Comments re Sediment Characterization Study Report (RE01)

Conowingo Sediment Characterization and Innovative Reuse and Beneficial Use Pilot Project

Cecil and Harford Counties

The contractor engaged by Maryland Environmental Service – Northgate-Dutra – has completed a Sediment Characterization Study Report ("Report") describing the chemical and physical characteristics of Conowingo reservoir sediments. The report is available on MDE's website. The results will be used determine environmentally safe options for dredged material reuse. The pilot dredging demonstration is scheduled in Fall of 2021 and will include additional sediment characterization and reuse evaluation of the dredge area, followed by an economic analysis to assess the market value of different Conowingo sediment reuses. The Coalition's review of the Report and related observations follow:

Background

- Revised Request for Proposal (RFP) – November 13, 2018 – State Agencies, Dept of Natural Resources (DNR), Maryland Department of the Environment (MDE), and Maryland Geological Survey (MSG)
- Northgate-Dutra (ND) Joint Venture (Northgate) awarded project in February 2019.

Northgate completed a literature and data review of existing sediment and bathymetric. EPA's CBP has calculated that an additional 6 million pounds of nitrogen and 26 thousand pounds of phosphorus annually.

Prior Models:

Conowingo Pond Mass Balance Model (CPMBM) – developed by HDR for Exelon

- Efficient model to evaluate nutrient load – magnitude and composition
- Access to this model and required funding could not be secure for the Conowingo project – used for TMDL midpoint assessment

Chesapeake Bay Environmental Modeling Package (CBEMP)- operated by the Chesapeake Bay Office, inputs to the CBEMP.

- A 2-dimensional model of the Reservoir using the adaptive hydraulics modeling system
- Model is reportedly the most effective tool to understand how changes to sediment and nutrient transport may affect downstream water quality

Prior Study Concerns:

Clean Chesapeake Coalition (CCC) submitted multiple concerns regarding the LSRWA Study (January 2015), to include but not limited to the following:

- Data was limited in terms of the number of core samples and the depth taken. Model was not capable of passing sediment through the gates, therefore, for this study the dam was modeled as an open boundary with downstream control represented by the water surface elevation.
- A one-dimensional model cannot account for scour since there is no lateral variable to account for sediment load on the river basin. This was Langland's (i.e., USGS') same concern regarding Exelon's use of the HEC6 model in their Sediment Transport Study.
- The AdH sediment model (a two-dimensional model) required bed sediment data. However, this may not the case given the following limitations: A one dimensional model, HEC-RAS, was used to provide data for the AdH model; the two-dimensional AdH model utilized the HEC-RAS model results (sediment load and flow) from Holtwood Dam as the inflowing sediment load boundary condition.
- Only 8 bed core samples were taken from Conowingo Reservoir to a maximum depth of only one foot. Core samples were required to determine the inception of erosion (critical shear stress for erosion) and the erosion rate used to develop six material zones.

Conowingo Sediment Characterization Study Report - May 28, 2021

The Project Study has 2 components:

1) Sediment Characterization from Pennsylvania Line to the Conowingo Dam.

- Characterize sediment grain size/distribution
- Analyze sediment core samples- board panel of chemical constituents
- Asses the abundance of coal layers.
- Provide useful data to help understand nutrient and sediment transport

2) IR/BU Pilot Project - Evaluation and demonstration of the feasibility of sediment reuse.

- Overall objective - Identify potential solutions for reducing nitrogen, phosphorus and sediment loads.

Data Evaluation:

- Characterize overall thickness and volume of sediment wedge behind dam in Project area
- Characterize grain size distribution of sediment- to consider reuse options
- Analyze sediment core samples for constituents to assess sediment reuse option
- Assess the abundance and distribution of granular coal layers – previous investigations

- Understand nutrient and sediment transport data to reduce ongoing sediment loads to the Upper Chesapeake Bay.

Addressing Data Gaps Concerns from previous investigations (concerns are in line with CCC's comments regarding the LSRWA Study 01/2015):

- Limited to 5 sampling events
- Limited core sample depth- average of 3 feet below sediment surface, deepest 11 feet
- Sediment behind dam can approach 80-0 feet thick, the sediment wedge impounded by the dam – largely uncharacterized prior to the Sediment Characterization Study
- Temporal Variation- samples collected over 3 decades, reservoir transitioned into a state of dynamic equilibrium
- Varied Analytical Suites- previous studies had varying objectives
- Dynamic Bathymetry- data collected over the last 30 years indicates episodes of scour followed by temporary localized deposition Deep channels frequently – area avoided during sediment core evaluation.

Current Study Location of Sediment Core Samples and Boring Depths:

- December 2020 sediment samples
- 19 Coring locations
- Core Locations B5, B6, B7 and B8 collected in ahigh flow velocity channel-exhibit sandy layers-due to a history of repeated scour and deposition to the main channel
- Thick accumulation of sand observed in Boring location C1 from0.8 to 45.5 feet-confluence of two higher velocity flow channels at the State line
- Core samples closer to dam – thick accumulation of elastic silt and clay (greater than 95% fines)
- 28 possible sample core locations submitted to Exelon for access approval with 19 core locations proposed for drilling and nine alternative proposed locations – Exelon approval
- 150 sediment core intervals collected at the 19-coring location
- 32 cores selected for a broader analytical suite analysis - in consultation with MDE's Sampling Analysis Plan (SAP) (Northgate 2019)

Sediment Characterization Study Results:

- Field work (samples) conducted December 4 to 12, 2020
- Barge allowed drilling up to approx. 55 feet depth of water
- Core location had to be adjusted to contingency location (D1)-shallow for barge
- Sample core – dual tube sampler driven down into the sediment
- Samples cores were split lengthwise from top to bottom, photoionization detector (PID)
- PID readings above background were not observed
- 10 samples representing a variety of grain size – VOC analysis based on PID readings
- A discrete sample based on Terra Core Analysis (small size)

- 32 samples selected lithologic core-layers were analyzed for the broader suite of IR/BU Guidance to assess whether constituents beyond the target analytes are present in deeper sediment- Huh?
- 32 samples analyzed for VOCs
- Presence of coal layers & coal grains dispersed throughout the reservoir's sediment
- Core sediments contain elevated Total Organic Carbon (TOC) (ranging from 14% to 40%)– (max values range from 41% to 64%) presence of coal-correlation between coal and polycyclic aromatic hydrocarbons (PAH) (occurs naturally in coal)
- Four predominate lithologies observed in cores: Dark gray and greenish color
  - Lean Clay
  - Elastic silt
  - Sand and silt mixtures
  - Granular coal with silt

- Metals
  - Arsenic -sediment ranged from 1.5 mg/kg- 20 mg/kg. > 4.9 mg/kg it appears that arsenic is occurring naturally from NY and PA. the highest arsenic concentrations occur at low TOC
  - Manganese
  - Thallium
- Chemical Analytes detected (below all project screening levels)
  - PCBs
  - Organochlorine pesticide
  - Dioxins and furans

Report Recommendations:

- Project area 200 million cubic yds of material – PA/MD line
- Areas considered for potential dredging – will require additional characterization data
- Consider the influence of Coal on different IR/BU alternatives- solid separation technologies for alternatives for coal and non-coal sediments
- Updating the CPMBM to consider sediment grain size and layer characteristics
- Dredging alters the bathymetry of the reservoir changing the age and sediment composition exposed to scour and resuspension, Critical sheer stress of sediments & erosion rates and settling rates are important for sediment transport. Influence of grain size, cohesiveness and density need to be considered in hydrodynamic/ sediment transport models.

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