CBPO WQGIT Modeling Priorities Summary

As CBP approaches the 2017 Midpoint Assessment, the Goal Implementation Teams (GITs) are prioritizing possible modeling changes needed. Below is a short list, description, and link to the work-plans of "high" and "low" priorities needs that the Modeling Workgroup and/or Modeling Team are the lead or supporting partners on. The "high" priority items are items that must be completed for the Midpoint Assessment and "low" priority issues should be addressed, but cannot take precedence over the "high" priorities. It will be challenging for the existing Modeling Workgroup and Modeling Team to address all of these issues given time constraints and the operational needs of the partnership. However, additional resources to establish a modeling laboratory would create a new entity that could advance the management-identified research priorities of CBP.

High priorities:

1. *Model data processing:* The evaluation of existing model data processing and the identification and prioritization of improved processing methods to support enhanced analyses and decisions.

2. *Modeling baseline/input data assumptions:* Provide access to improved baseline/input data and assumptions which are incorporated into functional models that operate collaboratively.

3. *Revise watershed modeling system structure:* Investigate, evaluate, and possibly transition to an all PQUAL model, to enhance decision support and to improve transparency, accuracy, and confidence. The benefits of a PQUAL Model is that the calibration would be simple, fast, and precise. The Watershed Model run times would be shorter, and sensitivity to inputs would be explicitly specified, which provides clarity.

4. *Revisit Watershed Model calibration methods:* Revisit Watershed Model calibration methods with the goal of improving local watershed results, including revisiting regional factors. The workplan also includes activities to extend the simulation period and to revise the Airshed and WQSTMs.

5. *Midpoint Assessment and Phase III WIP Schedule:* Actions on the schedule will include soliciting and prioritizing input from the Partnership, gathering data and conducting analyses to address midpoint assessment priorities, incorporating findings into the Chesapeake Bay Program modeling tools, as appropriate, reviewing results, developing Watershed Implementation Plans (WIPs) and milestones, and modifying the Bay TMDL, as necessary. The schedule will include approximate dates as well as recommended timeframes for completing actions. The schedule will be an appendix of the Midpoint Assessment Guiding Principles, and will be subject to change as the midpoint assessment progresses.

6. *Trapping capacity behind dams, esp. Susquehanna, and greater capture of local impoundments and reservoirs:* There are three primary objectives: (1) develop and assess options for addressing increased amounts of sediment and nutrients from the Lower

Susquehanna Reservoirs, (2) better characterize trapping of sediment in reservoirs, and (3) develop an approach to simulate effect of impoundments in the Bay watershed.

7. *Improved modeling accuracy of land use characteristics, phosphorus, and sediment:* Improve characterization of urban land use with differentiating loading rates. Assess the model's accuracy by running small scale simulations for headwater areas with relatively uniform land use (all urban or all agriculture) to verify loadings based on input parameters. Improve the model's depiction of explicit stream erosion: after a watershed reaches a certain impervious threshold, much of the sediment and phosphorus may be coming from stream erosion versus land surface wash off, especially in low density dominated areas. Improve the model's depiction of local hydrologic networks by distinguishing connected from non-connected areas, and incorporating proximity to watercourses. This would help improve regionalization factors that currently display large variability between segments.

Low priorities:

1. *Improve communication about the role of forests in attenuating the nutrient loads to Bay tidal water from air deposition, esp. of nitrogen compounds:* In the experience of Forestry Workgroup (FWG) members, the way in which the Chesapeake Bay Program presents nutrient loads can lead to the misunderstanding that forests themselves are a large source of nutrients, rather than air deposition onto forest lands, which the forest "controls" to a large extent. The only nutrient loads to the Bay attributed to forests are caused by air deposition, and the forest ecosystem reduces (attenuates) these loads substantially, thus preventing a large percentage from reaching the Bay. The Program's information about air pollution as a source of nutrients, presented on the Chesapeake Bay website, fails to mention the important role that land use and resulting attenuation play in reducing air deposition loads to the Bay. Continuing loss of forest lands and their attenuating capacity, especially conversion to developed land, would increase the volume of delivered nutrient loads from air deposition.

2. *Review and refine modeled assumptions about forests:* Currently, 1% of "forest" land cover in the Chesapeake Bay Watershed Model is assumed to be harvested annually. Some states have regulatory programs around forest harvesting and document acres of forests harvested and BMPs applied on those acres for any given year. Thus far, Virginia and West Virginia have been working with the Modeling Team to report actual forest harvested acres to the model, and Delaware has similar information. Other jurisdictions that are unable to report actual acres of forest harvest could continue to use or refine the 1% harvest assumption based on best available data. Two complementary tasks will be pursued by the Forestry Workgroup in 2013-2014: 1) The Workgroup will continue to develop the Verification Protocol for Forest Harvest BMPs, examining current and proposed future methods for tracking and verifying these BMPs in each jurisdiction. And 2) the Workgroup will convene an Expert Panel to review the efficiency rate assigned to Forest Harvest BMPs. This Expert Panel will also recommend what the literature says about loading rates resulting from harvested forest, and also about loading rates for the proposed new land cover layer "true forest".

3. *Enhanced use and explanation of monitoring data for the TMDL Midpoint Assessment:* The Chesapeake Bay Program (CBP) will enhance the use of monitoring information as part of the Midpoint Assessment to assess attainment of water-quality standards in the Bay, water quality responses in the watershed, and relationships to actions being implemented for *Chesapeake Bay Total Maximum Daily Load for Nitrogen, Phosphorus and Sediment* (Bay TMDL). The CBP partners have endorsed (PSC, May 2012) an integrated approach that includes three primary pieces of information to assess progress toward water-quality standards: (1) reporting of water-quality practices, (2) trends of nitrogen, phosphorus, and sediment in the watershed, and (3) attainment of dissolved oxygen, chlorophyll-a, and water clarity/SAV standards.

4. *Establishment and update of BMP definition and efficiencies:* The reevaluation of prioritized approved BMPs, and the evaluation and establishment of new BMPs to improve their definitions and associated effectiveness values through the partnership approved BMP protocol process.

5. *Accurate representation of federal land boundaries and land uses within those boundaries:* Improve the accuracy of federal land boundaries and land use information informing the Phase 6 suite of models.

6. *Determine delivery factor changes impact on jurisdictions' trading and offset programs:* When delivery factors in the Chesapeake Bay Watershed model change, trading and offset program that rely on these delivery factors will need to change, at a minimum, credit calculation methodology.

7. *Influence of climate change on Water Quality Standards and Bay TMDL:* The airshed, watershed, and Water Quality and Sediment Transport models will be used to examine the impact of climate change on projected water quality. Current efforts are to frame an initial future climate-change scenario based on estimated 2050 conditions.

8. *Effects of Conowingo infill on Chesapeake Bay Water Quality Standards:* The Modeling Workgroup will work with the US Army Corps of Engineers (USACE) Lower Susquehanna River Watershed Assessment (LSRWA) study and the Scientific, Technical, Assessment, and Reporting (STAR) workplan for the assessment of trapping capacity behind dams, especially the Conowingo, as well as greater representation of local impoundments and reservoirs throughout the Phase 6 Watershed Model domain.

9. *Influence of oyster filter feeders on water quality, with increased aquaculture and sanctuary development:* The oyster model will be revised as necessary to incorporate aquaculture operations and additional oyster biomass brought about by restoration activities including sanctuaries. Current and projected data on biomass distribution and abundance will be mapped onto the current computational grid and various combinations of restoration and load reductions will be examined.

10. *Refinement of shallow water simulation for improved assessment of open water DO and SAV/clarity standards:* The employment and rigorous comparison of different models applied to

shallow-water systems by different teams is proposed as an initial step towards the development of multiple management models, which would contribute to the research and development of shallow-water modeling.

11. *Refined assessment of James River chlorophyll:* The Modeling Workgroup is working closely with the principal investigators of the James River Chlorophyll Model and is providing assistance as requested on an as-needed basis. Assistance includes technical assistance as requested, via provision of boundary condition support, model data needs support, and other ancillary technical support as requested.