Lower Susquehanna RIVERKEEPER® ASSOCIATION

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RE: Application # 17-WQC-02 – Conowingo Hydroelectric Project

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Good evening. Since 1928, Conowingo dam has dramatically altered the Susquehanna River's flow patterns, holding back sediment and nutrients and preventing it from moving downstream at natural rates, while preventing the migration of many species of fish such as the American shad and American eel, in exchange for hydroelectric power that generates private profits for Exelon. Historically, the Susquehanna River has transported sediment, from 10 million tons per year (in the 1930s) to under 3 million tons per year (2000s). Part of the sediment, and associated pollutants including nitrogen and phosphorus, have entered the Chesapeake Bay, while the remainder has been trapped behind the lower Susquehanna River dams. Of the 4 lower Susquehanna River dams, York Haven, Safe Harbor, Holtwood, and Conowingo, all but Conowingo, the furthest south, have reached "dynamic equilibrium", a state of minimized trapping capacity that fluctuates somewhat with storm-based scouring and filling, basically no longer trapping sediment. As this trapping capacity is reducing rapidly to state of dynamic equilibrium, scouring of trapped sediments is on the increase. Scouring of sediment from behind Conowingo Dam into the Chesapeake Bay and the loss of its sediment retaining capacity represent two imminent and substantial threats to the bay.

The first threat to the Chesapeake Bay is the reoccurrence of what is known as the "catastrophic pulse." During 4 days in 1972, the flood waters of Tropical Storm Agnes transported 4 years-worth of sediment and pollutants down the Susquehanna River from New York and Pennsylvania. When the flood waters reached the lower Susquehanna River dams the waters scoured another 8 years of pollutant bearing sediment that had been trapped in the reservoir behind the dams (much from Conowingo). This "catastrophic pulse" of 12 years-worth, or 30 million tons of sediments combined with the surge of freshwater to inflict the biggest single damaging event ever recorded in the Chesapeake Bay. Over the past 40 years sediment has accumulated behind the dam to a level exceeding 1972 levels, creating a threat of damages even greater than that experienced in 1972. Scientists agree that the question is not if a "catastrophic pulse" will occur again, but only a matter of when.

The second threats occurs as the Conowingo Reservoir approaches sediment storage capacity and we see a massive increase in the annual average output of sediment and phosphorus to the Chesapeake Bay. The paradox of the Conowingo Dam is that is currently collects and retains 45-55% of Susquehanna sediment. As minimum sediment trapping capacity, or "dynamic equilibrium," is approached, the annual load of sediment from the Susquehanna to the Chesapeake has increased, perhaps as much as an additional 2 million tons. Along with this sediment, we will see an additional 30 to 40% increase in phosphorus and a 2% increase in nitrogen. These increases, if not mitigated, will affect aspects of the Chesapeake Bay health and management from the size of dead zones, to feeding and breeding capabilities of aquatic species (including crab and oysters), to channel dredging frequency and costs.

The U.S. Army Corps of Engineers, Baltimore District (USACE), and the Maryland Department of the Environment (MDE) partnered to conduct the Lower Susquehanna River Watershed Assessment (LSRWA). This report presents assessment efforts and documents findings. The purpose of this assessment was to analyze the movement of sediment and associated nutrient loads within the lower Susquehanna watershed through the series of hydroelectric dams (Safe Harbor, Holtwood, and Conowingo) located on the lower Susquehanna River to the upper Chesapeake Bay. Critical components of this watershed assessment included: (1) use of hydrologic, hydraulic, and sediment transport models to link incoming sediment and associated nutrient projections to in-reservoir processes at the dams and to estimate impacts to living resources in the upper Chesapeake Bay; (2) identification of watershed-wide sediment management strategies; and (3) assessment of cumulative impacts from sediment management strategies on the upper Chesapeake Bay ecosystem.

We recently consulted with Paul Frank, P.E. of FlowWest to review the modeling analyses performed for the LSWRA to determine if the general conclusions presented in the LSRWA were supported by the underlying modeling analyses, to ensure that the appropriate input data and assumptions were used, and to offer professional opinions on additional or revised modeling analyses that should have been performed. FlowWest's capabilities span the full suite of water resources management and ecosystem restoration services aligned for projects at the intersection of people, infrastructure, and the environment.

A review summary from Paul's report concludes that the LSRWA analysis of sediment and nutrient impacts on the Chesapeake Bay depended on a "daisy chain" of models that passed outputs successively from one model to another. This included the Adh (or Adaptive Hydraulics) model, the CBEMP (or Chesapeake Bay Environmental Model Package) and the Corps of Engineers' HEC-RAS model. At each stage, predicted sediment quantities were lower than the best available estimates or actual measured data suggested, in some cases by considerable amounts. This resulted in an underrepresentation of potential sediment impacts (and in turn likely nutrient impacts) on the Chesapeake Bay.

In general, the Adh and CBEMP modelers did not appropriately reflect the exponential relationship between flow and sediment load, and selected input model flowrates that did not reflect the expected magnitude of events likely to occur during the 46 year FERC licensing window.

The Adh and CBEMP models predicted and evaluated the impacts of annual sediment loading rates to the Chesapeake Bay that were lower than estimates made from actual observations of bathymetric change and measured sediment loads by the USGS, therefore underestimating the impacts of typical annual sediment loading on the Chesapeake Bay.

For example, during review of the LSRWA documents, FlowWest found that storms were characterized by peak flowrate, but in two different ways, leading to some confusion. The method by which the "peak" flow is calculated has critical implications for how corresponding sediment and nutrient loads to the Chesapeake Bay during storm events were modeled in the LSWRA. This is where some of the most significant flaws with the LSRWA modeling arose. Tropical Storm Lee, for example, was modeled by both the USGS with HEC-RAS and the USACE with AdH, based on daily average flow. For Tropical Storm Lee, the highest daily average flow occurred between 12:00 am on September 8, 2011 and 12:00 am on September 9, 2011, and was 709,000 cubic feet per second.

While this daily average flow represents the 24-hour period that symmetrically spans the time 00:00 on any given day, a 24-hour running average flow can be calculated at any other similarly arbitrary window, such as the window that produces the highest peak 24-hour averaged flow. For Tropical Storm Lee, this occurs by averaging instantaneous flows between 15:30 and 15:30 each day of the event, resulting in a peak 24-hour average flow of 746,000 cfs. When the Army Corps of Engineers Adh modelers compared their results against USGS measurements of sediment loads, Tropical Storm Lee is represented based on storm average flow, or 632,000 cfs. Based on instantaneous flow, Tropical Storm Lee peaked at 778,000 cfs at 04:15 on September 9, 2011.

In addition, the Adh modeling, which spanned the years 2008-2011, included Tropical Storm Lee, an approximately 20-year return interval flow event. The CBEMP modeling, which spanned the years 1991-2000, included the January 1996 storm event whose peak flow represented 25-50 year return interval flow event. However, since only daily average flows were considered, rather than peak flows, reduced the event from a 909,000 cfs event to a 622,000 cfs event. It represents an approximately 20-year return interval flow event similar to Tropical Storm Lee. All of these discrepancies mean that the LSRWA analysis simply failed to assess the full potential for scouring associated with the large-size storm that is predicted to occur during the license period.

It is notable that the Phase 6 Watershed Model (WSM) which simulates the whole Chesapeake Bay watershed to estimate loads of sediments and nutrients to the Bay, predicted little to no scour from Conowingo during the January 1996 event, requiring modelers to add scour contributions from Conowingo from the Adh modeling of Tropical Storm Lee to the WSM to bring it into agreement with observations. Given that the FERC licensing process for Conowingo is likely to be 40 years, the effects of larger storm events on the Chesapeake Bay should have been performed. In a given 40-year period, there is an approximately 33% chance that a 100-year return interval flow event will occur, meaning that there is a reasonable chance in the next FERC license period for Conowingo that bed scour event substantially larger than either Tropical Storm Lee or January 1996 event will occur. Because the Adh modeling produced lower scour predictions from Conowingo than estimated by USGS, the CBEMP evaluations carried these low scour predictions forward to the impacts which underestimated storm-based scour loads on the Chesapeake Bay.

Also, Exelon's application mischaracterizes the Chesapeake Bay Total Maximum Daily Load for Nitrogen, Phosphorus and Sediment incorrectly claiming that it provides a comprehensive framework for addressing any impacts resulting from the reduction in trapping capacity behind Conowingo Dam caused by sediment introduced upstream of Conowingo Dam. This assertion can be readily dismissed, given that the US EPA expressly declined to include a wasteload allocation in the Chesapeake Bay TMDL to account for scoured-sediment and nutrient discharges from the Conowingo Dam Project. This decision was based on the incorrect assumption that the Conowingo Reservoir has not yet reached dynamic equilibrium and would not until after 2025.

Furthermore, there are new sediment studies completed by the University of Maryland Center for Environmental Science that this 401 certification does not take into account. We will be reviewing these newer studies to ensure that the appropriate input data and assumptions were used, and to offer professional opinions on additional or revised modeling analyses that should have been performed. Given this disclosure, we note that Exelon's application mentions this sediment study it agreed to help fund in 2014, but it does not provide information on the results or the status of that study. Given that the need for additional study was the primary reason given for delaying the licensing process, this is a serious omission. We and others in the public should not be required to comment on an application that is so blatantly incomplete.

We are also concerned about eel placement in lower piedmont tributaries south of York Haven Dam. Many of these tributaries are the highest contributors of nutrients and sediment from the Susquehanna watershed to the Chesapeake. Making certain that the eels are in these tributaries, boosts the potential for eastern elliptio mussel populations to regain their former prominence in the ecosystem. This in turn, will restore a natural pollutant reduction system that was in place prior to the existence of the lower Susquehanna River dams. Eels in the Susquehanna appear to be the dominant and almost unique host species for the larvae of elliptio mussels.

In conclusion, the Conowingo Dam Project has profoundly altered the Lower Susquehanna River system. It has historically trapped an average of 50-67% of the annual sediment load (1.5 to 2 million tons), along with the nitrogen and phosphorus attached to the trapped sediment. If not for the Conowingo Dam, this load would have been delivered to the Lower Susquehanna River and Chesapeake Bay at normal rates. Exelon incorrectly claims that the Conowingo Dam Project has functioned as a "best management practice" for the Chesapeake Bay, but this is an overly simplistic portrayal of the Project's effects. In fact, the Dam and its reservoir have produced an enormous artificial repository of sediment and associated nutrients that can be scoured by high flow events, re-mobilized, and delivered downstream by large storm-induced flows.

Exelon's application for 401 water quality certification cannot be issued unless Maryland imposes a requirement for the company to participate as a financial partner in a specific plan for removing a minimum of 4 million tons of sediment from Conowingo Reservoir annually until 100 million tons are removed, and for maintaining the same level thereafter. If Maryland concludes that it lacks sufficient information at this time – a conclusion that is well justified given the shortcomings of the analyses discussed in this testimony – Maryland should deny the certification outright. Maryland must also complete a detailed analysis of the effects of climate change in order to accurately assess the impacts the Project will have on the state's water quality standards now and in years to come. On behalf of myself and the Lower Susquehanna Riverkeeper Association, we thank you for your time tonight. I am available for questions.

Sincerely,

Ted Evgeniadis
Lower Susquehanna RIVERKEEPER®