

**DELAWARE RIVER BASIN COMMISSION
REGULATED FLOW ADVISORY COMMITTEE
June 17, 2009**

MEETING SUMMARY

The June 17, 2009 Regulated Flow Advisory Committee (RFAC) meeting began at 10:00 a.m. at the Delaware River Basin Commission (DRBC) offices in West Trenton, New Jersey. Joseph Miri of the New Jersey Department of Environmental Protection chaired the meeting. Dr. Miri invited everyone present to introduce themselves and did the same with those attending via teleconference.

Approval of the minutes from the December 11, 2008 RFAC meeting

The minutes from the December 11, 2008 meeting were reviewed. Stewart Lovell requested a correction to the third paragraph on page four, where Wilmington is referred to as Southern Delaware – it should be Northern Delaware instead. A motion was made and seconded to approve the minutes as corrected. All committee members voted in favor.

Hydrologic Conditions Report

Hernán Quinodoz of DRBC reported on the current hydrologic conditions in the Basin. He said year-to-date precipitation totals are below the long-term average throughout the basin, with deficits generally increasing from north to south. Conditions have varied greatly over the period, however, with a dry spell during February and March. As of April 7, 2009 the Delaware River Basin was classified as abnormally dry by the National Drought Mitigation Center. Two months later, on June 9, most of the basin was back to normal status, after a recent wetter-than-normal period.

Monthly precipitation totals analyzed by the Middle Atlantic River Forecast Center showed significant departures from normal. As of February 2009, parts of the Delaware Basin had monthly totals smaller than 75% below normal; totals in some counties were between 51% and 75% below normal. During March 2009 precipitation totals in most of the Basin were between 51% and 75% below normal. During the first half of June, the entire basin recorded precipitation totals higher than normal, with the middle and lower basin having the highest surpluses, at more than 75% above normal.

Groundwater monitoring wells displayed a similar pattern since the beginning of the year. As an example, we looked at data from two long-term USGS county monitoring wells in Pennsylvania, one in Bucks County and one in Chester County. Both wells displayed water depths (30-day moving averages) lower than normal during March and April, rebounding back to normal during May and June (normal conditions for groundwater are defined as values between the 25- and 75-percentile of historical water depths for the same day of the year).

Streamflows also reflected a similar pattern. For example, the USGS gages on the Delaware River at Montague and Trenton registered flows below the median (50-percentile) from mid-March to mid-May. The USGS gages on the Lehigh River at Bethlehem and the Schuylkill River at Philadelphia registered flows below the median from mid-January to early-May. After that period, flows at both gages were higher than the median and remain so today.

Storage in the major basin reservoirs is currently at full capacity, which is normal for the time of year. This applies to the three NYC Delaware Basin reservoirs and to Beltzville and Blue Marsh reservoirs in the lower basin. Releases from the three NYC reservoirs are at "L1-c" rates: 325 cfs from Cannonsville, 150 cfs from Pepacton and 110 cfs from Neversink. Chlorides in the tidal Delaware River are currently at normal levels: the salt front (250 ppm) on June 12 was located at river mile 69, two miles upstream of the average location for June.

Both the short- and medium-term forecasts indicate improved hydrologic conditions in the basin. On June 16, the five-day precipitation forecast called for between 1.75 and 3.00 inches of rain. The US Seasonal Drought Outlook, prepared by the National Weather Service, calls for normal conditions throughout the basin for the period through August 30.

FFMP Temporary Summer 2009 Releases Program

Dr. Muralidhar of NYS DEC reviewed the main features of the Flexible Flow Management Program (FFMP) and presented its latest modification, the temporary summer 2009 releases program. This temporary program was approved by the Decree Parties on May 27, 2009 and took effect on June 1, 2009.

Dr. Muralidhar provided a brief assessment of the FFMP since originally approved by the Decree Parties in September 2007. There has been good cooperation among staff from the three agencies involved in managing the program: NYS DEC, NYC DEP and the Office of the Delaware River Master (ODRM) of the USGS. The FFMP is working effectively, while being adaptively managed by the Decree parties.

The first temporary change in the program was in effect during June 9-11, 2008. The change was enacted in response to unseasonably high air temperatures experienced in early June, which produced rapid and large increases in stream water temperatures. This temporary program allowed extra releases from Cannonsville reservoir, to provide thermal protection downstream to Hancock, NY. The extra water was taken from the Interim Excess Release Quantity (IERQ) defined in the FFMP. Dr. Muralidhar indicated that stream temperatures downstream of Junction Pool are not controllable by reservoir releases, due to the high flows on the East Branch Delaware River, a source of warmer water.

The second change to the program was the Emergency Thermal Releases Program, in effect from July 11 to September 15, 2008. This program was enacted as a preventive

measure, to be able to respond to potential future extraordinary thermal conditions on a timely manner. The program allowed emergency releases from Cannonsville Reservoir to provide thermal protection downstream to just below Hancock, NY. Water for the program was provided from an Extraordinary Needs Bank of 1,340 cfs-days created from the 2008-09 IERQ. Additional water was provided from a reduction in the Montague flow target, from 1850 cfs to 1830 cfs. However, most water in the Extraordinary Needs Bank went unused because the triggering criteria (3-day average maximum and minimum air temperature) were never met. Upon review of the program, the temperature triggering criteria were found to be too restrictive.

The first non-emergency modification of the FFMP (Modification # 1) was enacted on December 10, 2008. The key change was extending the summer season (originally June 1-August 31) to the May 21-September 15 period, which includes both the Memorial Day and Labor Day weekends. This change, developed in response to public requests, allows larger reservoir releases over an extended period of time.

The second non-emergency modification of the FFMP (Modification # 2) was enacted on June 1, 2009. The key change is an increase in normal summer releases from Cannonsville reservoir during normal operating conditions – releases range from 300 to 325 cfs, depending on reservoir storage levels (previous rate was 260 cfs). The increased release rates are intended to address instream thermal concerns expressed by fishermen. Water for the program is provided from an IERQ Extraordinary Needs Bank of 9,300 cfs-days, reallocating water that would have been available for a higher Montague flow target during the summer (June 15-September 15). Under the current program, the Montague flow target remains at 1750 cfs during the summer.

Dr. Muralidhar indicated that the current program (Modification # 2) is supported by staff from the fishery agencies in NY and PA. Key benefits of the program include: (1) improved habitat with incremental Cannonsville releases in the West Branch Delaware River and the Upper Delaware River upstream of Hankins, NY; (2) thermal mitigation in the Upper Delaware River, in the vicinity of Junction Pool; and (3) mitigation of ‘yo-yo-ing’ in releases needed to meet the Montague flow target (both the reduced Montague target and the increased Cannonsville releases reduce the magnitude of releases needed to meet the Montague flow). Dr. Muralidhar further indicated that the increased Cannonsville releases would extend a coldwater plume below Hancock, NY; the coldwater plume could reach as far downstream as Lordville, NY when flows in the East Branch are lower than flows in the West Branch Delaware River. However, thermal events are still possible when air temperatures are above normal for an extended period of time or when flows in the East Branch are higher than flows in the West Branch Delaware River.

The current program (Modification # 2) was designed to have no significant impact on water supply, as measured by drought days simulated over the period of record. The current program has no impacts on the Delaware River flows at Callicoon, NY and no impacts on NYC combined Delaware basin reservoir storage. Dr. Muralidhar presented a set of charts to demonstrate these points.

Discussion followed Dr. Muralidhar's presentation. Mary Ellen Noble asked if the presentation would be posted on the web. Others indicated that it would be posted both on the River Master's website and on DRBC's website. Phil Chase asked about the advantage of trading the higher (1,850 cfs) Montague flow target for higher Cannonsville releases. His view was that the lower 1,750 flow target adopted in the new program meant a loss a 100 cfs. Gary Paulachok responded that releases to sustain the 1,850-cfs flow target are supplemental to the natural flow conditions – if there was no directed release on a particular day, the 100-cfs would not come down the river. The extra 100-cfs release is included in the River Master Directed Release. Gary Paulachok further indicated that the new program described by Dr. Muralidhar requires an additional release from Cannonsville of 65 cfs on a daily basis for 93 days.

Bob Tudor stated that because there is only a fixed amount of water in the system, if you want to allocate water in a new way, you have to find a source. The thinking behind the current program is that larger releases from Cannonsville during the summer will be more beneficial than using the same water to increase the Montague target from 1,750 cfs to 1,850 cfs, also during the summer. Phil Chase recalled that around 1970 the excess release rate was as high as 900 cfs; New York City used more water over the following years and by 1980 the excess release rate was down to 100 cfs. When the rate was 900 cfs there was water up to the banks and the rainbow trout population just exploded. Now even the lower 100-cfs rate is no longer there. Dr. Muralidhar responded that the current program does not use all the excess release water – only 2/3 of it is used for the new summer program, leaving about 3,300 cfs-days in the Excess Release Bank. He also indicated that even though the water is being released through a different program, it is still coming down the river.

Dr. Muralidhar indicated that the current summer program holds some water in reserve in case we have a repeat of last summer conditions and additional releases are needed to mitigate high instream temperatures. Someone commented that one of the major objectives of the FFMP program was to avoid having to manage banks of dedicated storage on a daily basis. Dr. Muralidhar agreed, but also mentioned that last year, as temperatures increased, there were calls to reconstitute the storage banks to provide additional emergency releases. In response to another question, Dr. Muralidhar replied that the triggers for temperature mitigation releases are water temperature exceeding 75°F for two consecutive days and air temperature exceeding 85°F for two consecutive days. Jeff Zimmerman asked if RFAC would consider asking SEF to evaluate the temperature threshold. Dr. Muralidhar replied that this issue was an item in today's meeting agenda.

Peter Kolesar said the current program is a step in the right direction and that his research group has done extensive analyses of the habitat impact of the Montague flow target and the habitat impact of increasing Cannonsville flows – they found out that even a modest increase in Cannonsville releases provides a modest habitat benefit for trout. Jim Serio said the Delaware River Decision Support System (DSS) showed no habitat benefits when the ERQ water is used to meet the higher (1,850 cfs) Montague target. Instead, shifting the water from the ERQ to higher Cannonsville releases was found to provide

definite benefits. However, these habitat benefits occur almost exclusively on the West Branch Delaware River; there is a very minimum benefit on the mainstem Delaware River.

Mark Hartle commented on a statement made by Dr. Muralidhar during his presentation, when he stated that staff from the Pennsylvania Fish and Boat Commission (PA FBC) supported the current summer releases program. Mark Hartle stated that the PA FBC staff had not evaluated the program as a whole, but only some of its elements. They even disagree with some elements of the program, such as the temperature releases bank. However, the view of PA FBC staff is that the current summer releases program is a step in the right direction. The current program is not what it should be in the long run, but PA FBC staff agrees that it will provide the habitat benefits mentioned by Jim Serio.

Bob Bachman said he had noticed several comments indicating that PA FBC has been in support of the summer releases program, while his understanding was that PA FBC's only involvement had been a few telephone calls to consult with Mark Hartle. Bob Bachman approved of splitting the normal (L2) zone into two release levels, but was against banks for temperature mitigation releases. He said even the idea of banks being able to provide any help to the fishery is simply not true. Review of temperature data shows that when you release a slug of cold water down the river, it takes at least two days to get to where it is needed and then maybe two more days for the water temperature to start coming down. That is why our position has been for a long time that it is better to put the same water into sustained higher releases and not in banks. Banks do not work. Dr. Muralidhar agreed with Mr. Bachman and emphasized that the current program dedicates most of the extra water to higher releases. The water left in the bank does not have to be used for temperature mitigation releases; it can be used for any other purpose as needs develop during the year.

Jim Serio asked how the new provisions to avoid yo-yo-ing of NYC releases would work in practice. How will this new flexibility work with ramping of releases? Tom Murphy responded that the FFMP previously restricted ramping to three days – the actual language in the FFMP is “generally over three days but not to exceed...” Now the “not to exceed” limit has been removed, allowing changes in release rates to be effected over a longer period of time. An example would be in the spring when reservoir storage moves into the highest-release zone (L1-a) and 1,500-cfs releases from Cannonsville are called for. The higher releases would lower storage levels, triggering reduced release rates. Since runoff would still be high, the lower releases would be overcome by it, bringing storage back to the highest-release zone. Complying with the FFMP language would create situations where releases jump up and down over short periods of time (yo-yo-ing) – that is something that nobody likes, including the fishery people and NYC DEP reservoir operators (potential impacts on equipment). The new provisions would allow us to respond on a situational basis - after releases move up to the L1-a level and runoff is still high, lower releases may be called for, but we would have the flexibility not to go all the way down to the L1-b or L1-c release rate. Being able to lower release rates to an intermediate level that may match runoff incoming into the reservoir would give the situation a better chance to stabilize.

Jim Serio said you also need to look at the front end. Instead of waiting for the trigger yesterday to ramp up to 1,500 cfs, perhaps you could have started to ramp over previous days. Doing this as soon as it becomes evident that the reservoir is going to spill can provide some extra benefit for a week or so. You could do the ramping at both ends more gradually, not just at the falling end. Bill Gast replied that the changes just made to the FFMP language would allow that. The language is not specific on either direction, so it could come from the front end too. In response to a question, Gary Paulachok indicated that the revised FFMP language is posted on the River Master's web site. It is called the Storage Balancing Agreement. It has been posted for about a week to 10 days.

Tom Murphy said the new language gives NYC time to look at the hydrologic conditions that are prevailing and make a decision on whether they want to wait for extra time or wait and see before they make release changes. It gives NYC flexibility to respond to conditions instead of being locked into a specific operational procedure.

Mary Ellen Noble asked if someone would have the capability of at the end of this water year to compare the net water release, the difference because of the ramping to avoid yo-yo-ing of releases. Tom Murphy questioned the value of such a comparison and the time and effort involved. Mary Ellen Noble replied that keeping track of the extra water involved in longer ramping over the first year of the program might be something useful.

Report on Subcommittee on Ecological Flows (SEF) Activities

Mark Hartle, chairperson of the Subcommittee on Ecological Flows (SEF), provided a report on SEF activities. In response to direction from RFAC (at the last RFAC meeting), SEF evaluated an expansion of its membership to add expertise in estuarine ecology. SEF solicited an additional member from each state in the basin and two members at large. New York and Pennsylvania responded affirmatively, nominating Norman McBride of the NYS DEC, Bureau of Fisheries and Daryl Pierce of the Penna. Fish and Boat Commission (PA FBC), respectively. Mark is awaiting responses from New Jersey and Delaware. Joe Miri stated that New Jersey will nominate an additional member soon. Harry Otto indicated that Roy Miller is retiring on July 1, 2009 and discussion is ongoing as to who will replace him – thus there are two open spots for Delaware representatives on SEF.

Two at-large members have been nominated: Danielle Kreeger, Science Director, Partnership for the Delaware Estuary, Wilmington, DE and Eric Powell, Director, Rutgers University Haskin Shellfish Research Laboratory, Port Norris, NJ. Mark Hartle said he would ask New Jersey if they want Eric Powell to represent New Jersey or to serve as at-large member of the subcommittee. Mark said the US Department of the Interior has requested an additional member for SEF and nominated Cindy Tibbott of the US Fish and Wildlife Service (USFWS), State College office. The USFWS is the federal trustee for federally threatened and endangered species such as the dwarf wedgemussel. SEF seeks a decision from RFAC on the acceptability of nominated candidates, including the request from the US Department of Interior for additional representation.

Mark Hartle then reported on two dwarf wedgemussel studies that are ongoing, but not yet complete. SEF will convene to review the results when complete draft reports from each study are available. The first study was commissioned by the USFWS and contracted out to Piotr Parasiewicz. The study is entitled “Dwarf Wedgemussel Habitat in the Upper Delaware River.” The final report will have three parts; the first of them is dated May 2009 and has been circulated among SEF member agencies, but not yet considered by SEF due to its incompleteness. The second study is being conducted by Bill Lellis of the USGS, Leetown Science Center. The study is entitled “Reevaluation of the Decision Support System (DSS) Dwarf Wedgemussel Component and Follow-up Flow vs. Habitat Analysis.” This study is internally funded by USGS and Bill Lellis is cooperating with Ken Bovee, also with the USGS, one of the developers of the Delaware River DSS. Study completion has been delayed by the inability to fill staff positions – completion is expected later in 2009.

Mark Hartle listed other ongoing studies and analyses of which SEF members are aware: (1) Joint NYS DEC/PA FBC white paper, tentatively entitled “Recommended Improvements to the Flexible Flow Management Program for the Best Management of Coldwater Fish Community and Threatened and Endangered Species Protection” (contacts are Jim Daley, NYS DEC Bureau of Fisheries and Mark Hartle, PA FBC); (2) June 17, 2009 fisheries and flood mitigation constituents’ proposal for reservoir releases (contact is Jeff Zimmerman); (3) possible request from RFAC for SEF to evaluate the temperature range for suitable trout habitat in Upper Delaware; (4) draft paper from The Nature Conservancy (TNC), “Flow Alteration in the Upper Delaware Basin” (contact is Colin Apse) – SEF has agreed to distribute the report to SEF and RFAC members (feedback can be provided directly to Colin Apse); and (5) US Department of Interior concerns with ramping rates, especially after River Master directed releases and possible flow target at Callicoon to protect dwarf wedgemussel. SEF will meet and consider these reports and any RFAC requests regarding the studies; a time frame for completion of the SEF reviews has to be determined.

Erik Silldorff handed out copies of a draft report prepared by TNC staff and entitled “Flow Alteration in the Upper Delaware Basin.” This report has just been provided to DRBC by Colin Apse of TNC. Erik provided hard copies only to RFAC members and indicated that additional copies would be provided to SEF members for review; he offered to provide electronic copies by email to anyone interested.

Someone asked Erik Silldorff if he had a chance to look at the report, knowing that TNC was advocating for more natural flow regimes. Erik responded that the report analyzes USGS publicly available flow data prior to the NYC reservoirs being built and then in successive management periods when the reservoirs were in operation – the intent is to evaluate the strictly hydrological alteration, not a biological response. The report looks at how streamflow has changed since the reservoirs were built; it looks at all the successive management decisions by the Decree Parties and the DRBC to improve the management of the NYC reservoir releases for ecological benefits. The report then looks at the 2008

implementation of the FFMP. The report states that the FFMP reservoir releases are a move in a positive direction, towards a more natural flow regime.

Mary Ellen Noble pointed to the difficulty of getting hold of information and suggested that it would be best to have a single place where everybody could post items. Currently, each time somebody adds something to the picture, you don't know exactly where to go to download the information. She pointed to the draft report from TNC as an example.

Dr. Muralidhar stated that before SEF considers all of these reports, the RFAC should have an opportunity to review and comment on these things, prioritizing exactly what subject needs to be evaluated by SEF. Before SEF gets involved in analyzing water supply reservoir management impacts during 1954-2008, the topic should be an agenda item for RFAC. Joe Miri brought up the need to identify priorities for SEF to follow. There is a procedure whereby RFAC has to approve it and it has to be considered for approval. Thus, the tasks assigned to SEF are very clearly set forth.

Peter Kolesar disagreed with this approach to managing both RFAC and SEF agendas. He said SEF is a scientific committee and a group of scientist cannot be told that some documents should not be looked at, which is how this conversation began. How can people serve in SEF if judgments will be formed prior to their consideration? Joe Miri said RFAC is not forming judgments prior to SEF's consideration; RFAC is not telling SEF what to recommend as far as review of an item, but RFAC is prescribing what their work plan is. This gets us through the complications of the institutions that we are trying to deal with. This is the lay of the land at the moment – although it could be changed. The ground rules that we currently have are that RFAC makes a determination of what SEF can do and prioritizes items on SEF's agenda.

Erik Silldorff offered his own view – SEF as a group of scientists are allowed to read anything that they want to read. The RFAC tasks them with what specifically they need to do for RFAC. Joe Miri said RFAC is not trying to censor what SEF may look at, but direct what SEF engages in, in terms of categories of studies. For example, no one asked SEF to find out the details of the DSS – no one prescribed those results. RFAC did assign them the project to do the analysis – SEF did that analysis and presented their findings. The same goes for these reviews. SEF is being asked to review these studies and they can say anything they please about these projects after their review.

Peter Kolesar asked the group here to recognize the opportunity that comes about as a consequence of reconsidering the DSS, about augmenting its ability to handle the dwarf wedgemussel habitat. He is concerned about the existing issues with the DSS – everyone that works with the DSS knows how tedious and awkward it is to use. He would like to see that any investment being made now to evaluate the DSS with respect to dwarf wedgemussel habitat can simultaneously try to make the DSS a much more useful tool for the broad community – not just for those interested in the dwarf wedgemussel. Gary Paulachok suggested that Peter could express his concerns directly to Ken Bovee and Bill Lellis, since they are the people engaged in the DSS work. Ken Bovee actually

developed the DSS. Peter Kolesar replied that he sees an opportunity for RFAC to give some direction. This project is something that needs to be driven.

Someone asked if the DSS changes would involve simply modifying the Excel spreadsheet model or also rewriting it in a program language to allow analyses of the entire period of record. Mark Hartle replied that his understanding was that they are looking at habitat suitability only, without changing the DSS from Excel to a more robust programming language. Jim Serio stated that he had spoken with Bill Lellis and found out that some limitations were related to funding. Bill Lellis told Jim that they have the money to rewrite the DSS to make it run for the whole period of record, but they are only doing it for the dwarf wedgemussel. It is not in a new language; it is still in Excel. However, by eliminating other parts of the DSS, Lellis and colleagues can allow Excel to run for the whole period of record, but only for dwarf wedgemussel habitat evaluations.

Jim Serio agreed with Peter Kolesar on the advantages of having some direction from RFAC to USGS, because everybody recognizes the limitations of the DSS, and Bill Lellis is not going to address the temperature modeling issue and the need for other metrics. Joe Miri said he was unaware of this USGS study – this shows that anyone can take a product and use it. In this case, the USGS Leetown Science Center went back to the original DSS and figured out how to make these changes to fit their needs. Although RFAC would like to have the opportunity and time to think about how best to proceed, the USGS project has its own independent funding.

Don Hamilton said with the limited amount of funding and resources that Bill Lellis has, he is pursuing the DSS revision with a primary focus on dwarf wedgemussel, because this is a trust species that the Department of the Interior is responsible for. He might be open to looking at other species in that redesign of the DSS. If someone approached him about that, and could bring additional funding, he may be open to consider expanding the scope of the project. Currently his focus has to be somewhat limited because of the resources he has to work with.

Someone asked if RFAC could help the DSS project conducted by Bill Lellis. Joe Miri replied that analyzing the DSS model in some comprehensive way could require significant funding. RFAC could not task SEF with this analysis without some funding being available and some prioritization of possible issues. Someone argued that the first task should be to establish what is wrong with the current version of the DSS and what capabilities are needed – this should be done before talking about funding. Joe Miri asked RFAC members if they felt that some action could be taken today on this issue. He then suggested contacting Bill Lellis as a first step, to get his view on what the DSS-related issues are.

Don Hamilton asked whether RFAC could try to come up with a list of flow-related study needs for the basin, assigning a priority to each item on the list and looking for funding opportunities to support those studies. Joe Miri agreed that a prioritized list of research or analysis is needed in order to make any judgments about what your next step is. His

concern is that lacking such a prioritized list, it is difficult to provide direction to SEF today on DSS-related studies.

Potential Evaluation by SEF of Temperature Range Required for Suitable Trout Habitat in the Upper Delaware

Joe Miri introduced the issue – What are the instream temperatures that produce suitable habitat conditions for trout? To have suitable habitat, is there a range of temperatures that are desirable? Are there specific temperature thresholds? Joe Miri said someone recently suggested that this might be a good task for SEF. He asked RFAC members to address today whether this should be done and if so to suggest options for implementing this kind of analysis. What do we have to suggest SEF to review?

Dr. Muralidhar stated that existing criteria for instream water temperature are not to exceed either 72°F daily average or 75°F daily maximum. These limits have been used until now for implementing the releases prescribed in DRBC's Docket D-77-20. At the last River Master Advisory Committee Meeting, when Norm McBride was evaluating recent water temperature data, a suggestion was made to consider using a weekly average of 68°F as a limit. Norm suggested that 70°F daily maximum could be an alternative limit. Since different criteria have been tossed around recently, we may need to reconsider this issue. Especially if we have three different criteria, it is hard for managers to decide which one is the one to use – it would be best to ask fishery biologists to weigh in on this issue. And that brings us right to the point of whether SEF can contribute to the clarification of that question.

Mark Hartle indicated that he saw this as a relevant assignment for SEF because of the potential advantages of standardizing the way we consider temperature-related issues – results would allow for better communication, evaluation of programs, setting of goals, whatever you want to do. He stated that there are three different elements that would come into play in this assignment. The first element is what is established in regulation. For example, stream water quality regulations in PA have a temperature standard for the Delaware that is 66°F in the summer; DRBC has criteria that trigger some actions if a discharger increases temperatures above 58°F. The second element is what is optimal, for example the West Branch is most affected by releases from Cannonsville and then you have warming in the East Branch and then the East and West Branches come together, so you have a gradient of temperature. What is the optimum gradient? The third element is what is the maximum? What keeps them alive, what do they thrive in? What do the existing regulations say?

Dr. Muralidhar stated that the problem with that approach is that we have a limited amount of water for releases. Even with temperatures like those registered last summer, 75°F for 5 consecutive days, there have been no confirmed fish kills since 1985, when the basin was in a serious drought. If a 75°F maximum water temperature is not causing any severe problems such as fish kills, why should releases be made when temperatures exceed 65°F? Mark Hartle replied that Dr. Muralidhar was already about two steps ahead of him. First we have to realize that not killing and suitable are not the same thing.

Wouldn't you want to know what the best temperature is? There is obviously a transition zone which moves upstream in drier years and in warmer years and ultimately you would not want that zone to fluctuate from Hancock down to Hankins. Mark said these are all relevant issues that we need to look at.

Erik Silldorff spoke of a parallel ongoing process at DRBC, also looking at instream temperature, which at some point should connect with the Water Quality Advisory Committee. Three DRBC staff members, Bob Limbeck, Erik Silldorff, and John Yagecic are looking at both the designated uses and associated temperature criteria for the entire river system – the biggest controversy is in Zone 1A which is from Hancock down to Narrowsburg; also the zone of the West Branch which is shared boundary waters. There is an ongoing process looking at what temperatures are appropriate for criteria. Not just what criteria exist, because current DRBC criteria are inappropriate. DRBC criteria do not set maximum thresholds for the river; it only sets limits for dischargers, which are not allowed to increase temperature above 5°C for different temperature ranges for different parts of the river. This process at DRBC is relevant to what SEF will be doing and at some point the two efforts should be coordinated.

Bob Bachman pointed out that there is a lot of recent information regarding the critical temperatures for cold water insects, critical temperatures for trout, and certainly SEF is capable of providing RFAC with very important information whereupon you can make your decisions about how much water to release, when to release it and how to release it in order to control temperatures. When the three reservoirs were built, they changed the river ecosystems – if you want to maintain a cold water ecosystem it has certain thermal requirements. You cannot base it on whether or not you saw a bunch of fish floating down the river – that is not the way to look at it. You look at impacts on the insects, how the other ecological critters living on the river are impacted and because of the interest of the trout fishery, how are the rainbow and brown trout impacted? You cannot use an LD50 that means that 50% of them die over a seven-day period at 75°F and say that is OK. That is clearly not an adequate number, but you can define the maximum temperature at which the insects and fish can be happy. These are the conditions that we are going to try to obtain for certain distances down these various rivers, and they are a function of how much water you get – not what the fish need, but what you are capable of doing for them. I quite agree with Dr. Muralidhar's statement that the amount of water available is limited, and this limits what you are trying to accomplish. You are trying to support a cold water ecosystem and nobody has yet, in the time I have been on SEF, defined what that is. What you are trying to find out is, once a maximum temperature has been established, how far down the river can temperature be maintained below the maximum?

Bill Gast made a motion to assign to SEF the study of this issue. He asked Mark Hartle what exactly is needed in the way of assignment to make it specific. Is a temperature range sufficient or do you need something more specific? Joe Miri asked Mark Hartle if this type of analysis could be done without dedicated funding. Is this something that SEF could do on its own? Bob Tudor asked if SEF could do a literature search looking at scientific studies that have already been done. Bill Gast proposed that SEF be assigned to

meet and discuss what is needed to do this analysis and report back to RFAC with recommendations on what kind of analysis SEF would use. Then RFAC could make a more informed decision. Bob Tudor asked Mark Hartle if it would be possible to define the scope today. Joe Miri said SEF can state the question in the way it feels it is most appropriate.

Mark Hartle said it was a reasonable request to ask SEF as a scientific and technical challenge to basically do an expert panel evaluation of the temperature range required for suitable trout habitat – the question is phrased appropriately so you will get our input and any resources that we can have. There are many studies in the literature that provide relevant information – if you want anything more intensive than that, then you are going to have to come up with some money to make that happen. With SEF's existing capabilities we can do an initial expert panel evaluation of the temperature range required for suitable trout habitat. Suitable trout habitat will probably take many forms. We will have the benefit of considering all such forms.

Bill Gast made a motion for SEF to do an evaluation of the temperature range required for suitable trout habitat in the Upper Delaware. Then asked if the analysis should be restricted only to trout or expanded to include other species such as insects. Don Hamilton added that there is a lot of existing information in the literature about habitat temperatures for trout, probably more than for any other species that we are considering. Don said looking at desired resource conditions in different sections of the river would bring a little more focus to SEF's efforts. If water quality zone 1A needs to be subdivided into different sections, rather than Hancock and Narrowsburg, then SEF should consider that. We could look at existing conditions in the river under some of the flow regimes that we have had and what desired conditions are for species and habitat in different sections of the river. It might make the task a bit more reasonable.

Bob Tudor indicated that DRBC is working along those lines now, with their evaluation of designated uses for sections of the river. Erik Silldorff added that the first question to address is what the temperature requirements for trout are, but not where those temperature requirements would be applied to the river. The latter is a process of defining the uses of the river, which is part of defining water quality standards and DRBC standards. It is part of the purview of the Water Quality Advisory Committee (WQAC) and this is where there needs to be some coordination between RFAC and WQAC – perhaps even joint meetings could be set up to deal with temperature issues. Another big question right now relates to our trout maintenance propagation, which extends all the way down to Narrowsburg. It is a very heavy task for the NYC reservoirs to maintain suitable temperatures all the way down to Narrowsburg. There is some need to revisit the designated uses splitting zone 1A, extending from Hancock down to Narrowsburg, into multiple zones and whether or not we do a full maintenance propagation even for the sections from Hancock to Lordville and Lordville to Callicoon, is kind of a cool water transition zone because we realize there is not enough cold water in the system. For the zone that extends from Callicoon down to Narrowsburg the use designation is not within the realm of SEF to define. Instead SEF can consider the science behind the temperature needs – this can be done independently of the application of it. Erik again emphasized

the coordination aspect, because the issue is currently being considered by the Water Quality Advisory Committee and DRBC. This is an important question involving the application of the temperature criteria and the temperature target that we are trying to hit with the reservoir releases.

Bill Muszynski asked for a clarification on the white paper that Mark Hartle mentioned earlier, to be prepared jointly by the PA FBC and NYS DEC, how would that influence this expert panel? What is the difference with SEF's evaluation? Mark Hartle said the white paper refers to cold water fishery community and its scope is broader, including temperatures, releases and habitat. The goal is to develop a set of recommended improvements to flow management programs for best management of cold water fish and threatened and endangered species protection, jointly supported by NYS DEC and PA FBC. Dr. Muralidhar said he would like to have a definition of what the white paper would cover, before a lot of time and effort are spent on it. Bob Tudor indicated that the white paper is a separate effort, independent from SEF. He asked Dr. Muralidhar if he was asking just to be kept informed of what is essentially a joint NYS DEC-PA FBC project. Dr. Muralidhar responded affirmatively.

Bill Muszynski asked about the relationship between the white paper and the SEF evaluation. Mark Hartle said the white paper would go beyond trout needs, looking at other species too. The aim is to define a temperature regime not just to survive but to be a viable population and if so the white paper may have some strings upon it that the SEF investigation should not necessarily have. Elaine Reichart asked about the time line for any output, since it is the middle of June and RFAC does not meet very often. She said while everybody discusses, the aquatic life in the river suffers. She asked for an accelerated timeline for SEF to accomplish what they are charged to do.

Bill Gast reiterated his motion to request that SEF conduct an expert panel evaluation of the temperature range required for suitable trout habitat in the Upper Delaware. Someone seconded the motion and chair Miri asked all members to vote on the motion. The motion was approved with no one opposed. Joe Miri asked SEF to proceed with their evaluation as quickly as possible, since RFAC has some urgency to consider this issue.

Fisheries and Flood Mitigation Constituent's Proposal, presented by Jeff Zimmerman

Jeff Zimmerman presented a proposal for alternative releases from the NYC Delaware Basin reservoirs, on behalf of eight groups that advocate for fisheries and flood mitigation. The eight groups are: Friends of the Upper Delaware River, North Delaware River Watershed Conservancy, Aquatic Conservation Unlimited, Drowning on the Delaware, R.A.F.T. (Residents Against Flood Trends), New Jersey Council of Trout Unlimited, New York State Council of Trout Unlimited, and Pennsylvania Council of Trout Unlimited. Mr. Zimmerman circulated copies of a letter (dated April 20, 2009) that he sent to the governors of the four basin states on behalf of the same eight groups.

Jeff Zimmerman said this proposal was developed in response to last year's shutdown of the Delaware Aqueduct, when work was being done on Shaft 6 – this is the access shaft of the aqueduct on the East Side of the Hudson (the aqueduct is otherwise known as the Rondout-West Branch Tunnel or RWBT). During the shutdown period the decree parties considered and adopted a temporary release schedule to release water that would build up in the three Delaware basin reservoirs while there were no diversions being made from Rondout through the aqueduct tunnel.

Mr. Zimmerman's group developed the current proposal in anticipation of a possible shutdown of the Delaware Aqueduct during 2009-2010 to conduct additional repairs to Shaft 6. They calculated that a 34-day shutdown (based on a 700 mgd NYC diversion) would build up an extra 23.8 BG of additional water in the three reservoirs. They considered the extra water that would build up in the reservoirs because of the reduced NYC consumption that was recently reported. They also considered the extra water that would be saved if the Montague flow target were met by weekly averaging instead of the current practice of daily averaging.

This proposal would release all the water that was estimated to build up in the reservoirs and would do so over a year. Their release schedule is an overlay to the existing FFMP release schedule. For example, summer releases would be 650 cfs from Cannonsville, 220 cfs from Pepacton, and 150 cfs from Neversink. A second release schedule with more generous releases was developed assuming a 60-day shutdown of the NYC tunnel diversions. Mr. Zimmerman stated that this proposal brings significant benefits to instream trout habitat and provided habitat estimates for spawning and adult trout. At the same time, this proposal would have no impacts on water supply, as measured by drought days simulated over the period of record.

Although not evaluated in their proposal, Mr. Zimmerman also called for flood mitigation measures, both structural and non-structural, to be incorporated into a revised FFMP. He cited the following structural mitigation measures: reduced storage (storage voids), siphons, crest gates and/or flood gates, larger release valves, and dry dams. He also cited possible non-structural mitigation measures: basin-wide flood management plan, detailed emergency action plans for downstream communities, expanded dam safety investigation and public reporting, and improved flood warning systems.

Discussion followed Mr. Zimmerman's presentation. Bill Gast asked about possible reasons for the recent seven-percent reduction in NYC's water demand cited in the presentation. Mr. Zimmerman replied that the reduction was reported in the New York Times, referring to a statement by the Acting Commissioner of NYC DEP at the beginning of April. This reduction in water demand is believed to be related to the economic meltdown, with fewer people going to work in Manhattan or staying in Manhattan hotels.

Mary Ellen Noble asked if the proposal presented by Mr. Zimmerman could be implemented. Tom Murphy replied that the proposal is not a workable program, because it is based on the assumption that there is a guarantee that everything falls into place as

planned – it assumes that there is a schedule that does not slip. Mary Ellen Noble asked if it is possible that the tunnel repair work will not be done this fall. Tom Murphy replied that this is a possibility.

Jeff Zimmerman asked a number of questions related to the contract that NYC DEP has with Global Diving to work on the Shaft 6 repairs. Tom Murphy answered the questions about the nature of the repair work. He said some of the work could be done without shutting down the tunnel diversions, although part of the work will require short-term shutdowns. Tom Murphy said the contract with Global Diving has a flexible schedule. He said the decision has been made to go forward with the repair work, whether it happens this year or next year. Jeff Zimmerman then asked questions on the scheduling of the repair work and what variables need to be considered. Tom Murphy cited the availability of specialized equipment (some has to be fabricated and tested for the project) and the ability to shutdown the Rondout-West Branch Tunnel while meeting NYC's water demand from other reservoirs.

Jeff Zimmerman remarked that their proposal was to have the extra releases during the summer, before the tunnel shutdown and asked for some certainty that the repair would happen this year. Tom Murphy replied that nobody could provide such certainty at this point in time. Stefanie Baxter said she understood NYC's situation – What happens if extra water is released this summer and later there is a delay in the project that prevents work being done this year? If we release the water prior to the actual work, there is a chance that we may be out of that water when needed over the next several months.

Jeff Zimmerman countered that there should be a one-year predictability to the work that NYC will be performing – in theory you know that you are going to have extra water that you are going to have to release and so releasing it before you shut down seems to be as logical as releasing after you shut down. Tom Murphy disagreed, because this assumes that you can be certain that you are going to be able to shut the tunnel down and also certain that the hydrologic conditions will remain favorable (wet conditions like we are experiencing now). If you go into a drought in the fall, the shutdown will not be done, no matter what else is in place at the time. If the schedule slips for any reason, it could easily slip for a whole year. That is why we cannot have the certainty needed to have releases in advance of the tunnel work. Bill Gast indicated that the one-year predictability should instead be a one-year planning horizon for flow-management measures that could be taken in case the shutdown occurs.

Jeff Zimmerman said he should not be the only one asking these questions – DRBC, this committee, and the Decree Parties representatives from states other than NY should all be asking these kinds of questions. He said this type of flow management planning is within our collective capabilities to undertake, but only the citizens groups are asking the questions and developing proposals. Joe Miri replied that after the experience of last year's shutdown, the Decree Parties now have internal agreements for NYC to keep the parties better informed of what their long range plans are.

Chuck Schroeder said he was concerned about the possibility of NYC running out of water and the concept that the last day of the flood can be the first day of the next drought. He asked Dr. Miller, a climatologist at Rutgers University, what that meant. Dr. Miller replied that this means that the reservoirs are managed on a drought paradigm. However, we are not in a drought cycle, but we are in a flood-drought cycle. They are managing the reservoirs with half a cycle in mind and that is bad management. Mr. Schroeder said the flood victims see this situation as a game, where NYC sits on one side of the table and maybe the DRBC sits on the same side of the table too, while the flood victims and the fishermen and the environmentalists sit on the other side of the table; all the cards are held by NYC, they hold the game book and the rules, and they change them from time to time. They don't tell us and they don't explain it. However, there is disagreement on the NYC side of the table. A representative from PA said that full reservoirs have no impact on flooding; then Governor Rendell writes a letter stating that they do. The Rutgers climatologist said anyone who makes a statement like that instantly loses their credibility. NYC has made that statement many, many times.

Mr. Schroeder asked that reservoirs levels be lowered because they are putting a lot of citizens in jeopardy. He said the reservoirs are now full, just as they were before the huge flood on June 28, 2006. The reservoirs will soon be spilling, and people are scared. This game is going to blow up. Our forum is here. The New York Times covers this issue very aggressively now and they are working on it again. The Times keeps hammering the NYC DEP and have not been complimentary in the past. Mr. Schroeder then asked: Is there nothing to protect us from these criminals? Who is going to be held responsible for another flood, another \$100M worth of damage or more lives lost? Find the guilty and take them out on a perp walk.

Don Hamilton changed the subject to NYC's actual water use. He asked if the 1954 Supreme Court Decree requires NYC to provide a projection of their water use for the following year. Jeff Zimmerman added that under the decree the ERQ is supposed to be established each year by taking the actual consumption from last year and predicting what it is going to be the next year (which has a cap on it; it cannot go up more than $7\frac{1}{4}$ BG) and then you calculate the safe yield. Tom Murphy replied that the quantity used is not last year's actual consumption, but a projection of consumption for the following year. Gary Paulachok said he wanted to clear up any confusion regarding the NYC demand quantity that goes into the ERQ calculation – it is not the actual consumption from the previous calendar year, as stated earlier. The Supreme Court Decree in section III.B.1.(c) states that “in any such year the City's estimate of anticipated consumption shall not exceed by more than $7\frac{1}{4}$ BG the actual consumption in any previous calendar year.” Note that it says any previous calendar year. Tom Brand said the ERQ has been so ridiculous and unresponsive to real needs because NYC picks the highest use year to calculate the ERQ, even though for the last 20 years NYC's water use has continually been going down. The Decree language is meant for the anticipated continued growth in use, not for decreasing use.

Bob Bachman pointed out that actual NYC diversions over the last two years have been less than 600 mgd. He said it appears from the calculations that at least about 100 mgd

can safely be added to the release schedule without any impact on anybody. When you know that an extra 100 mgd will not be used every year, the fishery people and the flood people do not understand why that extra 100 mgd cannot be used for releases. Tom Murphy replied that this is a somewhat contentious topic of discussion at the Decree Parties work group right now. New York City is not opposed to releasing water that is not needed right now, if that same amount of water will be available for NYC to use when needed in the future. However, NYC does not want to establish a program that will create additional habitats and benefits now but that will have to be reduced in the future when NYC needs the water. NYC aims to develop programs that are sustainable and needs reliable partners to come up with such programs.

Bob Bachman argued the opposite view. He said he has heard that there is no projected increase in the City's water use for the next 20 years. Then for the next 20 years the river ecosystem could use that extra water and the people living along the river, their property and their lives could use it. And NYC could still take it back in 20 years or 10 years or 5 years – NYC is authorized to take 800 mgd and will have it if they use it. But today we hear that is not being used and as a result you get sometimes (like last year) record low flows in the Delaware at Callicoon – all time record lows and the reservoirs are almost full. Right now the reservoirs are full and if a hurricane comes we are going to get flooded out again. Bob Bachman said he believed that additional releases would be sustainable under the current situation. Tom Murphy replied that this is the issue currently being discussed at the Decree Parties work group. NYC is asking its partners in the decree parties to agree on the sustainability concept and to come up with answers that do not just rely on the NYC reservoirs for sustaining fisheries and flood mitigation programs.

Joe Miri said he understands that NYC wants to discuss sustainability, but said the issue of safe yield is part and parcel with sustainability. He disagreed with the idea of the lower basin or someone other than the City providing the extra water over and above the safe yield. He said, whether we are talking about fisheries or flood mitigation, the real issue is whether the reservoirs today have to be as full as they are and as full as we keep them under the FFMP and the current flow management program in order to protect the City's water supply. While the City feels that the lower basin needs to provide this water because there isn't any extra in their reservoirs, New Jersey's position is that the NYC reservoirs do not have to be kept as full as they currently are and as full as they are intended to be under the FFMP program. New Jersey is trying to work with the City and the other decree parties to develop a different way of operating that provides for defined risk for everyone so that we know what the risk of running out of water is, where the City's risk ends and where the lower basin's risk starts. Under the current arrangement that boundary point is a little muddy, but we are talking about it and it is a contentious issue. Based on what I have been hearing, a resolution will not happen very soon, but at least we are starting to talk about the right things, the real issues of contention – we are starting to address the issues of sustainability and safe yield. Hopefully we can look forward to resolving these issues.

Jim Daley commented on the ecological effects of Jeff Zimmerman's proposal. He said he was concerned not just about the volume of water available, but the volume of cold water available. Somewhere around June 1 the thermocline shuts off and the amount of cold water available becomes fixed for the upcoming year. He indicated that with the numbers being proposed for additional releases, a rough calculation yields about 110 BG of extra release between April and September. His concern is that such volume may exceed the amount of cold water that we have available. Garth Pettinger replied that the amount of cold water in the reservoirs and its usage had been considered in making the proposal. He said they would rather lose the 44°F water, allowing it to go up to 50 or 55°F towards the end of the season, when the thermal issues are not a problem. You still have the quantity of water to use. He said the cold water would not be lost in June, July and August – the temperature change would happen in September. Someone added that although it would be a rarity to have a hot spell in September, if that happens we may have run out of enough water that was colder than ambient water, so that that it would not be beneficial to release it. Jim Daley said he would like to see those calculations because the numbers cited did not seem quite right to him. Garth Pettinger said they would be happy to meet with Jim to discuss this further.

Norm McBride said most of the high volume in Cannonsville is going to be water at 45°F; once you get into 50°F you are starting to get into the thermocline and higher. He said they had run out of cold water in mid-August in years with high river master directed releases. At that point the releases turn turbid and the fishermen consider the river un-fishable. Someone said he was more concerned about the fish than the fishermen. Another person brought up the existing trout fishery in Cannonsville reservoir and said we should not sacrifice that fishery to benefit the West Branch. We want to keep both.

Jeff Zimmerman closed the discussion on this item. He said he appreciated the City's concern about sustainability, but added that he would like to examine sustainability in a transparent fashion. He would not want the discussion over what is sustainable and what can be done taken back into the dark closet where the Decree Parties meet. It should be out in the open at DRBC, where the public has an opportunity to work together and reason with the Decree Parties. He said they have put a fair amount of effort into this proposal and have plenty of resources to stand up to any scientific rigors that the other parties would like to apply to the discussions. He asked the Decree Parties to bring their discussion out in the open and to let the good science rule the day.

An Augmented FFMP – a proposal by Peter Kolesar and James Serio

Peter Kolesar requested a few minutes to read a statement proposing changes to the FFMP reservoir releases, to which Mr. Miri agreed. What follows is Professor Kolesar's statement.

On behalf of the conservation coalition, that was formed 3-4 years ago, of Trout Unlimited, The Nature Conservancy, The Delaware River Foundation, Theodore Gordon Flyfishers, and the team of researchers at Columbia University, we wish to congratulate the Decree Parties and the Delaware River Basin Commission (DRBC) for the changes to

the Flexible Flow Management Plan (FFMP) that were announced on May 27, 2009. These recent changes bring the FFMP into nearly exact correspondence to the CP2 flow management plan that the coalition originally proposed to the Decree Parties and the DRBC in March of 2007. Additionally, we are pleased that the Decree Parties have recognized, as we had earlier suggested, that the IERQ bank can be utilized to the ecological benefit of the River without increased drought risk.

The principal change to the FFMP, increasing the Cannonsville summertime normal (L2) release from 260 up to 325 cfs will, indeed, according to our analyses, make some improvements to trout habitat in the West Branch and rather more modest gains in the Upper Mainstem of the Delaware. Our simulations also show that it will modestly increase the end of summer reservoir voids, thereby reducing somewhat hurricane flood risk. But, much more is needed for the environment and much more is possible – all without increase in drought risk to New York City or any of the users of Delaware water.

Speaking on our own behalf, intensive continuing research, carried out over the last four months by us (Peter Kolesar and James Serio) has shown that a “sustainable” release policy is possible that can protect trout well down into the Upper Mainstem of the Delaware during the critical early summer months. The key to solving the summertime habitat problem is the recognition that a release policy can and should be based on forecasts of anticipated actual New York City water diversions. As we have argued in the past, to manage the River as if New York City will take an annual average 800 mgd diversion when we know full well that I will take only an annual average diversion of around 500 mgd is to unnecessarily punish all other stakeholders and the environment. Our statement to the DRBC, dated January 16, 2008 “Augmented Flexible Flow Management Plan” documents the substantial magnitude of the punishing efforts of such misrepresentations of the City’s actual usage on habitat, spill frequency, reservoir voids and the like.

Sustainability does not require that we act today as if the worst case diversion (800 mgd) is currently actually happening. Sustainability only requests that we have a plan for appropriately prudent actions to take, if, in fact, the worst diversion scenario does occur. We argue that the Decree parties adopt a plan that does exactly that. The plan we propose calls for higher releases when anticipated diversions are lower, precisely because such a policy converts wasteful spills to ecologically useful flows. When anticipated diversions are high the plan reduces releases to prudent levels.

Our plan is not based on conjecture or wishful thinking. Over the last four months we have run more than 200 OASIS simulations and DSS habitat evaluations, and in the process have shown that as long as diversion are realistically, and we might add conservatively, forecasted, it is feasible to release enough cold water from the New York City dams, principally from Cannonsville, to protect the upper river and still stay well within the benchmark of 5,560 total drought days that has been established by the Decree Parties. We have already shared many details of our extensive analyses with the Pennsylvania Fish and Boat Commission, with the New York State DEC Bureau of Fisheries and with The National Park Service.

In January 2008 we proposed to the DRBC and Decree parties an “Augmented FFMP” in which the current four release matrices contained in the FFMP namely the 765, 780, 790, and 800 mgd matrices (Table 3 with 35, 20, 10 and 0 mgd available) are augmented by a series of other matrices keyed to forecasted New York City diversions. Today, we revisit and extend this concept. In Table 1 below, we suggest a set of release matrices for use as follows: One when diversions are forecasted to be below 500 mgd, another to be employed if diversions are between 500 and 600 mgd, another to be used when New York City diversion are forecasted to be between 600 and 700 mgd, and still another if diversions are forecasted to be between 700 and 765 mgd. We would maintain use of the four existing matrices contained in current FFMP, namely those at diversions of 765, 780, 790, and 800 mgd. (As we have noted before, New York City is in fact obligated by the 1954 Supreme Court decree to make annual forecasts of its water needs. Our own statistical analysis of historical diversion records shows that such forecasts can readily be made to a high degree of accuracy).

TABLE 1. Augmented FFMP Proposal: Summer L2 Releases

Forecasted Average NYC Daily Diversions (mgd)	Cannonsville Summer Normal Conservation Release (cfs)	Pepacton Summer Normal Conservation Release (cfs)
Less than 500	700	200
Between 500 and 600	600	175
Between 600 and 700	450	150
Between 700 and 765	400	140
Between 765 and 780	325	140
Between 780 and 790	234	126
Between 790 and 800	212	114
800	190	102

Our research has confirmed that releases from Cannonsville not only protect the West Branch fishery and increase the Upper Mainstem fishery, but are the most efficient use of water to optimize fishery habitat throughout the entire Upper Delaware System. The table contains our recommended Cannonsville and Pepacton normal summertime (L2) releases. All other releases are as contained in the current FFMP 765 matrix. This augmented policy, by recognizing the reality of what is actually happening in the system, provides for greatly increased trout habitat in the Upper Delaware region, including highly significant gain in the Upper Mainstem. The policies produce higher end-of-summer reservoir voids, thereby to some extent mitigating the potential for flooding in the hurricane season. They have the additional benefit of providing increased protection for the federally endangered dwarf wedgemussel beds in the Upper Delaware.

There has been much discussion about the implications of setting a precedent by actually having a release policy that is sensibly keyed to current New York City demands rather than keyed to the worst case – just because at some time in the future the worst-case might occur and the system would have to respond to it. We must emphasize that our

proposal already incorporates explicit provision for such an eventuality. It does this by keying releases to 800 mgd diversions should they be needed. We strongly object to the notion that the River's environment and River communities must be continually penalized over the foreseeable future because of the small possibility that some time in the distant future New York City requirements might be substantially higher than they are now and than they have been over the last decade, and indeed than they are reasonably projected to be over coming decades.

Our research program has included extensive analyses of the potential benefits of splitting the L2 release range, modifications to the Montague flow-target level, averaging the Montague flow-target and introduction of a (seasonal) flow-target at Callicoon. We are prepared to report on these aspects of our work to the Decree Parties, the DRBC, RFAC or SEF at another time.

As mentioned, we have already shared many details of our extensive analyses with the Pennsylvania Fish and Boat Commission, with the New York State DEC Bureau of Fisheries and with The National Park Service and we would be delighted to do so with the SEF, the RFAC, and the DRBC or with any of the Decree Parties. Moreover, we would be pleased to collaborate fully in continuing research with any of the interested parties.

In summary, research shows that we can protect the environment and mitigate the potential for flooding – all at no real increase in risk to New York City. We owe it to the inhabitants of the Delaware River communities and to the citizens of New York, New Jersey, Pennsylvania, and Delaware. Let's do it – we do know how.

Discussion followed the statement read by Professor Kolesar. Mary Ellen Noble said she wanted to recognize the high level of expertise and effort that stakeholders like Peter Kolesar bring to the table. These presentations show that the issues are out of the box already. She asked for more transparency in dealing with these issues and said to committee members that we can only gain from engaging with stakeholders that come to these meetings. She then argued that what we are really talking about here is risk – risk to NYC water supply now and 20 years from now, risk to fish this summer and 20 years from now, and risk to Philadelphia water intakes this summer and 20 years from now. These are all major community and social issues that deserve input from all the stakeholders and deserve to be discussed as openly as possible. She recognized that the Decree Parties must be allowed their own quiet forum, but only for a fraction of their time (she suggested 25%) – the rest of the Decree Parties work could be open to the public. She said the Decree Parties could let stakeholders know what their positions and thoughts are before they are set in concrete.

Dr. Muralidhar said he had no questions about the technical analysis done by Professor Kolesar. He agreed with the objective of developing a sustainable fisheries program and said the FFMP is an example, where the 800 mgd for NYC was split into 35 mgd for fisheries releases and 765 mgd for NYC – because NYC can take the 35 mgd back when they need it. He said he did not believe we could have a program running for three years

with 500 mgd for NYC (allowing a 700-cfs summer release from Cannonsville); he asked how such program could cut back on releases when NYC needed the unused water back.

Joe Miri thanked everyone for making comments today and stated that at least we are committed to the ideas of sustainability and safe yield and that these issues are on the table for discussion. We are nibbling around the edges. He said we have to address the question posed by Dr. Muralidhar, but not necessarily in the context of the current operating regime.

Peter Kolesar said he would try to rephrase what he had just heard. He said the argument is being made that if you cannot guarantee that you can implement this program at higher release levels for every single year going into the next century, then we can never do it. Therefore we must, in this century, punish this river, we must tolerate having 100%, 200%, 300% less trout habitat than is possible and we must punish those who are potential victims of flooding and we must punish the dwarf wedgemussels – all because we cannot guarantee that we will make the same releases every day into the next century. He said this was just an artificial constraint. He said Dr. Muralidhar had previously said that these ideas, although interesting, were “out of the box,” while the Decree Parties had to stay “inside the box.” He said he thought it is time to get out of the box, but being prudent at the same time. He said the moment that NYC tells us that their anticipated use for the next 1 to 2 years is jumping from 540 to 765 mgd, we change the program. And we change the program automatically because the cutbacks are already written in stone and agreed to by the Decree Parties. Dr. Muralidhar replied that the experience with the release programs since 1955 has been that more and more water is needed over time – there has never been a case where we are allowed to cut back. He said if we establish a program based upon hypothetical releases, you can never take it back. Peter Kolesar disagreed, saying that the cutbacks are part of the proposal.

Joe Miri said we have explored a lot of things today, including safe yield and sustainability, and it seems that everyone wants to talk about these issues. We have to think outside the box. We are going to try and do that.

Bob Tudor said that his sense from the discourse today was that people appreciated the opportunity to have this kind of discourse and get involved in the policy-level discussions. He said that while the pattern of RFAC has been to have meetings maybe twice a year, he felt there could be an interest in having more frequent meetings. Joe Miri replied that the only requirement was to have at least two meetings a year and suggested that RFAC could set a date for a meeting in about three months or so. He said committee members could set a date today if they wished.

Elaine Reichart said RFAC could have a meeting to hear about SEF’s findings. Bob Tudor said nothing precluded SEF from submitting the scope of work to RFAC, which RFAC could approve in the interim – SEF could just report back at some future RFAC meeting. Bill Gast asked Mark Hartle how much time SEF would need to prepare the scope of work that was requested. Mark replied that it would be done in three weeks.

Joe Miri saw a problem in setting a date for a meeting before knowing about the progress of the Decree Parties negotiations and the SEF work. He suggested instead saving the date for a possible meeting towards the end of the summer or beginning of September. Bill Gast said RFAC has to do two things in the near future: approve the scope of work requested from SEF and consider SEF's recommendations for additional members. He suggested an RFAC meeting sometime in August to approve the additional SEF members so they could fully participate in SEF meetings. Joe Miri agreed that dealing with the SEF nominations would not have to wait for another RFAC meeting. However, there are two states that have to identify additional people to serve as SEF members. If that is done within the next week or two, they could be incorporated as members, pending formal RFAC approval at a later meeting.

Dan Plummer asked if coming to the RFAC meetings was just a waste of time. He pointed to all the efforts behind the proposals of Jeff Zimmerman and Peter Kolesar. He said they both identified serious and substantial issues that need to be dealt with, but was not sure if this committee was going to take them seriously. He asked if all these questions will go nowhere when we all leave this room. Joe Miri replied that he wished to be able to give Mr. Plummer an answer. We are trying to do our best to continue negotiations. Thus far, the negotiations have been conducted privately, but at one point the parties are going to have to either agree or agree to disagree, and there isn't any other promise or guarantee that any of us here could make today. I think that the Decree Parties have some pretty straightforward positions and we need to express them a little more clearly and discuss them further in the work group among the parties in order to make progress. Joe Miri indicated that New Jersey had a consistent position of being committed to safety of operations, defined risk for everybody, and providing water for everybody and for the various objectives. He said New Jersey was committed to a certain level of transparency and good science, which was seen as the bottom line that has to be adhered to. This is part of the discussion as well.

Dan Plummer said he and others do not intend to sit back and be content with the status quo. He asked: Are you going to take this information to where it should go? Or will it just sit here? Will it even leave this room? Joe Miri replied that the members of the Decree Parties work group are here. We already have the information; we don't have to deliver it to anybody. We can inform our principals and the commissioners about what was said today and the sense of the meeting and the urgency. I think that individual members can do that.

Jeff Zimmerman asked if in the spirit of transparency, his presentation could be put on the RFAC web site, to which Bob Tudor replied affirmatively.

Don Hamilton brought back the issue of NYC's obligation to forecast its water needs for the upcoming water year and asked if this was done on an annual basis. Joe Miri replied that historically it has been done on an annual basis, but the City has made its projection equivalent to the highest consumption year (1980). He added that under the FFMP there is a different arrangement that departs from the decree prescription – we use a different system yield and a different projection of water use. Tom Murphy explained that the

Decree has a formula to calculate the ERQ based on a very high safe yield (calculated before the drought of the 1960s) – that is why NYC has been using a high consumption rate to balance things out. He said in the Decree we are dealing with very old numbers. He added that the work group would like to reevaluate the ERQ components based on actual current conditions - what is the current safe yield and what are the most current consumption expectations for NYC?

Peter Kolesar said that issues get muddled in the discussion, but this is a foundational issue. You cannot manage the river sensibly if you are not going to face reality, and the simplest reality is a decent forecast of how much water NYC is going to use next year. He indicated that if NYC could not provide a decent forecast, he could easily provide a good range forecast. Tom Brand asked why this continues to be debated. He said under the Decree the projection of NYC's water use is supposed to be based on the last few years of use, with the expectation that NYC is going to continue to draw a safe yield base. The 7 ¼ BG was a fudge factor in case there was a sudden leap in use. When you come back and use the worst case year to project the next year use, you add another fudge factor that does not make any sense. It has never made sense to the water supply engineer doing a safe yield analysis, which is what was done in the 1950s – they have not done this correctly since 1954. Gary Paulachok indicated that the USGS was not involved in those calculations. The method was developed by technical consultants furnished by the decree parties.

Joe Miri said the key question is safe yield. We need to have the discussions that are fundamental to any water supply system, any reservoirs, any surface water system – you need a basic understanding of the criteria that grow out of safe yield principles. New Jersey is committed to doing that. Joe Miri said he was hearing everyone loud and clear that we have to figure out some way to get by this problem about not using water that the City says it may use in the future, while everybody here is saying let us use it for other purposes temporarily. New Jersey's proposals and suggestions would go beyond that point; it would solve the problem of the timeframe and of giving up water and giving back water. It would define what the river has and what the City has and we would define that risk and present that risk. Then the burden is on those who choose to exceed safe yield and that risk is properly placed where it belongs and not placed elsewhere.

The meeting was adjourned at 1:30 p.m. by Dr. Miri.

Next Meeting Date

No meeting date was set. Committee members will be canvassed later to arrange a meeting, tentatively in late July or early August 2009.

REGULATED FLOW ADVISORY COMMITTEE (RFAC)

JUNE 17, 2009

ATTENDANCE - in person

NAME	AGENCY
BACHMAN, Bob	Friends of the Upper Delaware River (FUDR)
BRAND, Tom	New Jersey Department of Environmental Protection (NJ DEP)
CHASE, Phil	Upper Delaware Council (UDC)
CONOLLY, Paula	Phila. Water Dept.
DOUGLASS, Bill	UDC
GAST, Bill	Pennsylvania Department of Environmental Protection (PA DEP)
GRUBER, Hank	Army Corps of Engineers (ACOE)
HAMILTON, Don	National Park Service – Upper Delaware Scenic and Recreational River
HARTLE, Mark	Pennsylvania Fish & Boat Commission
KOLESAR, Peter	Columbia University
LIAGHAT, Hoss	PA DEP
LOVELL, Stewart	Delaware Department of Natural Resources and Environmental Control (DE DNREC)
MIRI, Joe	NJ DEP
MURALIDHAR, D.	New York State Department of Environmental Conservation (NYS DEC)
MUSZYNSKI, Bill	Delaware River Basin Commission (DRBC)
NOBLE, Mary Ellen	Delaware Riverkeeper Network
PAULACHOK, Gary	United States Geological Survey – Office of the Delaware River Master
PETTINGER, Garth	NYSCTU
PLUMMER, Dan	FUDR
QUINODOZ, Hernan	DRBC
REICHART, Elaine	Aquatic Conservation Unlimited
SAFAFAR, Senobar	New York City Department of Environmental Protection
SCHROEDER, Chuck	Drowning on the Delaware
SERIO, Jim	Delaware River Foundation
SILLDORFF, Erik	DRBC
STEVENS, Glen	ACOE
TUDOR, Bob	DRBC
WILSON, Kerry	PA DEP
ZIMMERMAN, Jeff	FUDR et al.

REGULATED FLOW ADVISORY COMMITTEE (RFAC)

JUNE 17, 2009

ATTENDANCE - via teleconference

NAME	AGENCY
BAXTER, Stefanie	Delaware Geological Survey
DALEY, Jim	NYS DEC
FREEHAFER, Peter	NYS DEC
McBRIDE, Norm	NYS DEC
OTTO, Harry	DE DNREC
TARRIER, Brenan	NYS DEC