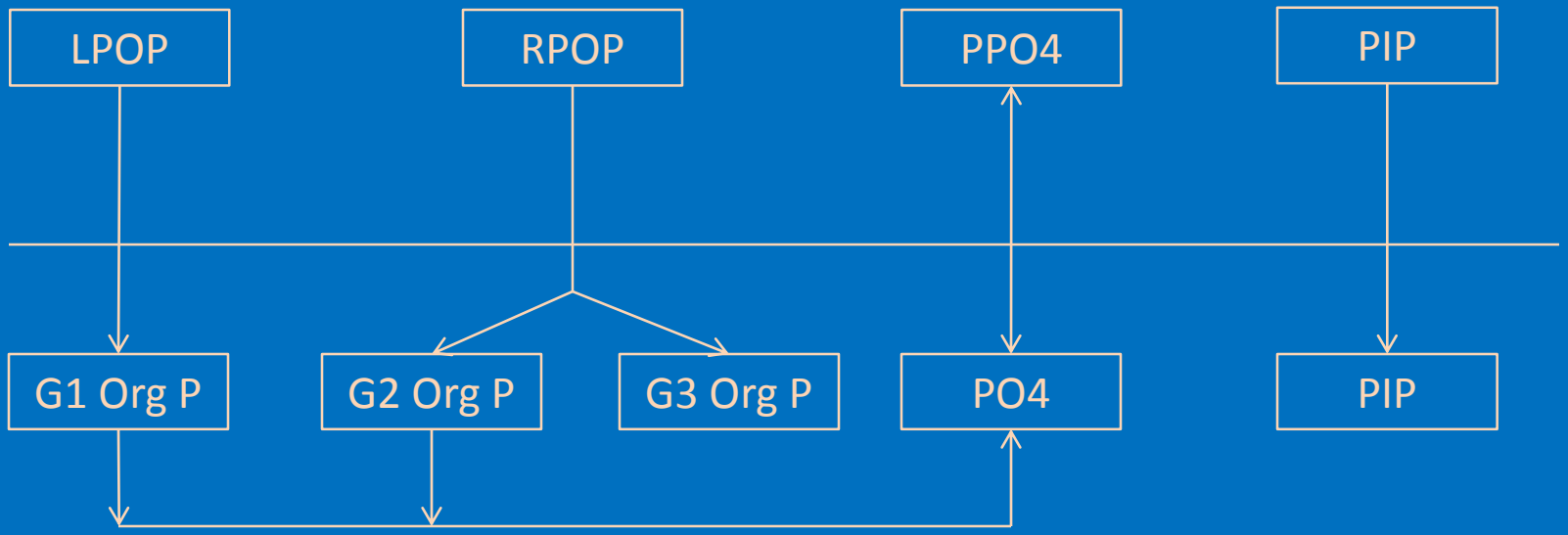
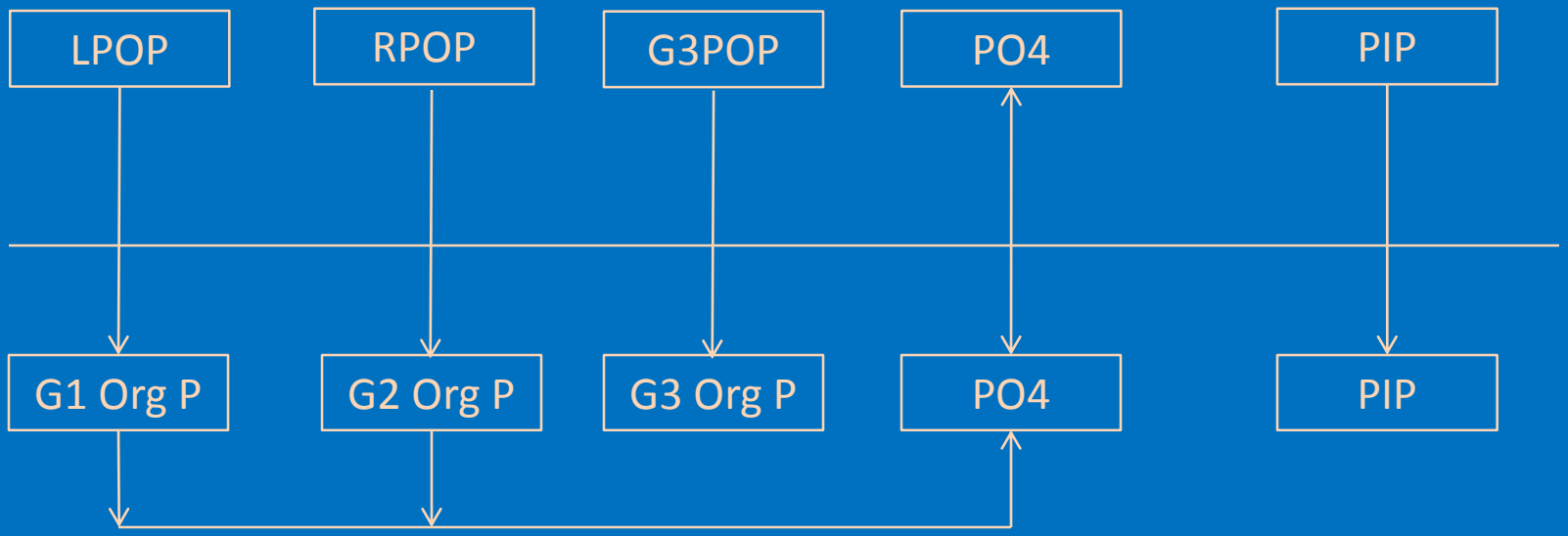
Calibration of Bay and Tributaries

- So where are we?
  - In April, we accepted the Phase 6 WSM as “good to go”.
  - We moved our primary calibration period to 2002 – 2011.
  - We have shoreline erosion loads on N and P.
  - We have explicit representation of G1, G2, G3 reactivity classes in the loads and in the WQM code.

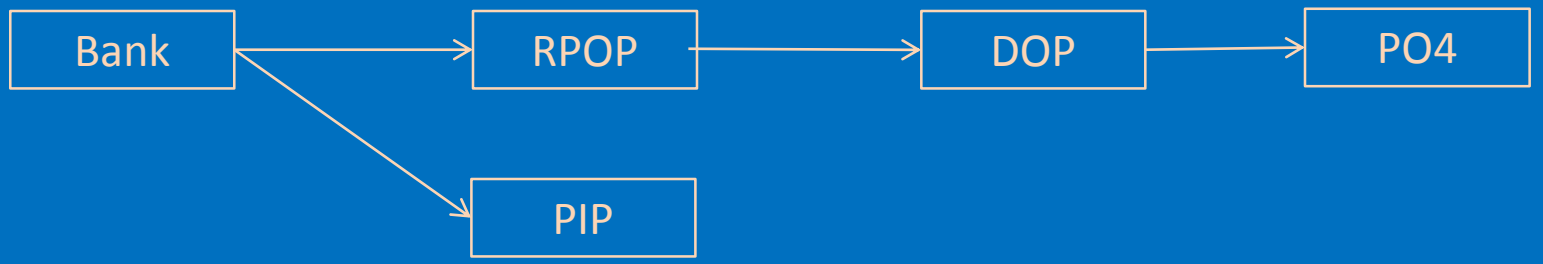
Former Routing of Water Column P to Sediments



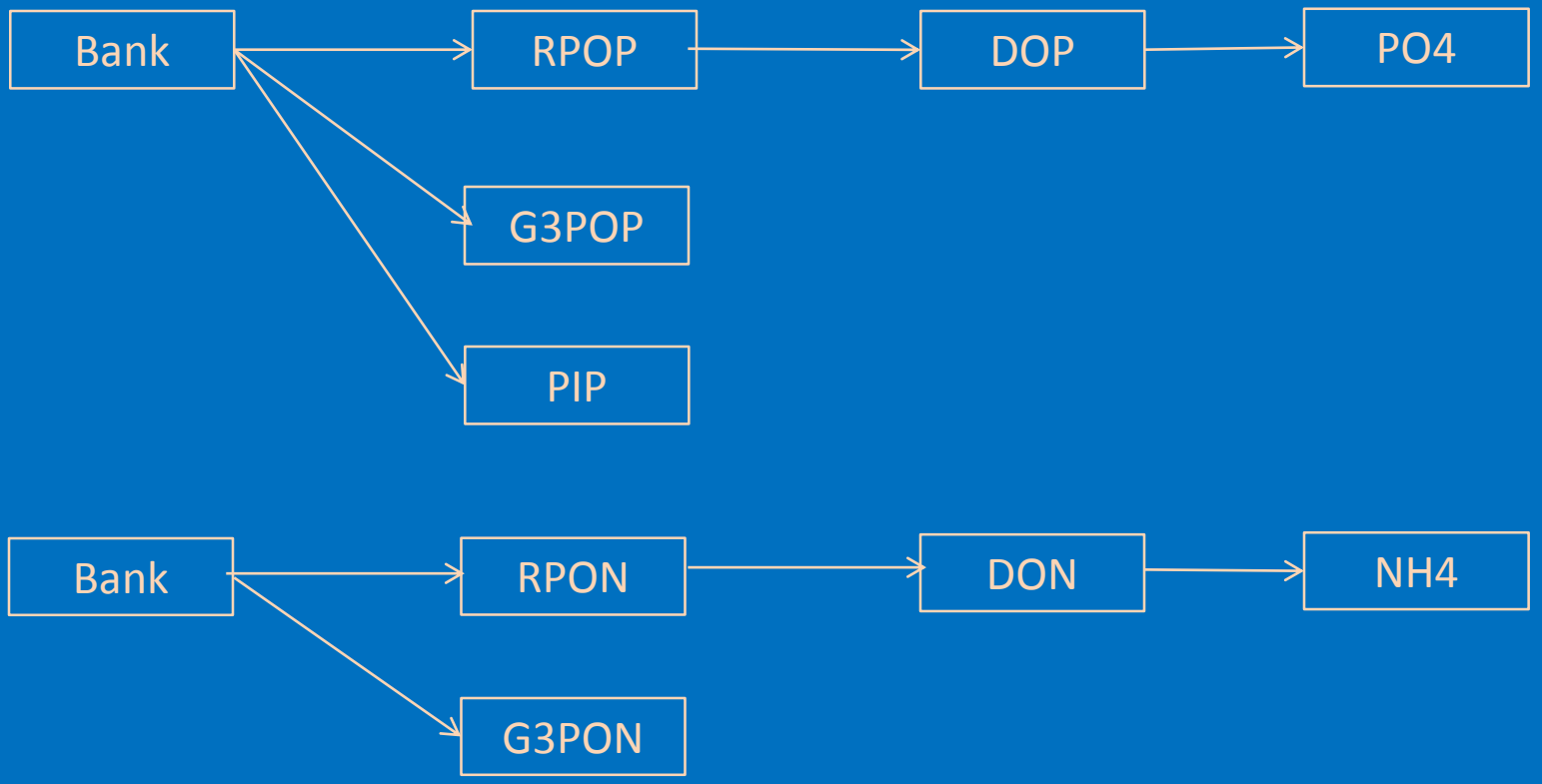
Revised Routing of Water Column P to Sediments



Initial Routing of Bank Nutrient Loads to Water Column



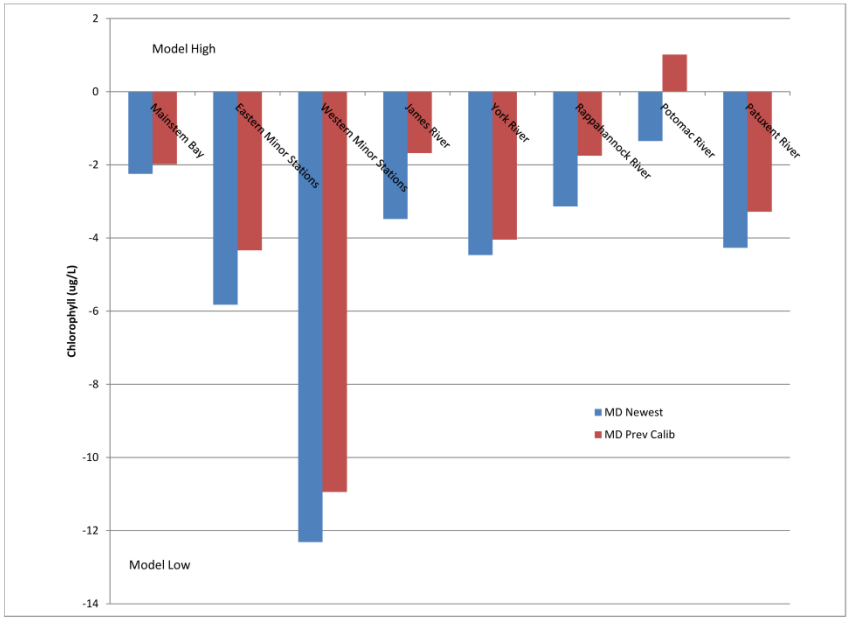
Revised Routing of Bank Nutrient Loads to Water Column



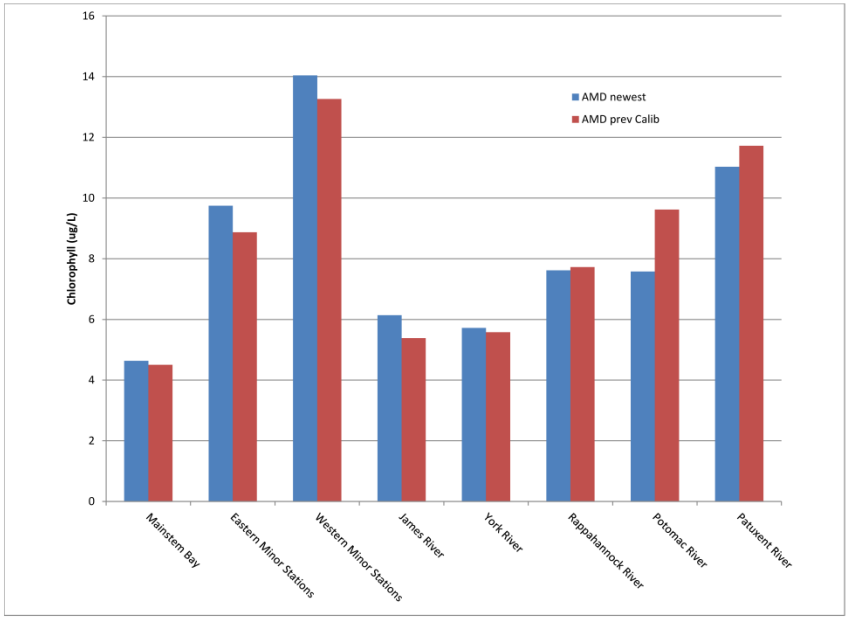
Our Philosophy

- A calibration as good as or better than the previous calibration.
- Let's compare 2002 – 2005 with the present model to 2002 – 2005 from the 1985 – 2005 run of the previous (2010 TMDL) calibration.
- Use our traditional statistics
  - Mean Difference – describes if model is, on average, high or low.
  - Absolute Mean Difference – a measure of the average absolute difference between model and data.

Chlorophyll

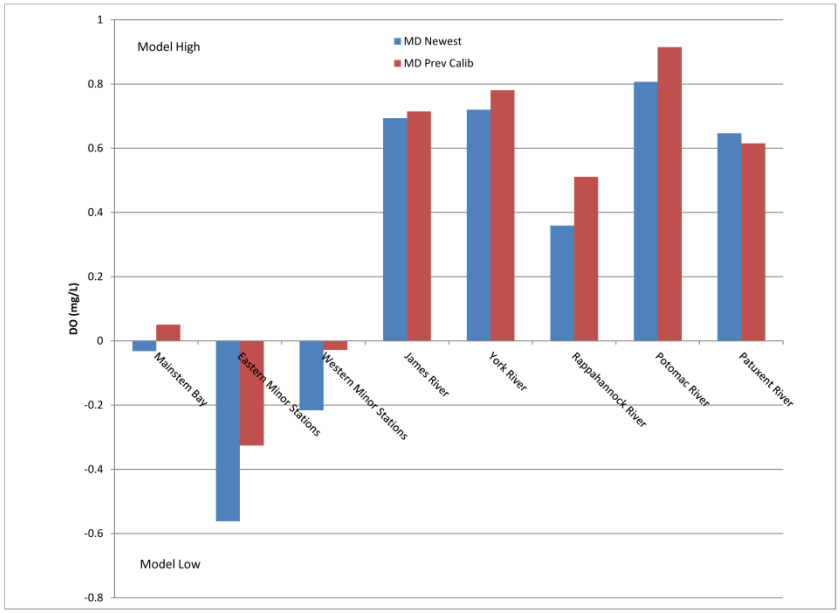


Mean Difference

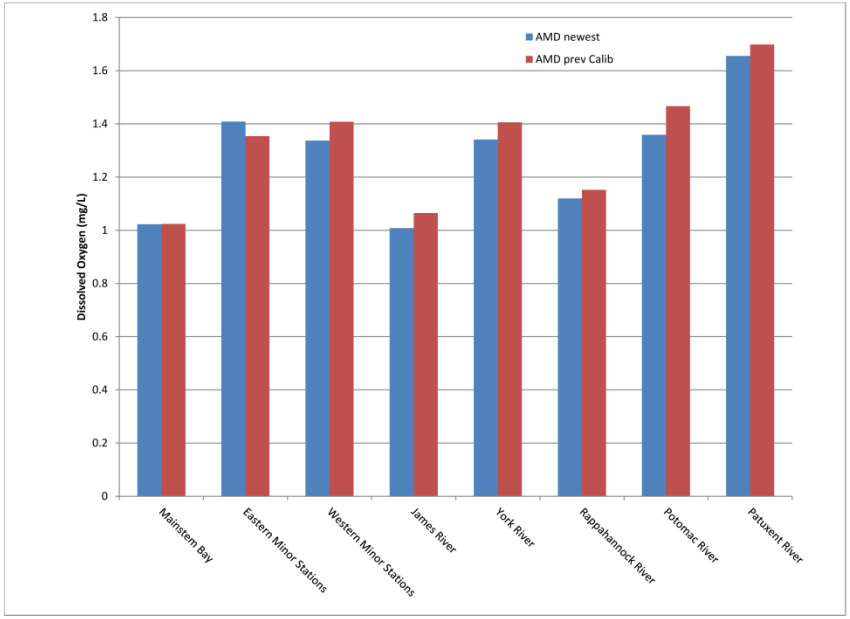


Absolute Mean Difference

Dissolved Oxygen

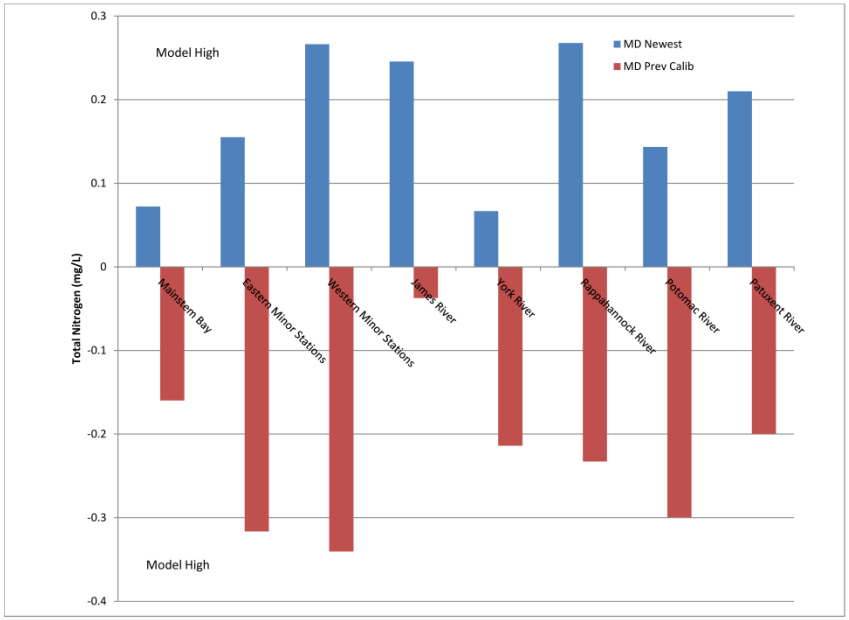


Mean Difference

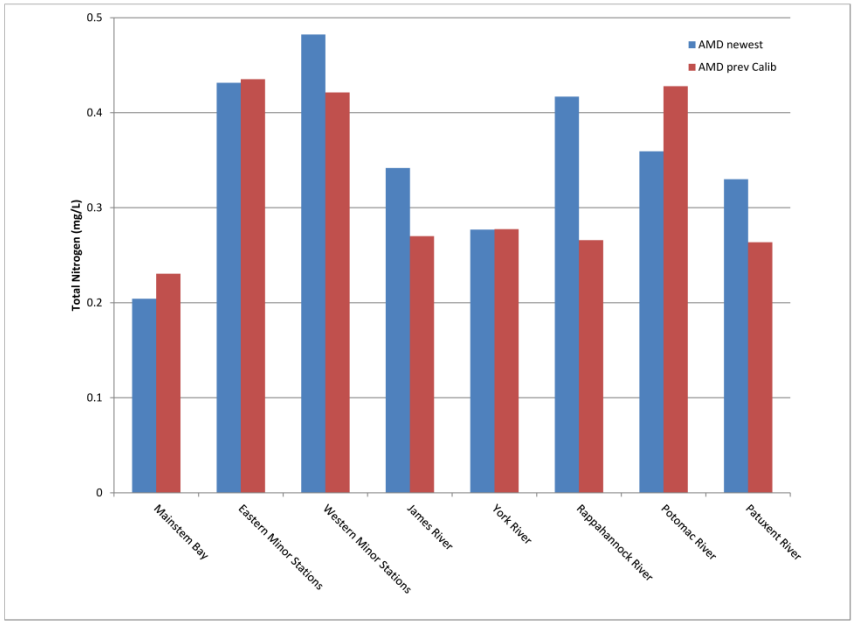


Absolute Mean Difference

Total Nitrogen

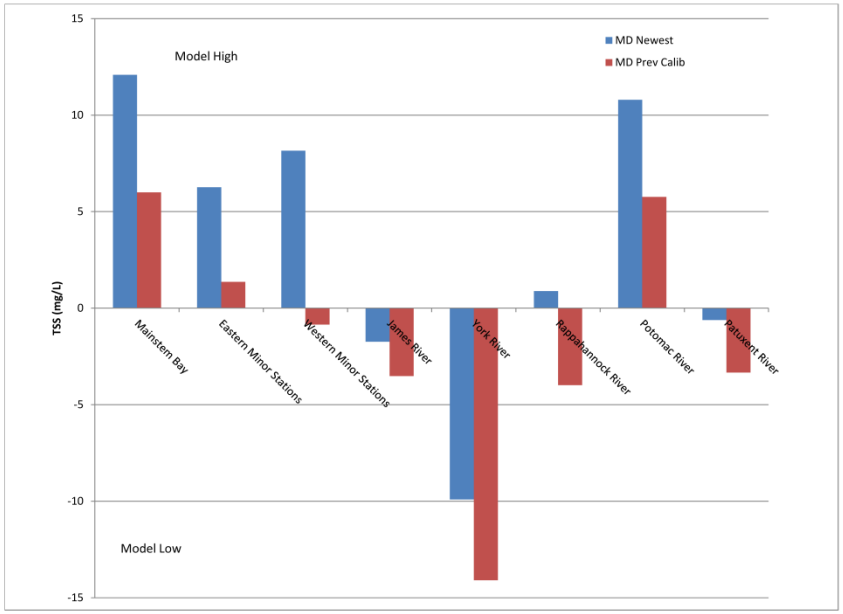


Mean Difference

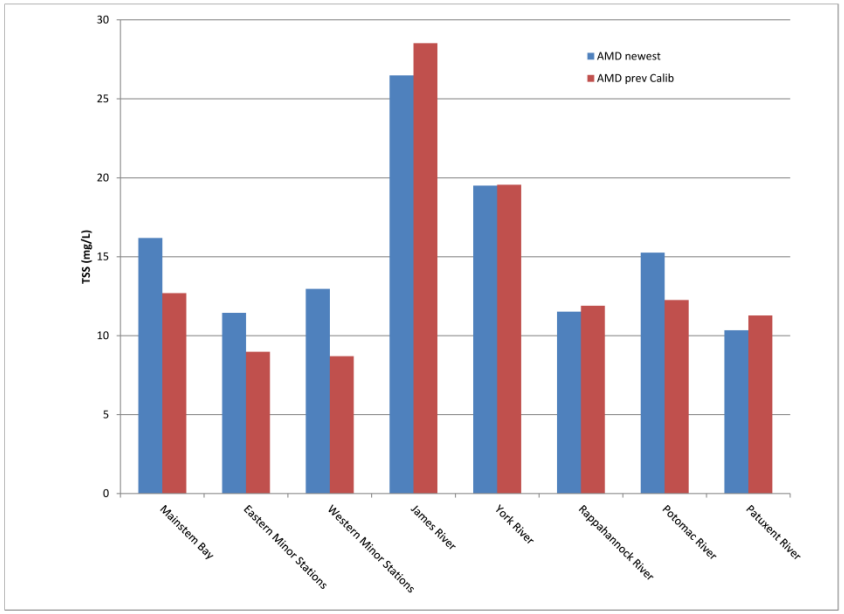


Absolute Mean Difference

Total Suspended Solids

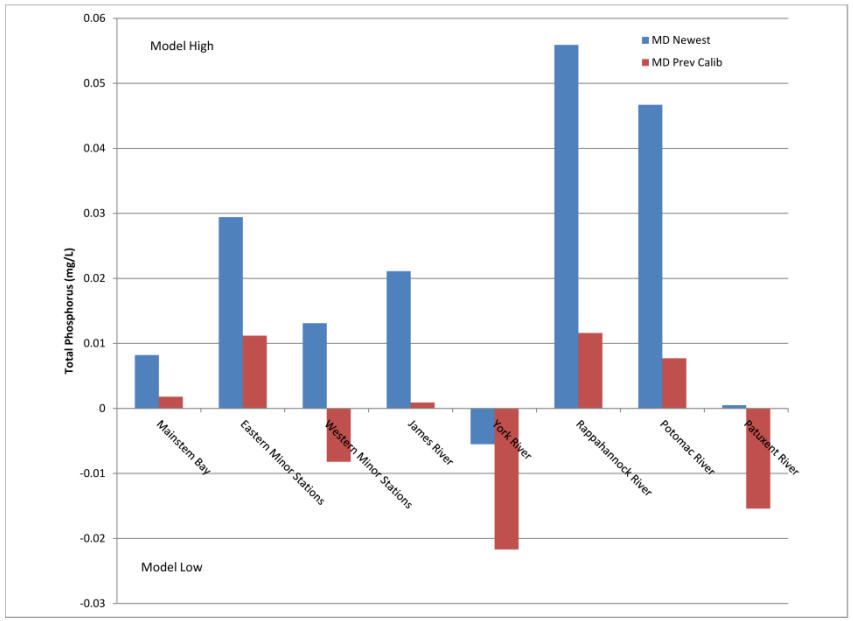


Mean Difference

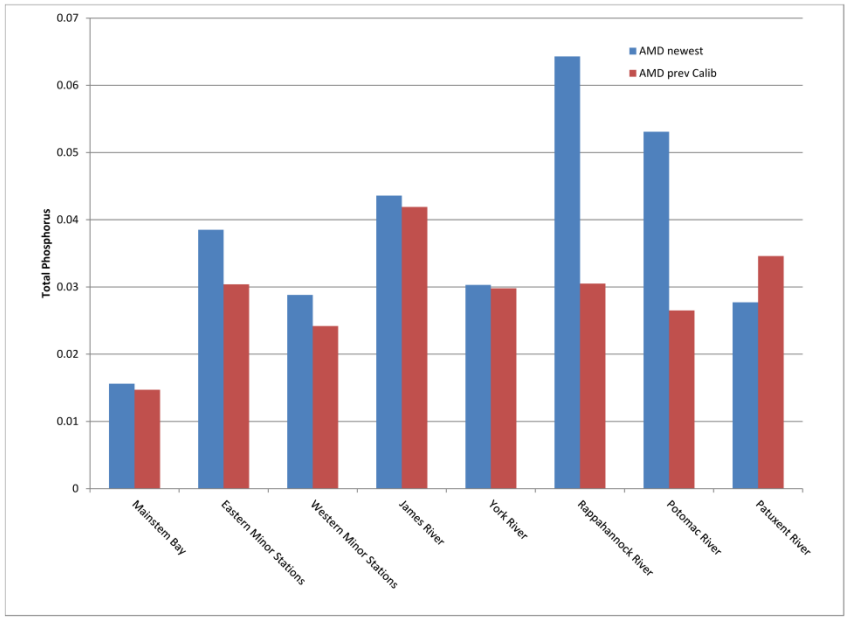


Absolute Mean Difference

Total Phosphorus



Mean Difference



Absolute Mean Difference

Summary

- Chlorophyll is lower than previously (≈1 µg/L). May be an improvement or deterioration, depending on system.
- Dissolved oxygen is lower than previously (≈0.05 mg/L). In most systems, this is an improvement. Be cautious, however. This is a summary of all DO observations, not bottom-water hypoxia. This result is likely due to less algal production.
- Total nitrogen is up universally by a considerable amount (≈0.2 mg/L). The base case seems strange and may be an artifact of the 21-year run. The quantitative effect on calibration is system-dependent.

Summary

- Total suspended solids increase universally (≈5 mg/L). The result is a deterioration in calibration in several systems including the Bay and Potomac River.
- Total phosphorus is up universally by 0.01 mg/L or more. This almost always represents a deterioration in calibration.

Summary

- In many cases, the computed particle concentrations (organic and inorganic) near fall lines demonstrate high-frequency oscillations. I say the results resemble a “comb.” The maximum computed concentrations greatly exceed the observed populations.
- The WQM behavior apparently originates with the fall-line loading.
- The WQM behavior does not necessarily indicate the loads are faulty. The loads may very well be representative. In that case, we will begin calibration/developments to bring the WQM into agreement with the observations.
- We want to be sure the WSM loads are representative and the loading characteristics will continue as WSM calibration continues.

Potential WQM Adjustments

- Spatially-varying settling rates for particulate organic matter. Use higher rates near loading sources.
- Change the mixture of clay and silt in the TSS loads. Increase the fraction of silt at higher flows.
- Concentration-dependent settling velocities for particles. Use higher velocities at higher concentrations. An empirical correction for larger particles during high-flow events. May also represent floculation.

Where Do We Go from Here?

- We expect another delivery of the Phase 6 WSM soon.
- Install revised loads and reassess WQM behavior with the new loads.
- Work with the WSM team to determine accuracy of loads, origin of WQM behavior.
- Recalibrate WQM as necessary.
- Extend WQM application period. We can readily extend to 1991 – 2000.