

OUTFALL MONITORING SCIENCE ADVISORY PANEL (OMSAP) MEETING

Tuesday, December 2, 2008, 10:00 AM - 3:00 PM, Smith Conference Room, WHOI

SUMMARY

AGENDA TOPICS

ATTENDANCE

Members Present: Andy Solow, WHOI (chair); Bob Beardsley, WHOI; Bob Kenney, URI; Scott Nixon, URI; Judy Pederson, MIT/Sea Grant; and Mike Shiaris, U Mass Boston.

Observers: Eric Adams, MIT; Grace Bigornia-Vitale, MWRA; Mike Bothner, USGS; Ellie Baptiste Carpenter, Battelle; Martin Dowgert, USFDA; Matt Fitzpatrick, Battelle; Rocky Geyer, WHOI; Roger Janson, EPA; Chris John, MWRA; Ken Keay, MWRA; Yong Lao, MWRA; Ben Lasley, Save the Harbor/Save the Bay; Wendy Leo, MWRA; Scott Libby, Battelle; Matt Liebman, EPA; Mike Mickelson, MWRA; Tara Nye, Association to Preserve Cape Cod; Andrea Rex, MWRA; Rich Signell, USGS; David Taylor, MWRA; and Cathy Vakalopoulos, MADEP.

MEETING SUMMARY

Permit Update

Roger Janson (EPA) stated that EPA has a working draft of MWRA's new NPDES permit. When they are ready, they will discuss it with MWRA, as well as involve others and open it for public comment. Some of the key issues that they are working on are the level of monitoring and potentially making the MWRA communities co-permittees. The OMSAP requirement will also be revisited, the CSO section will be updated, and blending will be addressed. J. Pederson asked if EPA will be consulting with OMSAP. R. Janson replied that they will involve the appropriate folks at the appropriate time. A. Rex asked about the length of the public comment period and if portions of the draft permit are appealed, whether other portions can go into effect. R. Janson replied that the public comment period will be at least 60 days, and if parts of the permit are appealed, then the entire permit is stayed, but then unappealed portions can go into effect.

Annual Monitoring Review 2007 and Monitoring Update

Andrea Rex (MWRA) and her staff summarized the monitoring results for 2007. For a look at the results, read MWRA's 2007 Outfall Monitoring Overview:

<http://www.mwra.state.ma.us/harbor/enquad/pdf/2008-17.pdf>

In 2007, there were no permit or Contingency Plan exceedances. The group discussed the monitoring results.

Dave Taylor (MWRA) presented early signs of seagrass recovery in Boston Harbor. Because of the recent reductions in loadings of nitrogen, phosphorus, total suspended solids, and particulate organic carbon from wastewater treatment, rivers and non-point sources, phytoplankton biomass has been reduced, and water clarity and bottom water dissolved oxygen have improved. Because there was enough light reaching the bottom before the outfall diversion, it is likely that decreased nutrient loading caused a reduction of epiphytic growth on the seagrasses which in turn contributed to the recolonization of seagrasses in some small areas of Boston Harbor.

Mike Mickelson (MWRA) reviewed the results of the ambient water quality monitoring in 2007. We have observed annual *Phaeocystis* blooms since the outfall went on-line. S. Libby

and D. Borkman are examining factors during *Phaeocystis* years that reduce copepod numbers and also increase salinity. It appears that hot weather terminates these blooms. A. Solow noted that *Phaeocystis* blooms are regional. S. Libby added that they only see *Phaeocystis* in its colonial form. *Phaeocystis* may be present in its microflagellate form all of the time or the cells could be advected into the bays, much like red tide.

Ken Keay (MWRA) reviewed the 2007 benthic, fish and shellfish monitoring results. A. Solow asked about *Clostridium* in Boston Harbor. K. Keay replied that it has decreased in abundance. M. Shiaris asked if the treatment plant removes any *Clostridium*. A. Rex replied that only some is removed by aerobic secondary treatment. K. Keay added that *Clostridium* concentrations are roughly correlated to solids removal and the spores are resistant to chlorination. M. Bothner asked about silver as a tracer. K. Keay said that they do not see a strong silver signal in their sampling. During the flounder discussion, M. Bothner asked if they are finding more females now. K. Keay replied that the sex ratios have changed and there are more females. He added that when they were studying the flounder lesions a few years ago, ratios of male to females were closer to 50/50 later in the season. The next flounder sampling will be in 2009. M. Liebman asked if the drape over the hardbottom stations is significant. K. Keay replied that it is noteworthy but it is not clear whether it is due to the outfall because we do not see the drape at stations closer to the outfall.

Red Tide 2008

Scott Libby (Battelle) described the 2008 *Alexandrium* bloom dynamics. Based on large cyst distributions mapped in the fall of 2007 and model results, we braced for a large spring bloom. There was a large bloom, but closures only reached the Cape Cod Canal this year. Though the cell abundances and duration of the Contingency Plan exceedance were comparable to the historic bloom in 2005, the closures were not as extensive this year. One interesting note is that *Alexandrium* bloomed in Boston Harbor in 2008 and not in 2005. We are still looking at the data to get a better understanding of why this happened. Winds from the south-southwest caused upwelling and nutrients brought to the surface may have had some influence on the bloom in Boston Harbor. Looking back at bloom data back to 1972, it appears that we are in a more active regional bloom cycle that could last 10-20 years.

S. Nixon asked if there are nutrients in the red tide bloom model and whether there is nutrient limitation. S. Libby replied yes to both questions and added that nutrients affect *Alexandrium* but *Alexandrium* doesn't use up all of the nutrients. S. Nixon asked when the bloom suddenly decreased in Boston Harbor, what did the nutrients look like? S. Libby replied that the nutrients were depleted (but not by *Alexandrium*). When this occurs, the cells turn into cysts. S. Nixon thinks that MWRA should only monitor this bloom every year if nutrients are proven to play a large role in bloom dynamics. In 2005, we did not see a sustained bloom around the outfall, but there were also storms mixing and moving the waters. Was there a sustained bloom around the outfall in 2008? A. Rex replied no. S. Libby added that there were high cell numbers in western Mass Bay and elevated numbers south of the outfall and this will be examined further. A. Solow asked if Dennis McGillicuddy has modeled turning the outfall on and off. S. Libby replied that this can't be done because the nutrients in the model are climatological. They did remove the ammonium and the modeled reduction in cell count was very small (~3-5%) locally at the peak of the bloom.

Proposed Change in Modeling

Before the discussion began, B. Beardsley announced that he is an unpaid advisor to the modelers. As such, he would participate in the discussion but not vote on any decisions. M. Mickelson described MWRA's proposal to update the hydrodynamic model which is a component of the Bays Eutrophication model (BEM). According to their NPDES permit,

MWRA is required to update, maintain, and run the BEM. Since 1989, MWRA has used the same hydrodynamic model (Estuarine and Coastal Ocean Model, semi-implicit, or ECOMsi). There are newer models preferred by the modeling community. The most promising alternative is called FVCOM (Finite Volume Coastal Ocean Model). Eric Adams (MIT and chair of OMSAP's Model Evaluation Group, or MEG) reviewed the opinions of the MEG members. Out of eight members, five were in favor of switching the model, one was undecided and two did not provide an opinion. R. Signell, M. Mickelson, S. Nixon, B. Beardsley, and E. Adams discussed the pros and cons of the two models. R. Signell thinks that ECOMsi is still a good model but FVCOM can provide more detail. Pros of FVCOM are that it is more modern, user-friendly, flexible with gridding and can make calculations in areas that need refinement. In addition, Changshen Chen (U Mass Dartmouth) is already modeling the Gulf of Maine and Massachusetts Bay with FVCOM. One drawback is the amount of comparison needed between the models and data before the FVCOM replaces ECOMsi. E. Adams would like to see FVCOM run with old data and compared to the calibrated ECOMsi model results. Also, ECOMsi seems to model outfall mixing well and we would have to test to see how well FVCOM models it. Overall MEG approves of moving to FVCOM, but with extensive testing.

R. Janson asked about the model as it relates to what MWRA should be concerned about. What conditions of nutrient loading has the model predicted? Will this new model be able to predict this? If not, then the viability of this will not survive. A. Rex replied that the model predicted an increase in nearfield ammonium as well as changes in the phytoplankton. M. Mickelson added that the purpose of the model is to address concerns about the outfall. We have compared model runs with the outfall turned on and off, and the difference is minimal. R. Janson said that EPA needs to be able to support each permit condition. At some point, the model needs to be more predictive. R. Signell thinks that "prediction" could be a numerical simulation to fill in the gaps where there are no data and it can also be used for forecasting. R. Janson said that one important model prediction would be to see whether or not there should be nutrient limitations. A. Rex said that they are requesting this change to the modeling because it would make the model more useable. M. Mickelson added that this change will not affect the model's ability to predict. M. Liebman said that the permit language can be modified to reflect the current capabilities of the model. The frustration is that we are not using the model enough to predict.

The group continued to discuss modeling details. B. Beardsley said that the main concerns that he has heard about FVCOM is that the outfall risers need to be modeled well and that more effort needs to be placed on learning more about the system (e.g. test blending). E. Adams thinks FVCOM is a better model, but that it just needs more testing. A. Solow asked E. Adams if he could list the tests that are needed. E. Adams agreed.

S. Nixon asked if the current model has been run for 10 years using chlorophyll and productivity data with a focus on the nearfield and the boundary. M. Mickelson replied that ECOMsi used to only be able to run one month at a time. Now it can run two years at a time but we can't answer decadal questions with ECOMsi. E. Adams thinks FVCOM should run past years for comparison but that we don't have to run all of the years. S. Nixon agreed that running FVCOM with past years would provide a symmetry of closure. Given the practical difficulties of ECOMsi, we should encourage the easier model to test new questions, but do all of the necessary testing. Go with the best available tools. **ACTION:** OMSAP decided to approve the proposed change from the ECOMsi model to the FVCOM model with one addition to the language (see underlined): "OMSAP recommends to MassDEP and EPA that they allow MWRA to fulfill its permit requirement to update the Bays Eutrophication Model

by coupling the water quality model RCA to the hydrodynamic model FVCOM provided suitable test intercalibrations are run, including checking dilution at the outfall.”

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Summary prepared by C. Vakalopoulos.