

RMP Contaminant Fate Workgroup Meeting
January 15th, 2008
San Francisco Estuary Institute
Meeting Minutes
DRAFT

Attendees:

Shaun Ayers (UC Davis)	Mike Connor (SFEI)
Joel Baker (University of Washington)	Jay Davis (SFEI)
Barbara Baginska (RWQCB)	Ben Greenfield (SFEI)
Arleen Feng (ACPWA)	Letitia Grenier (SFEI)
Jim Hunt (UC Berkeley)	Katie Harrold (SFEI)
Richard Looker (RWQCB)	Michelle Lent (SFEI)
Rob Mason (UConn)	John Oram (SFEI)
Bill Mills (Tetra Tech)	Sarah Rothenberg (SFEI)
Trish Mulvey (SFEI Board)	Meg Sedlak (SFEI)
John Prall (Port of Oakland)	Don Yee (SFEI)
Sujoy Roy (Tetra Tech)	
Darrell Slotten (UC Davis)	
Chris Sommers (Stormwater Agencies (EOA))	

1. Introductions and Review of Agenda

Jay Davis convened the meeting at 10 am with a review the agenda and introducing the goals of the meeting. The highest priority item for the meeting was discussion of the mercury (Hg) proposals with a goal of selecting projects to recommend for funding. The second highest priority item was review of the multi-box PCB model. The third priority item was discussing of the CFWG Five-Year Plan, which will also be discussed at the next CFWG meeting.

2. Review of Previous Meeting Minutes

Jay Davis gave a brief overview of the minutes from the September 14, 2007 meeting. Highlights from the minutes include the Five-Year Plan, next steps for modeling efforts, the multi-box PCB model, and Hg strategy questions. Eight responses to the Hg RFP have been received. Don is continuing to work on the methyl-mercury (MeHg) mass budget. The workgroup was given the opportunity to comment on the minutes and suggest edits. No edits were deemed necessary.

3. Review of Reports on the Multi-box PCB Model of San Francisco Bay

John Oram presented the latest developments from the multi-box model. A copy of the presentation will be posted on the web. Two documents pertaining to the model, *A Forecast Model of Long-Term PCB Fate in San Francisco Bay* and *A Model of Long-Term PCB Fate in San Francisco Bay: Model Formulation, Calibration, and Uncertainty Analysis, Version 2.1* were distributed to the workgroup prior to the meeting. The workgroup review of these documents is of the utmost importance. To re-orient the workgroup the presentation started with an overview of the model.

Information gaps include:

- a lack of sediment cores, which affect the confidence in the predicted subsurface vertical profile
- attenuation/degradation rates
- estimate outflow of sediment and PCBs through the Golden Gate.

The USGS (Dan Hanes, Menlo Park Office) is planning a 2008 study across the Golden Gate to estimate sediment flux. Richard Looker questioned if this effort would be successful given that past attempts have not been.

Possible next steps for the PCB model include:

- determining if the South Bay is depositional, as recent information suggests (D. Schoellhamer, personal communication); if so, will need to modify model (this would not be an easy modification)
- developing a congener specific model
- focusing on smaller spatial scales (e.g. hotspots, sub-embayments)
- developing a 3-dimensional model
- applying multi-box model to other contaminants

Chris Sommers asked if switching the South Bay from erosional to depositional would have a significant effect. He asked if a theoretical exercise could be used prior to making significant changes to the model. He noted that Jaffe's work suggests that the regimes are cyclical. John Oram said that he could do a theoretical exercise, try a quick fix, or fix the model. John presented model estimates of sedimentation in South Bay to illustrate that current predictions show South Bay as only slightly erosional (approx. 0.2m over last 60 yrs).

Jay Davis asked the workgroup to consider the following questions while reviewing the PCB Model reports.

1. Is the work technically sound?
2. Is the work properly communicated?
3. Is the model useful to the Water Board and if not how could it be made more useful?
4. Would stakeholders be comfortable using the multibox model as a TMDL tool?

Barbara Baginska asked if the model could be used for the North Bay even if there are questions about the depositional/erosional regime of the South Bay. Richard Looker noted that little is known about the North Bay; the South Bay work was paid for by the South Bay Salt Pond work. So although model appears well-behaved in North Bay, little information exists for validation.

Arlene Feng noted that the model was developed for legacy pollutants. She suggested adding a note to the report that the model was developed for PCBs and indicate to what extent it can be applied to other pollutants.

ACTION ITEMS:

- Please provide written comments on Multi-box PCB Model report to John Oram by February 12, 2008. These comments and the responses will be included as an appendix to the report.
- Seeing that temperature is a sensitive model parameter, look into and add discussion of potential effects of climate change on water temperature.
- Add discussion of application of model in current form to other pollutants. Include whole spectrum of pollutants in discussion. Include whether or not the model could be used for North Bay in spite of South Bay erosion/deposition problem.

4. Review of Five-Year Workplan for the CFWG

Don Yee presented the CFWG Five-Year Workplan. He began with the management context for the workplan. The CFWG addresses linkages between sources and exposure and effects, which can include in Bay transport, partitioning, transformation, and removal processes as well as projecting the effects of load changes (due to management actions) on processes and ultimately exposure. The CFWG work to date has been driven by TMDL needs such as mass budget and conceptual models for priority pollutants. He asked the workgroup to consider the following questions while reviewing the workplan:

1. Are the priorities and questions appropriate?
2. Have we identified and prioritized the right workplan elements?
3. Are the budget allocations and timing appropriate? (gross evaluation)

The proposed priority ranking for different contaminants is high: PCBs and Hg; moderate: PBDEs, dioxins/furans, selenium, PAHs, current use pesticides, and pharmaceuticals; low: organochlorine pesticides and trace metals (Cu, Ni, Ag, As, Cd Cr, Pb, Zn).

PCBs are the most thoroughly investigated of the priority pollutants thus far. Don requested input from the workgroup on the relative importance of further improving our understanding of PCBs or switching the emphasis to other pollutants. Possible continued efforts could include full 2- or 3-dimensional models. However, model complexity could surpass the available input data. The sedimentation component of the PCB model could be revised. Additional studies, such as continued coring and export through the Golden Gate, will improve the understanding of both PCBs and other contaminants. These improvements could be incorporated into the existing multi-box model.

Chris Sommers asked how much it would cost to fix the model so that adjustments could be made to all segments, not just the South Bay. John Oram indicated that to make the model more robust and able to accept changes in sediment regimes would cost up to \$50,000 depending on how much re-coding is required and the desired degree of model robustness (i.e., how much will we want to 'tweak' sedimentation rates?).

Chris asked how the pending core data would be integrated into the model and how those plans fit into the Five-Year Plan. Jay Davis indicated that so long as the updates to the model were small they could be done through data integration. If the core data will result in large changes and costs additional funds may be required.

Chris suggested that the prioritization of pollutants should be done in conjunction with stakeholders.

Richard Looker indicated that Tom Mumley is interested in in-Bay sediment transport and PCB sediment degradation coefficients. Regarding sediment transport, the Board acknowledges this as a key information gap. The workplan should at the very least acknowledge this information gap and suggest possible studies and/or collaborations.

Jay Davis noted that Frank Gobas had previously suggested doing a long-term incubation simulating San Francisco Bay conditions to determine degradation rates. Jim Hunt noted that the half-life of PCBs is on the order of 10-50 years, making incubation studies unrealistic. Joel Baker noted that the model uses one congener and that it may be necessary to include multiple congeners in future work. Arleen Feng noted that other models and TMDLs use multiple congeners and that we do not have a

degradation rate for PCBs all together. Joel Baker said that degradation is usually a much smaller loss than burial or export because of slow degradation rates.

Jay Davis reviewed the proposed budget for the Five-Year Plan. He noted that the plan proposes high funding for Hg question number one (Where is mercury entering the food web?) through the Small Fish project over the first three years and then switching the priority to Hg question number two (Which sources, processes, and pathways contribute disproportionately to food web accumulation?) through the high leverage projects for the last two years. He also noted that the plans are flexible and will be reviewed annually. The workgroup suggested separating the budget by what is funded through the workgroup's pilot and special study budget, data integration, and other sources (e.g., EEPS).

ACTION ITEMS:

- Please provide written comments on CFWG Five-Year Plan to Don Yee by February 12, 2008.
- Meg Sedlak and Don Yee to follow up with Richard Looker and Tom Mumley about sediment transport.
- Add statement saying that we will update multi-box when coring data are available.
- Discuss strategy on improving information on degradation rates.
- Add note that the budget projections are suggestions that are subject to program-wide evaluation by TRC.
- Clearly state in plan that it will be reevaluated annually.
- Incorporate Schoellhamer's SSC work into this plan, describing its scope, how it helps answer RMP questions, and how it connects with other fate work. Include other potential collaborators or ongoing studies as appropriate.
- Next meeting's goals will include closure of Five-Year Plan.

5. Food Web Uptake Study

Ben Greenfield presented a proposal for the 2008 Small Fish Workplan. This project has joint oversight from both CFWG and Exposure and Effects Workgroup (EEWG). Jay Davis noted that both workgroups have expertise relevant to the study.

Ben began by outlining the conceptual model that the study is based on: fish that inhabit the near-shore bay margins are likely to have higher Hg concentrations because the edges have higher methylation rates, are closer to sources, and have less dilution than fish that largely inhabit Bay open water. The Small Fish project has sampled Mississippi silversides (MISI), topsmelt (TOSM), arrowhead gobies, and cheekspot gobies in 2005-2007. MISI are found more in the shallows than TOSM, which come into margins with the tide, but then leave. In both 2005 and 2006 differences were observed in the Hg concentrations of TOSM and MISI, with TOSM being lower as expected. (2007 data is not yet available for analysis.)

Ben presented regional trends of TOSM. In general the South Bay had higher concentrations than the North Bay. Some spots were much higher, but these may be hotspots. Topsmelt Hg concentrations may be correlated with sediment MeHg concentrations ($R^2=0.61$).

Rob Mason noted that a study of lakes in Canada found that smaller lakes had higher fish Hg concentrations, but that methylation rates not bioenergetics was the cause. Arleen Feng noted that

uplands are hotter than open Bay water and that uptake and metabolic rates can change in different environments.

The effects of station and year were investigated for both MISI and TOSM. Station was found to have a greater effect on MISI and year was found to have a greater effect on TOSM. Ben suggested that this could be caused by more movement. Richard Looker asked how confident we were that TOSM were young of year. Letitia Grenier noted that fish less than 10 cm long are young of year. Darrell Slotten suggested that noise might be having a greater influence on the TOSM Hg concentrations because they are much lower than MISI Hg levels.

Rob Mason asked if concentrations of MeHg and Hg have been compared. Ben said that MeHg is generally 95% of total Hg in fish. Additionally, some 2007 samples will be subsampled and analyzed for both. Ben also noted that Darrell Slotten has done many comparisons of TOSM from the Delta.

In 2008 the workplan proposes splitting the 2008 effort between a spatial survey of 40 sites, monthly monitoring of two locations to determine temporal variation, and continued annual monitoring of eight long-term sites.

Ben presented potential sampling locations for the spatial survey: wetlands, urban outfall, POTW outfalls, and Control (upland, residential, no discharges). Richard Looker has suggested some POTW outfalls to sample, targeting large shallow-water outfalls. Rob Mason noted that Darrell Slotten looked at POTWs and did not detect a signal. Ben responded that in that case he would discuss what it means to have no signal. He also noted that there can be both/either differences in means and variability.

The two proposed temporal sites are Martin Luther King (MLK) Shoreline and a North Bay station to be sampled by US FWS. One RMP sediment sample has been collected from the area around MLK Shoreline and the MeHg concentration was very high. The site is also adjacent to small restored wetland and receives urban runoff from the surrounding areas. In addition to these two sites, other researchers have investigated seasonality in the Bay. Collin-Eagles Smith and Josh Ackerman (USGS) have investigated temporal trends in fish Hg concentrations in the South Bay and Darrell Slotten and Shaun Ayers have done similar research in the Delta.

Ben presented various ancillary parameters to be collected during sampling. Arleen Feng suggested using fluorescent dye to determine residence time. Ben Greenfield indicated that the project does not have a boat and that although dye would be the best way to determine residence time, it is probably not logistically feasible. Rob Mason suggested adding total organic carbon to the list of ancillary parameters.

Jim Hunt suggested that the ultimate goal of the study was a model. He noted that in this case there is a trade off between spatial and temporal scales to better understand variability. Since the project is expected to last at least three years, he suggested that it may be more productive for the emphasis be more focused each year, rather than split between the three proposed efforts for 2008. Ben said that in isolation the study would not lead to a mechanistic model, but will produce a statistical model. He also said that a small pilot study was conducted at three sites within 0.5 kilometers of each other to investigate spatial scales; however, the data are not yet available. Richard Looker said that the goal is to assess both the processes contributing to problem areas and a spatial survey to locate problem areas. Jim asked how well identified problem areas are understood. Ben suggested

that because the large drivers have not been identified it would be useful to look at many drivers. John Prall suggested sampling downstream from known sources (e.g. mines) and potentially collaborating with the proposed isotope study to the Hg RFP. Darrell Sloten said that Guadalupe River has been sampled. Rob Mason noted that there is a difference between sources and methylation potential and that it can be difficult to differentiate the two without ancillary data. Darrell said that with a sample design that includes many sites it can be possible to work on identifying sources. His study found that habitat had a much greater influence on Hg concentrations than proximity to mines or POTWs.

Arleen Feng suggested that outlining possible decision chains for future sampling years would be useful. She also suggested that Ben discuss catchment size and flows with Lester McKee. She emphasized the need to discuss and further develop the proposed GIS parameters.

Mike Connor said that Jim Hunt was asking if the proposal could be updated with more specific hypotheses. He suggested that the focus of the 2008 study be more focused.

Joel Baker suggested archiving subsamples of fish compositing for future analyses of other contaminants. In 2007 some fish were collected for organics analysis, but generally the fish are not collected or stored for organics analysis.

ACTION ITEMS:

- Review information from the Sacramento County study where there was no impact on bioaccumulation.
- Clearly state in plan that it will be reevaluated annually.
- Articulate beneficial outcomes of study more fully.
- Strengthen GIS analysis - talk to Lester McKee.
- Consider archiving of samples for later analysis and potential collaboration for other contaminants.

6. Decision on Mercury Proposals

The workgroup's decision regarding the mercury proposals will be discussed in a memorandum to be distributed at a later date.