



Delaware River Basin Commission

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Kristen Bowman Kavanagh, P.E.
Executive Director

Minutes
Water Quality Advisory Committee
A Joint Meeting held with DRBC's Model Expert Panel
April 23, 2026

WQAC Members & Alternates who attended:

Chair:

Sarah Rickard, reserved Member from NYSDEC

Other Reserved

DNREC

Member: Bhanu Paudel

NJDEP

Member: Frank Klapinski

PADEP

Member: Harmonie Hawley

EPA

Member: Taylor Krolik (R3)

National Park Service

Member: John Clune

Non-Reserved

Academia/Science

Member: John Jackson (Stroud Water Research Center)

Environmental Professional

Alternate: Kacy Manahan (Delaware Riverkeeper
Network)

Local Watershed Organizations

Alternate: Stefanie Kroll (Riverways)

Regulated Community Industrial

Member: Scott T. Northey

Regulated Community Municipal

Member: Jason Cruz (PWD)

DRBC Model Expert Panel Members and Consultants who attended:

Vic Bierman, Jr., PhD, BCEEM (Senior Scientist Emeritus, LimnoTech, ret.)
DRBC consultant and liaison to Model Expert Panel

Robert Chant, PhD (Professor, Rutgers University Institute of Marine Sciences)

Scott Hines (Senior Environmental Scientist, LimnoTech)
DRBC consultant

Tim Wool (Environmental Scientist, USEPA Region 4, ret.)

Other Attendees:

Joseph Brodie (AKRF, Inc.)

Eileen Althouse (CDM Smith)

Zach Eichenwald (CDM Smith)

Paula Kulis (CDM Smith)

Julia Palmer (Delaware Riverkeeper Network)

Brandon Bach (HDR)

Andrew Thuman (HDR)

Michael Dillon (Manko, Gold, Katcher & Fox)

Teresa Guloy (NJDEP)

Claire Huang-Lindabury (NJDEP)

Catherine Jedrzejczyk (NJDEP)

Sarah Beganskas (DRBC)
Jake Bransky (DRBC)
Pamela Bush (DRBC)
Fanghui Chen (DRBC)
Jeremy Conkle (DRBC)
Joey Fogarty (DRBC)
Mike Heller (DRBC)
Naomi Mendelsohn (DRBC)
Elaine Panuccio (DRBC)
Chad Pindar (DRBC)
Kate Schmidt (DRBC)
Namsoo Suk (DRBC)
Li Zheng (DRBC)

Brent Gotsch (NYC DEP)
Kelly Anderson (Philadelphia Water Dept)
Kinman Leung (Philadelphia Water Dept)
Julie Midgette (Philadelphia Water Dept)
Melanie Murphy (Philadelphia Water Dept)
Alex Ridyard (Philadelphia Water Dept)
Denise Hakowski (USEPA, Region 3)
Katie Lavallee (Woods Hole Group)

Welcome and Call to Order

The meeting was called to order by Sarah Rickard at approximately 10:00 AM. Voting members (or alternates) introduced themselves.

Administrative items

WQAC Liaison Thomas Amidon provided a [membership update](#), during which he announced three membership changes. The State of Delaware changed its DNREC reserved membership appointment from Steven Williams to Michael Bott (Bhanu Paudel remains the alternate member for Delaware). The DRBC announced two new non-reserved WQAC membership appointments.

1. Stefanie Kroll (PhD) was appointed effective immediately to represent the Local Watershed Organization stakeholder category for the remainder of a term that expires on July 31, 2030. Tom acknowledged with gratitude Gail Farmer's service to the WQAC in this capacity since 2020.
2. Lia Mastropolo was appointed to represent the Environmental Professional stakeholder category for a 5-year term that begins on August 1, 2026. Tom acknowledged with gratitude that Maya van Rossum has served the WQAC in this capacity more than 25 years, and that her current term expires July 31, 2026.

Both appointments to non-reserved membership positions were made by the Executive Director of the DRBC from among the multiple applications received.

Minutes from meeting held on December 4, 2025 were provided to the Members on April 9, 2026 for review and comment and approved with no changes.

Results of Estuary Dissolved Oxygen Model Enhancements

Matt Amato [presented](#) the results of the enhancements that DRBC staff have made over the last few years to the estuary dissolved oxygen model [documented](#) September 2024. After reviewing the major enhancements to the model and why the model was enhanced, Matt reviewed the improvements to model-data comparisons of chlorophyll-a, particulate carbon, sediment oxygen demand and nutrient fluxes, and dissolved oxygen. Matt then described how the enhancements improved the mechanistic representation of different processes influencing dissolved oxygen dynamics throughout the estuary.

Kacy Manahan asked about the model-data comparisons for phytoplankton and why the continuous data labeled “PWD (daily average)” appeared to be different and generally higher than the individual points labeled “Boat-run (surface, grab samples).” Matt explained the boat run phytoplankton samples are biased high because they are daytime grab samples taken at the surface and that, like the model output, the sensor data provided by PWD were averaged daily for the model-data comparison. Tom added that the grab samples are also taken at a different location and depth within the same model grid.

Jay Cruz thanked Matt for the presentation the whole DRBC team for the model updates and for documenting them in a forthcoming model report that he looks forward to reading. Regarding the chart of the sediment oxygen demand, Jay asked what DRBC thinks causes the sharp variability in the SOD time series. Matt provided some perspective on the plots by noting that there is no temporal component. The x-axis is a spatial plot by river mile. The model output are laterally averaged across the river resulting in the black line. The reason for the spatial variability is that DRBC used a spatially varying net settling scheme that was based on observed sediment organic carbon. As a result, there is a range of settling throughout the model. Cells with higher settling rates deposit more carbon, feeding more sediment diagenesis and therefore more sediment oxygen demand.

Frank Klapinski asked when DRBC expects to complete its supplemental calibration report that will document the model enhancements. Matt Amato indicated that DRBC expects the report in late summer or early fall.

Model Suitability Evaluation

On behalf of DRBC’s Model Expert Panel, Vic Bierman, DRBC’s consultant and liaison to the panel, [presented](#) a description of the Model Expert Panel, the model review process, and the panel’s findings with regard to the model enhancements. Vic described how the sediment diagenesis model directly links organic carbon and dissolved oxygen between the water column and sediments, resulting in a more constrained model with less uncertainty. Vic articulated the conclusions of the Model Expert Panel, namely that the model upgrade allows for a more defensible evaluation of future load reduction scenarios by incorporating changes to sediment dynamics that impact dissolved oxygen.

John Jackson asked Vic why the model enhancement to dynamically simulate sediment diagenesis is important. The 2024 model results were good, and the new results are still good. The “black box” approach to prescribing SOD in 2024 was not a massive hole in the model, so why does this new work really matter? Vic Bierman explained that the reason the water column results look similar between the 2024 and 2026 models and compare favorably to measured data is that both have similar SOD rates and those rates are consistent with observed SOD rates. In 2024, DRBC **prescribed** the SOD correctly; in 2026, the model **calculated** SOD correctly. That's the difference., and it produces a huge benefit when the model is used for future for load change scenarios. To the extent that a change scenario results in future changes to the sediment, the new model can calculate the impact of those changes on SOD and nutrient fluxes, both of which can impact water column dissolved oxygen.

John Jackson followed up by asking why DRBC was successful in implementing sediment diagenesis modeling in the Delaware River estuary given how difficult it is to achieve. Vic noted that the sediment diagenesis model has been around for a few decades. The reason it is so difficult to successfully implement these sediment diagenesis models is that you have to “feed” the sediments organic carbon, which originates from internal phytoplankton and external inputs from the watershed. Most attempts to implement a mechanistic sediment diagenesis model fail because the sediments run out of organic carbon. I really focused in my presentation on better science, but more data was absolutely crucial.

DRBC performed a much more complete characterization of organic carbon sources and production, resulting in enough carbon to close the loop between the water column and sediments.

How the estuary model will be used in context of WLA Study

Thomas Amidon [described](#) how the DRBC expects to use the enhanced dissolved oxygen model for the ongoing wasteload allocation (WLA) study. Tom reviewed the overall strategy for implementing EPA's new dissolved oxygen criteria, the WLA study objectives, the co-regulators who comprise the WLA Study workgroup, and the WLA Study process. After reviewing the substance of the discussion at the kickoff meeting for the WLA Study workgroup, Tom described the study methodology and how change factor analysis will allow the WLA Study to leverage and extend model results over a 15 year period from 2011 to 2025. Tom ended by describing how the WLA Study will make use of the model to support DO saturation criteria without introducing additional uncertainty.

John Jackson asked about the seasonal aspect to the WLA study and whether there is any lag of wasteload retention. Do we know mechanistically if what happens in June affect July, for instance? Tom stated that the main issue with seasonality is the fact that nitrification is actually a mediated oxidation of ammonia to nitrate that is very temperature sensitive, making the system much less sensitive to ammonia discharges during the winter months. John asked what the definition of the seasons will be and what kind of margin of safety will be built around that. Tom pointed out that the criteria will also influence that decision because the criteria are based on two seasons: March through June and July through October.

Discussion

Frank Klapinski asked whether DRBC has any idea how many model runs they expect to perform during WLA study. Tom estimated, and Li Zheng affirmed, that we expect to make several hundred 3D runs and 3-4 times that many 2D runs. Vic asked how many model runs DRBC conducted to get to this point in the project, maybe overall and then over the last 2 years. Vic guessed it must be well over 1000. Li Zheng offered a ballpark number of about 1300 to 1400 runs, each over 2 to 3 years. Vic made the point that this is a very complex model of a very complex system that generated an enormous amount of data. Every time you run the model, there are dozens of visual and quantitative metrics that are used to evaluate the results of model simulations over space and time. Post processing of the model results is almost as complex as actually running the model itself. It's an enormous effort. And this speaks to how tightly constrained this model is to the data.

Frank Klapinski asked whether the plots Matt showed showing chlorophyll-a model-data comparisons were averaged across multiple cells. Matt shared the plot again and explained that the chlorophyll-a and dissolved oxygen model-data comparisons are at the cell where PWD 's buoy B is located. Tom added that the model-data plots were designed to be as close as possible to the location and depth where the actual sensor is.

Jason Cruz asked about the public review/ input process for the modeling report and the WLA study report. Namsoo Suk responded that there will not be a formal public comment period, but that DRBC will solicit feedback from WQAC and other interested groups as needed to identify and address concerns with the WLA development conditions. Jay asked whether PWD, for example, will have the opportunity to review the assumptions used in the various scenarios in some form of a written report. Namsoo indicated that DRBC will exchange information with the water quality advisory committee and the co-regulators, allowing for participation in a parallel track as the study progresses. Jay noted that a couple of other dischargers were not able to attend the meeting today, and there may be others that are interested in what assumptions will be used for their actual wasted allocation scenario. Namsoo

suggested to Jay that as the WQAC member representing municipal dischargers, it might be helpful to inform the remainder of municipalities to participate in this water quality advisory committee, especially during next 15 months while the WLA study is underway. Tom added that when a facility receives a permit, there is a formal public process, but that it would be helpful if these conversations happened before that time. DRBC has met with PWD's own modelers on more than one occasion and been quite transparent with one another about our models and what we're learning about the system. Jay agreed that involvement now and in the next couple of months is the right time for that coordination rather than in a permitting scenario a year from now.

John Jackson asked about the term "reserve capacity" in Tom's presentation. Tom answered that reserve capacity is a term of art in the TMDL world that accounts for future growth and expansion. We do have to think about future growth in the system when we perform the WLA study. John then asked how DRBC anticipates the wasteload allocation will account for variable conditions over the course of the summer, or amongst years of varying conditions. Tom indicated that DRBC is estimating scenario results over an entire 15-year period, which covers a wide range range of conditions. Different seasons and years will yield different results for the same load scenario. John asked whether the load will be fixed, and Tom answered that the load will not be fixed, but the allowable load will be defined. Namsoo pointed out that the criteria itself account for some of that variability, since performance is based on the 10th and 50th percentiles rather than minimum DO as a criterion.

Paula Kulis asked about the impact of recent model improvements the demonstration of attainability of the DO criteria. Tom stated that DRBC is not in a position to answer that question yet because the WLA study has not been completed. The DRBC's enhanced model does allow us to state more definitively that there is no reason to expect significant reductions in SOD impacts in the future. Paula asked whether DRBC intends to re-run the "HADO" scenario. Tom indicated that DRBC would likely be re-running some of the scenarios from the 2024 pathways study. However, regarding the "highest attainable dissolved oxygen condition," this is a different exercise. DRBC will be re-running some of the scenarios that allow us to confirm what is important and not important, to make sure that those answers have not changed. However, the main purpose of the WLA Study is to identify combinations of load scenarios that will satisfy the criteria.

Not hearing more questions, Namsoo reminded the stakeholders that this project has been a significant undertaking initiated by Resolution 2017-4. Namsoo conveyed DRBC's appreciation for PWD's sharing of data critical for the model development. Namsoo also acknowledged with appreciation the model expert panel members and modeling consultants throughout this process, as well as those present at this meeting, Tim Wool and Bob Chant, along with DRBC's technical consultants Dr. Bierman and Scott Hinz.

Adjournment

Jason Cruz moved to adjourn the meeting, and Frank Klapinski seconded the motion. All voted in favor and the meeting was adjourned at approximately 12:00 PM.

These Minutes were approved by the Water Quality Advisory Committee on July 23, 2026.