2017	05/03/17	Prepare a revised scope and budget for the CUP/Toxicity Year 1-2 Interpretative Report that includes synthesis of readily available information in the Delta, not just Delta RMP data	Matthew Heberger	07/21/17	Complete	
74	SC Action Items 5/3/2017	05/03/17	Regarding the Chlorophyll-a Intercalibration Study for FY17/18, provide Gregg Gearheart with the specifics about how partner agencies can participate	Thomas Jabusch	05/31/17	Complete	