1. **The 2017 midpoint assessment**

- **What is the midpoint assessment?**
  - **Review and incorporation of the latest science, data, tools, BMPs and lessons-learned to determine whether Partnership's strategies will result in all practices in place by 2025 necessary to attain water quality standards in the Bay**
  - **WQGIT recommends changes to modeling decision support tools…**
  - **Findings from Midpoint Assessment may help jurisdictions prepare Phase III WIPs, which will guide milestones and implementation from 2018-2025**
  - **With PSC endorsement, WQGIT decided on specific priorities and work to be done as part of assessment**
- **Summary of PSC high level priorities**
  - **Incorporate better model input data from local partners, particularly for current, historic and future land uses and their associated pollution loading rates**
  - **Revisit model calibration methods and assumptions so modeling results better align with monitoring data**
  - **Includes accounting for decreased trapping capacity behind dams, though this is not just a modeling issue**
  - **Make CBP models more transparent, easier to understand, and better decision-support tools**
  - **Ultimately, enhance decision support and assessment tools to enable successful engagement of local partners**
- **Bottom Line for Meeting 2025 Goal**
  - **Partnership needs to be able to engage local partners in order to get practices on the ground**
  - **Current suite of modeling tools is pushing partners away**
  - **Changes to modeling inputs and assumptions will allow us to work with key partners**

- **Healthy step in adaptive management process**

2. Modeling workgroup priorities

- Airshed Model
  - Update Airshed Model to new CMAQ Bidirectional Ammonia Model
- Watershed Model
  - Revise Watershed Model system structure
  - Revisit Watershed Model calibration methods, including regional factors
- Water Quality and Sediment Transport Model
  - Refine and update the Water Quality and Sediment Transport Model (WQSTM)
  - Refinement of shallow water simulation for improved assessment of open water DO and SAV/clarity standards
- TMDL Charges
  - Effects of Conowingo infill on Chesapeake Bay water quality standards
  - Examine the influence of climate change (CC) on Chesapeake WQ standards and the 2010 Bay TMDL
  - Review James River chlorophyll criteria and James River TMDL allocations
  - Influence of oyster filter feeders on water quality, with increased aquaculture and sanctuary development
- STAR Requests
  - Support needs of water quality goal team and TMDL Mid-point assessment support
  - Assess and Explain Water Quality Trends

3. Key Points in the Phase 6 modeling development

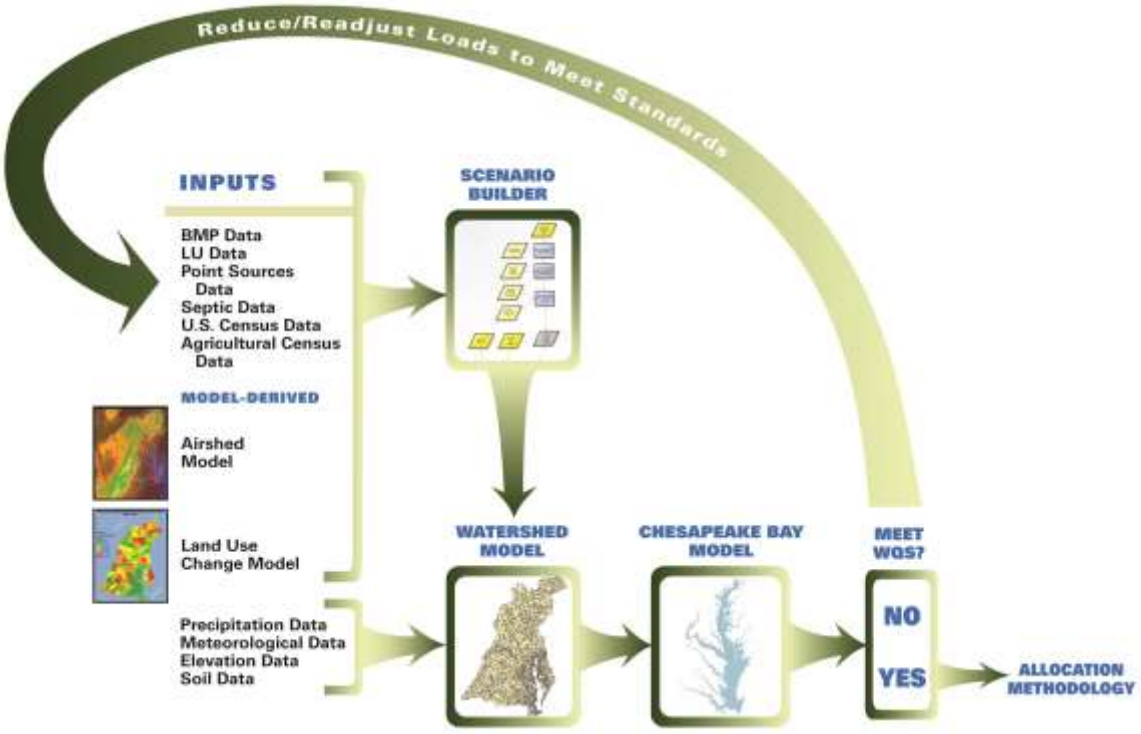
Phase	Year	Segments	Years	land uses	Purpose
0	1983	30	2	5	Split NPS/PS
1	1990	63	4	7	Refine NPS
2	1994	63	4	9	1992 "40%" agreement
4.1	1997	89	8	9	Confirmation of 40% goals
4.3	2003	94	8	9	Re-allocation in 2003
5.3	2010	1956	22	24	TMDL
5.3.2	2011	2365	22	30	Phase 2 WIP development
6	2017		>22		Phase 3 WIP development

- Phase 6 is an evolution of Phase 5. It builds upon the strengths of existing models and provides improvements directed by the most recent data and scientific understanding. To this end, it is important to recognize what has remained unchanged, where the improvements are and why the have occurred.
- What: Many of the fundamental modeling processes have remained the same but have been improved with better, and more recent, input information. In some cases the modeling processes have changed, such as the simulation of phosphorus transport or have been simplified to make them more transparent.

- **Why: The improvements are to provide increased confidence in Bay restoration decision making. This is accomplished through including the most recent monitoring information, increasing the transparency of the modeling tools, improved resolution of transport processes (mechanistic and geographic) and by leveraging the strength of multiple models within the Bay watershed.**

- **The development of Phase 6 is driven by the feedback of WQGIT members, recommendations from STAC and recent advancements and understanding of nutrient/sediment modeling. It is a partnership model. Because of this, the finalization of Phase 6 had many dependencies that must be factored into the next year and a half.**

- **A note on comparing to Phase 6 to Phase 5. In comparing this version of the model to previous versions of the modeling tools, history has shown that a common question is to understand the level of effort required to meet water quality goals. It must be communicated that these models are a suite of models and ultimate must be applied as a complete system to answer this question.**



4. Evolution of the Decision Making Tools (Atmospheric, Watershed and Estuarine)

- **Common to all models**
  - **Extended to more recent years. Phase 5 is based on 1985 to 2005 information.**
  - **Segmentation**

- **Atmospheric Deposition Model (See previous quarterly presentation**
  - **The 2002, 2011, 2018, and 2025 CMAQ Scenarios are developed with CMAQ 5.0.2 which is the latest release. Includes new bidirectional ammonia model.**
  - **All future scenarios are projected from the 2011 NEI emission inventories**
    - **Add more to this section later**

- **Watershed Model**
  - ***Charge – Add transparency and revisit calibration methods, including regional factors.***
  - ***Segmentation***
    - **Based on Phase 5 with modifications to incorporate new stations and remove federal land boundaries**
  - **Hydrology**
    - ***Line of evidence driving change***
      - Need to extend model to more recent time period to capture more monitoring in both watershed and WQSTM.
    - ***New Inputs***
      - New Precipitation extends model to 2013
      - Temperature
    - ***Land and River simulation method***
      - Phase 5
    - ***Calibration***
      - Phase 5 with some refinement to calibration objectives
    - ***Decision points***
      - Reached consensus on new precipitation
      - Modeling WG agreed that results were are as good or better than that of Phase 5

- **Sediment**
  - ***Lines of evidence driving change***
    - Need for improved geographic accuracy to support Phase III WIP development
  - ***Land Simulation***
    - Setting the sector target loading rates
      - *Global targets based on Phase 5*
      - *Local Targets: Phase 5 or considering Rusle2 - Will provide more specificity to landuse than the original Phase 5. Still need some parameters for this to work*
    - Sensitivity - converting inputs to outputs
      - *Phase 5*
    - Land to stream and stream to river delivery
      - *SCS Sediment Delivery Ratio being replaced with recently developed USGS method*
    - The effect of management practices on loads
      - *Phase 5*
  - ***River Simulation***
    - Phase 5
    - Improved reservoir characteristics
  - ***Calibration objectives - same as Phase 5***
  - ***Decision points***
    - Reached consensus on land sediment methodology using RUSLE 2
    - Need consensus on targets
    - Need consensus on Sediment delivery ratio

- **Nitrogen**
  - ***Lines of evidence that are driving modeling changes***
    - Need for improved geographic representation to support Phase III WIP development
  - ***Land Simulation***
    - Setting the sector target loading rates
      - *Global targets based upon multiple models, Phase 5, CEAP, SPARROW*
      - *Source sector WGs for new landuse categories and establishing within sector differences*
    - Sensitivity - Converting inputs to outputs
      - *Phase 5 applied*
      - *Multiple models used for comparison P5, CEAP, SPARROW*
    - Transport factor (replaces regional factor)
      - *Land delivery variance SPARROW*
      - *Stream delivery using USGS*
    - The effect of the management practices on loads
      - *Phase 5*
    - time series
      - *River delivery*
      - *Lag Time included but can be turned off (USGS)*
  - ***River simulation***
    - Phase 5
  - ***Calibration***
    - Geographic specificity expected to reduce influence of a regional calibration factor

- River simulation objective the same

- ***Decision points***
  - Consensus on nitrogen sensitivity
  - Consensus on transport factor
  - Working to reach consensus on targets
  - Working to reach consensus on time series method (lag time)

- **Phosphorus**
  - ***Lines of evidence for changes***
    - Phosphorus symposium
    - New Insights Report
    - STAC Phosphorus dynamics report
    - Eastern Shore monitoring trends
    - USGS WRTDS Phosphorus Trends
  - ***Land Simulation***
    - Targets
      - *Global targets based upon multiple models, including Phase 5*
      - *Source sector WGs for new landuse categories and establishing within sector differences*
    - The effect of management practices on loads
      - *Phase 5*
    - Sensitivity - Converting inputs to outputs
      - *APLE*
    - Create time series
  - ***River simulation***
    - River simulation the same as Phase 5
  - ***Calibration***
  - ***Decision Points***
    - Need to reach consensus on targets, phosphorus sensitivity, time series model

- **Water Quality Sediment Transport Model**
  - ***Charge – Revise and update the water quality sediment transport model and refine the shallow water simulation for improved assessment of open water dissolved oxygen and SAV/clarity standards.***
  - **Segmentation**
    - ***Same***
  - **Inputs – New information from atmospheric deposition model and watershed model**
  - **Hydrodynamics**
    - ***Extended to 2011***
  - **Sediment**
    - ***Refined sediment transport to better account for labile vs refractory nutrients. This is important to address impacts from Conowingo sediment scour and shoreline erosion.***
  - **Nutrients**
    - ***Same processes but includes improved representation of labile vs refractory nutrient exchange from the sediment***
  - **Calibration methods**
    - ***Continue to review mainstem stations***
    - ***Add focus to shallow water areas - "big data" approach used to inform calibration. Many shallow water sites incorporated by extending the model to simulate more recent years***
  - **Other**
    - ***Filter feeder***
    - The oyster model will be revised as necessary to incorporate aquaculture operations and additional oyster biomass

- **Phase 6 Review Process**
  - **Materials to be developed to support review**
    - **Draft Model reports available in January 2016**
    - **Calibration Metrics**
      - ***NS hydrology***
      - ***Water Quality – what summary information will be needed?***
      - ***What have we used before and what do we need***
    - **April 2016 - Key Scenarios to be used for review**
      - ***Calibration 1985-2014***
      - ***All Forest***
      - ***1985***
      - ***2009***
      - ***2014***
      - ***WIP Phase II***
      - ***No Action (2010)***
  - **STAC Reviews**
    - **Process: Report out to modeling WG after each review.**
    - **February 2016: Phase 6 watershed**
    - **April 2016: Conowingo Modeling Approach**
      - Will be dependent on need to recalibrate the WQSTM

- **June/July 2016: Climate Change Approach - After Watershed model**
- **June 2016: Water Quality Sediment Transport model**

Modeling Workgroup Review

- **The expectation is that consensus will be reached on key model development decision points by workgroup members by the end of CY 2015**
- **The 2016 review process will be: 1) developing STAC questions, 2) internal review by WG members, 3) seeking consensus that model can be applied by jurisdications in Phase III WIP development**

WQGIT, MB, PSC

- **Schedule briefings throughout the year with the plan of reaching agreement to present to MB and the PSC toward the end of CY 2016**
- **After each STAC review report out to WQGIT, MB and PSC**

- **"Major" 2016 Model development dependencies that need to be considered in the review process and final schedule**
  - **Dependencies**
    - **Landuse (Sept 2016)**
    - **Conowingo monitoring data**
    - **Historic BMP information**
    - **STAC Review/Fatal Flaws**
    - **BMP efficiencies - Are there any major practices that are being finalized through the review period?**
    - **Poultry Litter Subcommittee - Manure application and mass balance**
    - **BMP verification**
  - **Actions**
    - **We need dates to be verified by lead**
    - **How do we address these dependencies in reaching consensus on an approved model by December 2016**

- **Next Steps**
  - **Review Phase 6 prototype 1**
  - **Reach consensus on remaining decisions for December Phase 6 Model**
  - **WQGIT briefing in August of 2015 to cover remaining build schedule to the end of CY 2016 and review and revision through 2016- See attachment for proposed briefings**

- **Possible activities for 2017**
  - **Scenarios as assigned**
  - **Additional climate scenarios**
  - **Geographic Isolation Scenarios**
  - **Uncertainty analysis**
  - **Factors affecting trends**