

## Meeting notes - Mystic River Water Quality Science Forum

Date: January 11, 2011

Location: EPA's New Building – 5 Post Office Square Boston, MA

Conference Room: Court Room 6 – 15<sup>th</sup> floor

### Stephen- welcome

Good Morning and welcome to the third annual Mystic River Water Quality Forum. It is great to see such a big turnout. Thanks to the Water Quality Monitoring Director at the Mystic River Watershed Association; Patrick Herron, for your efforts in helping with this meeting. Thank you to all the staff from EPA who helped pull this meeting together. Let's also give a special thanks to all of the presenters at today's meeting.

- Again this year, we have a diverse group of people here; from municipalities to top notch Universities, from State to Federal agencies, and non-profits and for-profits. I am glad to see a wide range of groups and hopefully this will again lead to great discussions on water quality.
- The agenda is full with interesting presentations that show us all the great work that is going on in the watershed. We will hear the latest finding from monitoring in the Mystic, learn about areas that need further attention and find out about recent monitoring for cyanobacteria.
- As all of you know, in 2008 we hosted a Mystic River Summit. At that time, the Mystic watershed had received a grade of a "D" for two years in a row (2006 and 2007) for overall bacterial water quality. In 2008 and 2009, we saw a slight improvement as the grade increased to a "C-." In 2009, the watershed met standards for swimming 57% of the time and safe for boating 93% of the time.
- Since the Summit, the Steering Committee has made great progress. In the almost two years since that meeting, the group has been organizing and focused on drafting its mission and setting priorities that focus on improving water quality and increasing open space and access to the watershed. The group has organized three subcommittees – municipal, business, and science. The Committee has emphasized the need for Agencies and watershed groups to continue ongoing base program work in support of the goal of improving water quality.
- It is good to see some of the Steering Committee members here today. Can members of the steering committee raise your hands? The Steering Committee will need the science and expertise from this group as it moves forward in its mission and priorities. Caitlyn Whittle will tell you more about the Steering Committee toward the end of the meeting.
- This science meeting will continue to provide a forum for those collecting data to share their results that will hopefully lead to more collaboration and better understanding of the problems affecting the Mystic River Watershed.
- The work that you are involved in is critical to the success of the Mystic River Watershed Initiative and will help the Steering Committee set future priorities, monitor progress, and assess environmental problems and possible solutions.
- Today's meeting is important and we encourage you all to have robust discussions, exchange scientific and technical ideas, and help us move forward to restore the Mystic. This meeting will

continue the great dialogue and collaboration, and we hope you all will continue to work with us on key science issues in the future. Thank you!

**Tom/Patrick**

Tom

Thank you to Leah and Karen for setting this meeting up. Thanks to co-chair, Patrick. The EPA New England Regional Lab will continue to support MyRWA into the next year with the hotspot monitoring program by providing bacteria analyses. I hope you all find the meeting to be useful. When asking three different people what the purpose of the meeting was each had three different answers to: provide 1) feedback on monitoring program 2) educate and be educated, 3) share information and network. This year, we tried to leave more time for questions and answers. Let's go around the room and give introductions.

Patrick- State of the Mystic

- Very grateful for support by EPA, and in support of hotspot monitoring program. A lot has happened in the Mystic over the past year.
- Reiteration of C- grade, an improvement over a D.
- It takes time to remove illicit connections. In 2010, there were tremendous rain events – February and March – close to 100 SSOs in the watershed and at least 30M gallons of rainwater/sewage being released.
- In Chelsea, there has been a successful completion of the Blue Cities project.
- In Revere, the settlement resulting in \$75M in investments going to improve infrastructure in Revere.
- This year, discussions happening between BWSC and Mystic parties. First look at new MS4 permits asking municipalities to comply with over the next 5 years.
- New subcommittees – water quality and open space – slow work, hopefully see some successes in 2011.
- MWRA made commitment to perform optimization study in the Mystic to hopefully reduce SSOs.
- Beginning of the reconstruction of the inter-lake dam allowing for habitat restoration in upper mystic lake for herring. Open toward the end of the herring run last year allowed for populations seen in upper Mystic Lake. A lot of credit to the DCR for making that project happen. There will be a new herring monitoring program this year.

Tom

- Last year we announced that we were setting up a workgroup with the intention of working on monitoring. We assembled a group with MyRWA, MassDEP, UGSG, EPA, other reps to allow focus on details of monitoring. Have held two meetings: in the spring, stormwater monitoring and cyanobacteria. Met in November and touched on coordinated sampling efforts and consistent pipe labeling and data management. Would like to compile stormwater data in a system that is useable. Will be holding future meetings to continue to plan activities.

## **Brief Updates**

Caitlyn –Steering committee update

- Thank you all for being here. We are going to hear a lot of great presentations and learn a lot about the science going on in the watershed today. We're very thankful for your interest and eagerness to participate in this great work.
- I'm here to give you all an update on the Steering Committee. As Stephen mentioned in the beginning of this meeting, the Committee has been meeting throughout 2010 and has remained focused on identifying priorities for the coming years.
- As you all know, the Committee itself is a coordinating and collaborating information exchange group that works to establish strategic direction and priorities as well as to recommend key projects and actions needed to improve water quality and environmental conditions in the Mystic River Watershed. The committee is made up of nonprofit organizations as well as state, local, and federal agencies.
- Just as a reminder, Steering Committee meetings are all open to the public and are typically on Wednesdays every other month. The next meeting is scheduled for February 16<sup>th</sup> and will be held at MAPC's offices in Boston.
- Meetings, locations, agendas, and notes are all posted on the web. You are more than welcome to attend the meeting when the agenda interests you.
- During the 2010 year, three new non-profit groups were added to the Committee – FAR, Tri-CAP, and Groundwork Somerville – to maintain balance between agencies and community organizations as well as between upper and lower watershed groups.
- The Steering Committee spent the majority of 2010 working to identify priority actions that can be worked on together to further their goals of improving water quality and increasing open space and access to the watershed.
- In order to identify the right set of actions, the committee asked that two sub-groups work between Steering Committee meetings creating matrices of potential water quality improvement actions and identifying areas of focus for open space actions.
- After several months of work, these two sub-groups are poised to present the Steering Committee with a handful of actions that we anticipate will be signed onto as collaborating work for 2011. We hope that the Steering Committee will come to consensus around these actions so that we can kick off this year with activities that will further the mission and goals of the group.
- In addition to Steering Committee meetings, there are three subcommittees that also hold somewhat regular meetings. Last January, the municipal subcommittee held its first meeting and held quarterly meetings throughout 2010. Their next meeting is later this month. This group has focused a lot on municipal stormwater permits and how they might share resources effectively.
- In September, the business subcommittee held its first meeting. They are also very interested in stormwater permits.
- Lastly, the science subcommittee, co-chaired by Patrick and Tom, is working diligently and graciously hosts this annual forum. Tom filled us all in on the WQ workgroup and what's been going on there.

## University Collaboration

- EPA has also been very fortunate to start a collaboration with the University of Massachusetts in Boston. Last spring, we announced an opportunity for local area universities to collaborate with EPA on urban waters work as well as our Mystic work. We received a lot of interest. We selected UMass as the lead university and have been working with them for some time now. We expect to have a signed MOU very soon.
- We will look to the university to collaborate on our science subcommittee as well as act as a technical liaison to the Steering Committee. You will be hearing from Anamarija Frankic later today with an update from UMass.
- As part of this collaboration, we've hired Karen Simpson, a co-op and PhD. student at UMass, at EPA. Karen is working in the surface water branch and assists on much of the Mystic work.
- Because we received so much interest from area universities and colleges in response to our announcement, we are planning, with UMass, to host a university collaborative meeting that will serve as a discussion forum for local area universities.
  - Potential topical areas include assessing the effectiveness of LID practices, developing analytical methods to track cyanobacteria, developing estimates of pollutant reductions for stormwater BMPs, investigating ways to reconnect people with their waterways, and how to effectively use real-time water quality sensors to share data to the public
- For those of you from the academic community, please let us know if you're interested in participating in this kind of meeting. We will certainly keep everyone posted on our progress and as always meeting and notes will be posted on the website.

Todd

- There are eight administrative orders and a few judicial referrals. Most recently EPA and DOJ have filed a lawsuit against BWSC.
- Have been busy on the enforcement end, and we will continue to take enforcement efforts where they are necessary.
- We have been taking a lot of data and funneling that to MassDEP. We are leveraging resources as best we can.
- There are a few things in the public realm about the complaint toward BWSC. We aren't taking a case and alleging that folks are incompetent. Like all of our municipal cases, this is about putting enough resources toward a significant problem. Boston has a very dense population in a large area, and it needs to be addressed.

Kevin Brander

- About a year ago, we lost two people dedicated to bacteria source tracking program. We haven't been able to replace them, but there are further budget shortfalls. We have no concrete numbers, but hopefully we can keep the staff we have.

- The BST program has, for three years preceding 2010, was taking 10-20 cases. Our lab is more targeting to serious issues and complaints, emergencies.
- DEP has 5 orders: Cambridge, Somerville, Arlington, Belmont, Melrose. Despite cutbacks, we've been sampling in those communities and have issued a few more orders.
- New Commissioner, from EEEA settling in now. He will have budget challenges and technical issues, such as the ones we'll hear about later today. Require carefully thought out strategies.
- We have not been involved in communities where there are AOs issued. The state has to be a party where DOJ is involved.
- DEP will have some level of involvement in the BWSC negotiations and Revere work.
- Practice is going to be to continue to share data with EPA and folks here once we collect data and QAQC. We can't discuss enforcement actions until they are taken, but we can share public records.
- We are here to continue to work with Todd and other parties interested.

#### Anamarija Frankic

- Been working with partners to develop outreach and education program for small grant. Great to bring education and research outreach and education to local students. Reached out to other community colleges and other universities because teaching in the spring and summer will bring a unique and interdisciplinary opportunity. The BAC (Boston Architectural College) showed interest in working in the MyRWA, as well. Will be working together (BAC students and UMass students) on 5 open space sites. Will have 25 students working on maybe 2 sites to assess environmental conditions and figure out how to improve conditions. This is something that neither university has done, but we will be working together to build on this and develop interesting interdisciplinary projects for students to be involved in.
- Will also work on Pier 5 in Charlestown to identify ways to get it for education and community.
- Trying to involve two sites at UMass-Boston for salt flats, salt marsh, and restoring eelgrass. Students are really excited to be working on these projects. We are trying to understand how to improve the watershed and coastal areas. Very happy and looking forward to working with MWRA. Students operate a pump-out boat thru MWRA for free.

#### Brad Arndt

- Groundwork Somerville – water chestnut removal project. Thanks to a three year MET grant, GW was able to start an intensive collaborative effort to begin addressing aquatic invasives on the Mystic River, particularly with water chestnut. Thanks to collaboration – 100s of volunteers.

May – August removed 220,000 lbs of water chestnut from the lower Mystic. Done thru combined effort of mechanical harvesting and hand harvesting. A great collaboration. Most of them will come back – it is a smart plant. We are hoping that within three years time, we can create a more systemic program through the GW and collaboration to eradicate the water chestnut from the lower Mystic.

**Question:** What did you do with the removed weeds?

- It was contracted with a Lexington landscaping facility – it was mulched, composted, and resold.

**Question:** Is Ell Pond on today's agenda? Is there an update on Ell Pond in Melrose? Is there work underway to improve water quality and remove invasive species?

**Response:** Essentially there isn't. Susan works for EPA and con comm.. There has been a lot of work on flood control and now working on water quality issues. Kevin mentioned that there is an AO in Melrose for illicit discharges that are related to Ell Pond. There is a lot of focus on that aspect of the problem in Melrose. There isn't anything going on for invasive species. Historically, the pond has been treated for nuisance vegetation. The stormwater side is hanging out there, pending the MS4 permit. Kevin – Melrose has an enforcement action. There is active investigation to eliminate drainage systems going into the pond. Have eliminated some cess pools. Have tested and sealed 1500' of sewer line. They have taken another round of sampling and DEP will receive a status report by the 15h of this month. There will be a new update. Patrick – Ell Pond may come up in the cyanobacteria presentation later this morning.

### **EPA's Stormwater Monitoring and Research – Effort Summary (Todd Borci, Peter Philbrook, & Leah O'Neill)**

Regional Applied Research Effort (RARE)

- Two year research project finished up this past fall. A general sampling effort, but most of the work focused on the Mystic and eastern MA.
- Identify screening tools so that efforts can be focused on high priority areas.
- Going to try to coordinate efforts among EPA offices, the state, and watershed orgs to identify areas of possible illicit connections.
- Two year sample season collected many sets of samples. 335 sample sets at 253 locations. Over 3657 water quality data points.

Maps – in the room and will be posted on the website. Green results are below state water quality standards. Yellow exceeds the standard (E. coli), orange exceeds boating standard, red and a very high exceedance.

- Many analytes tested for. A variety to see what was in the watershed and what best would be used as a screening tool for illicit connections. Style of tests are chosen based on what's available, reagents used in the test, waste generated, ease in the field, cost, etc. Tested for over 20 analytes and pharmaceuticals. Even testing for ammonia over 5 methods so that results could be compared to see which would be viable screening tools in the field.
- Most locations were surface water or end of pipe locations.
- Almost 65% of sites exceeded primary state WQ standards. That is a huge amount if you're trying to prioritize areas or look for illicit connections.
- Bacteria tests, ammonia test strips, surfactant test kits, and chlorine (total) test kits were able to narrow sites down to about 25%. Were really focused on coming out with cheap screening parameters to recommend in the MS4 permits for under \$5 per location. The cost will still be in running bacteria samples, but we wanted to focus on the additional parameters (multiple line of evidence) to focus on where the "real" problems are. We are still crunching numbers, but these tests have popped out at us right away. These are best minimum things to do. Going forward, we're looking at the last 25% to see what we had for pharmaceuticals results. When you fail all three minimum criteria, we can say that you are xx% likely to fail the pharmaceutical test. We paired this grant with a Regional Method for advanced methods for pharmaceuticals.

Peter

- Best target compounds to look for in an advanced technique.
- HPLC to detect tandem mass-spectrometer.
- Tested a number of pharmaceutical parameters: caffeine, human caffeine metabolites, Tylenol, antidepressants/anticonvulsants, anti-epilepsy, blood pressure meds, nicotine metabolites, human waste pigments, and antibiotics. Samples are filtered and extracted within 24-hours.
- Process thru \$10 cartridge for about 1.5 hours. Method is fairly environmentally friendly. Only water and 10mls ethanol. GCMS use methylene-chloride (carcinogenic).
- Run 8 samples with 4 for QC (12 total). Standard compounds (Carbon-13) very expensive. HPLC columns cost about \$600. HPLC = \$500K.
- Typical result – caffeine would be high, urobilin breaks down rapidly, so 79000ppt is a higher concentration sample. Can't use it to test all the samples because of the cost. Market value - \$600/sample.
- We are looking for a suite of compounds and to come up with an analytical method that can be used nation-wide. It is a time intensive sample to run. There aren't a lot of labs doing this kind of work – three or four nationally. Until this becomes a more popular method, the costs will stay very high. There is a poster in the back of the room.

Todd

- Key to point out that if you send the samples to a private lab, you might not get to test for the best set of compounds. Want to come up with a threshold and reporting limit. Caffeine is seen in background samples.
- Acetaminophen is a good indicator.
- Will show some interesting samples – limits of our approach. There are some locations where it might be difficult to find the source of the wastewater and not everything can be solved thru enforcement actions.
- Spot Pond Brook in Stoneham – east of spot pond. Clean result. No hits for E. coli, surfactants or ammonia. Non-detects for most pharmaceuticals.
- Ryder Mill, Arlington, MA – dirtier sample. Outfall to Mill Brook. In Mill Brook is known to be a source of high bacteria results. Put a lot of time into sampling here in early 2010 to help MassDEP. In the field, a whitish-gray bacterial plaque on the outfall. Sample for E coli – 1300, elevated but not spectacular. Surfactants – 0.3 mg/L. We've been using 0.25mg/L as a threshold for a "hit." Ammonia is 3mg/L (Threshold 0.5 mg/L). So we see exceedance of bacteria, surfactant and ammonia field kit. Flagged for wastewater influence based on field kits. Look at pharmaceuticals – 15,000 for urobilin, caffeine 520 mg/L, 15,000 ng/L for acetaminophen. Most of the pharmaceuticals were present, so it's interesting to have hits for all the compounds. Might see non-detect if nobody is taking certain meds at a location if it is a small or individual influence.
- Based on looking at these data, we can judge if there is a single source (illicit) or larger source (SS).
- Chelsea Creek, Chelsea, MA – Looks awful, smell is bad. Interesting and worth presenting. Bacteria results, not that high – 100 mpn. Ran field kits – surfactants and ammonia high. Saltwater can cause false positive on the surfactant kits. This site is in the tidal area, so there is a possible influence. High ammonia for a stormwater outfall. But we can sometimes see elevated ammonia particularly in saltwater tidal wetlands that have been filled over time. This is a good example of wondering where the limitations of these kits might be. Look at pharmaceutical results – caffeine high, acetaminophen high – there is some type of wastewater influence upstream. Could be a cracked sewer pipe? Pipes are made with loose joints to collect groundwater. Still working on this one.
- Meetinghouse Brook, Medford, MA – Stream in culverts has higher chance of being contaminated. Go into Fells and sample headwaters and then sample downstream. Upstream,

low bacteria and no pharmaceuticals detected. Downstream, elevated bacteria and across the board and low levels of pharmaceuticals. Some type of influence.

- Mill Brook, Arlington, MA – Do upstream and downstream (Arlington/Lex line and then lower Mystic Lake area). Do a few sampling events. Only 8 samples per event, so it would take three events to get a solid sample across the area. Saw detectable levels of pharmaceuticals in-stream. Kept going further and further upstream. Upstream – low bacteria, acetaminophen almost non-detect, in stream – elevated bacteria and very high acetaminophen. This location needs more work. EPA may be going back here to look.
- When we look at these types of issues, we look at sewer pipes and sewer pipe alignment matches with storm drains. This is where the MS4 permit comes into play. All the maps can influence these numbers.
- Future watershed work – there is a lot of data to go thru. We see a low of issues in the watershed. There are a lot of areas where we are still coordinating with MyRWA and with the state. Stormwater outfalls. There are a lot of municipal locations. Will also be recommending the chlorine test kit.

**Question:** Where is this information available?

**Response:** The data is not on the website. It has been being QA'd. If there are particular questions, we can share it. We've provided communities with the data once it was developed. The pharmaceutical data is in and QA/QC'd.

**Question:** Can the data be requested?

**Response:** Our hope is that over the course of 2011, we will package it and send it to a community. We've spoken in late fall, so we can send this information as soon as we can.

**Question:** You mentioned that when you're doing monitoring, you are also assessing sewer maps? Are those available?

**Response:** A lot of what we've been doing is taking what we've had and going into the field to take samples. We don't have a lot of the maps. Some communities we have the maps, but for many, we don't.

Tom

NOTE: Stormwater phase II public hearing in Leominster is cancelled for tomorrow. Thank you Patty Passariello for passing on the message

### **I/I & SSOs (Patrick Herron)**

\$5.5M go out in proposals from 2006 fuel spills - \$1M to MET and \$4.5M thru NAWCA

## Inflow and Infiltration – a primer

- Infiltration is the movement of groundwater into the sewer pipes thru cracks and joints.
- Inflow – direct connections to the sewer systems of rainwater. In some cases we have direct connections that can happen at the residential area.
- Homeowners can have gutters connecting to sewer, sump pumps connected to sewer.
- With infiltration – you are filling up pipes that are normally only 1/3 full, then they overflow. Overflows represent public health hazards – people are out in them, walking their dogs, living nearby. They are sources that are diminishing water quality.
- Combine to larger flows – Medford/Arlington border – brown plume. March storm – have somewhere between 5-10M gallons of flow coming out in a couple of days. If this flow weren't released, it would be in people's basements. At this point, the flow needs to find relief.
- How significant is I/I in the budget of flow going out to MWRA? Sanitary flow does make up a significant amount of flow. But, how much of the flow that is treated at Deer Island is not sanitary flow? Boston dwarfs the amount of flow coming from the other municipalities. For 2009, the flow treated out of Deer Island – 54% was sanitary flow and the rest (45%) was rainwater.
- Units of gallons/day per inch diameter mile: Top for the watershed – Malden and Medford for I/I in the watershed. Infiltration is an issue for these towns. Both have old development. Followed by Melrose and Revere. Revere has a lot of inflow. Somerville is a CSO community, hard to compare. At the bottom – Burlington and Wilmington. These towns contribute to overflows in the Aberjona. Much lower infiltration and inflow.
- Inflow causes SSOs. Infiltration plays a role, but inflow is the problem.
- 2001 MWRA report on I/I. Graph of a storm event that occurred in 1998. Over the course of the storm, infiltration remained somewhat level. Sanitary sewer is diurnal. Inflow is a surcharge to the system. We should be focusing our efforts on inflow.
- In the Mystic River communities, where is the inflow? Gallons/day/inch diameter mile (to balance bigger towns). Four communities are much higher than others – Revere, Somerville, Cambridge, and Chelsea. Somerville, Cambridge and Chelsea are all combined sewer communities, they are allowed to operate like this. Revere is not a combined system, but it is operating like one. Revere is currently under consent decree resulting in \$75M to correct these issues and other surface water problems.
- Medford, BWSC, Melrose, Stoneham, Everett. Burlington, Woburn, Winchester, Woburn, Reading. Which communities have progressive programs to remove inflow? Do the

communities have sump pump programs? Across the MWRA system, you can look at all the municipalities and average is about xxx.

- Can look at communities doing good job and ask them what they are doing? Between 2003 and 2006, they replaced most of the meters, so there is change in how the towns perform. How much is due to improvement of the meters? So from 2006 – 2009, who is doing better? In 2009, there is a lot of change. What can we learn? On the surface, this is a small subset of data and too short a period of time to see who is making the most progress. Compared to 2006 flows, both Woburn and Wilmington seem to be doing a good job. Maybe there are good reasons for that and it might be worth speaking with both municipalities to find out what they're doing.
- How is inflow and infiltration being worked on? MWRA has an active I/I program giving funds to municipalities to use. Program is a 45% grant and 55% interest free loan to municipalities. All municipalities are using these funds and/or have plans to use them. Since 1993 - \$195M has been allocated. This investment does seem to be working, but could be targeted toward inflow. Each community is taking their own unique approach. Regulatory oversight is helping to drive change.
- Arlington is dealing with chronic SSOs and a lot of inflow into their system. Some of it comes from Lexington and Bedford. Problems are connected with other communities. They are designing a new program to go home to home to look at connections to the system. It will be a long process.
- Burlington has some programs that may be worth presenting at that municipal subcommittee. Illicit sump pump sewer connection thru amnesty program. Burlington has some development which provides funds to developers to remove I/I from the system. They are assigned sump pumps in homes. Also a private residential source inflow removal program – if you sell your home in Burlington, you are either in the amnesty program or you need to have an inspection performed on the home before it's sold to show there is no connection. Burlington/Woburn have issues at Horn Pond.
- Woburn invested \$8M over the last 5 years. Gained entry to 91% of 5500 homes.
- Lexington has 500 house inspections and putting thru upgrades expected to remove xx
- How do we work on I/I to make progress to reduce chronic SSOs? Have municipal subcommittee on I/I and ask towns to do some presentations to share experiences and strategies. Need to improve the template to reporting SSOs – responsibility of DEP. Maybe looking to EPA for guidance.
- Need to provide information to public on SSOs, there is no notification system. There needs to be public information for safety and prioritizing the problem.
- We need to prioritize funding to reduce SSOs – target inflow, not infiltration.

- Need to look at individual storms – model 1, 2, 5 etc. year storms. Where in our communities are having overflows during smaller storms? We can work on those areas first.
- We need to make a long-term plan about how to reduce these SSOs. Need to pull communities together if they are all contributing. Add financial disincentives for SSOs.

**Question/Comment:** Inflow depends on climate in the areas, pervious and impervious surfaces and how that can add to infiltration? You could plot in three dimensions –age of community, height above sea level, and %impervious surfaces.

**Question:** It looks like your three CSO communities following Revere are contributing almost as much as Revere to the amount of non-sanitary water going into Deer Island plant. What is the plan for the CSO communities?

**Response:** Long-term CSO control plan is making steps across Boston Harbor to remove and separate many parts of these systems. At the end of the plan, there will be some CSOs still in place – Alewife Brook, we will have CSOs, or Cambridge that has resources and investing to go beyond the CSO control plan. Long-term plan is to look at how cost effective the solutions are for each case going forward. Separating some communities can have high costs compared to where dollars can be invested elsewhere.

#### **Monitoring Updates for the Mystic and Alewife (Kelly Coughlin)**

- Alewife projects (CSO control plan) have been delayed by citizen appeals.
- Cambridge projects have resumed design. The last of the projects will be completed by Dec 2015, currently on schedule.
- Alewife Brook – will see 80% reduction in CSO volumes in a typical year. A lot of the significant reductions have already occurred.
- Charles and Inner Harbor have been achieved in the past 10 years.
- CSO volumes according to MWRA models for 2009 – 12M gallons discharged into Alewife Brook, 1MG into upper mystic and 74M gallons downstream of the dam. As of 2015, will see large reduction in frequencies of discharges into Alewife Brook. Would see additional capacity for sanitary flows for residential communities.
- In 2007 changed methods for Enterococci and E coli to Enterolert and Colilert. E. coli concentrations in Mystic from upstream to downstream – saw modest increases with the method switch. For Enterococcus, see the inverse (slight drops in concentrations). Tend to be more non-detects with new method.
- In the Alewife, we've seen significant drops in the E. coli concentrations from Little River to Mystic Valley Parkway. For Enterococcus, we're seeing a more dramatic drop than we'd

expected to see. It is hard to tease out if these drops are driven by the method or by something else.

- Not seeing extremely high bacteria counts that we used to see with older methods. Since it is unclear, we are looking into more comparison testing using old methods and we're interested in getting information from EPA and MyRWA to see if some of the numbers match up in the Alewife area.

#### Nitrogen and Phosphorus in the Mystic (and Charles)

- These two systems are somewhat similar. Began this program in 1993. Intent is to look at nutrient loading to the harbor. All locations are sampled on the same day and done every two weeks year round.
- Total nitrogen averages for a year. In the Mystic are consistently higher in the Mystic than in the Charles. We aren't seeing big changes between wet and dry years. Frequency of rain events exceeding 2" there doesn't seem to be a difference between wet and dry years.
- Same graph for phosphorus – Charles is consistently higher than the Mystic, except for 2010 (data set not complete). There isn't much difference between wet years or dry years or with heavy rain events.
- Look at locations (downstream of the lakes, Boston Ave, Earhart dam), two locations in the Charles (waterdown dam, science museum). Look at systems in the summer and winter, averaged from 2007 -2010. Both have nitrogen concentrations lower in the summer. For phosphorous, trend is reversed. Higher concentrations in the summer for both rivers.
- Factors to evaluate – flushing rate of the basins, physical structure of the water column, reservoir of nutrients in the sediments (especially P), what are the contributions from the sub-watersheds?

**Question:** You mention relatively crude- what does this mean?

**Response:** Only two locations and measuring concentrations and trying to draw conclusions – it is hard with a lot of other dynamics. Mystic has the highest chlorophyll concentrations and the cloudiest waters. But we don't see nutrient concentrations that would jive with what you'd expect.

**Question:** Your chlorophyll numbers come from samples of water with cyanobacteria and other algae in the water. When you take a phosphorus sample, do you filter out the cyanobacteria that contains a lot of P, or do you just sample the water?

**Response:** Measure both – total P and also dissolved P. In the Mystic, we aren't seeing chlorophyll levels going up with P going up. The relationships aren't very straight forward.

**Cyanobacteria – Mike Celona, Roger Frymire, Tom Faber**

Mike

- In fresh water, cyanobacteria (blue green algae) can undergo a population explosion under the right conditions. When water becomes warm and stagnant, added to that a lot of phosphorous, the population undergoes explosion. In the marine world, this is known as a “red tide.” In fresh water, there are a number of organisms. Some of them can produce toxins that are unsafe for people and animals. Others can just become skin irritants, so public health becomes involved.
- HAB – Harmful Algae Bloom
- Water becomes a color – blue, red, green. Can be a surface scum, can move in the water column during the day. They can crowd each other out at the top and form a scum layer that can wash on shore.
- HABs have been studied nationally. The CDC put out proposals to states to get cooperative agreements to do human health studies. MA has applied and accepted as the only New England state. Received 5 years worth of funding to find health impacts by collecting environmental and human health data. They are looking for pets, fish kills, and livestock impacts.
- Health effects of HABs – skin or eye irritation, GI issues, most of them you wouldn’t be hospitalized for or go to the doctor (sub-clinical). Two more commonly found toxins – microcystin and anatoxin – causing liver problems and neurological problems, respectively. There is a test for microcystin, there is a test for anatoxin-a. For other toxins the tests either don’t exist or are expensive.
- In 2008, DPH developed advisory criteria: (1) scum or mat present; or (2) a cell count exceeding 70,000 cells/mL; or (3) microcystin toxin value of 14 ppb .
- Goals of MDPH project: monitor water bodies with a history of bloom (Spy Pond), respond to reports of blooms and collect samples (Ell Pond), conduct surveillance for individuals, etc.
- Spy Pond – have been sampling for two years. No swimming allowed, but B&G has boating lessons. Want to have two weeks of data following a bloom, so if there is a late bloom, will continue sampling into the fall. Trying to find a correlation between one or more nutrients and cyanobacteria to find a cheaper and easier way to get a cell count. Huge November bloom – sampled into mid-December. Our algae season heats up in August and September, so it isn’t a June issue. It was very unexpected to have a bloom in November. There is a lot of diversity in a scum or bloom. 60% of samples contained three or more genera. Weeks of dominance can switch.
- Ell Pond in Melrose – alerted by MyRWA that there appeared to be elevated levels. Went out in September and sampled (no swimming allowed). Cell count high, issued advisory – there for almost 2 months.

- Health surveillance – focused on routine locations and more focused in the summer where people were swimming or having other contact. Gave boards of health information on HABs, sent information to hospitals and veterinarians. Distributed pamphlets.
- Next steps – Spy Pond has 2 years worth of data – trying to look at water quality nutrients to find correlations between chlorophyll-a and cyanobacteria. Planning sampling for this year, probably go back to Spy Pond.

Roger

Using EPA provided microscope to do cell counting. Three main species: Anabaena, Aphanizomenon, Microcystis

- In October there was a bloom on the Charles. Thick green scum- dries out and turns bluegreen. It has a terrible odor. Highly toxic, can kill a dog.
- In Spy Pond, it formed specs on the surface and then washed out on the shore line. Under a scope - When it is too thick to focus down thru it, you have to guess. If it is thick, you are probably over a health guideline anyway.
- Another species, Phani (Aphanizomenon), is of concern in the watershed – clumps can be 3-6” long. Have seen this on the Charles. When you look at it closely, you can see threads that clump together. Under a scope, you can see a clump with specialized cells to fix nitrogen. Later in the season, it starts to die off and forms vegetative cysts to sprout into new blooms the next year.
- Cyanobacteria tend to be very small cells and are the basis for chloroplasts in other plants.
- Ani (anabaena)- causes a pea green/blue color to the water when it is the dominant species. Looks like a string of pearls. Most cyanobacteria are protected by a sheen of sugar molecules. Comes in a linear and circular form (same spp.). You can get clumps.
- Have had a lot of varied in strands – oscillatoria. Identification isn’t good and can vary between labs. When it is the dominant species, it can color the water a light translucent green. This species isn’t forming a surface scum, but it is moved by the wind and will concentrate downstream/down wind.
- Collected some lumps from the bottom to verify that it is cyanobacteria. Need to identify the species. Most of the samples come from CRWA and MyRWA interns.
- In Ell Pond –sampled some scum around a cyan colored rock. Found spirulina – there are remaining questions about toxins bioaccumulating in humans causing neurological damage. Found in standard green color as well as in purple.
- Counting cells under a scope is an art, but there are ways to QA your methods.

- Little River on kayak, seen a lot of microcystis. Found a little inlet that showed blooms. Using google earth, can find two water bodies that look like they had a bloom at the time. It could also be duckweed, which looks the same on google earth. Same google earth photos show microcystis bloom in Lake in Saugus watershed. Aerial photography can be very helpful in identifying cyanobacterial blooms.
- Genetic labs need to do more work on identifying these species.

Tom

- Buoy monitoring project that EPA is involved in. Installed the buoy system in Wedge Pond in Winchester.
- Data was available on the website, but password protected. Had issues making it publicly accessible, but will continue to work on it and hopefully will have it available next year without a password. Partners and others who requested access were granted access.
- On the site, there were two buoys – Wedge Pond and in the Charles by community boating. Purpose was to collect WQ data and make it available and to see if the buoy could help with tracking cyanobacteria blooms.
- The data were displayed every 15 minutes. Every week, the instruments were swapped out and calibrated. Buoy was deployed from June – Sept. The sonde was 1 meter below the surface
- If you go to the google earth image, and you zoom in, you can see the buoy as a spot.
- Parameters monitored: Temperature, conductivity, pH, DO, chlorophyll, phycocyanin. There were some problems with the sondes, but mostly we got all the data.
- Collected grab samples 1m down next to the probe to correlate with cell counts and chlorophyll-a. We used two labs – the EPA lab and DPH lab – to look at the samples.
- Phycocyanin probe reading in Wedge Pond – this cyanobacteria pigment can be measured by the probe. In general, the measurements at this pond were very low. Early in the summer, the town did an algaecide treatment of the whole pond. We expected the cyanobacteria to come back, but it didn't.
- In the Charles, we saw higher readings, so these values were adjusted with our lab cell counts.
- There are a lot of fluctuations at 8/24, will want to go back and look at that.
- For DO, 5 mg/L is the state standard. We did see some DO violations. For pH, we did see violations of pH, above 8.3, which is the MA surface WQ standard. Saw similar exceedances in the Charles.

- Looking at phycocyanin across Wedge Pond and in the Charles, there was more variation in the Charles.
- Took some feedback from people who used the data from the buoy. There was consensus to move the Mystic buoy to a new spot next year.
- The probes worked well, we changed them out every week and they held their calibrations very well.
- We did have poor correlation between the chlorophyll probe and chlorophyll-a lab results. Some correlation issues with cell counts as well.
- Moving forward, the data is almost completely validated and it will be made available. We plan to deploy the buoy in the Mystic and Charles next year. We'd like to find a good location for the Mystic buoy. We chose the location that was known to have blooms, but also high recreation use. That is why Wedge Pond was chosen. Need better ways to calibrate chlorophyll and phycocyanin probes.

**Question:** Was information relayed to the town?

**Response:** No blooms were seen in Wedge Pond, so there wasn't anything to report.

**Question/Comment:** There is opportunity at Sandy Beach, if you need a new site. Lifeguards there don't necessarily know about cyanobacteria and what the problems are.

**Question:** Is anyone finding or ID-ing health problems that are directly linked to HABs and levels of E. coli and fecal coliform in the Mystic?

**Response:** Mike – we did not get any reports on health effects in 2010. In terms of education and outreach, DPH has distributed materials to physicians, and have tried to make them aware that patients who have certain symptoms to keep this on the radar screen. Main contact is with local health departments. Similar to beach outreach, a lot of the less severe health impacts are not generally reported to anyone-- neither to the health department to a doctor. It is similar to bacteria issues at beaches, for the most part, epidemiology studies have shown that these things are quick stomach bugs. Most people don't correlate these things to the beach, etc. It is very hard to get this kind of information. There are minor, but can become more severe, health impacts. A lot of it happens under the radar. Went out to water bodies to talk to people to do some education/outreach.

**Question:** Are there thoughts about using the buoys to measure additional WQ parameters by deploying multiple sondes?

**Response:** We only have two Buoys right now. We are talking about buying more. One of the things we're thinking about the buoys in stream locations during the off season. In the summer, they will be out

in lakes and ponds. Patrick – a challenge of using buoys for other WQ parameters – some of the nutrient parameters you are looking for info on don't have good reliable probes.

### **Open Discussion**

Patrick

A study in 2010 identified the Mystic and Charles as having the highest level of PAHs related to coal-tar sealants across the country. West to east, we have higher concentrations of these carcinogenic compounds coming off sealants into our water bodies.

**Question:** Does MA have an ordinance to outlaw the use of these sealants? Was it specifically linked to the sealants – current use or past practices?

**Response:** They used a core technique to see when the sealants were put down, and they have a good signature for these coal-tar sealants and they were able to identify these PAHs from sealants from the last 10-20 years.

**Question:** Is there model legislation?

**Response:** Not yet.

**Question:** EK – Patrick mentioned that one municipality is using real estate transfer to address illicit connections. Which town was it and was it a local ordinance? Is there an inspection of the house?

**Response:** It was an ordinance that was passed in Burlington. It is relatively new – passed in 2010. They are still learning its effectiveness. In many cases, it is not easy to find the outlet of these pumps and might require smoke or dye testing. Saugus recently lost a lawsuit with developers where they were trying to assign fees to developers to offset I/I. The developers thought it was an unfair fee. The developers won the case, so Saugus will have to go back to the books.

**What topics should we see in next year's forum?** -Patrick

**Response:** Sediments, general or specific in the Malden River

**Question:** Have there been studies to determine animal contributions – Canada geese, domestic pets, etc.?

**Response:** Patrick – circumstantial evidence is good here. Aberjona going into Mystic lake vs. Upper lake going into lower lake, there are isolated spots going in with sewage, but the Aberjona River is a large input. There are other strategies outlined by the RARE to help us figure out if animals are contributing. We are still at the place where we have stuff to remove that we know about. Tom – DEP did a study trying to identify percentages between animal waste. We still have stormwater inputs and pharmaceutical

data show that there is human waste. EPA will continue to work on methods to tease this out – human vs. non-human.

**Question:** Is the system CSO limited or SSO limited? If we have limited funds, should we go after CSOs or SSOs?

**Response:** Patrick – this is a cost-benefit analysis. The issues are linked, there is only so much capacity in the sewer lines. The more CSOs you have, the less SSOs you have. Neither of them are something we really want. We need to make good investments in both areas. Todd – from the regulatory perspective, SSOs are illegal. Under a 100-year storm, it is an enforcement discretion. SSOs are not allowed. Sump pumps can overwhelm pipes in small non-MS4 town – thought of an amnesty program, it is unlikely homeowners will go. People are completely unaware of what they are doing. When their basement is flooding, they just want to get rid of the water. Patrick – you need to provide a solution to these people, and you need an amnesty program that allows people to come forward and receive assistance from the town. The pressure seems to have to come from outside the municipality.

**Question:** If people do the right thing and pump the water out of their basements into the street, a CSO community will still just go into the stormdrain?

**Response:** Patrick – a CSO community is a different animal. SSOs are illegal in CSO communities. There is a large land tribe on the Mystic that is being brought to the attention of the governor to keep the land as it is a mitigation of flooding and pollutants – a large flood plain forest is on the books to be eliminated. Hopefully people will see the connection between keeping the forest.

### **Final Comment**

Stormwater seems like a good topic. You can mention the suggestions now or email Tom or Patrick. We will post all the presentations at MyRWA's website. We'll send everyone a link. We will also send out a survey monkey so that folks can say what was good, what will make it more useful going forward.