This study evaluated the combination of ozone and granular activated carbon (GAC) treatment for the removal of sulfide and disinfection byproduct (DBP) precursors in drinking water at the pilot-scale. The research conducted was performed at the Auxiliary (Aux) and Main Water Treatment Plants (WTPs) in Sanford, Florida. Both WTPs rely upon groundwater sources that contain total sulfide ranging from 0.02 to 2.35 mg/L and total organic carbon (TOC) ranging from 0.61 to 2.20 mg/L. The Aux WTP’s raw water contains, on average, 88% more sulfide and 24% more TOC than the Main WTP.

Haloacetic acids (HAA5) and total trihalomethanes (TTHMs) comprise the regulated forms of DBPs. HAA5 are consistently below the maximum contaminant level (MCL) of 60 μg/L, while TTHM ranges from 70 to 110 μg/L, at times exceeding the MCL of 80 μg/L in the distribution system. Ozone alone removed total sulfide and reduced UV-254 by about 60% at the Aux Plant and 35% at the Main Plant. Producing an ozone residual of 0.50 mg/L prevented the formation of bromate while removing approximately 35 to 60% concentration of DBP precursors as measured by UV-254. Operating the GAC unit at an empty bed contact time (EBCT) of 10 minutes for the Aux Plant and 5.5 minutes for the Main Plant resulted in 75% and 53% of UV-254 reduction, respectively. The average 120 hour TTHM formation potential for the Aux and Main Plants were 66 μg/L and 52 μg/L, respectively, after treatment by ozone and GAC. GAC exhaustion was deemed to have occurred after seven weeks for the Aux Plant and eleven weeks for the Main Plant. The GAC columns operated in three phases: an adsorption phase, a transitional phase, and a biologically activated carbon (BAC) phase. The GAC adsorption phase was found to produce the lowest TTHMs; however, TTHMs remained less than 80 μg/L during the BAC stage at each plant. BAC exhaustion did not occur during the course of this study. Ozone-GAC reduced chlorine demand by 73% for the Aux Plant and 10% for the Main Plant.