PHILADELPHIA WATER DEPARTMENT

Debra A. McCarty, Water Commissioner

April 8, 2019

Delaware River Basin Commission
PO Box 7360
West Trenton, NJ 08628

Subject: Regulated Flow Advisory Committee Request for Comments

Dear Ms. Shallcross,

The Philadelphia Water Department (PWD) would like to thank the Delaware River Basin Commission (DRBC) for the opportunity to provide comments on the 2017 Flexible Flow Management Program Salinity Study Statement and the Flexible Flow Management Program 2017 General Study Workplan. These documents were released to the public, including PWD, in advance of the February 20, 2019 Regulated Flow Advisory Committee (RFAC) meeting, which ultimately was postponed due to inclement weather. PWD is pleased to serve as a member of the RFAC given that the policies regulating upstream reservoirs significantly impact the water quality and quantity of the drinking water supply to 1.6 million customers in Philadelphia. At the time of these comments, the RFAC meeting is rescheduled for April 9, 2019 and PWD has yet to participate in a broader discussion of these documents with other RFAC members. PWD is looking forward to discussing the Salinity Study Statement and Workplan as well as the following public comments at the April RFAC meeting.

1. *'Comparable protection' of the Philadelphia drinking water supply is a policy that leads to no ocean salt at the PWD Baxter Water Treatment Plant intake. A policy contributing to ocean salt at the PWD Baxter Water Treatment Plant intake for one day is considered a 'significant adverse impact'.*

The Philadelphia drinking water supply comes from the non-tidal Schuylkill River and the tidal Delaware River. All PWD drinking water treatment plant intakes are influenced by the reservoir release policies within the FFMP. The drinking water treatment plant intake on the tidal Delaware River is vulnerable to salinity intrusion, which is when ocean salt moves far enough upstream to reach the intake. The PWD drinking water treatment plant on the Delaware River is not a desalination facility. Any sodium and chloride present in the source water passes through treatment and onto customers, raising public health and infrastructure corrosion concerns if ocean salt were to reach the intake.

The PWD tidal Delaware River intake experienced salinity intrusion in the 1964 and 1965 droughts. During and following the salinity intrusion events in 1964 and 1965, ocean salt reaching the drinking water intake was regarded an unacceptable public health risk. Due to this risk, reservoir releases dedicated to the management of salinity intrusion have been a feature of drought policies for the past 37 years since the 1982 Good Faith Agreement.

While the drought reservoir release policies have not changed in the 2017 FFMP, new language is included that states a reduction in the New York City contribution to salinity repulsion releases is forthcoming in 2023.

> *"If studies by the Decree Parties or external entities on behalf of a Decree Party support that detachment provides comparable protection for existing resources and uses within the Basin and does not cause significant adverse impacts, then detachment will be implemented between June 1, 2023 and May 31, 2028, based on a schedule to be unanimously determined by the Decree Parties." 2017 FFMP, Section IV.3.b.*

While PWD always welcomes the attention of high-quality science on the drinking water supply, the coupling of study outcomes with a pre-determined policy change is extremely concerning. The definitions of 'comparable protection' and 'significant adverse impacts' are not included in the 2017 FFMP. This oversight leaves an open opportunity for other Decree Parties to define what is and is not detrimental to Philadelphia, potentially using technical short-cuts to estimate salinity changes. PWD, the public water utility responsible for the integrity of the drinking water supply to 1.6 million Philadelphians, businesses and industries, is taking the opportunity provided by these public comments to define 'comparable protection' and 'significant adverse impacts'.

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2. *PWD performs extensive salinity analyses and will provide results to the Pennsylvania Department of Environmental Protection (PADEP), RFAC and stakeholders studying fisheries and aquatic resources.*

It is critical that PWD understand the water supply influences of reservoir releases, sea level rise, dredging and other in-basin activities, on the length of salinity intrusion and its potential impacts on finished drinking water quality, public health and infrastructure corrosion. To further this understanding, PWD performs comprehensive water planning studies that rely upon significant data collection efforts, in-depth analyses of recent and historic datasets, and the use of both a three-dimensional salinity model of the tidal estuary and a reservoir optimization

model of the non-tidal Delaware River Basin. Over the past decade, PWD has committed extensive resources to technical support, oceanographic research and data collection in an effort to build models capable of supporting planning for the preservation and protection of the Philadelphia drinking water supply.

As the largest drinking water supplier in the state of Pennsylvania, PWD intends to share the results of this comprehensive planning effort with PADEP to inform state policy decisions, such as FFMP negotiations. PWD also intends to share these results with RFAC and the public in a series of public presentations and additional reports made available at www.phila.gov/water/sustainability/protectingwaterways . PWD also will work with regional stakeholders interested in looking at PWD salinity study results to interpret policy impacts on fisheries and aquatic resources.

3. *PWD suggests that the best approach to evaluating and understanding the processes that force the intrusion of ocean salt into the upper Delaware Estuary is two-fold. First, through thorough, systematic investigations of the historic observed data and conditions. And second, through the conduct of numerical simulation experiments performed using a validated three-dimensional hydrodynamic model, to expose the important underlying physical mechanisms that drive salinity intrusion and to then predict the necessary conditions for the protection of the Philadelphia drinking water supply.*

In past decades, considerations of the salinity intrusion length up to and into the upper tidal reaches of the Delaware Estuary often relied upon inferred relationships between the axial salinity distribution and the inflow rate of freshwater. In addition, one-dimensional computational approaches were employed to predict the salinity distribution through advective-dispersive considerations, driven primarily by the interaction of streamflow inputs with primary sea level forcing, as influenced by meteorological conditions in the Bay and on the adjacent continental shelf.

However, in more recent years, it has become apparent that the salt intrusion length is profoundly influenced by more complex processes of estuarine exchange flow and secondary circulation. Initial fundamental work emerged in the late 1970's that pointed to the importance of these processes (R. Smith - U of Cambridge). But the new understanding of estuarine exchange flow and the importance of secondary circulation has evolved primarily since the late 1980's through the work of, among numerous other luminaries, J. H. Simpson (Bangor U), R. J. Chant (Rutgers U), D. A. Jay (Portland State U), W. R. Geyer (Woods Hole Oceanographic Institution), R.P. Signell (USGS), and P. MacCready (U of Washington).

Some of the fundamental research in this area has been performed in the Delaware Estuary. It is now well accepted that these exchange flow physics significantly modify salt intrusion length,

with sensitivities to processes such as buoyancy inputs, periodic strain-induced stratification, horizontal salinity gradients, channel width and depth, tidal mixing/stirring, flow curvature, and even in narrow channels, the effects of Coriolis. These physical phenomena are not one-dimensional in nature, nor are they two-dimensional (depth-averaged) in nature. Numerical simulations employed to predict the salt intrusion length must be performed using a fully 3-dimensional hydrodynamic model validated to represent properly all of the fundamentally important physical processes governing the estuarine exchange flow.

4. *The expert panel convened to advise and support the modeling needs of the DRBC Designated Use Study is a resource that could be consulted to advise RFAC and the Decree Parties on the validity of the variety of tools described as available to study salinity in the Workplan.*

PWD is using the best available technology to study the impacts of how reservoir policy changes may influence salinity intrusion and ultimately the water supply to Philadelphia residents, businesses and industries. There are several modeling approaches listed in the Workplan that are not capable of simulating the estuarine circulation processes that advance ocean salt upstream towards Philadelphia during periods of low streamflow.

Any study evaluating the relationship between reservoir policy and salinity intrusion using an empirical, 0-dimensional, or a 1-dimensional modeling tool should be considered inadequate to advise decision makers on matters critical to the public health of Philadelphians. Again, numerical simulations employed to predict the salt intrusion length must be performed using a fully 3-dimensional hydrodynamic model validated to represent properly all of the fundamentally important physical processes governing the estuarine exchange flow.

There is an expert panel already convened by DRBC to support the modeling needs of the Designated Use study that can provide sound guidance to RFAC and the Decree Parties regarding salinity modeling approaches. The hydrodynamics that properly drive an estuary dissolved oxygen water quality model should be the same hydrodynamics that drive an estuary salinity model. The expert panel is already familiar with hydrodynamics and simulation tools, as well as the techniques used to evaluate model performance and validation. The RFAC and Decree Parties could utilize this existing resource to obtain objective advice and review of salinity modeling techniques and reports submitted to support the Workplan.

5. *RFAC should replace the Decree Party Workgroup, technical and policy deliberations should be made in public.*

The Workplan contains a number of technical studies that are of interest to public drinking water suppliers, water quality, drought management, fisheries and aquatic resources. As studies are completed they should be shared with all RFAC members, presented and discussed

publicly at an RFAC meeting. With the drinking water resources to millions of people in Southeastern Pennsylvania being evaluated within the Workplan, PWD as a public entity and an RFAC member deserves to be included in the technical discussions of studies within the Workplan. The RFAC should replace the Decree Party Workgroup, and all private technical and policy deliberations related to the Workplan should be made in public at an RFAC meeting.

Sincerely,

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