



THE COMMONWEALTH OF MASSACHUSETTS

WATER RESOURCES COMMISSION

100 CAMBRIDGE STREET, BOSTON MA 02114

Meeting Minutes for April 12, 2012

100 Cambridge Street, Boston, MA, 1:00 p.m.

Minutes amended and approved May 10, 2012

Members in Attendance:

Kathleen Baskin	Designee, Executive Office of Energy and Environmental Affairs (EEA)
Marilyn Contreas	Designee, Department of Housing and Community Development (DHCD)
Jonathan Yeo	Designee, Department of Conservation and Recreation (DCR)
Bethany Card	Designee, Department of Environmental Protection (MassDEP)
Gerard Kennedy	Designee, Department of Agricultural Resources (DAR)
Tim Purinton	Designee, Department of Fish and Game (DFG)
Thomas Cambareri	Public Member
Bob Zimmerman	Public Member

Members Absent

Joseph E. Pelczarski	Designee, Massachusetts Office of Coastal Zone Management (CZM)
John Lebeaux	Public Member

Others in Attendance:

Marilyn McCrory	DCR
Michele Drury	DCR
Bruce Hansen	DCR
Linda Hutchins	DCR
Sara Levin	USGS
Becky McEnroe	Aquaria Water
Brent Courchene	AECOM
Vandana Rao	EEA
Michelle Craddock	DFG/Div. of Ecological Restoration
Pam Heidell	MA Water Resources Authority
Peter Weiskel	USGS
Thomas Maguire	MassDEP
Laila Parker	DFG/Div. of Ecological Restoration
Tom Lamonte	MassDEP
Duane LeVangie	MassDEP
Jen Pederson	MA Water Works Assn.
Richard Bradley	Irrigation Assn. of New England

Baskin called the meeting to order at 1:10 p.m.

Agenda Item #1: Executive Director's Report

Baskin announced that the updated Water Conservation Standards will be on the agenda for a vote at the May 10 meeting of the Water Resources Commission. Commission staff plan to update this document in phases, with the first phase consisting of primarily "housekeeping" revisions that bring the document up to date. Revisions that will require more consideration and may involve stakeholder participation will be made over the next year.

Agenda Item #2: Vote on the Minutes of March 2012

Baskin invited a motion to approve the meeting minutes for March 8, 2012.

V O T E	A motion was made by Yeo with a second by Card to approve the meeting minutes for March 8, 2012.
	The vote to approve was unanimous of those present.

Agenda Item #3: Discussion: Hydrologic Conditions and Drought Management in Massachusetts

Baskin announced that the Drought Management Task Force will convene on April 13. The task force consists of federal and state agencies and organizations affected by drought. In determining whether to declare that drought conditions are in effect, the task force considers seven parameters, including a crop moisture index, precipitation, streamflow, groundwater levels, reservoir levels, and fire danger. The task force evaluates these parameters for each region of the state.

Hansen provided an update on the hydrologic conditions for March 2012. March represented the third consecutive month where rainfall was below normal. Statewide precipitation was 36 percent of normal, with some variation across the regions of the state. March was also the tenth driest March in the period of record (118 years). The January-to-March period was the fourth driest and the warmest three-month period in the period of record. Fire danger is extremely high.

Groundwater levels statewide are below normal, except on Cape Cod and in the Connecticut Valley, where groundwater conditions are normal. Streamflow statewide is generally below normal. Hansen called attention to flow duration graphs for eight stations in the hydrologic conditions report; these show streamflow being below the record low for the period of record. He explained that current streamflows are equivalent to normal streamflows for June and July. If below-normal precipitation continues through June, there is a strong possibility for severely depleted streamflows in June or July. Hansen reported that the Drought Monitor indicates that 50 percent of the state is experiencing severe drought conditions, and the rest of the state is in a moderate drought condition. The Seasonal Drought Outlook predicts an ongoing drought in Massachusetts, with some improvement through June 2012.

Zimmerman and Hansen engaged in some discussion of whether normal rainfall that could be expected for this time of year will be sufficient to recharge groundwater and restore streamflows. Zimmerman advocated for reducing the amount of groundwater that is being pumped, given early leaf-out and the uncertainty of receiving sufficient rainfall in the coming months. Baskin commented that everyone is concerned about a drought that starts this early in the season and noted that some public water suppliers have already implemented outdoor watering restrictions. Purinton asked if the Drought Management Task Force could act more quickly on a proposal to create a new drought declaration process that would be more responsive to drought conditions. Yeo responded that the Drought Management Task Force will take this into consideration at its meeting on April 13 and plans to meet again in early May, with the intent of responding as quickly as possible. LeVangie added that MassDEP is constrained in actions it can take through the Water Management Act permitting program by existing permits, which do not include a seven-day low-flow value as a trigger.

Hutchins explained that the drought action levels are normal, advisory, watch, warning, and emergency, and, for precipitation, the state has moved into the drought-watch level. She added

that a preponderance of indices must hit certain thresholds before certain actions are taken in accordance with the Drought Management Plan. She reviewed the various indices used. Though fire danger has been extremely high, the Drought Management Plan uses a measure of soil moisture conditions, which are presently normal. Groundwater levels and reservoir levels remain normal, while streamflow has triggered an advisory level in the southeast region of the state, with other regions likely to reach the advisory level by the end of April. She noted that groundwater levels need to recover before a region moves out of a drought action level.

Baskin added that the Drought Management Task Force will continue meeting monthly to monitor conditions. Cambareri commented that water levels in the Cape Cod region have not yet recovered.

Agenda Item #4: Vote on Modification of Aquaria's 2012 Sampling Protocol at the Desalination Plant, Dighton

Drury introduced Brent Courchene and Rebecca McEnroe, representing Aquaria Water. She thanked and acknowledged the work of staff at MassDEP, the Division of Marine Fisheries, and the Office of Coastal Zone Management. Drury provided background on the selection of a fisheries exclusion system for the Aquaria project (*Ed. note: see discussion of the Aquaria fisheries exclusion systems in the meeting minutes of the Water Resources Commission for January 2008, February 2008, November 2009, and October 2010*). Aquaria has been using the Gunderboom fisheries exclusion system because the Filtrex system did not perform as well in the field as it did in the laboratory. However, because the Gunderboom company has been experiencing financial difficulties, Aquaria is testing a new exclusionary device, the Beaudrey system. State environmental agencies are providing input to the testing this device for impingement and entrainment and advising Aquaria. She noted that Aquaria may return to the commission at some point for approval of this new device.

[Kennedy leaves.]

Drury explained why Aquaria is requesting a modification of its approved sampling protocol. The approved sampling plan requires a certain number of samples based on assumptions about the quantity of water that would be withdrawn. However, because demand has been less than expected, Aquaria needs to withdraw water only to perform maintenance flushing. Withdrawals above the amounts needed for maintenance serve no purpose, resulting in unnecessary use of energy and chemicals. After discussion with agency staff, Aquaria developed a graduated sampling program, based on demand; as demand fluctuates, the number of samples will also fluctuate. The only differences from the sampling plan approved in 2010 are in the number of samples from the Gunderboom system and the raw water intake. Drury noted that agency staff support Aquaria's request and recommend that the commission approve the modified sampling routine.

Drury explained that Aquaria has also requested a modification of the dive inspection schedule that is part of the approved operation and maintenance plan. Upon review, agency staff expressed concern about this modification and recommended that the commission deny this request.

McEnroe commented that Aquaria has not been delivering water to clients for about ten months and that the only water being withdrawn is for the purpose of keeping the system in good working order. She added that the company proposed the alternative sampling plan because it is not in anyone's interest to pump more water from the river than is needed.

Baskin invited a motion on the staff recommendation.

V O T E	A motion was made by Purinton with a second by Yeo to accept the April 12, 2012, staff recommendation concerning Aquaria’s request for modification to its 2012 sampling protocol. The vote to approve was unanimous of those present.
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Baskin advised the Aquaria representatives that the modified sampling protocol is in effect immediately. She added that agency staff look forward to coordinating with Aquaria on its study of the Beaudrey fisheries exclusion system.

Agenda Item #5: Presentation: Estimating the Firm Yield of Reservoirs in Massachusetts

Baskin welcomed Sara Levin and Peter Weiskel of the U.S. Geological Survey (USGS).

Levin provided an overview of the development of the Firm Yield Estimator (FYE) tool since 1996. USGS released the latest model version, 2.0, and report in 2011 (available at <http://pubs.usgs.gov/sir/2011/5125>). Levin gave an overview of refinements that were made to the model and outlined additional analyses conducted.

Levin provided an overview of how the model works. She showed a schematic illustrating all the processes that occur in a reservoir on a daily basis. She explained that the model includes a water balance equation that incorporates all of these processes and is solved for every time period in the period of record. She explained the iterative process used to solve the water balance equation, starting with a low yield for drinking water withdrawals and then increasing the yield with each iteration, until the reservoir fails – that is, water level in the reservoir would drop below the intake. Firm yield is then the highest rate of withdrawal that will not cause reservoir failure during the simulation.

She discussed refinements made to the model in more detail. An important refinement was the ability to conduct analyses using a daily, instead of monthly, time step. She explained that the monthly time step used in FYE version 1.0 resulted in an overestimation of firm yield. Another new tool, the Sustainable Yield Estimator, provided the ability to estimate daily streamflows for any ungaged site in Massachusetts. Using daily streamflows provides a more accurate representation of the range and variability of flows coming into the reservoir and a better estimate of firm yield.

Levin reviewed three simulation options available to model users: controlling volumes of water released, changing the reliability setting, and a demand management scenario that allows the user to set water-use restrictions during dry periods to see how these reduce firm yield. Levin described in detail two hypothetical controlled-release scenarios to see the percent change in firm yield compared to the no-releases scenario. She noted that the storage ratio is the controlling factor in how a reservoir responds to controlled releases. Levin also described how changing the reliability setting and reducing demand increase firm yield. Different combinations of all three management scenarios were also analyzed to examine tradeoffs among them. Other options for evaluating the effects of controlled releases were also discussed. Yeo commented that many towns do not have the infrastructure needed to do controlled releases. He also pointed out that the minimum pool for some reservoir systems must sometimes be located above the intake to avoid water quality problems.

Levin described additional analyses to assess the impact of data from less severe droughts on the calculation of firm yield. These analyses highlight the importance of using the most severe drought on record to calculate firm yield. The Firm Yield Estimator uses the 1960s drought, which is the longest and most severe drought on record.

Levin also described sources of uncertainty in the model and how these uncertainties may affect the calculation of firm yield. She noted that the current firm yields are conservative estimates and that the best way to reduce uncertainty is to have gaged streamflow data over a long period of record.

Several questions addressed uncertainties and their effect on the estimation of firm yield. Pederson asked how the Firm Yield Estimator relates to the interim surface water transition rule. Baskin responded that this remains to be determined. Pederson expressed concern about the emphasis on downstream releases in the Firm Yield report and said that, given the concerns about climate change, water suppliers do not believe downstream releases are appropriate, as their first concern is to ensure reliability and redundancy. She also asked if USGS had done anything to “ground-truth” the results of the model against information that the water suppliers had on their own firm yield. Levin responded that USGS contacted many water suppliers, but only two had data that could be used. Baskin asked what kinds of data would have been useful if these could be collected in the future. Levin suggested streamflow measurements, particularly streamflow coming into the reservoir, and data on stage elevations at a daily time scale.

Purinton commented that the analysis of downstream releases will be helpful in analyzing options for flow restoration and assessing mitigation options. Weiskel commented that the effects of climate change are a great concern for both water suppliers and those concerned about river instream flows. He added that USGS would welcome an opportunity to use this model or a more detailed site-specific hydrologic model at the basin level to analyze the effects of climate change.

[Yeo leaves.]

Agenda Item #6: Presentation: Precipitation Return Periods and Adaptation

Baskin introduced Tom Maguire of the Massachusetts Department of Environmental Protection. Maguire described a project MassDEP is conducting in cooperation with USGS with funding from EPA to recommend potential changes to wetland regulations and policies to address climate change impact on interests protected by the Wetlands Protection Act.

Maguire described a study conducted at the University of Massachusetts, Boston, regarding trends in maximum precipitation in northern New England. The study, which included precipitation stations in Massachusetts, found increasing maximum precipitation trends after 2005.

Maguire discussed analyses of precipitation amounts associated with storms of various return frequencies. He noted that MassDEP’s wetlands program bases stormwater design standards on Technical Paper 40 (TP40), published by the U.S. Weather Bureau in 1961. He noted TP40 was based on annual maxima series 1936 to 1958. He indicated the Northeast Regional Climate Center (NRCC) at Cornell University, in conjunction with the U.S. Natural Resources Conservation Service, prepared a new analysis in 2011 using partial duration series from 1936 to 2008. The NRCC return frequencies were published online at <http://precip.net>.

Using Boston as a case study, the data show that the 100-year 24-hour storm has increased from approximately 7 inches to 9 inches. Maguire noted for the 100-year 24-hour storm, this represents a 26 percent increase in Boston. He noted that for more frequent storms, such as 2-year and 10-year storms, the results were similar between the two studies.

Maguire explained differences between the methodology used in the two studies. Some discussion followed of the effect of time periods used in the analyses and the increasing frequency of larger storm events. Maguire noted that the selection of the type of statistical distribution and data series used affects the return-period result, especially at the right tail of the distribution. He noted that the National Weather Service update to TP40 plans to fit annual maxima series to Generalized Extreme Value (GEV) distribution, and that this may produce a 100-year 24-hour storm depth even larger than that determined by NRCC, based solely on distribution selection.

Using a hypothetical 10-acre site, peak runoff rate from the TP40 100-year storm is equivalent to the NRCC 32-year storm peak runoff rate. When potential climate change is factored in, the runoff rate from the 32-year storm becomes equivalent to the runoff rate from a 20-year storm. MassDEP's wetlands program requires projects in wetland resource areas to control runoff for the 2-, 10-, and 100-year storms so as to not increase peak rate of runoff. If the level of stormwater control being provided is inadequate, then the potential for stream channel changes and downstream flooding increases. Maguire also noted that as the climate trends towards higher precipitation intensity continue, Massachusetts infrastructure, such as bridges and culverts, will have higher potential to be damaged.

There was some discussion of Army Corps of Engineers and Massachusetts Department of Transportation permitting requirements for bridge replacement and stream crossing standards for culverts. Purinton commented that the Division of Ecological Restoration is working with MassDEP to provide incentives, through streamlined permitting, for crossings that conform to the stream-crossing standards and to provide disincentives for in-kind replacements.

Maguire reviewed the increasing frequency of federal disaster declarations in Massachusetts, resulting in increases in damage to public infrastructure sustained by the state. Since 2001, there has been flooding damage every year and a half, on average, based on federal disaster declarations.

He indicated that the MassDEP wetlands program has sought assistance from USGS to seek recommendations to address climate change, such as design storms in the wetlands regulations, stormwater design standards, floodplain designations, culvert-sizing standards, vernal pool protection, and wildlife habitat evaluations. MassDEP is in the information-gathering phase, is working with USGS, and may convene a working group to assist the agency in reviewing regulations and policy after USGS recommendations are complete.

Meeting adjourned, 3:00 p.m.

Documents or Exhibits Used at Meeting:

- WRC Meeting Minutes for March 8, 2012
- Levin, S.B., Archfield, S.A., and Massey, A.J., 2011, Refinement and evaluation of the Massachusetts firm-yield estimator model version 2.0: U.S. Geological Survey Scientific

Investigations Report 2011–5125, 49 p., plus CD–ROM. Available at <http://pubs.usgs.gov/sir/2011/5125>

- Correspondence from Don Rose, Coler & Colantonio, to Kathleen Baskin, dated March 7, 2012, regarding Offsets for FoxRock Properties at 105 Research Road, Hingham
- Memorandum from WRC Staff to Water Resources Commission, dated April 12, 2012: Update on Cohasset’s activities to implement its drought management plan, as part of a finding of Insignificance under the Interbasin Transfer Act
- Interbasin Transfer Act project status report
- Memorandum from WRC Staff to Water Resources Commission, dated April 12, 2012: Staff Recommendation on Modifications to the 2012 Sampling Protocol for the Taunton River Desalination Plant (Aquaria).
- Current Water Conditions in Massachusetts, April 12, 2012
- Presentation slides by Sara Levin, USGS: Refinement and further evaluation of the Massachusetts Firm-Yield-Estimator model version 2.0 (available on the [Water Resources Commission](#) website).
- University of Massachusetts, Boston, study by Ellen Douglas and Chelsea Fairbanks (referenced by Tom Maguire): available at http://www.faculty.umb.edu/ellen.douglas/files/Douglas&Fairbank_JoHE_072010.pdf.