

# BIENNIAL STRATEGY REVIEW SYSTEM

## Chesapeake Bay Program



### Logic and Action Plan: Post Quarterly Progress Meeting

#### 2017 WIP, 2025 WIP and Water Quality Standards Attainment and Monitoring Outcomes – 2018-2019

[NOTE: make sure to edit **pre-** or **post-** in the text above, to tell the reader whether this logic and action plan is in preparation for your quarterly progress meeting or has been updated based on discussion at the quarterly progress meeting.]

**Long-term Target:** (the metric for success of Outcome)

**Two-year Target:** (increment of metric for success)

**Instructions:** Before your quarterly progress meeting, provide the status of individual actions in the table below using this color key.

Action has been completed or is moving forward as planned.

Action has encountered minor obstacles.

Action has not been taken or has encountered a serious barrier.

Additional instructions for completing or updating your logic and action plan can be found on [ChesapeakeDecisions](#).

Factor	Current Efforts	Gap	Actions	Metrics	Expected Response and Application	Learn/Adapt
What is impacting our ability to achieve our outcome?	What current efforts are addressing this factor?	What further efforts or information are needed to fully address this factor?	What actions are essential (to help fill this gap) to achieve our outcome?	What will we measure or observe to determine progress in filling identified gap?	How and when do we expect these actions to address the identified gap? How might that affect our work going forward?	What did we learn from taking this action? How will this lesson impact our work?
<b>Continuing to enhance and sustain the capacity of state and local governments and the private sector to</b>	Continued funding and technical assistance support for BMP implementation, tracking,	Connecting water quality practices to other local priorities (co-benefits); continuous and stable funding stream to support	<b>1.1</b> <a href="#">Support the development and implementation of Phase III WIPs.</a> <b>1.2</b> <a href="#">Support development and implementation of two-year milestones.</a>	METRIC EXISTS: Consistent grant administration is one measure of progress:	State funding efforts for cover crops is one example: certification each year and expenditure figures attest to program implementation. See <a href="#">example</a> :	Successful and popular program, reinforces education; High level of buy in. Costly

<b>implement practices</b>	verifying, and reporting through voluntary and regulatory (NPDES permits) measures	implementation efforts; strengthened coordination between federal, state and local levels to accelerate implementation (e.g., better coordination with LGAC).	<p><b>5.5</b> <a href="#">Provide Support for continued BMP implementation, tracking and reporting on agricultural loads</a></p> <p><b>5.6</b> <a href="#">Work with other federal agencies to build capacity that will support an efficient and robust trading market</a></p> <p><b>5.7</b> <a href="#">Guide development of jurisdictions' trading and offset programs</a></p> <p><b>6.1</b> <a href="#">Communication of funding needs to elected officials</a></p>	<p>Fed (examples):</p> <ul style="list-style-type: none"> <li>• CBRAP</li> <li>• CBIG</li> <li>• CREP</li> <li>• NFWF SWG/INS R</li> </ul> <p>State (examples):</p> <ul style="list-style-type: none"> <li>• SRF</li> <li>• Trust Fund</li> <li>• Bay Restoration Fund (BRF)</li> <li>• Open Space</li> </ul> <p>Reports on dollars spent, results achieved in reductions (N,P,TSS)</p>		investment by the State.
<b>Delivering the necessary financial capacity to implement practices and programs</b>	Development of citizens monitoring programs; CBPO Grant Programs (CBIG, CBRAP); WIP Assistance Funding; state programs targeted towards delivering funding and technical assistance to local programs and initiatives;	Ensuring funding is targeted towards priority practices and watersheds; continued federal, state and local funding coupled with the identification and leveraging of other (e.g., private) funding sources	<p><b>5.1</b> <a href="#">Evaluation of the Phase III WIPs and 2-year milestones</a></p> <p><b>5.2</b> <a href="#">On-going sharing of lessons learned to help inform future 2-year milestones from WIP development and implementation</a></p> <p><b>5.3</b> <a href="#">"Return on Investment" analysis of installed BMPs from data in grants (costs and pollution reductions) to better target BMPs and funding</a></p>	CURRENT METRIC EXISTS BUT COULD BE REFINED. While funding programs are in place, refinement of the assessment of need and best use can be improved. This is an ongoing factor which will be a focal point in the Phase III WIP, as modeling	State funding efforts to distribute BRF and Trust Fund dollars currently use priority funding metrics to evaluate projects and implementation in MD. These metrics rank best performance on a pound of reduction per dollar spent. This example from MD could be shared with the other jurisdictions for potentially exploring or adopting for their own use. See, e.g., MDE Program <a href="#">webpage</a> : See also DNR Program <a href="#">webpage</a> : See also, <a href="#">areas designated by MDP</a> called PFA's which direct state dollars to targeted urban areas)	We have learned that targeted frameworks for spending millions of dollars are complex and important economic drivers. Ongoing evaluation of results and implementation success is always needed. New initiatives to incentivize private sector participants are

**Commented [PL1]:** Technical assistance gaps remain - particularly in the ag sector where higher levels of implementation are planned and expected - and states are experiencing resource and technical challenges with implementing BMP verification programs. However, work continues to move forward on better quantifying co-benefits. Increased funding toward Bay grant programs.

**Commented [PL2]:** Funding gaps vary amongst state and local jurisdictions, but more financial resources are needed in some areas to meet implementation goals by 2025. Work and support continues to target funding towards priority watersheds and practices. Discussions are underway to leverage other sources of (federal) funding (e.g., NRCS). Conowingo WIP financing strategy may serve as a model for private sector investments in water quality improvements.

	Farm Bill/NRCS funding; exploration of private investment options		<p><b>5.4</b> <a href="#">Evaluation of BMP implementation and maintenance costs and actual nutrient and sediment reductions</a></p> <p><b>6.1</b> <a href="#">Communication of funding needs to elected officials</a></p>	results are finalized and finer grained goals are developed.		being pursued in MD. Would be good to see if similar examples exist in the other jurisdictions.
<b>Improving the identification of sources and their contributions to nitrogen, phosphorus and sediment pollutant loads</b>	Explaining trends project provided initial findings on relation between nutrient sources and trends in the watershed. Developing methods to measure and report on incremental progress towards attaining Water Quality Standards. Information shared with WQ GIT reps, and the findings being used to inform WIP development; High resolution land cover and	Continuation of current efforts and future data collection efforts to coincide with two-year milestones and annual progress runs. Better translate the scientific findings into management implications and work with State and local governments to apply findings toward implementing water-quality practices (improved targeting). This information will provide additional lines of evidence to measure progress, including changes	<p><b>1.3</b> <a href="#">Continue to incorporate additional/more recent local land use data.</a></p> <p><b>4.1</b> <a href="#">Refine information on the factors affecting the changes in sources and loads through the Bay watershed, and their delivery and impacts on the estuary. Better understand response times to management of nitrogen, phosphorus, and sediment.</a></p> <p><b>4.2</b> <a href="#">Better predict future impacts of population growth and climate change in the Bay watershed and impacts on water quality.</a></p> <p><b>4.11</b> <a href="#">Provide enhanced focus how population changes and economic influences may affect nutrient and sediment loads, and estuary changes.</a></p>	METRIC EXISTS. The Mid Point Assessment is complete. New modeling tools were finalized in 2017 and Phase III WIPs are to be completed in 2019	More refined local goals; more study and remedies in response to new sources with implementation planning improvements. See e.g., the MDE <a href="#">webpage</a> related to Water Quality Certification of the Conowingo Dam and solutions to sediment infill.	<p>This is an ongoing effort.</p> <p>Use of USGS's new modeling approach to identifying sediment source to aid in targeting sediment sources and management actions</p>

**Commented [PL3]:** The work on explaining trends and the updates to the high-resolution land cover data continues. Working to incorporate more monitoring and trends data into assessments of progress.

	land use data produced and used to improve Phase 6 model inputs; Phase 6 model calibration; Maintained monitoring networks and provided trend updates.	in aquatic conditions.	<a href="#">4.14 Updating the high-resolution land cover and land use datasets to remap the Chesapeake Bay Watershed.</a>			
<b>Develop a business strategy for sustaining and growing monitoring programming that supports information needs</b>	Gap-filling opportunities have been discussed by STAR and its workgroups in meetings and STAC workshops	Negative pressures on program information maintenance derive from the annual cost inflation reducing the power of a dollar to accomplish the same work, replacing aging infrastructure and lost partnerships.	<a href="#">3.1 Commitments to incorporating new partners, new technologies, and new assessment protocols that leverage existing programming while adapting and enhancing approaches that improve information gathering resolution and efficiency</a>			
<b>Support the use of new data streams having classified their integrity</b>	The Chesapeake Monitoring Cooperative has developed a Memorandum of understanding that has been approved by STAR and its workgroups, has support from GITs and Advisory Committees, and is poised to be signed by	The monitoring program provides limited support for assessing water quality standards attainment in the Bay and adequate, but not recommended, levels of monitoring in evaluating pollution inputs from the watershed to the Bay.	<a href="#">3.2 Partnership support and use of new and existing data streams such as those being assembled by the Chesapeake Monitoring Cooperative from volunteer networks and data available in the Water Quality Exchange (WQX) (e.g., STORET) and nontraditional partner efforts will expand spatial and temporal resolution of decision-support assessments. STAR will use information from enhanced analysis to help</a>			

	Partnership signatories.	Centralizing monitoring data from varied sources (non-CB grants) to make it available to the partnership for analysis.  STAR will use information from enhanced analysis to help explain water quality trends information from Chesapeake Monitoring Cooperative	<a href="#">explain water quality trends.</a>			
<b>Quantifying the reductions from pollution control practices and verifying their continued performance</b>	BMP expert panels and implementation of BMP verification programs	Streamlining and simplification of the requirements for BMP verification as described in the 2014 BMP Framework to	<a href="#">4.3 Quantifying the effect of variations in watershed properties (such as soils, geology) on nutrient and sediment reduction practices</a>	METRIC EXISTS. Current annual progress is one method to assess implementation relative to achievement of the 2025 goals.	This is an ongoing effort. There will be further review of methods to quantify reduction scenarios as needed local goals are developed.	This is an ongoing effort. One lesson has become evident: BMP verification must be robust and applicable across sectors.
	Updating the Manure Treatment Technology Expert Panel Report with specific calculation methodology that provides more advanced considerations in the calculation of credits.	recognize resource limitations; implementation of BMP verification programs; continued crediting of new, innovative practices.	<a href="#">2.2 Quantifying changes in Best Management Practices (BMP) performance over time through verification</a>			
		Routine review of BMP expert panels to ensure accurate reduction quantifications, especially for innovative practices (e.g., use	<a href="#">4.4 Evaluating the potential future impacts of climate change on BMP performance</a>  <a href="#">7.6 Review and refine stream restoration technical protocols in order to preserve and enhance ecological function in stream restoration, floodplain</a>			

**Commented [PL4]:** BMP panels underway or completed. Ad-hoc action team recently established to address verification issues and concerns. Work continues under the USWG on stream restoration protocols.

		of data from INSR grants).	<a href="#">connection, and urban stream practices.</a>			
<b>Enhancing the existing decision support tools (Phase 6) and accelerate the time to fully utilize a new BMP in the model (e.g. time from completion of BMP expert panel report to crediting in model).</b>	Completed - Phase 6 model development occurred over past 5 years, approval by PSC for management application	Continue to build in optimization system to address costs and effectiveness. Explore approaches to build in co-benefits of water quality practices with other CBP outcomes into decision support tools. Refine Phase 6 Model as agreed to address simulation of phosphorus in soil.	<b>1.4</b> <a href="#">Modeling tools will be updated with new information every two years, to coincide with two-year milestone development. These updates will be consistent with the decisions approved by the PSC in July 2018. Phase 6 suite of modeling tools released and approved by the CBP partnership for management application in the Phase III WIPs and two-year milestones.</a>	METRIC EXISTS. The Mid Point Assessment is complete. New modeling tools were finalized in 2017 and Phase III WIPs are to be completed in 2019	Better understanding and application of modeling framework has become possible. The models represent better and more land use categories, take advantage of refined land use capture methods and incorporate local data in some jurisdictions, all of which improves the accuracy and resolution of the products which in turn helps to better guide Chesapeake Bay restoration decisions.	State agencies, NGOs and local government and citizen advisory committees will continue to participate in Chesapeake Bay Partnership meetings, decisions and to contribute to the assessment of progress toward 2025.
		Updating modeling tools may not be consistent with the PSC decision on the stopping rule and freezing planning targets through 2025. Modeling workgroup and WQGIT will consider options in April and May 2019.	<b>7.2</b> <a href="#">Develop approaches to better quantify co-benefits with other outcomes into decision-support tools</a> <b>1.7</b> <a href="#">Improve the quality and representation of soil P input data in the Phase 6 watershed model to improve development of Phase III WIPs.</a>			

**Commented [PL5]:** Completed. Phase 6 was used to set the Phase III WIP planning targets, supported Phase III WIP development and implementation, and will support future milestone development and implementation. Updates to the Phase 6 model (e.g., CAST) continues to occur on a 2-year cycle. This includes the incorporation of updated land use data, BMPs, and other data sources (e.g., 2017 Ag Census).

<b>Ongoing review and update historical implementation data that has been submitted by the jurisdictions to the CBP partnership, confirming that BMPs are still in place and ensuring that accurate information is included in the modeling tools</b>	Completed – jurisdictions have spent the last couple years updating their BMP historical data, as well as developing their BMP verification programs	The Basin-wide BMP Verification Framework needs to be streamlined and simplified to allow for realistic verification programs based on available resources. BMP verification program implementation and annual progress submissions	<p><b>2.1</b> <a href="#">Annual implementation progress reporting for inclusion in modeling tools and annual reporting on progress on programmatic milestones.</a></p> <p><b>2.2</b> <a href="#">Quantifying changes in Best Management Practices (BMP) performance over time through verification</a></p>	METRIC EXISTS.  Annual progress reviews will continue.	Verification protocols were developed. See response to # 4 above	This is an ongoing effort.
<b>Support the ongoing need for synthesis and communication s of science findings and needs</b>	Through the Midpoint Assessment, there was significant Partnership investment in updating the science that underpinned advances in modeling, monitoring and management tools and assessments. Substantial publication efforts were initiated under the Midpoint Assessment	While key products were provided, the need for additional synthesis and communications of new findings remains to explain factors affecting water quality trends (including local water quality) and linkages between sources and ecosystem response to support adaptive management. Will link to <a href="#">data dashboard</a> . However, no current website postings for	<p><b>4.5</b> <a href="#">Continued and enhanced development of metrics to assess change, such as GAMS for tidal water quality trends, including salinity or flow-adjustment and modeling predictors to analyze factors influencing tidal water quality trends</a></p> <p><b>8.1</b> <a href="#">Communicate findings on management-relevant time frames (e.g., reporting of incremental progress in attaining Water Quality Standards).</a></p> <p><b>4.6</b> <a href="#">Analyses that compare monitoring results to model outputs to identify drivers of inconsistencies and assess the ability to account for these drivers</a></p>			

**Commented [PL6]:** Completed. Jurisdictions have the opportunity to update their historical record every year to coincide with the annual progress and verification submissions.

		presentation of storylines. Appropriate presentations will be posted to the Integrated Trends Analysis Team (ITAT) <a href="#">webpage</a> and Phase III WIP development webpage on chesapeakebay.net. USGS will get presentations approved for posting.	<p><b>4.7</b> <a href="#">Employ statistical methods or models to assess and quantify interactions</a></p> <p><b>4.8</b> <a href="#">Analyze linkages between the loads and flow from watershed and response of tidal waters. Emphasize understanding of influence of BMP implementation on watershed and estuary response (see next bullet)</a></p> <p><b>4.16</b> <a href="#">Prioritization of research needs. Prioritization is underway by STAR and USGS. The Management Board will review this prioritization of research needs.</a></p>			
<p><b>The Management Board directed the WQGIT to consider co-benefits for a selected set of CBP outcomes:</b></p> <p><b>Improving Habitats;</b></p> <p><b>Reducing Toxic Contaminants;</b></p> <p><b>Conserving Lands;</b></p> <p><b>Addressing Climate Resiliency;</b></p> <p><b>Public Access.</b></p> <p><b>There was a stakeholder</b></p>	<p>The EPA expectations document for the Phase III WIP development process included</p> <p>encouragement for the jurisdictions to consider multiple benefits of watershed management practices and policy. The Climate Resiliency</p>	<p>Need for technical understanding from monitoring and modeling science to support inclusion of selected co-benefits</p>	<p><b>7.1</b> <a href="#">Optimization tools for co-benefits will be explored. An optimization framework with respect to cost and water quality in CAST is under development, and this framework is being built to be flexible enough that we can incorporate co-benefits, as optimization goals or constraints, once we have quantitative information regarding the ecosystem services. So, incorporating co-benefits in an optimization procedure will be possible once the co-benefits are quantified</a></p>			

**Commented [PL7]:** Co-benefit fact sheets have been completed. Projects underway to better understand and quantify ecosystem services. Optimization framework and tool still under development.



<p><b>survey done by LGAC (Local Government Advisory Committee) to identify outcomes most of interest to local governments. Of those, this selection is MB's best judgement as most closely related to the water quality outcomes. The selected outcomes have had co-benefits identified with them, according to the "Estimation of BMP Impact on Chesapeake Bay Program Management Strategies" (Tetra Tech 2017 report).</b></p>	<p>Workgroup, with WQGIT support, has been charged with developing and communicating understanding of climate-resilient BMP siting and design. The Urban Stormwater Workgroup and the Stream Health Workgroup have submitted a proposed GIT project to explore opportunities for enhanced ecological uplift in stream restoration practices for nutrient and sediment reductions, which did not receive funding; however ad-hoc stream committees are ongoing anyways in the Urban Stormwater Workgroup (USWG).</p>		<p><b>7.3</b> <a href="#">Develop improved understanding of the potential benefits, and risks, of selected practices and policies to provide benefits to multiple outcomes.</a></p> <p><b>8.3</b> <a href="#">Existing technical tools will be expanded, and new tools may be developed, to provide the information for decision makers to consider practices that provide benefits for multiple outcomes. Tools include Watershed Data Dashboard currently developing planning, tracking and reporting tools in coordination with PA. These tools will be developed in coordination with WQGIT, EPA and jurisdictions. Currently working to build on the Cross GIT mapping effort, and are preparing to coordinate with all GITs in this effort. Current story maps (Conservation and Restoration) are available online, and report on these mapping efforts is being developed.</a></p> <p><b>4.9</b> <a href="#">Build capacity for analysis and communication of linkage between watershed changes and estuary response</a></p>			
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			<p><b>7.4</b> <a href="#">Collaborate with source-sector workgroups to identify projects of mutual interest that support collective reductions of toxic contaminants, nutrients and sediments. Explore and develop approaches for estimating BMP removal effectiveness for PCBs and other selected toxic contaminants. Collaborate on reductions from stream restoration practices (with Stream Health Workgroup and USWG). Explore approaches to integrate Phase III WIP development for stormwater practices with stormwater reductions (e.g. MS4) under local toxic contaminants TMDLs.</a></p> <p><b>7.5</b> <a href="#">Cross—outcome consideration of applications, management practice implications, and next steps from report on PCB removal and WWTP ENR upgrades</a></p> <p><b>7.6</b> <a href="#">Review and refine stream restoration technical protocols in order to preserve and enhance ecological function in stream restoration, floodplain connection, and urban stream practices.</a></p>			
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			<a href="#">7.7 Ecosystem Services Valuation Project</a>			
<b>Understanding the factors affecting the ecosystem response to pollutant load reductions to focus management efforts and strategies</b>	Better understanding of “lag times”, which has been built into the Phase 6 suite of modeling tools for planning purposes. Explaining trends project	The relationships between water quality improvements and the recovery of habitat conditions for fish and shellfish populations and how increases in plant and animal	<a href="#">4.10 The WQGIT will collaborate with the Climate Resiliency Workgroup to pursue research, policies and practices to address climate impacts in the Watershed with regards to water quality management practices.</a>	SEVERAL METRICS WILL BE NEEDED HERE.  This is an ongoing effort.	Many options are available and could include: <ul style="list-style-type: none"> <li>• Technical, scientific studies of the uncertainties, such as time lag in restoration or targeting more effective practices and implementation locations</li> <li>• Financial studies and gap analyses to determine innovative funding initiatives and needs</li> <li>• Population projections and trends coupled with economic estimates related to restoration and growth capacity analysis</li> </ul> Development of co-benefits analysis and promotion of multi-faceted interventions that produce economic activity in addition to resulting in higher eco system service benefits	This is an ongoing effort. Jurisdictions engage with Chesapeake Bay partners that range from NGOs to academic institutions to develop economic solutions that improve environmental outcomes.
	(through STAR) provided initial findings for both the watershed and estuary. Held a STAC workshop, with WQ GIT reps, on ways to integrate the findings and inform WIP development. Explaining trends project also providing a better understanding of other factors in addition to nitrogen, phosphorus and sediment pollutant load reduction that affect response of DO, clarity,	biomass in response to improved water quality improves the assimilative capacity of the system for nutrients and sediment. Assess the time it will take for different tidal segments to achieve water-quality standards to better understand responses restoration efforts	<a href="#">4.11 Provide enhanced focus how population changes and economic influences may affect nutrient and sediment loads, and estuary changes.</a>  <a href="#">4.12 Improved understanding of uncertainty associated with model projections. The partnership needs to have a better understanding of uncertainty quantification. Performance targets will be developed in future time periods, as the partnership develops additional data/information on uncertainty associated with model projections. The partnership will decide what to do with uncertainty quantification in future time periods.</a>			

**Commented [PL8]:** Work is ongoing to understand climate resilient BMPs (e.g., NOAA project). Further research and funding could be directed towards this effort to support jurisdictions’ two-year milestones (climate change loads to be addressed starting with the 2022-2023 milestones). Need update from Modeling Team on addressing uncertainty and timing for achieving water quality standards. Lag times have been built into the Phase 6 Watershed Model.

	SAV and chlorophyll; the effects of climate change due to increased temperatures and sea level rise in the estuary		<p><b>4.14</b> <a href="#">Updating the high-resolution land cover and land use datasets to remap the Chesapeake Bay Watershed.</a></p> <p><b>8.4</b> <a href="#">Establish stronger use of results to inform implementation of WIPs and 2-year milestones through 2025.</a></p>			
<b>Factoring in effects from continued climate change</b>	CBP partnership developed the tools to quantify the effects of changes in watershed flows, storm intensity and changes in hypoxia due to increased temperatures and sea level rise in the estuary. Current efforts are to frame an initial future climate change scenario based on estimated 2025 conditions	Better understanding of climate resilient BMPs and the quantification of climate change impacts on hypoxia in 2025 and beyond. The partnership will be looking at projected climate change effects expected by 2025, 2035, 2045, and 2050 from the baseline of 1995.	<p><b>1.5</b> <a href="#">Document current state and local programs, policies, and strategies to address climate change</a></p> <p><b>4.4</b> <a href="#">Evaluating the potential future impacts of climate change on BMP performance</a></p> <p><b>4.13</b> <a href="#">Continue to refine the estimate of pollutant load changes due to 2025 conditions so that jurisdictions will be able to meet the expectation to account for these additional nutrient and sediment pollutant loads beginning in 2022.</a></p>			
<b>Assessing the implementation potential of filter feeders for nutrient and sediment reductions</b>	The oyster model has been revised as necessary to incorporate aquaculture operations and	Complete second part of oyster BMP panel in the 2018 timeframe and update modeling tools as		METRIC EXISTS. The Oyster Recovery Partnership's 2017 presentation	Oyster Recovery Partnership Further information is posted on ORP's website: <a href="https://oysterrecovery.org/water-quality-improvement/">https://oysterrecovery.org/water-quality-improvement/</a>	The ORP's Oyster Recovery Partnership 2016 – 2021 Strategic Plan is available <a href="#">here</a> . The phase 2

**Commented [PL9]:** Modeling team has completed the updated climate change assessment and now working with the partnership on understanding results and achieving consensus decisions on how to incorporate climate impacts into planning and implementation efforts.

**Commented [PL10]:** Although delayed, the second oyster BMP panel should be available for partnership review and comment in the summer 2020 timeframe.

	additional oyster biomass brought about by restoration activities including sanctuaries. First part of oyster BMP panel completed and approved by the CBP partnership.	a result of this information. Updating modeling tools may not be consistent with the PSC decision on the stopping rule and freezing planning targets through 2025. Modeling workgroup and WQGIT will consider options in April and May 2019		on metrics and ways to measure progress of oysters as a BMP can be found <a href="#">here</a>		report to be completed in Summer of 2019. A public webinar on the work of the panel will be held in May 2019.
<b>Addressing the impact the lower Susquehanna dams have on the pollutant loads to the Bay, including changes over time</b>	Numerous studies have been completed to understand the trapping capacity behind dams, especially the Conowingo, as well as greater representation of local impoundments and reservoirs throughout the Phase 6 Watershed Model.	Development of a Conowingo WIP and Planning Targets, as well as a financing strategy to fund implementation of the Conowingo WIP and its associated two-year milestones over time. Also, development of a timeline for implementing the Conowingo WIP and achieving the Conowingo Planning Targets.	<b>1.6</b> <a href="#">Development and implementation of a Conowingo WIP, two-year milestones, and financing strategy to achieve the nutrient and sediment load reduction targets because of Conowingo dam reaching its trapping capacity.</a> <b>4.15</b> <a href="#">Provide analyses of Conowingo and estuarine monitoring through 2018 high flows to support Conowingo WIP development</a>	Phase 6.0 Modeling and planning metrics are being developed and will be elaborated upon through the Conowingo WIP	This effort is ongoing by state and federal agencies in cooperation with several private and NGO partners. Partners have developed a draft Framework for the Conowingo Watershed Implementation Plan.	
<b>Addressing chlorophyll in the tidal James River</b>	CBP partnership is working closely with the principal investigators of the James River chlorophyll-a criteria	Modeling and criteria and assessment alternatives analysis have delayed final rule making that will establish new Chlorophyll-a	<b>2.3</b> <a href="#">Planning targets developed for the James River for dissolved oxygen only. Any additional actions needed to meet new chlorophyll-criteria will be developed separate from the Phase 3 WIP planning process.</a>			

**Commented [PL11]:** The modeling assessment on quantifying the additional nutrient and sediment loads due to Conowingo infill has been completed. The Conowingo WIP Steering Committee and three grantee organizations have been working on developing the Conowingo WIP (both numeric and programmatic analyses). However, CWIP has been delayed due to lack of consensus decisions on numeric and programmatic commitments.

**Commented [PL12]:** This action is complete.

	assessment to determine the criteria necessary to meet water quality standards in the James River.	criteria for the James until summer 2019.				
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### ACTIONS – 2018-2019

Action #	Description	Performance Target(s)	Responsible Party (or Parties)	Geographic Location	Expected Timeline
<b>Management Approach 1: : WIPs, and Two-Year Milestones to reach attainment of target loads to reduce N, P, and sediment provided in the Chesapeake Bay TMDL.</b>					
<b>1.1</b>	Support the development and implementation of Phase III WIPs.	Draft and final Phase III WIPs	Jurisdictions, WQGIT and source sector workgroups, EPA, CBPO, STAR, Habitat GIT, co-benefit GITs	Chesapeake Bay Watershed and jurisdictions	Draft Phase III WIPs due April 12, 2019 and final Phase III WIPs due August 9, 2019
<b>1.2</b>	Support development and implementation of two-year milestones.	Final 2020-2021 milestones and final status report on 2018-2019 milestones  Use of USGS's new modeling approach to identifying sediment source to aid in targeting sediment sources and management actions	Jurisdictions, WQGIT and source sector workgroups, EPA, CBPO, STAR, Habitat GIT, co-benefit GITs	Chesapeake Bay Watershed and jurisdictions	Jan 2020
<b>1.3</b>	Continue to incorporate additional/more recent local land use data.	Updated land use data in the Phase 6 model, as approved by the PSC, to inform the 2020-2021 milestones (referring to July 2018 Stopping Rule decision).	Land Use Workgroup, Watershed Technical Workgroup, WQGIT, state and local jurisdictions	Chesapeake Bay Watershed and jurisdictions	2019

**Commented [PL13]:** Completed.

**Commented [PL14]:** Final 2020-2021 milestones submitted. Need STAR to update sediment actions.

**Commented [PL15]:** Updated land use data incorporated into Phase 6. Work underway and on schedule to collect updated high-resolution land cover data to inform next version of CAST (i.e., CAST 2021)

## ACTIONS – 2018-2019

Action #	Description	Performance Target(s)	Responsible Party (or Parties)	Geographic Location	Expected Timeline
1.4	Modeling tools will be updated with new information every two years, to coincide with two-year milestone development. These updates will be consistent with the <a href="#">decisions</a> approved by the PSC in July 2018. Phase 6 suite of modeling tools released and approved by the CBP partnership for management application in the Phase III WIPs and two-year milestones.	Work with CBPO to identify the soil P data made available to CBPO and subsequently incorporated into the Phase 6 Model as approved by the PSC.	AgWG and CBPO	Chesapeake Bay Watershed and Jurisdictions	2018/2019
		Identify possible additional sources of county-level soil phosphorus data			
1.5	Document current state and local programs, policies, and strategies to address climate change	Draft and final WIPs and 2-year milestones			
1.6	Development and implementation of a Conowingo WIP, two-year milestones, and financing strategy to achieve the nutrient and sediment load reduction targets because of Conowingo dam reaching its trapping capacity.	Draft and final Conowingo WIP	PSC, RFP award recipient	Susquehanna Basin	TBD pending PSC decision
1.7	Improve the quality and representation of soil P input data in the Phase 6 watershed model to improve development of Phase III WIPs.	1. The AgWG will work with CBPO to identify the soil P data made available to CBPO and subsequently incorporated into the CBP Phase 6.0 Watershed Model. Updating modeling tools may not be consistent with the PSC decision on the stopping rule and freezing planning targets through 2025. Modeling workgroup and WQGIT will consider options in April and May 2019.	AgWG and CBPO	Chesapeake Bay Watershed and State Jurisdictions	2018/2019
		2. Identify possible additional sources of county-level soil P data.	AgWG and CBPO	Chesapeake Bay Watershed and State Jurisdictions	2018/2019

**Commented [PL16]:** Work ongoing. CAST 2019 currently under Partnership review. Need update from AgWG on soil P data and where that work stands (Lucinda to reach out to Loretta).

**Commented [PL17]:** Completed for Phase III WIPs and jurisdictions will incorporate climate change considerations (including numeric loads) starting with their 2022-2023 milestones.

**Commented [PL18]:** This work is ongoing by the CWIP Steering Committee and grantees. However, there are delays on releasing the draft and final CWIP that will require the overall schedule to be revised. There has been difficulty in reaching consensus decisions on the CWIP CAST scenarios and narrative document.

**Commented [PL19]:** I will check with Loretta on the status of this action.

## ACTIONS – 2018-2019

Action #	Description	Performance Target(s)	Responsible Party (or Parties)	Geographic Location	Expected Timeline
		3. Address CBP Management Board's <i>Recommended Path Forward: Incorporating Soil Phosphorus in the Phase 6 Model</i> (Sept 21, 2017)	AgWG	Chesapeake Bay Watershed and State Jurisdictions	2018/2019
<b>Management Approach 2: Chesapeake Bay TMDL Accountability Framework to ensure cleanup commitments are established and met, including WIPs, and short and long-term benchmarks.</b>					
2.1	Annual implementation progress reporting for inclusion in modeling tools and annual reporting on progress on programmatic milestones.	Final progress data submission and annual programmatic milestone report.	Jurisdictions, CBPO, EPA	Chesapeake Bay watershed and State Jurisdictions	December 1, 2018 and December 1, 2019 (progress reports) and January 15, 2019 and January 15, 2020 (programmatic)
2.2	Quantifying changes in Best Management Practices (BMP) performance over time through verification	Provide support for development and implementation of jurisdictions' BMP verification plans	Jurisdictions, Source Sector Workgroups, BMP Verification Committee, CBPO, EPA		
2.3	Planning targets developed for the James River for dissolved oxygen only. Any additional actions needed to meet new chlorophyll-criteria will be developed separate from the Phase 3 WIP planning process.	Final planning targets for the James River	VA DEQ, EPA	James River estuary	
2.4	Development of an indicator to measure incremental progress towards attaining WQS				
<b>Management Approach 3: Enhance monitoring to address data limitations with the use of new data streams to better estimate water quality conditions.</b>					

**Commented [PL20]:** This process occurs on an annual basis and has been completed for 2018 and 2019. Jurisdictions' submissions and EPA's draft evaluations of 2020-2021 milestones is complete. Final evaluations are currently under development.

**Commented [PL21]:** Concerns have been raised on verification reporting and documentation. A BMP verification ad-hoc action team has been established to address the verification concerns raised by the WQGIT. However, funding and technical support continues to be provided to the jurisdictions for implementation of verification programs.

**Commented [PL22]:** This is complete.



### ACTIONS – 2018-2019

Action #	Description	Performance Target(s)	Responsible Party (or Parties)	Geographic Location	Expected Timeline
3.1	Commitments to incorporating new partners, new technologies, and new assessment protocols that leverage existing programming while adapting and enhancing approaches that improve information gathering resolution and efficiency		STAR: Integrated, Monitoring WG		2019-2020
3.2	Partnership support and use of new and existing data streams such as those being assembled by the Chesapeake Monitoring Cooperative from volunteer networks and data available in the Water Quality Exchange (WQX) (e.g., STORET) and nontraditional partner efforts will expand spatial and temporal resolution of decision-support assessments. STAR will use information from enhanced analysis to help explain water quality trends.	Provide support for the reporting of monitoring data (tidal and non-tidal) into the Chesapeake Bay clearinghouse and the WQX from traditional and nontraditional partners.	STAR, Integrated, Monitoring WG, and Chesapeake Monitoring Cooperative		2019-2020
3.3	Expand continuous monitoring in tributaries and the bay to improve the understanding of direct responses in the bay to watershed inputs		USGS, MD DNR, STAR: Integrated, Monitoring WG		2019-2020
<b>Management Approach 4: Enhance analysis of modeled and monitored data to better target pollution reduction practices and to better measure progress towards attaining Water Quality Standards.</b>					
4.1	Refine information on the factors affecting the changes in sources and loads through the Bay watershed, and their delivery and impacts on the estuary. Better understand response times to management of nitrogen, phosphorus, and sediment.		USGS, STAR Integrated Trends and Assessment WG, WQGIT, State Agencies		2019-2020

## ACTIONS – 2018-2019

Action #	Description	Performance Target(s)	Responsible Party (or Parties)	Geographic Location	Expected Timeline
4.2	Better predict future impacts of population growth and climate change in the Bay watershed and impacts on water quality.	More detail in Climate Resiliency Strategy and logic table/workplan	STAR Climate Resiliency Workgroup, and Modeling WG		2019-2020
4.3	Quantifying the effect of variations in watershed properties (such as soils, geology) on nutrient and sediment reduction practices				
4.4	Evaluating the potential future impacts of climate change on BMP performance		STAR Climate Resiliency Workgroup, and Modeling WG		2019-2020
4.5	Continued and enhanced development of metrics to assess change, such as GAMS for tidal water quality trends, including salinity or flow-adjustment and modeling predictors to analyze factors influencing tidal water quality trends	New methods for assessing incremental progress towards water quality standards attainment, for assessing trends in estimated water quality standards attainment over time, and for analyzing the spatial-temporal changes in estimated water quality standards attainment.	STAR Monitoring Team and ITAT		2019-2020
4.6	Analyses that compare monitoring results to model outputs to identify drivers of inconsistencies and assess the ability to account for these drivers		STAR monitoring team and Modeling Workgroup		2019-2020
4.7	Employ statistical methods or models to assess and quantify interactions		STAR workgroups		
4.8	Analyze linkages between the loads and flow from watershed and response of tidal waters. Emphasize understanding of influence of BMP implementation on watershed and estuary response (see next bullet)		STAR monitoring team, ITAT, USGS		2019-2020
4.9	Build capacity for analysis and communication of linkage between		STAR ITAT, USGS, UMCES, CBP monitoring		2019-2020

**Commented [PL23]:** Updated climate assessment is complete. Population growth continues to be tracked and addressed in the partnership's Phase 6 suite of modeling tools and through the jurisdictions' WIPs and two-year milestones.

## ACTIONS – 2018-2019

Action #	Description	Performance Target(s)	Responsible Party (or Parties)	Geographic Location	Expected Timeline
	watershed changes and estuary response		and modeling teams		
4.10	The WQGIT will collaborate with the Climate Resiliency Workgroup to pursue research, policies and practices to address climate impacts in the Watershed with regards to water quality management practices.	More detail in Climate Resiliency Strategy and logic table/workplan	WQGIT and STAR Climate Resiliency Workgroup		2019-2020
4.11	Provide enhanced focus how population changes and economic influences may affect nutrient and sediment loads, and estuary changes.				2019-2020
4.12	Improved understanding of uncertainty associated with model projections. The partnership needs to have a better understanding of uncertainty quantification. Performance targets will be developed in future time periods, as the partnership develops additional data/information on uncertainty associated with model projections. The partnership will decide what to do with uncertainty quantification in future time periods.		CBPO Modeling Team, STAR Modeling Workgroup		2019-2020
4.13	Continue to refine the estimate of pollutant load changes due to 2025 conditions so that jurisdictions will be able to meet the expectation to account for these additional nutrient and sediment pollutant loads beginning in 2022.		CBPO Modeling Team, STAR Modeling Workgroup		2019-2020
4.14	Updating the high-resolution land cover and land use datasets to remap the Chesapeake Bay Watershed.		The Chesapeake Conservancy		2019-2020

**Commented [PL24]:** This work is ongoing (e.g., NOAA project to identify and better quantify climate-resilient BMPs). However, further research is needed to support the jurisdictions' efforts to address climate impacts (particularly as the work to incorporate these impacts starting with the 2022-2023 milestones).

**Commented [PL25]:** Lucinda to follow up with Peter and Lew.

**Commented [PL26]:** Lucinda to follow up with Lew.

**Commented [PL27]:** Continues to be updated every two years and provided to the jurisdictions.

**Commented [PL28]:** Work underway and on schedule to inform the next iteration of CAST (e.g., CAST 2021).

## ACTIONS – 2018-2019

Action #	Description	Performance Target(s)	Responsible Party (or Parties)	Geographic Location	Expected Timeline
4.15	Provide analyses of Conowingo and estuarine monitoring through 2018 high flows to support Conowingo WIP development		USGS UMCES		2019
4.16	Prioritization of research needs. Prioritization is underway by STAR and USGS. The Management Board will review this prioritization of research needs.		STAR, USGS, MB		2019
<b>Management Approach 5: Phase III WIP implementation of actions jurisdictions will take to have all practices on the ground by 2025 to achieve their respective Phase III planning targets.</b>					
5.1	Evaluation of the Phase III WIPs and 2-year milestones		Jurisdictions, WQGIT, Source Sector Workgroups, Finance Workgroup, LGAC, CBC		
5.2	On-going sharing of lessons learned to help inform future 2-year milestones from WIP development and implementation		Jurisdictions, WQGIT, Source Sector Workgroups, Finance Workgroup, LGAC		
5.3	“Return on Investment” analysis of installed BMPs from data in grants (costs and pollution reductions) to better target BMPs and funding		WQGIT		
5.4	Evaluation of BMP implementation and maintenance costs and actual nutrient and sediment reductions	On-going sharing of lessons learned to help inform future 2-year milestones; reporting and/or sharing of select BMP monitoring studies	Jurisdictions, WQGIT, Source Sector Workgroups, BMP Verification Committee, CBPO, EPA		

**Commented [PL29]:** I believe the project is complete.

**Commented [PL30]:** Phase III WIP evaluations completed and milestone evaluations underway.

**Commented [PL31]:** I don't believe this work has been initiated?

**Commented [PL32]:** The implementation, operation, maintenance, and land costs have been updated in CAST.

## ACTIONS – 2018-2019

Action #	Description	Performance Target(s)	Responsible Party (or Parties)	Geographic Location	Expected Timeline
5.5	Provide Support for continued BMP implementation, tracking and reporting on agricultural loads	1. NRCS will continue to support voluntary actions by farmers and landowners to improve water quality by providing financial and technical assistance from the Environmental Quality Incentives Program (EQIP), Regional Conservation Partnership Program (RCPP), Agricultural Management Assistance (AMA) Program, Agricultural Conservation Easement Program (ACEP), Conservation Stewardship Program (CSP), and Conservation Technical Assistance (CTA) funds.	USDA	Chesapeake Bay Watershed and Jurisdictions	2018/2019
		2. Support the development and implementation of agricultural certainty programs in Bay watershed states.	USDA, EPA and State Agencies	Chesapeake Bay Watershed and Jurisdictions	2018/2019
5.6	Work with other federal agencies to build capacity that will support an efficient and robust trading market	Participate in calls and meeting with other federal agencies providing advice and suggestions regarding the use of nutrient and sediment credits. (e.g. use of oyster reef creation / restoration as a means of generating nutrient credits).	EPA, USDA, DOT, USACOE	Chesapeake Bay Watershed and Jurisdictions	2018/2019
5.7	Guide development of jurisdictions' trading and offset programs	Issue draft "MS4 and construction mitigation" technical memoranda setting forth EPA expectations for the Bay jurisdictions' offset and trading programs and explore means for addressing "interstate trading" considerations.	EPA	Chesapeake Bay Watershed and Jurisdictions	2018/2019
<b>Management Approach 6: Approaches targeted to local participation including municipalities, counties, soil and water conservation districts, and local private sector groups and individuals.</b>					
6.1	Communication of funding needs to elected officials		State Agencies, WQGIT, LGAC		
6.2	Development of success stories/lessons learned to share with local entities (focus on local water quality, improvements in flood				

**Commented [PL33]:** Financial and technical assistance support continues for Ag implementation but concerns about NRCS 1619 agreements (and lack of those agreements) have led to difficulties in verifying and reporting certain BMPs.

**Commented [PL34]:** I'm not sure where this stands. I'll follow up with folks at EPA to determine progress.

**Commented [PL35]:** Again, not sure where this action stands.

**Commented [PL36]:** Will need to defer to the jurisdictions.

**Commented [PL37]:** I believe this work is ongoing.

## ACTIONS – 2018-2019

Action #	Description	Performance Target(s)	Responsible Party (or Parties)	Geographic Location	Expected Timeline
	protection, livability, economic growth, in addition to improvements to the Bay)				
6.3	Developing and supporting state or regional approaches to improve local implementation (e.g., circuit rider programs)		State Agencies, WQGIT, LGAC		
<b>Management Approach 7: Cross-outcome collaboration and multiple benefits</b>					
7.1	Optimization tools for co-benefits will be explored. An optimization framework with respect to cost and water quality in CAST is under development, and this framework is being built to be flexible enough that we can incorporate co-benefits, as optimization goals or constraints, once we have quantitative information regarding the ecosystem services. So, incorporating co-benefits in an optimization procedure will be possible once the co-benefits are quantified	See 7.3 as it relates to CAST.	CBPO Modeling Team, CAST Team, WQGIT		2019-2020
7.2	Develop approaches to better quantify co-benefits with other outcomes into decision-support tools	See 7.3 as it relates to CAST.	CBPO Modeling Team, CAST team, Cross-Outcome Coordination Team, and selected WGs from other Goal Teams		2019-2020
7.3	Develop improved understanding of the potential benefits, and risks, of selected practices and policies to provide benefits to multiple outcomes.	Quantification of the Value of Green Infrastructure Hazard Mitigation Related to Inland and Coastal Flooding RFP to develop the following. Purpose of the research: Demonstrate how to quantify or monetize the value of natural assets (BMPs) to help planners	Cross-Outcome Coordination Team, selected WGs from other Goal Teams, USGS		2019-2020

**Commented [PL38]:** For all three of these actions under Management Approach 6, let's raise to the WQGIT for discussion.

**Commented [PL39]:** Work is underway on the optimization system and we have the Tetra Tech co-benefits report, but further work and quantification is needed to incorporate into CAST.

**Commented [PL40]:** Work is underway but more time is needed to identify and apply approaches.

**Commented [PL41]:** The report on GI Hazard Mitigation will soon be finalized. However, the process for identifying and quantifying ecosystem services is ongoing – further work and resources are needed.

## ACTIONS – 2018-2019

Action #	Description	Performance Target(s)	Responsible Party (or Parties)	Geographic Location	Expected Timeline
		realize this value and make decisions to optimize for considerations beyond just cost effectiveness; Improve ability to identify and quantify ecosystem services associated with natural green infrastructure and with watershed agreement outcomes; Identify methods for quantifying and valuing ecosystem services in such a way that values can be associated with BMP implementation levels in CAST and for future CAST optimization models; Delineate a process or methodology by which the Bay Program can identify ecosystem services associated with the watershed agreement outcomes or with other goals and priorities, identify which of these services can be quantified or valued, associate services with nutrient and sediment reduction BMPs, quantify services for use in CAST.			
7.4	Collaborate with source-sector workgroups to identify projects of mutual interest that support collective reductions of toxic contaminants, nutrients and sediments. Explore and develop approaches for estimating BMP removal effectiveness for PCBs and other selected toxic contaminants. Collaborate on reductions from stream restoration practices (with Stream Health Workgroup and USWG). Explore approaches to integrate Phase III WIP development for stormwater practices with stormwater reductions (e.g. MS4) under local toxic contaminants TMDLs.	Approaches for collaboration and prioritization of toxics/source sector issues are documented in the management strategies and workplans for Toxics Policy & Prevention and Toxics Research outcomes. Can reference Toxics documents in this item's performance targets. Conduct STAC workshop on either agricultural or stormwater settings, to inform benefits of nutrient, sediment, and contaminant reductions (2019)	Toxic Contaminants Workgroup (Collaboration with WQ Source Sector Workgroups), USGS, USWG, STAC		2019-2020

**Commented [PL42]:** Will need Scott to weigh in on this one. I believe the STAC workshop has been completed.

## ACTIONS – 2018-2019

Action #	Description	Performance Target(s)	Responsible Party (or Parties)	Geographic Location	Expected Timeline
7.5	Cross—outcome consideration of applications, management practice implications, and next steps from report on PCB removal and WWTP ENR upgrades		Toxic Contaminants Workgroup and WWTWG		
7.6	Review and refine stream restoration technical protocols in order to preserve and enhance ecological function in stream restoration, floodplain connection, and urban stream practices.		USWG, Stream Health Workgroup, Wetlands Workgroup and WTWG		
7.7	Ecosystem Services Valuation Project		WQGIT, Cross-GIT Coordinators, CAST team		
<b>Management Approach 8: Consistent scientific and technical communications and outreach to provide managers the opportunity to incorporate science into decision making.</b>					
8.1	Communicate findings on management-relevant time frames (e.g., reporting of incremental progress in attaining Water Quality Standards).		STAR workgroups, CBPO GIS team, working with WQ source sector WGs		2019-2020
8.2	Enhanced and continued synthesis projects that utilize interdisciplinary teams to: explain changes in water quality or ecosystem response in terms of management efforts or actions	Development of dashboard to create storylines	STAR ITAT, USGS, working with WQ source sector WGs		2019-2020
8.3	Existing technical tools will be expanded, and new tools may be developed, to provide the information for decision makers to consider practices that provide benefits for multiple outcomes. Tools include <a href="#">Watershed Data Dashboard</a> currently developing planning, tracking and		STAR GIS team, CBP modeling team, WQGIT, jurisdictions		2019-2020

**Commented [PL43]:** Again, need Scott to weigh in.

**Commented [PL44]:** Work is underway and ongoing by the USWG.

**Commented [PL45]:** Project is almost complete.



### ACTIONS – 2018-2019

Action #	Description	Performance Target(s)	Responsible Party (or Parties)	Geographic Location	Expected Timeline
	reporting tools in coordination with PA. These tools will be developed in coordination with WQGIT, EPA and jurisdictions. Currently working to build on the <a href="#">Cross GIT mapping effort</a> , and are preparing to coordinate with all GITs in this effort. Current story maps (Conservation and Restoration) are available online, and report on these mapping efforts is being developed.				
<b>8.4</b>	Establish stronger use of results to inform implementation of WIPs and 2-year milestones through 2025.	Partnership provide technical staff assistance to state and local governments to aid in developing plans and 2-year milestones	STAR interacting with WQ GIT and jurisdictions.		2019-2020
<b>8.5</b>	Development of success stories				