Regional Monitoring Program for Water Quality in San Francisco Estuary
Contaminant Fate Workgroup
May 29, 2007 Meeting Minutes

Attendees:
    Barbar Baginska (Regional Board)
    Joel Baker (U. of Maryland)
    Frank Gobas (Simon Frazier Univ.)
    Trish Mulvey (SFEI Board)
    Tom Mumley (Regional Board)
    Kit Conaway (UCSC)
    Andy Gunther (AMS)
    Fred Hetzel (Regional Board)
    Dave Schoellhamer (USGS)
    Chris Sommers (SCVURPPP/BASMAA)
    Bill Mills (Tetra Tech)
    Jay Davis (SFEI
    Ben Greenfield (SFEI)
    Katie Harold (SFEI)
    Susan Klosterhaus (SFEI)
    John Oram (SFEI)
    Meg Sedlak (SFEI)
    Don Yee (SFEI)

1. Welcome and Introductions
Jay Davis convened the meeting at 10:00 by explaining the role of the CFWG in the context of the Regional Monitoring Program (RMP). All workgroups are trying to follow a new schedule this year in which the focus of spring meetings is on short term goals (i.e., pilot and special studies) and the focus of the fall meetings is on longer term goals (i.e., 5 year plan). This new schedule will allow the workgroups to review pilot and special study proposals relevant to each workgroup and make recommendations to the TRC. It was estimated that approximately $500,000 are available for pilot and special studies in 2008; approximately $200,000 is dedicated to Exposure and Effects Pilot Study and the remaining funds are to be divided between 3 workgroups (Emerging Contaminants, Sources Pathways and Loadings, and Contaminant Fate).

2. Review of Previous Meeting Minutes
John Oram gave a brief overview of the minutes from the October 30, 2006 meeting. It was noted that no written comments were received regarding material presented at the October meeting and thus it is important that the workgroup acknowledge the minutes as the official record of workgroup guidance. The workgroup was given the opportunity to comment on the minutes and suggest edits. No edits were deemed necessary. Tom Mumley pointed out that the minutes mention the need to develop a 5 year plan and recognized that this discussion will be on agenda for the fall meeting.

3. Multibox PCB Model of San Francisco Bay

John Oram presented the latest developments from the multibox model. A copy of the presentation will be posted on the web. To re-orient the workgroup the presentation started with an outline of progress to date. This project is nearing closure and it is anticipated that a draft report will be released in the coming weeks. Thus, it was emphasized that workgroup review is of the utmost importance. John Oram's presentation walked the workgroup through the workings of the model, noting that workgroup review has been critical in overcoming certain challenges along the way. The modeling approach has changed over time in response to workgroup review and as a consequence results have improved significantly.

In discussing how the model parameterizes sediment mixing Fred Hetzel pointed out that the same depth dependent mixing profile is used throughout the Bay regardless of whether the region is erosional or depositional. It was acknowledged that this is a potential shortcoming of the model but that due to the lack of spatial sediment mixing data it is the best available option. Jay Davis pointed out that the same vertical profile used for mixing is used to define a depth dependent degradation profile in sediment such that PCBs degradation is limited to the surface layers. The lack of data regarding vertical mixing/degradation profiles was reiterated.

A validation of the hydrodynamic and sediment transport models was presented for select stations throughout the Bay. Overall, the workgroup agreed the model is able to reasonably reproduce salinity and suspended sediment (SSC) concentrations. However, the presentation compared 14-day averaged model results to daily observations. A recommendation to make like comparisons was made (daily versus daily and/or averaged versus averaged).

Uncalibrated hindcast results were presented for surface sediments in each subregion compared to NOAA-EMAP data and for a vertical sediment core in San Pablo Bay compared to a USGS core. The general spatial patterns of these results were in agreement with data. However, the model overestimated observations. A targeted calibration of the model was undertaken to improve the results. The targeted calibration focused on model parameters for which new information exist; WY 2000 loads from local watersheds, the temporal trend of historic loads, and the spatial distribution of loads from local watersheds. The WY 2000 annual load was reduced from 34kg/yr to 20kg/yr based on a review of existing data by Lester McKee (SFEI). The temporal trend of historic loads was altered such that it represents a running average of the estimates presented by Brievik et al and so that no PCBs are introduced to the system until 1950. And finally, the spatial distribution of loads from local watersheds were adjusted so that the relationship between percent of total PCB loads to percent industrial land use better fits results from KLI. Andy Gunther and Chris Sommers questioned whether this approach to adjusting the spatial loads is appropriate. Chris Sommers noted that land use characterizations are not very good. Fred Hetzel suggested that the relationship between land use and PCB loads is not very good. Jay Davis asked how sensitive model results were to this change. John Oram noted that they were less sensitive to this than to the other two targeted calibration parameters. Chris Sommers suggested looking at imperviousness to correct the land use data (Brake Pad Partnership did this). Barbara Baginska recommended looking at watershed connectivity.

Hindcast results after targeted calibration were presented to the workgroup. Results were much better than before but can still be improved. Joel Baker recommended in the previous workgroup meeting to use a spatially explicit K_{oc}. A second round of calibration did exactly that. Using a

model bias estimator that accounts for PCBs in water and sediment, the model was run iteratively with different values of Koc in each subregion until an acceptable (value close to one) model bias was achieved. Calibrated K_{oc} values ranged from 0.8e6 in the Lower South Bay to 4.0e6 in San Pablo Bay. Calibrated results were presented to the workgroup. Results are in agreement with filed data (ie. error bars overlap). Joel Baker wondered what might be driving regional differences in K_{oc}. Organic carbon quality might be an explanation. The workgroup acknowledge the calibrated model results are much improved relative to the original results.

John Oram proceeded by presenting the results of recent uncertainty analysis (UA). 10,000 model runs were made with parameters randomly drawn from known distributions. The UA focused on 3 sediment related outputs (SSC, net sedimentation, outflow) and 10 PCB related outputs (total concentration in water, concentration in sediment, mass in water, mass in sediment, burial, degradation, deposition, erosion, outflow, volatilization). The aggregate uncertainty in model results is represented by the standard deviation of all 10,000 runs. The standard deviation was found to be approximately half the mean of all runs. In other words, the uncertainty of the model estimates are +/- 50%.

Focus was then turned to forecast model setup. The forecast assumes that the Bay behaves in the future much like it has in the past 30 years. In evaluating forecast scenarios, model runs were made using different vertical profiles of PCBs in sediment. Forecast results were found to be highly sensitive to this parameter. In fact, the vertical profile seems to exert more control on the future trajectory of the Bay than does external PCB loads. Forecast scenarios were presented for a range of plausible cases: varying tributary loads, wastewater loads, Delta loads, varying degradation and attenuation, instantaneous PCB inputs representing barrel spills (Andy Gunther pointed out that barrel spill should be approximately 300kg). As mentioned previously, forecast results were found to be less sensitive to these scenarios than to changes in the vertical profile of PCBs in sediment at the time of initialization.

Conclusion presented to the workgroup were 1) vertical profile is extremely important for forecast model, 2) need better information regarding degradation and attenuation, and 3) can we better estimate from data the PCB mass lost to the ocean and would it be helpful for understanding the model results (outflow is one of the key loss pathways). Jay Davis concluded by stating to the workgroup that a draft report will be circulated in a few weeks. Written feedback by the workgroup will be valuable.

General comments from workgroup:
Fred Hetzel – Would like to see improved sediment model.
Dave Schoellhamer – draft sediment model report should be completed by August.
Andy Gunther – may want to rethink barrel spill scenario. PCBs are thick and not very mobile in the short-term. Is there a plan to publish? Would be important contribution.
Joel Baker – definitely worth publishing.
Fred Hetzel – May get argument that you should have modeled specific congeners.
Joel Baker – you really did one congener (PCB 118) and compared to sums of congeners.
Andy Gunther – may want to start thinking about impact of sediment cores (referring to sediment coring project by Don Yee).
Chris Sommers - Committee should be involved in integrating sediment cores into model

Trish Mulvey– Important to get this into literature first. Do we have a budget for achieving that goal?
Tom Mumley – How does this relate to Jaffe's bathymetric change work?
Dave Schoellhamer – sediment model calibrated to Jaffe's results.
Chris Sommers – How does model inform management decisions?
Fred Hetzel – Would like to see more sophisticated model. Will require more money.
John Oram – recent modeling workshop focused on developing 3D community model of Bay. Would include team of academics (Stanford, UCB) and local stakeholders (Steve Ritchie, SFEI).

4. Update on Sediment Coring Project
Don Yee presented a progress report on the sediment coring project. 17 sediment cores were budgeted for the project, with sites selected on a mixed random/deterministic approach; 6 depositional wetland sites specifically selected to understand loading history; 11 Bay sites selected to begin characterizing Bay sediments. To date, approximately 10 sections per core for 1 core per Bay segment have been analyzed for Pb210 and Cs. Other cores were analyzed at 30 and 60 cm. A brief summary of findings follows:

Suisun Bay: No Pb or Cs profiles were observed indicating that this segment may have already eroded to 1960 levels. A slight increase in both Pb and Cs around 30cm was observed and may be due to grainsize.

San Pablo Bay: Pb and Cs max observed in top 10cm. Suggests erosion, possibly to 1960 levels.

Central Bay: Top 5-10cm are well mixed in Pb and Cs with decreasing levels at depth. No subsurface maximum observed for Cs – may indicate no deposition since 1960s.

South Bay: Top 10cm well mixed in Pb and Cs with decreasing levels at depth. Pb decay and Cs surface maximum disagree. Expect Cs maximum in 1960s – maybe erosion & mixing.

Lower South Bay: Top 10cm well mixed in Pb and Cs. One core showed subsurface Cs maximum at 60cm; others decreasing at depth. These sites may be different erosional/depositional regimes.

Summary: Pb and Cs signals in general agreement; 30cm horizon = 40-60 years. Top layers highest in Cs for many sites = eroding or static regimes or redistribution from source. More complete core analysis expected for Bay cores by Fall 2007. Wetland cores will be analyzed later but should be consistent with deposition. Each core is funded for Hg and PCBS for 10 sections. May do other trace metals. May also analyze for BDE-47 if enough material.

General Workgroup Comments:
1960s signal could be confounded by watershed signal.
Barbara Baginska - What is the approximate depositional rate of Lower South Bay? Your Cs signal could be Chernobyl (1980s).

5. PBDE Mass Budget

John Oram presented results of the recently developed PBDE mass budget. The budget focused on BDE 47 and 209 in Bay water/sediment, runoff from local watersheds, air, wastewater, and Delta outflow. A draft manuscript was circulated to the workgroup prior to the meeting so that members could provide guidance on how to proceed towards publication. An interesting finding in the report was that the ratio of BDE 47 to BDE 209 in Mallard Island samples (1.2) is greater that the ratio for local tributaries (0.2). John Oram suggested two hypothesis: different volatilization rates and different solubilities. The workgroupd generally agreed these are plausible explanations. Frank Gobas suggested debromination of BDE 209 to BDE 47 could be driving the higher ratio. Jay Davis mentioned a similar situation is occurring with MeHg:Hg and suggested degradation may be driving that as well.

John Oram and Jay Davis asked that the workgroup review the manuscript and provide written comments in the next 4 to 6 weeks.

General Workgroup Comments:
Joel Baker – should remove references to Sum of PBDEs. Not modeled and therefore not terribly important for this paper.
Frank Gobas - What is the estimated doubling time of PBDEs in the Bay? Suggest look at bivalves and eggs.
Jay Davis – bivalves and eggs appear to leveling off.

6. UCSC Hg Proposals
Kit Conaway presented summaries for 3 Hg pilot and special studies proposals. The studies are part of the PS/SS proposal packet. A decision was made to forgo funding the Hg proposals until a Hg strategy is developed (on agenda for next CFWG meeting.

7. Workgroup Vision
Don Yee presented a draft outline for the workgroups 5 year plan. A working document will be presented at the next workgroup meeting (Fall 2007). The goal is to develop a 5 year strategy to govern workgroup activities. The strategy will be updated as needed throughout those 5 years. The draft outline presented prioritized contaminants as follows:
High – PCBs, Hg
Medium – PBDEs, Dioxins, PAHs, Se, current pesticides, Pharmaceuticals
Low – OC pesticides, Cu and other metals below threshold values

General Workgroup Comments:
Frank Gobas – Need a more formalized method for identifying emerging contaminants. Should consider interactions of pesticides (mixtures?). Categorize contaminants on use, persistence, K_{ow}, etc.
Meg Sedlak – The Emerging Contaminants Workgroup will handle emerging issues and develop strategy and prioritize emerging contaminants.
Trish Mulvey – Not clear why we are doing this. Seems clear enough for PCBs and Hg, but what about the others.
Tom Mumley – Hierarchy reflects our priorities. Hg very important to South Bay Salt Pond Restoration Project. Se on verge of TMDL development – looking for support from refineries. Are currently re-evaluating pesiticides.

Joel Baker – What about nutrients and climate change?
Jay Davis – Phytoplankton on increase. Nutrients are not limiting, mostly light limited at this point (see article by Cloern in Pulse).
Joel Baker – Exotics are changing food web structure. Should consider this.
Frank Gobas – How is current model going to link to bioaccumulation / food- web models?
Tom Mumley – Emerging standard is based on Se in fish.
Jay Davis – Managers should prioritize their concerns for workgroup vision.
Trish Mulvey – This would be important for talking to the public. If not planned for it won't happen.
Jay Davis – Maybe focus on smaller area (Lower South Bay). Model is making strong predictions here.
Joel Baker – Maybe should consider watershed models, though state of wastershed models is poor.

8. Pilot and Special Studies for 2008

A number of pilot and special study ideas were presented to the workgroup. Voting members of the workgroup then held a closed-door session to discuss and prioritize the proposals. The table below summarizes the workgroup's rankings. Proposals were distributed prior to the meeting, though some were missing.

	Investigators	$	Notes	Baker	Gobas	Mumley	Mulvey	Baginska	Comments
1	UCSC	30k							
2	UCSC	60k, 140k	No postdoc, postdoc		x	x	x	x	explain value
3	UCSC	60k							
5	Oram	14k		x		x		2 x	
6	Gross/Oram	77k							follow up with modeling forum/dredgers to find champion
8	Greenfield	20k		x		x		3 x	
9	Blum	75k+75k	2yrs	x (sea grant)	nsf match?	x		1 x	exp design? Source of fish?
10	Brostoff	174+125	2yrs						long-term strategy