WQGIT Decision on Climate Allocations

Background

The PSC met in March 2018 and agreed that the jurisdictions' Phase III WIPs would address climate change narratively and include numeric pollutant reduction loads due to 2025 climate change conditions. Specifically, the WIPs would include a narrative strategy describing the jurisdictions' current action plans and strategies to address an increase in nitrogen and phosphorus across the watershed as a result of climate change as well as changes in the tidal Chesapeake. The narrative included the initial estimates of climate change effects on dissolved oxygen standards equivalent to an increase of 9 million pounds of nitrogen and 0.5 million pounds of phosphorus across the watershed. As part of the same decision the PSC agreed to refine the climate modeling and assessment framework based on improved understanding of the science of the impacts of climate change. The partnership further committed to adopting revised numerical climate change targets by 2021 using updated versions of the CBP's modeling tools and incorporating those revised climate change estimates into 2022-2023 Milestones.

During 2019, the Modeling workgroup oversaw improvements in the CBP's ability to simulate the effects of climate change. Based on input from STAC and the partnership, upgrades were made to model inputs and processes. Changes were made to model inputs of rainfall, air temperature, wetland area change, sea level rise, and ocean temperature and salinity. Watershed delivery of nitrogen, phosphorus, and sediment were modeled using improved processes to capture the effects of climate changes on watershed loads. The estuarine algal simulation was improved, and the model results were validated using multiple model comparisons and analysis of observed data.

Climate change was found to have a more detrimental effect on water close to the surface of the Bay compared to deeper water and the effect also varied spatially. However, an analysis showed that the current CBP models were not appropriately designed to assess designated uses in shallow waters and that Open Water designated uses, while negatively affected, were still likely meeting water quality standards. There were also areas in the CB6MH and CB7MH segments of the Bay where the current open water designated use is applied throughout the water column (surface to bottom). In these areas, the models indicated that the non-attainment in the open water standard was isolated to areas below the pycnocline, an area typically held to the deep water or deep channel standard in mesohaline Bay segments. Modeling indicated that the deep water standard would be met in these areas of CB6 and CB7 under climate change conditions. The Modeling Workgroup recommended, and the WQGIT agreed, that Open Water designated uses not be considered for the current climate change allocation decisions. However, the Partnership's Criteria Assessment Protocol Workgroup (CAPW) will evaluate climate change risks to current water quality standard criteria and designated uses, including the open-water designated use for CB6MH and CB7MH, beginning this summer. Preliminary evaluations suggest that the addition of a deep water designated use in these areas would be appropriate.

Climate Allocation Options

The 2018 estimates of climate change effects were allocated to the states using the same allocation methodology as was used for the planning targets. The 'non-WWTP' line in the TMDL allocation curve was raised such that all jurisdictions had the same percent increase in level of effort and water quality standards were met. Over the first half of 2020, the WQGIT considered alternatives for allocating the nutrient reductions to counter the effect of climate change on dissolved oxygen in the deep water and

deep channel designated uses in the Chesapeake Bay. All options met the same volume-weighted average non-attainment as the PSC-agreed 2025 Phase III WIP planning targets based on 1990s climate. Further, all modeled non-attainment levels are within current or proposed variances. Regardless of the allocation option that is chosen, jurisdictions have the flexibility to meet the allocated climate change load reductions using whatever combination of point source or non-point source actions they deem appropriate. Jurisdictions may also exchange reductions between nitrogen and phosphorus and between basins, subject to appropriate exchange ratios.

Year

The WQGIT reviewed modeling scenarios that showed increasing level of nutrient reduction effort necessary as climate change intensifies from 2025 through 2055. The WQGIT considered the options of 2025 and 2035 for the target years for climate change effects and for implementation. In keeping with the PSC direction, the WQGIT decided to continue with accounting for climate effects between 1995 and 2025 and incorporating additional reductions by 2025. The WQGIT also decided that the current estimates of 2035 climate change effects should be documented in a narrative in the 2022-2023 milestones and that the partnership should continue to refine the climate modeling and assessment framework to update the 2035 estimates in 2025. This approach mirrors the March 2018 PSC approved approach for the initial 2025 climate change estimates.

Jurisdictional Watershed Loads

Climate change between 1995 and 2025 has generally increased total rainfall, the intensity of rainfall, and temperature-driven evapotranspiration in the watershed. Some of the improvements made since late 2017 in the CBP's ability to simulate the effects of climate change has allowed for improved geographic resolution in the resulting watershed loads. In most areas of the watershed, the total rainfall increase is larger than the evapotranspiration increase which leads to an increase in flow and resulting increase in nitrogen. The increase in water balance and the increase in rainfall intensity lead to an increase in phosphorus for all parts of the watershed. It was determined through modeling scenarios that if the individual jurisdictions were to reduce nitrogen and phosphorus loads by the amount of the climate-related increase in watershed loads estimated through 2025, water quality standards would be met at a level consistent with the 2017 planning target decision. As a result, no additional allocation, beyond the watershed based load increases estimated for each jurisdiction, would be needed. However, the estimate for 2035 (and beyond) climate change would need allocation beyond the jurisdictional watershed loads. This alternative is referred to as 'Watershed Loads First' or 'L1st' and would also require the selection of an alternative allocation approach for 2035 and beyond.

The WQGIT also considered an alternative referred to as 'Allocate All, NPS Only' that would allocate load reductions using a similar method to that used by the partnership in the 2010 TMDL, 2017 Phase III WIP Planning Targets and the initial climate change allocation in December, 2017. This method relates state-basin effectiveness to influence main stem dissolved oxygen to reduction effort (known as the TMDL allocation chart or the "hockey-stick plot" – see slide 3 of the July 2020 WQGIT presentation for an example). The alternative raises the non-wastewater ('NPS Only') line on the TMDL allocation chart to a higher level of effort until the additional climate change load is accounted for.

Wastewater Treatment

The WQGIT considered additional allocation options that used the TMDL allocation chart but included various changes to the wastewater treatment line. The wastewater treatment line in the original TMDL

allocation chart had the wastewater plants in the most effective basins set a 4.5mg/l for nitrogen and those in the least effective basins set at 8 mg/l Several scenarios were proposed and analyzed including:

- Moving the WWTP and non-WWTP lines by the same amount
- Moving the upper part of the WWTP line from 4.5 mg/l TN to 4 mg/l TN and from 0.22 mg/l TP to 0.18 mg/l TP and raising the non-WWTP line for any remaining load
- Moving the intercept of the WWTP line from 8 mg/l TN to 6 mg/l TN and from 0.54 mg/l TP to 0.364 mg/l TP and raising the non-WWTP line for any remaining load

These alternatives to the allocation approach resulted in options referred to as 'NPS+PS', '6 and 4.5', '6 and 4', and '8 and 4', each with a 'Watershed Loads First' and 'Allocate All' option. At the July 2020 WQGIT meeting, consensus was reached to exclude the '6 and 4.5' and '6 and 4' scenarios.

Proposed Adjustments to Watershed Loads First Allocation Method

At the July 2020 meeting, the WQGIT expressed interest in the reduction of climate change-induced loads for each jurisdiction using the 'watershed loads first' method. It was noted that New York had a much larger proportional increase than other jurisdictions using this allocation approach. New York's allocation was also a larger increase than the initial value presented to the PSC in December 2017. It was further noted that West Virginia had a negative load increase estimated due to climate change. The adjustment proposed, for 2025 climate only, for New York to be allocated 0.3 million pounds less nitrogen than their climate increase (returning to a value similar to the initial estimate in 2017), West Virginia to have no change in their nitrogen load. All other jurisdictions would make up the difference by increasing their allocated reductions equal to 108% of their climate load increase. This is a similar method to the final adjustment of Phase III Planning Target loads by the PSC in July 2018. This adjustment will balance the water quality effects of the New York and West Virginia exceptions. This change will only be made to the nitrogen allocation for 2025 climate change. All jurisdiction's phosphorus allocations would remain unchanged from the watershed loads first option. The estimate of 2035 climate change allocations would be based on Watershed Loads First with no adjustments, and allocating the balance based on the 'NPS Only' allocation approach.

Table 1: Proposed additional reductions beyond the Phase III Planning Targets to account for the effects of climate change in million pounds per year. "Dec 2017 PSC" are the climate adjustments considered by the PSC in December 2017, prior to model adjustments. "L1st Climate increase" are the 2025 watershed load increases due to climate change. "Adjusted L1st Proposed" are the proposed final adjustments to nitrogen loads to account for NY increases compared to the December 2017 PSC loads.

	TN			TP		
State	Dec 2017 PSC	L1st Climate increase	Adjusted L1st Proposed	Dec 2017 PSC	L1st Climate increase	Adjusted L1st Proposed
DC	0.006	0.006	0.007	0.001	0.001	0.001
DE	0.397	0.036	0.039	0.006	0.003	0.003
MD	2.194	1.061	1.142	0.117	0.111	0.111
NY	0.400	**0.699**	0.399	0.015	0.044	0.044
PA	4.135	1.683	1.811	0.143	0.095	0.095
VA	1.722	1.476	1.589	0.187	0.337	0.337
WV	0.236	**-0.054**	0.000	0.017	0.009	0.009
Total	9.089	4.908	4.986	0.485	0.599	0.599

Decision Timeline

March 2018	PSC requests additional modeling and consideration of climate change
October 2019	Modeling Workgroup approves modeling tools for climate change
February 2020	WQGIT agreed to use the updated climate model when assessing the allocation options
April 2020	WQGIT agrees to not include CB6MH and CB7MH in climate calculations
July 2020	WQGIT agrees to include adjustments for 2025 climate and reassess 2035 climate during the year 2025

At the August 24, 2020 meeting, the WQGIT leadership will request a decision to increase reduction effort, starting with the 2022-2023 milestones, to account for climate change through 2025 according to the values listed in the 'Adjusted L1st Proposed' columns in Table 1.