**DELAWARE RIVER BASIN COMMISSION**
**REGULATED FLOW ADVISORY COMMITTEE**
**December 14, 2010**

**MEETING SUMMARY**

The December 14, 2010 meeting of the Regulated Flow Advisory Committee (RFAC) began at approximately 10:00 a.m. at the Commission offices in West Trenton, NJ. Dr. Joseph Miri of the New Jersey Department of Environmental Protection chaired the meeting. Introductions were made around the room and via telephone for those attending on a conference call.

**Approval of the minutes from the of May 13, 2010 RFAC meeting**

Joe Miri asked for comments on the draft minutes of the May 13 meeting. There were no comments and the minutes were approved as drafted.

**Hydrologic conditions report**

Amy Shallcross reported on current hydrologic conditions in the basin. She said dry conditions developed in the lower basin over late summer and early fall, and by mid-September New Jersey and Pennsylvania had declared various drought watches and warnings on a county-by-county basis. In late summer and early fall DRBC directed reservoir releases to maintain the Trenton flow target. On September 24, low elevation in the lower-basin reservoirs triggered drought warning operations. Seven days later a storm brought between five and eight inches of rain to the basin. As a result, elevation in the lower-basin reservoirs crossed above the drought-warning line, beginning a 30-day countdown to end drought warning operations on October 31. Soon afterwards New Jersey and Pennsylvania declared the end of the county-by-county drought watches and warnings, with the entire lower basin being out of drought on November 10, 2010. DRBC-directed releases during 2010 totaled 4.8 billion gallons (bg) from Beltzville Reservoir and 4.3 bg from Blue Marsh Reservoir.

Amy reported that year-to-date precipitation in the basin is above normal. Current streamflows at USGS gages in the basin are in the normal or above-normal range; groundwater levels at USGS monitoring wells are mostly in the normal range. The NYC Delaware Basin reservoirs are currently at about 92% of capacity, and Beltzville and Blue Marsh reservoirs are both above 100% of the normal pool (flood control storage is available beyond the normal pool). The salt front is currently at river mile 69, downstream from the mid-December normal (river mile 74). The three-month outlook from NOAA/NWS calls for equal chances of having above- or below-normal temperatures and precipitation. Amy said this year there is a strong La Nina pattern, which means both a warmer-than-normal and a wetter-than-normal winter, with relatively more rain than snow.

**Overview of NJ DEP safe yield white paper**

Tom Brand said this presentation is a compilation of major issues that New Jersey had raised over the last four years, related to the FFMP and other aspects of the basin operating plan. He said the white paper shows that there are opportunities to make improvements if all parties come together and work on a collaborative plan to sustain NYC's safe yield and to improve operations throughout the basin. The main goal of the white paper is to reassess the quantity of water available, derived from a conjunctive-use, safe-yield-based operating plan using realistic demand conditions to optimize reservoir operations for sustainable water uses for all parties. This will

provide and protect water supply and water quality; support and sustain aquatic ecology and recreation; enhance flood mitigation; ensure salinity repulsion in Delaware Basin; and restore equity of water apportionments.

Tom defined safe yield as the sustainable supply of water that meets all uses and flow goals, without curtailment of diversions or releases, during a repetition of the drought of record. He said a realistic conjunctive-use safe-yield-based operating plan can better meet competing uses and needs by: equitably considering conjunctive effects of NYC reservoirs; using realistic demands to reflect existing and ultimate build-out needs and demand patterns; equitably prioritizing the risks and benefits between the decree parties relative to the selected uses and objectives; sustaining an ultimate build-out water supply quantity and quality; optimizing more effective fishery and other releases; enhancing flood mitigation; and eliminating or reducing unnecessary drought declarations. Expected benefits of a safe-yield-based operating plan include: yearly Montague flow goals tiered more effectively to sustain lower-basin reservoir storage through drought, protecting water supplies from salinity intrusion without a significant reduction in NYC's ultimate water supply reliability; a realistic annual average safe yield of 520 mgd to serve NYC's peak needs of up to 800 mgd in peak season and also periodically; and an improved probability of significant flood mitigation by chasing void spaces via use of an OST or similar advance warning system.

Tom Brand discussed the effects of what he called the over-draft program. He said the Good Faith Agreement of 1983 resulted in the reservoir operations program contained in Docket D-77-20-CP, Revision 1 (often referred to as Rev1). Tom said this program is based on over-drafting (diverting more than the safe yield) NYC's Delaware reservoirs at times. This is done by applying rules derived from the assumption that NYC must attempt to divert 800 mgd at all times (exceeding a minimum assumed safe yield of 480 mgd); causing a repeat of the drought of record conditions and many lesser droughts, by promoting low storage levels that trigger reduced releases and Montague flows and severe reduction of temporary fishery conservation releases. These actions conserve storage and increase NYC's safe yield. Tom stated that the FFMP augments fishery releases when needed the least, providing minor temporary improvement that are unsustainable in any dry year. He said the FFMP, whether assuming a draft of 800 mgd of 765 mgd, results in unnecessary limits on water availability, especially during "normal" precipitation years when much excess storage is rendered unusable by the restrictions built into the over-draft plan.

Tom said the assumption of over-drafting, built into the Good Faith Agreement, Rev1 and the FFMP, increases flood risk and adversely impacts fisheries and recreation by causing the NYC reservoirs to be frequently full or surcharged, for greater durations than would be necessary under a safe-yield-based program. Tom said the over-draft premise is now obsolete: 27 years after the 1983 Good Faith Agreement, there are significant changes in NYC's demand, advances in hydrologic modeling, a longer dependable flow record, and better understanding of natural resource requirements. Current basin management decisions are not based on use assumptions representative of NYC's existing or future demand. He said operating under the over-draft plan carries additional risks: operating the reservoirs to be near-full, full or surcharged with greater frequency and for longer durations causes inefficient releases and exacerbates flooding, due to less effective attenuation of peak flows.

Tom concluded with a list of recommendations from the NJ DEP white paper. The main recommendation is to conduct a comprehensive safe-yield analysis that includes realistic demand, hydraulic and hydrologic limitations, considers conjunctive effects of all NYC reservoirs, and applies consistent standards between the systems (reserve storage) to equitably optimize

alternative operations for optimal uses by all decree parties so as to safeguard economic, environmental and public safety interests. The white paper also recommends establishing a realistic safe-yield-based plan and modifying reservoir operations to sustain uses through the design drought; creating meaningful flood mitigation within constraints of the system; designing more consistent, sustainable fisheries flow goals; protecting NYC and lower-basin water-supply quantity and quality; repelling saltwater migration to protect Philadelphia and NJ American intakes; restoring an equitable NJ diversion at the D&R Canal; and applying an Early Warning System or OST to design advance releases that enhance mitigation of flood risks.

Mary Ellen Noble asked if Tom's presentation will be made available to the public. Tom Brand said he was not sure if the presentation could be distributed ahead of the white paper that covers a lot of the same information. Bob Tudor said DRBC will place a copy on its web site after obtaining the author's permission. Bob Tudor then stated his understanding that a major driver of NYC reservoir operations are certain water quality constraints established by EPA and asked Tom if he had factored them into his analysis. Tom Brand replied that NYC has probably not used the Croton system over the last six years. He said when the Croton filtration plant is completed, the Croton system would increase the combined safe yield by 240 mgd. At that point NYC should be forced to use the Croton system to its full extent instead of over-relying on water from the Delaware Basin.

**Overview of NYC DEP operational support tool (OST) white paper**

Thom Murphy said NYC DEP has a better way of doing things, both for the City and for downstream users. He said he also observed that in the presentation given by Tom Brand water quality was never mentioned; however, water quality plays a big role in reservoir operations and in OST. Thom described the operational support tool (OST), currently under development, as a decision support system that quantifies performance of alternative operations and helps make operating decisions. He said OST will provide a quantitative assessment of expected inflows, diversion needs, release requirements, storage levels, and drought risk. It will better define the capacity of the system to meet water quality and environmental objectives, maximizing additional benefits while maintaining water supply reliability and more robust water quality-based operations. However, OST does not tell operators what to do. OST provides a quantitative basis for making decisions and helps operators examine various scenarios to see how they can best meet multiple objectives.

Thom described the NYC water supply system, composed of three sub-systems: Delaware, Catskill, and Croton. There are nineteen reservoirs and three controlled lakes. The watersheds cover 2,000 square miles in parts of eight upstate counties. The system serves nine million people (half the population of New York State) and delivers about 1.1 billion gallons per day (bgd), with 45-percent of demand met by Delaware basin reservoirs through unfiltered supply. Some complex rules that affect the system are Delaware Basin rules, Part 670 NYS regulations and SPDES, and Croton System rules. The system is managed for multiple objectives: water supply reliability, highest quality water, environmental benefits downstream, and spill mitigation.

Thom said the impetus for developing OST was to enhance turbidity control in the Catskill system, thus reducing frequency and duration of alum treatment. The Catskill system is subject to Filtration Avoidance Determination (FAD) rules administered by EPA; the first FAD was granted in 1997, renewed in 2002 and again in 2007 (for 10 years). The 2007 FAD required that OST be part of turbidity management. Thom said OST will allow enhanced system-wide operations, providing decision support for the management of the entire NYC system, including Delaware Basin releases, peak flow mitigation (snowpack management), planning for major facility

outages, and support for emergency/contaminant spill response. It will help manage the Delaware and Catskill Shaft 4 interconnection, the Catskill-Delaware Ultraviolet Facility, and the Croton Filtration Plant. It will provide advance warning of turbidity events via forecasts and simulate turbidity control strategies in near-real time.

Thom said OST will help address multiple water quality and environmental objectives while still fulfilling core water supply reliability requirements. For example, OST will ensure overall system reliability by operating the reservoirs to be full at the start of drawdown (June 1) and balance reservoir drawdown. It will also factor in other considerations such as probability of refill, release requirements, economics and infrastructure constraints. Thom said there is potential for OST to provide additional releases to benefit downstream interests.

Thom listed all major data sources for OST: USGS streamflow and reservoir elevation data from gages throughout NYC system and Delaware Basin, NWS ensemble inflow forecasts, DEP SCADA reservoir operations data (elevation, diversion, release, spill), DEP key-point water quality data (temperature and turbidity), in-reservoir and in-stream water quality data (NRT robotic network), and meteorological and snowpack data. Each data source is automatically pooled, with raw data passed through a semi-automated QA/QC process. OST is built around DEP's existing OASIS-W2 Model, which merged OASIS (mass-balance reservoir system model) and W2 (2-D hydrodynamic and water quality model). OASIS-W2 was originally developed under the Catskill turbidity control study; it simulates system operations on a daily time step. The main purpose of OASIS is to look at long-term operating rules and what the options are. OST will operate OASIS-W2 through a new operator-friendly graphical interface that will integrate all data sources. OST will allow operators to look at the system under current conditions and also look at possible conditions a number of months into the future.

Thom said OASIS-W2 is driven by a historical series of reservoirs inflows. OST will allow a choice of three inflow time series: historical inflows (existing), conditional inflows, and NWS ensemble (probabilistic) forecasts. The conditional (Hirsch) forecasts account for current conditions but not meteorological forecasts; historical inflows are "conditioned" by recent inflows (relying on a serial correlation between recent and future inflows). The NWS ensemble forecasts are currently under development by NWS; they will account for current conditions and meteorological forecasts.

Thom then described the anticipated use of OST to help manage the NYC-owned Delaware Basin reservoirs. OST will help develop and evaluate alternative release plans, supporting Delaware Basin release programs. OST will use a probabilistic, risk-based approach to define excess release volumes available for release, while maintaining water supply reliability. Thom gave an example of a hypothetical modified release plan, whereby the FFMP release tables are modified based on the Fisheries White Paper developed by NYS DEC and PA FBC. OST would allow periodic selection of the most appropriate release table based on OST output.

Thom said NYC operates its system based on quantity, quality, and economics (the highest-quality water is Delaware water; the highest-cost water is Croton water). Reservoirs are chosen for diversions to deliver the highest quality water, maintain the FAD, avoid chemical treatment, and be fiscally responsible. OST will enhance NYC's ability to continue to deliver a reliable supply of high quality water and has the potential for increasing net system benefits, protecting NYC water supply while providing downstream benefits. Thom said the OST project is also an opportunity for the decree parties, by working together with NYC, to benefit from NYC's developing expertise and create a similar model for the conjunctive operation of the basin reservoirs. Thom ended his presentation indicating that OST will be deployed in phases, as new

components become available. A prototype graphical user interface is scheduled for June 2011. A full beta version is scheduled for October 2012 and the final version for October 2013.

A question and answer period followed the presentation. Phil Chase asked if the new aqueduct to be built and the OST system will allow NYC to take more water from the Delaware Basin, up to 800 mgd. Thom replied affirmatively and said that NYC will take more water from the Delaware Basin when necessary due to water quality considerations. For example, to deal with the turbidity event currently affecting the Catskill system, NYC is minimizing its diversions from Ashokan reservoir while increasing diversions form the Delaware system. In response to follow up questions, Thom stated that NYC will take water as needed, up to the quantities permitted to under the Supreme Court Decree. He said that is how Rondout reservoir is operated now; NYC does not take more water that it can use out of Rondout.

Lee Hartman said the 1954 Decree speaks of equitable apportionment of water but says nothing about water quality. He said he understood NYC's concerns about water quality in the reservoirs but said his organization (Trout Unlimited) is concerned about the quality of water in the river itself. He added that managing the reservoirs for water quality causes the reservoirs to be full. Thom replied that NYC manages the reservoirs based on both quantity and quality and said OST will allow NYC to manage water supply risks for the next three decades.

Mark Hartle asked for an example of how OST will use different release tables. Thom replied that all tables will be in play and will be chosen according to conditions prevailing at the time. The four existing FFMP release tables (0, 10, 20, and 35 mgd) will be used in OST; new tables will be developed for higher volumes of available water (50, 75, and 100 mgd). Thom said OST will calculate the impact of various releases on storage, considering expected inflows into the reservoirs and the City's water demand in near real-time. NYC reservoir operations will be adjusted depending on conditions and OST calculations: under wet conditions, releases could follow a table with higher releases than the 35-mgd table; under dry conditions, releases could move to a table with lower releases, such as the 20- or 10-mgd table. In the latter case, smaller releases will put off a drought by conserving water while still making enhanced releases. OST will be the tool to evaluate how best to operate both for the fisheries and for water supply.

Elaine Reichart asked if OST will be used for pre-emptive releases when a storm is forecasted and the reservoirs are near full. Thom replied that OST will make releases based on storage, but will not necessarily respond on a storm by storm basis. Elaine asked if OST will be used for sustaining cold-water ecosystems. Thom replied that how best to use the quantity of available cold water needs to be looked at. The concern is that making large cold-water releases early in the summer may impact how much cold water is available later on; adjusting the cold-water releases will be a balancing act. Elaine asked if NYC plans to have the Delaware system provide more than 75-percent of its water supply in the future. Thom replied that NYC plans on using the Delaware system to provide up to, but not more than, 800 mgd. He said the Delaware system may provide 75-percent of NYC's overall consumption if there are infrastructure problems or water-quality issues in other parts of the NYC system. Elaine asked if the Delaware system will be NYC's primary source of water when the Catskill and Croton system are either too expensive or unable to meet water-quality standards. Thom replied that the Delaware system is currently NYC's primary source of water. Elaine asked about the concept of drought neutral and how is defined in the OASIS model. Thom replied that the absolute number of drought days predicted by OASIS is not very meaningful because it varies significantly with model assumptions; Thom gave an example, assuming different values of the NYC diversion rate from the Delaware system. He stated that instead, drought days are useful as a relative metric to compare two release

programs on the same basis. In that context, drought neutral has been used as a goal when comparing the impacts of alternative release programs.

Jim Serio asked about the proposed capacity of the Delaware to Catskill interconnection tunnel. Tina Johnstone replied that the tunnel is still in the design phase, but NYC's expectation is that the tunnel will function on a range from 20 mgd to 300 mgd. Skip Garlits asked if NYC taking more water out of the Delaware reservoirs reduces the chance of those reservoirs spilling at any given time. Tom Murphy replied affirmatively. Skip said he understood that the OST program is not designed to provide additional flood relief, and asked if OST could produce additional storage voids when large releases are in place. Thom replied affirmatively.

Mary Ellen Noble stated that in the OST white paper there are references to making data available, and this presentation includes new release schedules to be developed. She asked how open is NYC going to be, letting people see the assumptions that are built into the OST system. She added that the decree parties should also have a very detailed look at the assumptions that are built into each piece of this model in order to negotiate a new release program by May 2011. She asked if the public will be able to see the OST assumptions. Thom Murphy replied that OST is designed to be a black box that plugs directly into other components of their system. But in developing a program with the other decree parties, some information will be shared and so OST may become a gray box. While the details of the entire NYC system will not be shared with everyone, NYC will share assumptions, inflow forecasts, current conditions, and water quality conditions. The details of what and how to share this information will be part of the negotiations with the parties. As far as how information is used to make release decisions, the parties should come to an agreement on the rationale and the process. Mary Ellen acknowledged that the cost of chemical treatment is a major factor in making operational decisions and asked if NYC would share how economics factors into making decisions. Thom replied that in his opinion, NYC should be able to share costs and the rationale behind making those decisions.

Joe Miri stated that after the 1960's drought we know that there is not enough water to provide 1,750 cfs at Montague and 800 mgd to NYC at the same time. He asked whether OST would help address that issue. He also asked who would bear the risk when we have another 1960's drought and we reach the point where there is not enough water to meet both objectives. He asked if NYC is willing to take its share of the risk to provide quality water, rather than put all the risk on the lower basin to make that water available. He asked if OST would get to address that question. Thom Murphy replied that OST is not going to operate any differently than how the FFMP operates now. However, OST will be like a crystal ball that will look a bit into the future and help make decisions. OST may cause operations to move from enhanced releases to less enhanced releases when a drought is in the forecast. This is a trade-off: if the drought does not occur, you have reduced releases for nothing, but if the drought occurs the drought-stage releases would start later. Thom said that the OST release program is a voluntary program on the part of NYC, because all release tables other than the base table are not sustainable in the long term. He said NYC's obligation will be to that base table and that any additional releases based on OST will be done only after evaluating the risk for water supply. Thom argued that the obligation on the part of the other decree parties is to move the base table to a higher level (e.g., 10, 20, or 35 mgd) by doing something to provide additional sources of sustainable water. Joe Miri asked if the 800-mgd maximum NYC diversion was hydrologically sustainable. He added that there is a clear risk of running out of water if NYC tries to take 800 mgd, given the hydrologic reality of the 1960's drought. Thom replied that NYC is only going to take 800 mgd if it needs it.

Bob Bachman asked if OST will be able to determine whether it is absolutely necessary to assume a June 1 fill date. He said he has been looking at the effects of these releases on the trout

fisheries for about seven years now, and it appears that operations built around a June 1 fill date cause both low flows and more spills in May and June, to the detriment of the fisheries. He asked if OST can evaluate other ways to optimize the use of the water. Tina Johnstone replied that OST can do that and said some experiments have been done moving the fill date from April 15 to June 15 to see how the probability of refill is affected. She recognized that in recent years, drawdown has begun earlier than June 1 and referred more technical OST questions to Jim Porter, who is the technical manager of the OST project for NYC DEP. Jim said OST is also being used to examine alternatives to storage being 100-percent full in the spring. Bob Bachman said another issue was NYC's preference for Cannonsville releases to meet the Montague flow target. He acknowledged that this preference was due to better water quality in Pepacton and Neversink, but the result was bringing Cannonsville storage down into the drought zone while the other two reservoirs were very high. He said that in using OST we should remember that the Supreme Court Decree says nothing about water quality or about supporting fisheries. Thom Murphy agreed and said that NYC has asked NYS DEC for help in developing the best tables for the fisheries. He added that OST will allow NYC to turn spilled water into managed release water.

**Overview of current NYC reservoir operations**

Tina Johnstone provided an overview of current NYC reservoir operations, focusing on the impacts to reservoir water quality caused by recent storm events. A significant challenge over the past several weeks has been turbidity in the Catskill system due to turbid inflow form recent storms; turbidity cannot exceed 5 NTU from Kensico reservoir since this would be a violation of the FAD rules. Tina mentioned that the total water consumption for NYC and upstate communities over the last few months has been around 1.1 billion gallons per day (bgd).

The first storm event brought between six and nine inches of rain over the Catskills watershed from September 26 to October 1. Inflows into Ashokan and Schoharie reservoirs were 18 bg each; this was problem for Schoharie, which has only 19 bg of storage capacity. Turbidities of inflows into Ashokan reached over 2300 NTU; turbidity in the West Basin of Ashokan reservoir a few days after the storm event ranged from 10 to 360 NTU. Several operational actions were taken to respond to the first storm event: shut down diversions from the Delaware reservoirs, close Shandaken tunnel, open Ashokan dividing weir, reduce Ashokan draft, maximize Rondout draft, and activate Ashokan waste channel (active since October 7). The Ashokan draft reductions required downstream stop shutter placement and increased dependence on the Delaware system. The flow through Ashokan dividing weir was reduced once it was determined that the West Basin would not spill and East Basin could be isolated. Tina said OST was used to determine that the waste channel could be used and Rondout draft could be maximized while ensuring that both the Delaware and Catskill systems would be refilled. She explained that the waste channel takes water from the West Basin in Ashokan reservoir to prevent it from spilling into the East Basin; this isolates the two bodies of water.

The second storm event brought an average of 2.5 inches of rain on November 30 and December 1. Runoff during December 1-6 was 18 bg into Ashokan and 15 bg into Schoharie. Turbidities of inflows into Ashokan reached over 1100 NTU; West Basin turbidity ranged from 30 to 500 NTU. In response to the second event, diversions from the Delaware reservoirs were shut down. Turbidity of Rondout draft remained below 2 NTU and turbidity in the Delaware reservoirs ranged from 1.7 to 3.7 NTU. Diversions from the Delaware reservoirs into Rondout were restored between December 7 and 9. Other operational actions were taken to respond to the second storm event: close Shandaken tunnel, open Ashokan dividing weir to minimize spilling from the West Basin into the East Basin, reduce Ashokan draft to 50 mgd (turbidity reached above 50 NTU), maximize Rondout draft, and keep Ashokan waste channel active. Tina indicated that the

response to this event was ongoing at the time of the presentation. OST was being used to determine that the waste channel could continue to be used and Rondout diversion could remain maximized while ensuring refill of the Delaware and Catskill systems. In addition, NYC DEP is using a suite of water quality and water system models to analyze turbidity transport in the Catskill system.

Tina mentioned issues affecting the Croton system, where extensive capital work continues in the Croton Aqueduct to support the new Croton Filtration Plant, currently under construction. She said Croton is held to stricter criteria than Kensico reservoir, and is more prone to violations due to lesser quality than that in the Delaware and Catskill systems. Croton turbidity ranges from 1.4 to 2.6 NTU, and color ranges from 22 to 40 units; if Croton was activated at this time, DEP could receive entry-point violations for both color and turbidity. Tina added that spills from Schoharie reservoir begin before storage reaches 100-percent; this is done now because of ongoing construction at Schoharie.

Tina said NYC plans to continue responding to the second storm event as follows: operate at reduced Ashokan draft until quality improves, maintain dependence upon Delaware system, and exhaust storage in West Branch and Boyds reservoirs. OST runs and water quality monitoring and modeling will continue. If water quality does not improve, NYC will consider Alum (aluminum sulfate) treatment for the Catskill Aqueduct diversion from Ashokan; this requires NYS DEC and NYS DOH approval under the existing SPDES permit.

Phil Chase asked how operations would change with the tunnel planned to connect the two systems. Tina replied that the new tunnel will allow NYC to put Delaware water into the Catskill aqueduct and blend it with the turbid water to get better water quality. If turbidity was very high and the Ashokan draft was shut down, the new tunnel could bring extra Delaware water into the Catskill aqueduct (in addition to Delaware water through the Rondout West Branch tunnel). She added that water quality and water supply system models are being used to analyze the turbidity transport in the Catskill system. For example, if Ashokan water with 50 NTU is going into the Catskill Aqueduct at a specific flow rate, the models can predict the resulting water turbidity in the Aqueduct and how long this flow could be sustained. Jim Porter said the expectation is that in the future there will be more extreme rain events that will produce high-turbidity events like the ones just reported here. Lee Hartman asked why the Delaware system seems to get rid of its turbidity faster than the Catskill system. Jim Porter replied that particle size in the Catskill basin streams is much smaller, due to glacial deposits in the basin; the Delaware basin streams have coarser grain particles that settle faster.

Someone asked if the spillage over the Ashokan dividing weir comes from the upper section where it is muddier. Tina replied that opening the dividing weir sends water through the gate in the bottom of the weir; once in the East Basin it has a longer time to settle out before it can come down the aqueduct. If the dividing weir is closed while inflows are higher than the flow out of the waste channel, the West Basin will fill up and spill turbid water over the dividing weir into the East Basin. Tina added that NYC began using the waste channel after figuring out how critical it is in its operations; it has been used more often in the last five years.

**Options available upon FFMP expiration**

Elaine Reichart of Aquatic Conservation Unlimited thanked the committee for allowing her the opportunity to present at this meeting. She said she would discuss Delaware River equity, the Supreme Court Special Masters Report, management of NYC water supply, and the right to know.

Elaine said the Supreme Court Decree is based on equity among the various water users and argued that if the Delaware River basin has first priority to Delaware River water, then releases from the NYC Delaware Basin reservoirs should not be contingent upon NYC's needs. Elaine said both flood protection and conservation have lost equity in the FFMP and the Rev1 release program, when compared to what the Supreme Court Decree set on a continued basis. She predicted that more equity would be lost as NYC modifies its operations to address water quality concerns. Elaine read a quote from Luna Leopold: "Decisions in the field of water development and management should aim toward the preservation of the integrity of the hydrologic continuum. The idea of a continuum implies a maintenance of balance …" She stated that both the FFMP and Rev1 reflect an imbalance, where NYC sits at the head of the river and determines what river users can get, in a reversal of what the Supreme Court Decree laid out in 1954. She then compared the Decree to the FFMP and the Rev1 program, and how they relate to the Excess Release quantity (ERQ), safe yield, and releases for ecosystem protection; she offered copies of a card detailing these comparisons. She expressed her opinion that OST is going to make things worse from both the flooding and the cold water fisheries perspectives.

Elaine said the 1954 Special Masters Report prepared for the Supreme Court determined the combined safe yield of the three NYC Delaware Basin reservoirs to be 800 mgd. She stated that a scientific reassessment is needed now to determine if that number is still true; this matters because the Decree links ERQ releases to safe yield. Elaine said from a lower-basin perspective it is most important to get back to the terms of the Supreme Court Decree through Rev1 to correct the inequities and have enough water flowing down the river.

Elaine cited language from the Special Masters Report: "the retention of jurisdiction was essential because the State and City of New York must take "the risk of the future" and that their plan might require modification." This referred to Pennsylvania's request that the Supreme Court retain jurisdiction over this case. Elaine said this is important because Pennsylvania wanted the amended decree to make clear that Pennsylvania shall never in the future be stopped from asking that the NYC diversion be reduced or even eliminated. She added that Pennsylvania was very vocal and insisted that the NYC diversions do not constitute a prior appropriation; Pennsylvania insisted on the principle of "equitable apportionment" being upheld. Pennsylvania also insisted on the creation of a River Master to guard against prior appropriation and the maintenance of river equity. Delaware concurred with these requests from Pennsylvania. Elaine expressed hope that going forward the lower-basin states can regain their equity.

Elaine discussed the management of NYC water supply and asked what she said were questions not thought of in 1954: Does the unacceptable quality of NYC's Catskill and Croton systems give NYC the legal right to rely predominantly on the Delaware River as its primary source for drinking water? Should the lower-basin states subsidize NYC's refusal to pay to filter the whole of their water supply? Is quality an acceptable parameter for increasing reliance of the Delaware System to 75-percent and higher, if doing do causes harm to the Delaware River and its people?

Elaine spoke about flood control and stated that as a byproduct of over-drafting the Delaware Basin reservoirs, NYC has allowed massive spilling of their reservoirs. She took exception to using the word "mitigation" in conjunction with "flood," and said the need is for flood control, not flood mitigation. She added that a main priority listed in the Delaware River Basin Compact is the control of flood damages, and argued that controlling reservoir spills is a way of doing that. Elaine said the ethos of "Do No Harm" applies to all aspects of the Delaware River, including the prevention of reservoir-induced flooding: to do no harm should be the guiding tenet of all government agencies involved with Delaware River management issues.

Elaine discussed the right and duty to know. She argued that the Decree parties, the DRBC and RFAC should be made aware of any major changes to the NYC water supply system. She said not knowing NYC's total system and subsystem yield and consumption numbers destroys the scientific integrity of any basin/reservoir plan. She gave the example of the Croton system, which has had water quality problems and was removed from service on numerous occasions over the past two decades. She said the entire Croton system was shut down for most of 2000-2001 because of contaminants that leaked into the NCA. Elaine stated that "Don't ask/Don't tell" is not an option, since Pennsylvania, New Jersey, Delaware and the River Master have the right, stipulated in the Supreme Court Decree, to inspect all NYC reservoir records pertaining to inflow, outflow and diversions. She added that what NYC does with their water system affects many from an ecosystem and a personal-safety perspective. Elaine said she was officially asking the decree parties and DRBC that going forward they get an understanding of what NYC is doing with their water system. She said the decree parties have a right according to the Decree to get this information and she asked the parties to obtain this information for the public.

Elaine stated that there is no agreement among the decree parties on whether the FFMP is a good thing and about the way forward. She said the Supreme Court charged the River Master with policing the agreement and asked Gary Paulachok how the River Master could at the same time police the agreement and work with the decree parties to develop a new agreement. Gary explained that the decree parties are the ones that decide how the waters of the basin are to be managed. The River Master then implements the actions and programs unanimously agreed to by the decree parties – it has been that way for more than 55 years. Gary stated that in September 2007 the decree parties signed the FFMP and in October 2010 all decree parties agreed to proceed in a particular direction to develop the next FFMP. He added that all the release programs that have been in place over the years have been unanimously approved by the decree parties – otherwise they would not have gone into effect.

Bob Tudor stated that Elaine seems to advocate for a management approach over a hydrologic continuum and asked her if that would apply to floodplain management and floodplain regulations. Elaine replied that she believes in the need for a holistic approach and that floodplain management should be part of it. Gary Paulachok asked Elaine what specific options to the FFMP she was advocating. Elaine replied that she would prefer to return to Decree-based operations to correct inequities. She said the true intent of the Decree was to let the River Basin users have first priority to the water. She added that the Special Masters Report shows that the lower-basin states were in fear of the very thing that has happened: their total equity and their rights to the water are at the whim of what NYC decides to do. Elaine said the lower-basin sates are paying for NYC to avoid filtering the water in their whole system.

**Decree party next steps towards new FFMP**

Gary Paulachok stated that he was asked by the decree party members to talk about how the process of developing a new FFMP is designed to work from now until May 2011. The current FFMP was put in place in October 2007 and there were revisions in December 2008. Since then a number of ideas have been offered on how to improve the FFMP, including the development of OST by NYC, the safe yield analysis from New Jersey, and other proposals. In October 2010 the decree party principals met in Parsippany, New Jersey to discuss what to do on June 1, 2011, when the FFMP expires. At the meeting they got briefings on the OST concept, New Jersey's safe yield analysis, and work group activities. On the basis of those discussions, the decree party principals unanimously agreed to develop a one-year reservoir releases program that will be based on the current FFMP, as modified by an integration of the Operational Support Tool (OST)

of NYC. Gary said there is a caveat to consider: New Jersey tied their support of the one-year program to the conduct of a reassessment study of water supply availability. New Jersey feels very strongly that the available water should be looked at and that the assessment study that was called for in the original FFMP must be carried out in order for New Jersey to support future programs.

Gary indicated that at the conclusion of the October meeting the decree party principals unanimously directed their work group members to work as quickly as possible to develop a draft agreement for their consideration. Since November 2010 there has been a fair amount of work involving the decree party work group and some of the individual parties. Gary said he worked with DRBC staff to review the current FFMP agreement and identify 16 sections of that agreement that will need to be revised or new language created to satisfy the one-year reservoir releases program agreement. The work group proposed using the current FFMP agreement as a starting point for the new one-year agreement and proposed tasking the work group members with specific writing assignments based on their technical expertise.

Gary said this process was informed by the FFMP impact assessments, a series of papers that the decree party work group put together for the principals looking at various performance measures (recreational boating, cold water fisheries, salinity repulsion, etc.). It was also informed by other reports, including the joint PA FBC/NYS DEC fishery white paper that Mark Hartle was a part of, a Nature Conservancy report on river flow conditions and ecological conditions prior to the construction of the three NYC reservoirs, and a National Park Service report (the Cole report) on flow needs of the dwarf wedge mussels in the upper basin. The process also included other mechanisms to receive public input (RFAC, meetings with stakeholder r groups, etc.). The work group worked in November to develop a draft work plan to integrate OST into the current FFMP, with revision of certain sections of the existing FFMP and the creation of new language to support the OST integration. The draft work plan was reviewed and unanimously approved by the decree party principals at their November conference call.

Gary reported that the principals directed the work group to start working on a draft agreement. The decree party work group is composed of technical members of the decree parties, supported by technical staff of the River Master's office, DRBC, the Philadelphia Water Department and various other members with specific expertise. From January to April 2011 the work group will be meeting at least two days per month to develop a draft agreement for consideration by the principals by the end of April 2011. It is anticipated that the decree party principals will spend most of May reviewing the draft agreement and identifying to the work group members what revisions need to be made to come up with an acceptable document. On the basis of the principals' input, the work group will prepare a final agreement. The decree party principals, if the agreement is satisfactory, would execute a final agreement sometime in May and on June 1, 2011 a new one-year releases program will be implemented.

Gary indicated that this entire process is tied to a reassessment study of water supply availability. NJ DEP staff will provide the work group with a draft document outlining the scope for the reassessment study. The work group will use this document to integrate the requirement for a reassessment study into the one-year agreement. Gary made it clear that the one-year agreement, currently under development, is contingent upon a satisfactory reassessment study proposal being made and accepted and also commitments for funding the study. Gary remarked that the agreement is for one year and one year only; an extension beyond one year would require the active effort and agreement of all five decree parties. He said this agreement will not go forward unless it receives unanimous approval of all decree parties; absent unanimous approval by the

decree parties, the program would revert to the last permanent reservoir releases program (Rev1), established in 1983.

A question and answer period followed Gary's presentation. Maya van Rossum asked when New Jersey will provide the scope of the reassessment study to the work group. Joe Miri replied that hopefully before Christmas. Hank Gruber said that back in 2007 when the reassessment study was initially considered, the Army Corps was going to provide 50-percent of the reassessment study cost. He asked if the current study would still require the same level of funding from the Army Corps. Joe Miri replied affirmatively. Elaine Reichart asked if there were going to be any projections or modeling of the effects of the gas drilling industry on water quality. Gary replied that such a task would not be included, since this is a one-year program and there is very limited time for developing the agreement.

Mary Ellen Noble asked how much of OST could be integrated into the FFMP on a one-year program. Gary replied that the plan was to integrate the OST version that is currently available, anticipating that NYC's schedule calls for a full test (beta) version to be available on October 2012 and the final OST version to be available on October 2013. Gary said the version that NYC is using now is a precursor to the fully automated system whereby NYC receives the same data stream that the fully automated system would receive when ready; in the current version the data input, analysis and interpretation are all done manually.

Mary Ellen Noble asked about the status of OST right now, what components are available, and how can we operate until the full OST program is available. Thom Murphy replied that the outputs of the tool will be used to find out what operational regime the system is in and determine which release table is applicable. Right now the FFMP has four release tables and under OST the concept is to have five to seven release tables. Mary Ellen Noble asked how the integration of OST and the FFMP could be done without going through an elaborate process of reviewing all the OST assumptions. Thom Murphy replied that there are plans for NYC to give a detailed presentation to the work group on the ins and outs and assumptions of OST. Thom Murphy added that NYC's obligation will be to make releases following the sustainable table, but the analysis of risk and the acceptance of risk will be up to NYC. The OST releases will be a voluntary program, since NYC will decide how best to operate their system. He explained that OST will be used to make excess water available for releases , but the other decree parties will not have a vote on which release table will be in effect at any given time. NYC can inform the other parties on the rationale used for choosing a release table, but NYC's obligation will be to the sustainable base table. Gary said if the decree party principals are not happy with the terms of the draft agreement, there will be no agreement. Thom added that if there is no agreement on an OST program, the new FFMP may be a program without OST.

Elaine Reichart asked if the decree parties are coming up with extra water for releases. Bob Tudor stated that NYC has always taken the position that whatever new programs are put in place with extra water that they make available on a voluntary basis would ultimately have to be borne by all the parties. NYC does not need the extra water right now but maybe 10 or 15 years down the road it may need their water back for sustainability reasons. At that point it will be up to the other parties to provide the extra water. Tina Johnstone added that NYC is looking to tap into the ERQ as a quid pro quo for going to a table with higher releases. Thom Murphy said OST releases will be above and beyond what an ERQ program provides, but does not mean that the ERQ goes away. He said the decree parties can choose to do what they wish with the ERQ but this is all excess release water, above a sustainable base table.

Maya van Rossum asked when would the water supply reassessment study get under way, how long it is going to take, and when the outcomes will start to influence the discussions on flows and the future iterations of the FFMP. She added that someone must have some sense of the quantity and quality of work that you would like to see in order to inform these discussions. Bob Tudor replied that there is a broad universe of issues and a core universe of issues that have to be addressed; the available budget and what that budget will support in a reasonable timeline also have to be considered. Joe Miri said it would best to defer this discussion until after a scope of work has been agreed to. Maya asked if we are going to be in the same place next year and asked how much money is already available. Hank Gruber stated that the Army Corps could contribute a little over $300,000, requiring a 50-percent match from other partners. Maya asked if that meant that the reassessment study cannot cost more than $600,000. Maya said many stakeholders in the basin had the expectation that this type of information would already be available or it would be on track to be completed. She said she expected this study to be a well-rounded scientific-based study that is going to provide really good information, and would like this study to be carried out in a way and in a time frame that will inform any next iterations of the FFMP. Joe Miri agreed.

Someone asked what happens if the decree parties fail to reach an agreement and releases go back to the Rev1 program, and whether that situation would last for one year only. Gary replied that absent an agreement, operations would revert to Rev1 and such operations would more than likely stay in effect until the parties come up with a new program that is acceptable to all of them. Don Hamilton asked what the proposed timeframe for completing the reassessment study was and whether that had to be completed within the one-year extension period. Gary said that information was not available.

**Election of RFAC vice-chair for 2011-2012 term**

Joe Miri announced that this was his last meeting serving as RFAC chair. He indicated that according to the committee by-laws the vice-chair, Stefanie Baxter, will become the chair on January 1. She will serve as chair for the 2011-2012 term. Joe Miri requested nominations for vice-chair for the 2011-2012 term. He pointed to the by-laws and indicated that candidates have to represent one of the decree parties. The committee unanimously elected Thom Murphy of NYC DEP to serve as vice-chair.

**Next meeting date**

The next RFAC meeting will be on Tuesday, January 25, 2011.

**Opportunity for public dialogue**

Someone asked if the decree parties could share the 16 areas in the FFMP agreement where the language needs to be modified. Bob Tudor said DRBC staff would post on its website a document highlighting the FFMP sections that have to be modified. Someone asked how to go about making a presentation on issues that RFAC is involved with. Stefanie Baxter indicated that the upcoming RFAC meeting would be an opportunity for public input on FFMP issues. She asked those interested in presenting to contact Hernán Quinodoz of DRBC as soon as possible to be included on the agenda. Stefanie asked that a copy of the presentation be sent to Hernán a few days prior to the meeting.

Dan Plummer stated that some members of the public would like to know if they could form an official subcommittee to work with RFAC (RFAC may form subcommittees as provided in the bylaws). He asked if it would be worth for the public to form a subcommittee to enable them to

be a more formal part of the process. Joe Miri indicated that RFAC would have to initiate that process. Bob Tudor said it would be in the public's best interest to put together a proposal and bring it to RFAC and have the committee consider the appropriateness of their proposal. Bob said RFAC is trying to be as transparent as it can be with its processes.

**REGULATED FLOW ADVISORY COMMITTEE (RFAC)**

**December 14, 2010**

**ATTENDANCE LIST**

| NAME | AFFILIATION |
|---|---|
| BACHMAN, Bob | Friends of the Upper Delaware River (FUDR) |
| BAXTER, Stefanie | Delaware Geological Survey |
| BRAND, Tom | New Jersey Department of Environmental Protection (NJDEP) |
| CHASE, Phil | Upper Delaware Council |
| COLLIER, Carol | Delaware River Basin Commission (DRBC) |
| EATON, Angus | New York State Department of Environmental Conservation (NYSDEC) |
| GARLITS, Skip | Stakeholder |
| GRUBER, Hank | US Army Corps of Engineers (USACE) |
| HAMILTON, Don (via phone) | National Park Service – Upper Delaware Scenic and Recreational River |
| HARTLE, Mark | Pennsylvania Fish & Boat Commission |
| HARTMAN, Lee | Trout Unlimited |
| HESSON, Molly | Philadelphia Water Department |
| JOHNSTONE, Tina | New York City Department of Environmental Protection (NYCDEP) |
| LIAGHAT, Hoss | Pennsylvania Department of Environmental Protection |
| LOVELL, Stewart | Delaware Department of Natural Resources and Environmental Control |
| MAYER, Bob | NYCDEP |
| MIRI, Joe | NJDEP |
| MOLZHAN, Bob | Water Resources Association of the Delaware River Basin |
| MURALIDHAR, D. | Hazen and Sawyer |
| MURPHY, Thomas | NYCDEP |
| MUZYNSKI, Bill | DRBC |
| NOBLE, Mary Ellen | Delaware Riverkeeper Network (DRN) |
| OLIVIO, Dana | NYCDEP |

| NAME | AFFILIATION |
|---|---|
| PAULACHOK, Gary | US Geological Survey – Office of the Delaware River Master |
| PLUMMER, Dan | FUDR |
| PORTER, Jim | NYCDEP |
| QUINODOZ, Hernán | DRBC |
| REICHART, Elaine | Aquatic Conservation Unlimited |
| RESTI, Sherri | FUDR |
| RINGEL, Edrea | NYCDEP |
| SALINAS, Julie | Pennsylvania Power and Light (PPL) |
| SERIO, Jim | Delaware River Foundation |
| SHALLCROSS, Amy | DRBC |
| STEVENS, Glen | USACE |
| TARRIER, Brenan (via phone) | NYSDEC |
| TUDOR, Bob | DRBC |
| VAN ROSSUM, Maya | DRN |
| ZIGON-RICHARDSON, Valerie | DRBC |
| ZIMMERMAN, Jeff | FUDR et al. |