

Treatment of 1,4-Dioxane Using Advanced Oxidation at Artesian Water Company's Llangollen Wellfield

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Abstract

The Artesian Water Company (Artesian) Llangollen Wellfield has a capacity of 2.2 MGD. Treatment was limited historically to aeration, chlorination, and pH adjustment. In 2000, bis(2-chloroethyl) ether (BCEE) was discovered in three of the wells. Subsequently, granular activated carbon (GAC) treatment was provided for the removal of BCEE. Recently, 1,4-dioxane was detected in one of the wells at levels of concern, and Artesian removed the well from service. Monitoring wells at a nearby landfill found 1,4-dioxane as high as 300 µg/L. The Delaware Department of Public Health requires that levels above 3.5 µg/L of 1,4-dioxane be reported. Artesian conducted a treatability study, which found that using UV-hydrogen peroxide and quenching the hydrogen peroxide with the existing GAC, was the most cost-effective treatment option to remove 1,4-dioxane. The full-scale treatment system includes two UV reactors, each with 144 lamps, which are sized to provide 2-log (99%) reduction of 1,4-dioxane. This paper describes critical components associated with the treatability study, bench studies, design, and initial operation.

Key words: 1,4-dioxane, UV Hydrogen Peroxide, GAC

Project Background

Artesian Water Company, Inc. (Artesian) is the oldest and largest investor owned public water utility on the Delmarva Peninsula. Its Llangollen wellfield consists of four public supply wells (Well 2, Well 6, Well 7, and Well G-3R) and one aquifer storage and recovery (ASR) well that are all screened in the Potomac Formation. The wellfield began operation in the 1950s and had a water supply withdrawal allocation of 3.8 MGD in the late 1960s. As a result of groundwater contamination in the region originating from two nearby Superfund sites, the Army Creek

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