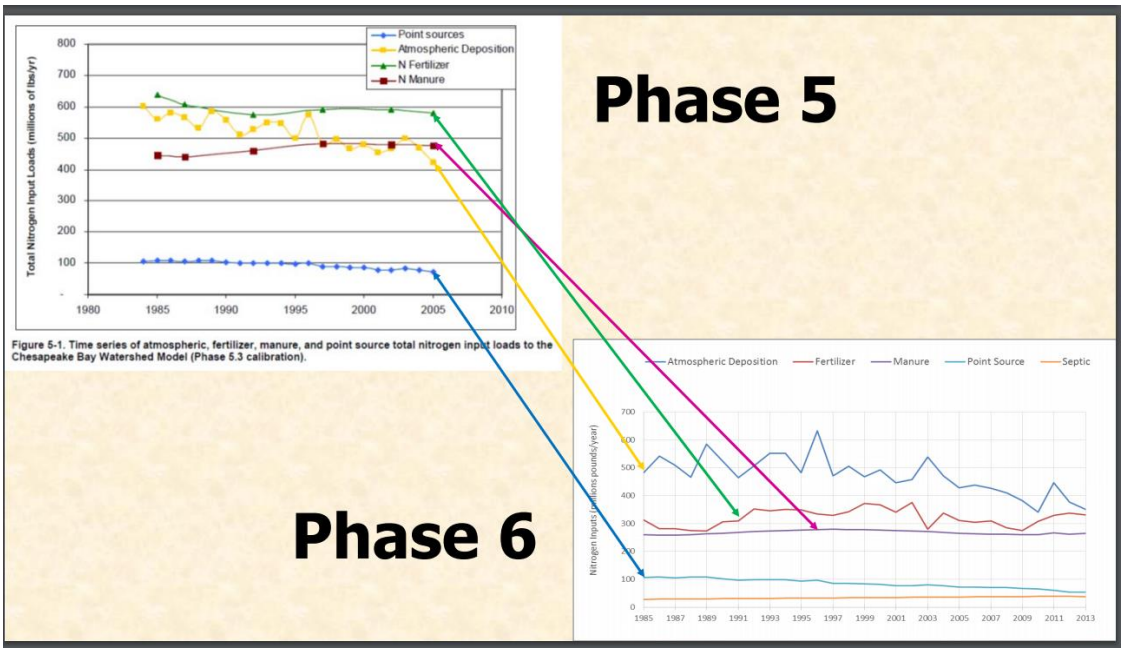
Global Targets and Local Targets

1. Global targets for crop have ranged from approximately 47 lbs N (Beta 2) to 30 lbs N (Beta 3) with the final proposed target as 38 lbs N. Variability in target ranges have also occurred for the pasture global land use, as well as P targets for both crop and pasture. However, P6 improved input estimations show significantly less absolute pounds of N and P throughout the calibration period (Figure 1, Jeff Sweeney 062917). Please provide the justification for selection of the global crop target given the decreased agricultural inputs, and in the context of STAC's comment on the circular logic of the global target's use (Draft report Nov. 2016).



2. Global target estimations were made for above-RIM locations only to calculate a land use target rate. These target estimates were subsequently applied to below-RIM locations. Is this an appropriate assumption given the lack of observed data and hydrologic connectivity of areas below-RIM stations?

3. Local land use targets were provided with the release of the P6 documentation((https://archive.chesapeakebay.net/modeling/Phase6/Draft_Phase_6/Documentation/10C%20Targets%20Draft%20Final.csv). Local targets are those loads reaching the EOSS that account for sensitivity to inputs; however, variability among all watershed segments is approximately +/- 2 lbs N and less than 1 lb P for most agricultural land uses. This suggests that inputs across the watershed (both nutrient inputs and soil P) are largely homogenous and variation in load delivery, beyond EOSS, is attributed to transport mechanisms (e.g. Stream-to-River factors). Please explain a jurisdiction's ability to affect meaningful change in water quality if load delivery is primarily attributed to transport factors (e.g. percent catchment in Piedmont carbonate)? And secondly, do the local targets sufficiently represent states (such as Maryland) who have greater documented nutrient management adoption (extent and time) than other jurisdictions?

Phosphorus Loads and Soil P

4. Section 2.5 of the P6 documentation states "*An area of considerable uncertainty is the phosphorus losses in stream reaches that are not reservoirs. Ator and others, 2011, Noe and*

others 2015a and 2016b indicate that the losses in free-flowing streams and rivers are relatively small. The Phase 5.3.2 watershed model had a significant loss of 12.8 million pounds of P in these systems. Attempts to calibrate the Phase 6 model in beta versions using the assumption of no let loss were not successful. Several major river systems had more phosphorus measured at the output than was generated by all upstream sources. For this reason, the Phase 5.3.2 losses of 12.8 million pounds were used in the final version." Does this statement suggest an additional 12.8 m lbs of legacy P exist in the stream network that have been unaccounted for in all inputs to the landscape? If yes, please confirm if the 12.8 million lbs P were then added to the calculation for estimating global targets and subsequently inferred to be primarily ag contributed given the global target methodology (i.e. crop ratio = 1.0)?

5. Maryland's soil P time series are largely reasonable with modest values across most counties and land uses. Remaining questions are:

    a. Many segments have soil P at 85-100 ppm over the calibration period. At these concentrations the state would not likely limit P inputs thus minimizing an opportunity to create change in the subsequent EOSS loads. I would like additional conversations with CBP and states on the potential management implications of this outcome.
    b. Creating the soil P time series relied on observed data sets from university and private labs where subsequent statistical methods were used to derive the time series. Please detail the robustness of the original observed data specifically used for "ag open space" and "specialty" land uses.
    c. Is there support, building on the APLE work, to consider soil P annually as a source of nutrients for crop uptake not just sensitivity for loss, i.e. mass balance option. This would produce an annual change in concentration and may eliminate the need for projection scenario concerns.

Nutrient Input Assumptions

6. P6 is using a hybrid of crop uptake (minor crops) and crop removal (major crops), depending on the crop type. Pasture uptake values were also observed as much too low. Discussion of this decision and implications to loads were brought to the AMS 22 June. It is agreed absolute values may have minimal effect; however, the relative difference between land uses may be important in regions limited to major crops. Additionally, a consistent choice of uptake or removal should be used.

7. Crop uptake is a N sensitivity component with N specie fractions (NO3, NH3, and organic N). Why are sensitivity factors for NO3 uptake negative values, while NH3 uptake and organic N uptake are positive values according to the P6 documentation?

8. Livestock to pasture ratios (animal per acre pasture) are unexplainably high in Kent County, MD. A review of the 2012 Ag Census confirms the total number of livestock (8,743 cows) with approximately 50% being dairy livestock. Pasture acres in the county are minimal. However, MDA provided assumptions to CBP indicating that dairy are largely confined throughout the year rather than on pasture. Please confirm that the livestock animals in Kent County were properly distributed between pasture, barnyard, and riparian pasture.

BMP Results and CAST scenarios

9. A scenario request was made to CBP to demonstrate the benefits of core NM. Staff presented prelim results to AgWG on 29 June (slide 8, http://www.chesapeakebay.net/channel_files/24799/amsupdateagworkgroup06292017.pdf)

suggesting measurable results from increased NM acres. However, state efforts (Maryland & Delaware) have not been able to replicate these results in CAST. Maryland has found modest decreases in N and P (<1%) with an additional 10% BMP implementation. Additionally, N loads (and some P) have actually increased in some counties with additional NM BMP coverage. Please provide the raw scenario files as shown to AgWG, and explain the CAST outcomes where increasing BMP coverage results in greater nutrient loads? A similar effect has been found for increased Manure Transport. Maryland must be assured that manure-rich counties (e.g. Somerset) with increased NM and/or Manure Transport, but without changes to broiler populations, would see decreases in loads.

10. Maryland full-season soybeans according to Tableau indicates an average of 130-140 lbs N applied annually, removal as 107-120 lbs N annually, and fixation rates similar to application rates. Additionally, previous discussions from Meissinger et al. cite ~ 45 lbs PAN contributed from the soil. Please explain the relationship between all legume parameters relative to potential losses of N?

11. A preliminary review of riparian pasture loads (N and P) look high. Staff is still conducting a review of BMP credit coverage, but may raise additional questions with CBP on the findings.

12. During conversation with CBP, MDE, and MDA, it was explained that crop needs for 2012 were met using actual data and to establish a new crop need baseline for later years (without actuals). For example, if crop applications were 110% of need in 2012, the new baseline for crop need in 2013 was set to 110%. Please confirm if this is an accurate explanation of the model assumptions? If yes, please explain the rationale for setting a new crop need baseline that is counter to agronomic recommendation?