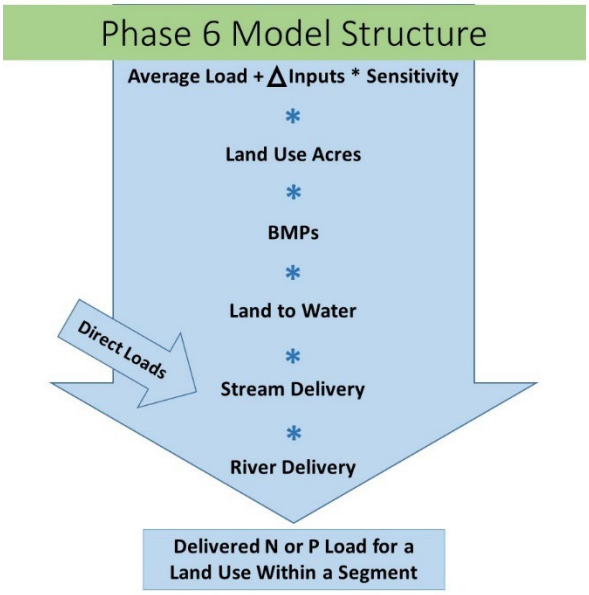
The **Chesapeake Bay Program's (CBP) Phase 6 Watershed Model** is a participatory creation of the CBP Partnership using a process responsive to decisions made in the CBP's Management Board, Modeling Workgroup, and Water Quality Goal Implementation Team.

The Phase 6 Model differs in structure from previous CBP models in that its physical simulation components are greatly simplified. This structure allows for better stakeholder understanding of the processes, speeds up computations, and results in a demonstrably better agreement with water quality observations. In prior versions of the watershed model, time-averaged output was generated by running an hourly time-step mechanistic simulation model over an extended period and then summarizing the output into average annual loads. Phase 6 reverses this concept such that the primary model structure for management scenarios is time averaged. The dynamic hourly model which drives estuarine loading is forced to match the time-averaged model. The time-averaged model is also known as CAST – the Chesapeake Assessment Scenario Tool, which is available online.

The primary water quality management decisions of the CBP are based on long-term flow-averaged estimates of nutrient and sediment load to the estuary. The management questions involve assessing the long-term loads from land uses and other sources indexed to watershed and political boundaries under various management scenarios. The information forms the basis of management decisions about where to implement BMPs and other control measures. In a typical year, hundreds of scenarios are run on CAST at different spatial scales and different levels of management.

The figure below shows the structure of the time-averaged model for nutrients. The processes represented correspond to separable scales and physical domains. The output of the model is the amount of nitrogen, phosphorus, or sediment delivered to tidal waters from a given land use or loading source in a watershed and county.



Average Loads are loads per acre per year for each land use averaged across the entire Chesapeake Bay watershed. *Inputs* are the factors that can change through scenarios that affect nutrient export from a land use. *Sensitivities* are the change in export load for each unit change in input load.

Nutrient and sediment loads are then multiplied by the area of the *land use* in the segment and the effect of local *BMPs*. *Land to Water* factors are applied to account for spatial differences in loads due to physical watershed characteristics. Finally *Stream and River Delivery* factors are applied to account for reductions in nutrients and sediment moving through the fluvial system.

Each process depicted in the figure above is represented by a simple coefficient which is determined using information from various models, empirical studies, mass balances, and other sources. The factors are publicly available and calculated according to work done by CBP workgroups and documented on the CAST website.