The Non-Tidal Passaic River Basin Nutrient TMDL

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A presentation was provided at the Second Passaic River Symposium in 2006 that described the development of a phosphorus TMDL for the non-tidal Passaic River basin, which was based on technical studies performed by Najarian & Associates and Omni Environmental. The TMDL has since been finalized, proposed, and adopted by NJDEP on April 24, 2008. This presentation focuses on the site-specific criteria established by NJDEP, the integration of the Wanaque Reservoir TMDL analysis with the Passaic River TMDL analysis, and the final outcomes in terms of point and nonpoint source phosphorus reductions.

Watershed modeling analyses were performed to assess the impact of point and nonpoint source reductions on dissolved oxygen, phosphorus concentrations, and chlorophyll-a in streams throughout the system. Most of the streams in the Passaic River Basin are not very sensitive to decreases in phosphorus loads. However, based on the assessment of stream response and the Wanaque Reservoir study, two critical stream locations were identified in the Passaic River Basin; phytoplankton chlorophyll-a end points (water quality targets) were developed for both of these critical locations:

- Pompton River at the Passaic River Confluence – the Wanaque South intake draws water from both the Passaic and Pompton Rivers. This is a critical location because it represents a major source of phosphorus to the Wanaque Reservoir.
- Passaic River upstream Dundee Dam – reduction of phosphorus can attenuate the extreme DO swings and reduce the phytoplankton peaks experienced during critical summer conditions in the downstream portion of the Passaic River from upstream of Great Falls to Dundee Dam.

Because these chlorophyll-a end points relate directly to the impairment of uses at these locations, they form the basis for site-specific criteria that supersede and replace the instream and in-lake phosphorus criteria that would otherwise be applied to these waterbodies. The target TMDL condition was therefore defined as the phosphorus loading condition that satisfies water quality end points for both Dundee Lake and the Wanaque Reservoir.

The Passaic River Basin model was used to predict the water quality outcome associated with various phosphorus reduction scenarios, in particular the summer average phytoplankton concentration in the Passaic River at Dundee Lake. In order to fully integrate the Non-Tidal Passaic River Basin TMDL Study with the Wanaque Reservoir TMDL Study, the Passaic River Basin model was also used to simulate phosphorus concentration at the Wanaque South intake for various phosphorus reduction scenarios. Time series of phosphorus concentration predictions were provided to NJDEP and their technical consultant for the Wanaque Reservoir TMDL Study in order to predict the summer average phytoplankton in the Wanaque Reservoir associated with each phosphorus reduction scenario. Various combinations of effluent concentrations and runoff reductions were iteratively tested in terms of their impact on the end points at both critical locations. A TMDL Condition was developed to satisfy the water quality targets established for both critical locations, and thereby satisfy the watershed-specific criteria for the non-tidal Passaic River Basin.