The disinfection of water for potabilization has proven to be one of the most significant public achievements of the 20th century. Although chemical disinfectants are successfully utilized to inactivate acute pathogenic organisms, they may react with natural organic matter (NOM) to produce potentially harmful disinfection by-products (DBPs). As a result, the United States Environmental Protection Agency regulates DBPs such as total trihalomethanes (TTHMs) and haloacetic acids (HAAs). The research herein is focused on the formation, removal, and control of TTHMs and HAAs in a small public water system (PWS) in Polk County, Florida (County).

Pilot-scale tests were implemented to determine the efficacy of stripping TTHMs using single-pass spray and recirculating tray aeration systems, both operating at flows of 3 gallons per minute. In the spray aerator evaluation, an average TTHM reduction of 29.5% was recorded. With tray aeration, a 47.9% reduction of TTHMs was observed after a single pass through the assembly. The benefits of additional recirculation appeared to decrease significantly after four passes, at a TTHM removal of 84.9%.

A raw water blending effort was conducted to model bypass around granular activated carbon (GAC) adsorption vessels. The results demonstrated the feasibility of a 50% blend in full-scale treatment operations. With this blend, chlorine residuals and HAA concentrations were able to be controlled throughout 48 hours of incubation at 30°C. From the data collected, a water quality plan was developed for the County’s Waverly PWS. The plan to control the formation of DBPs integrated a recirculating tray aeration process for TTHM stripping complemented with GAC adsorption process for removing DBP precursors.

The estimated conceptual operating cost was approximated at $24,000 annually. This cost considered carbon replacement as well as the recirculation pump operation. If the recommended 50% GAC bypass is applied, the conceptual operating cost reduces to approximately $15,250 annually.