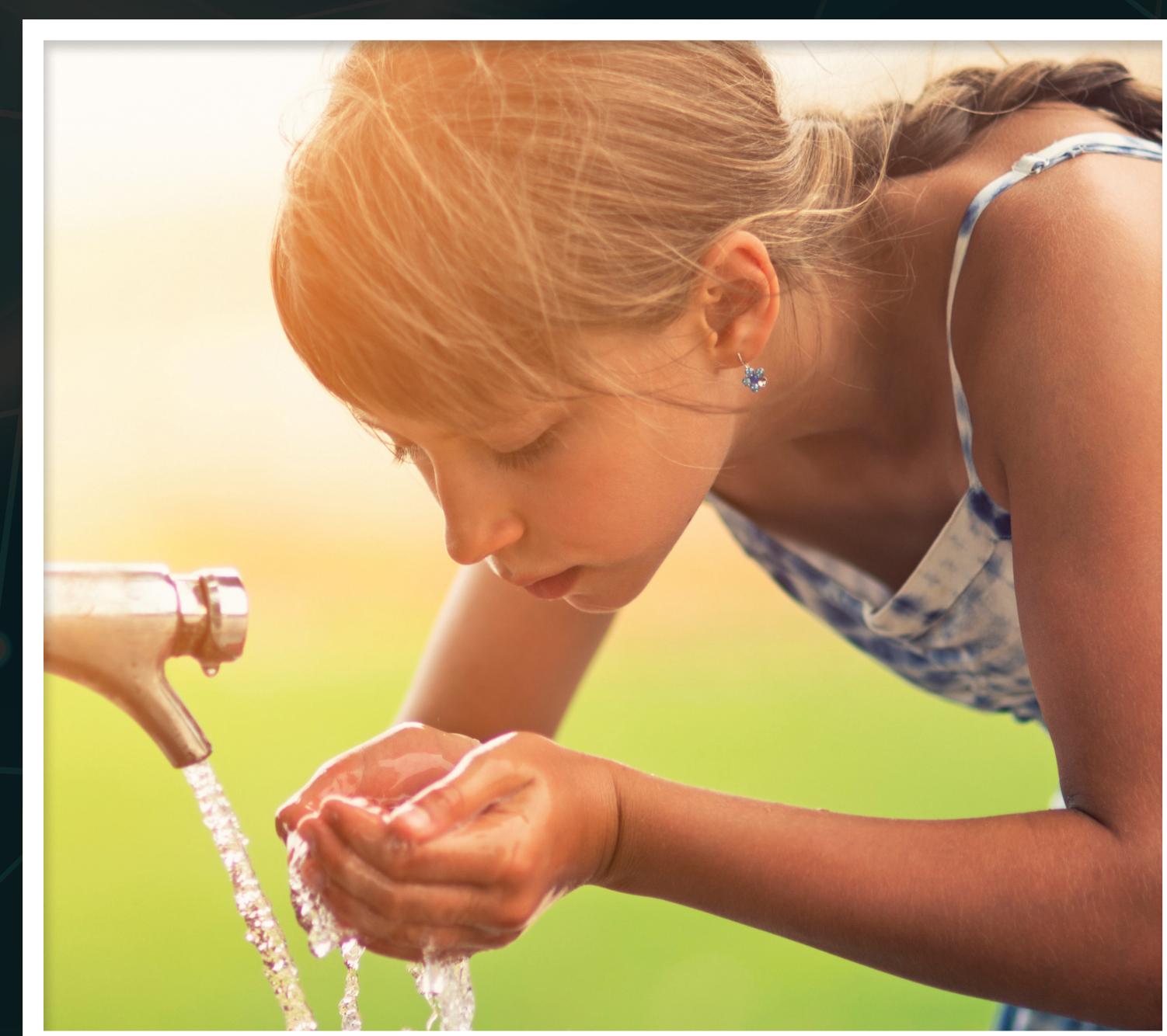
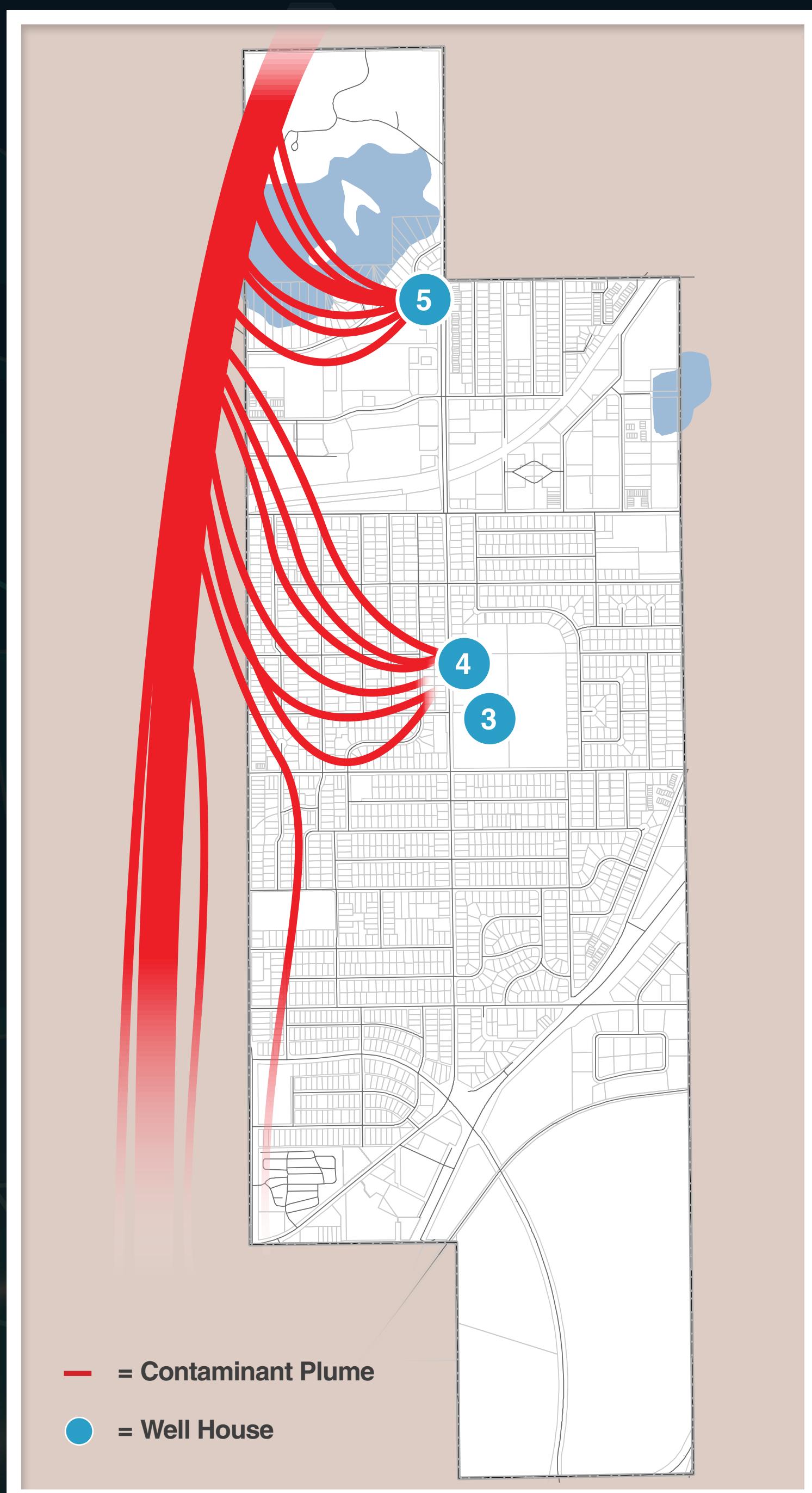
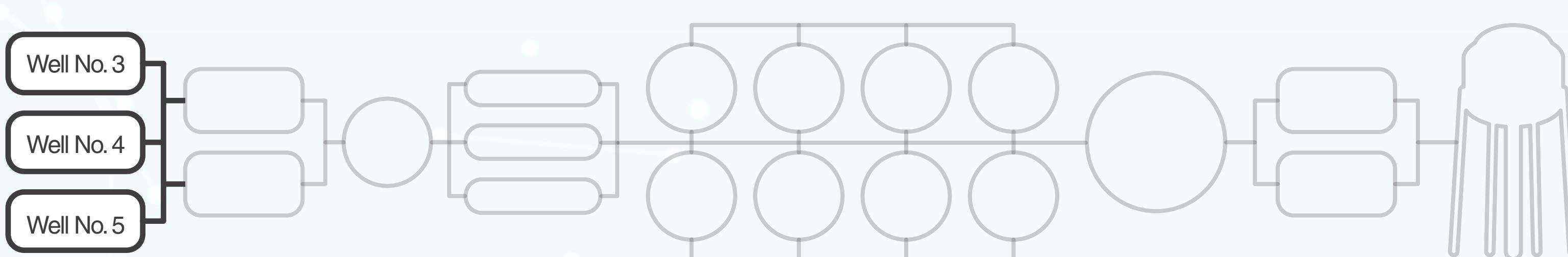


Advanced Oxidation Process (AOP)
Water Treatment Plant



The City of St. Anthony has three municipal wells it uses to supply groundwater. The water is pumped into the water treatment plant where it goes through the process as shown on this tour. On average, the City uses 810,000 gallons of water per day supplied by these wells.

The contaminant 1,4-dioxane was detected in the groundwater in 2015. The contaminant plume is shown on the graphic above. Since detection, the City has continued to offer safe drinking water by implementing water conservation ordinances and adjusting how it operates its wells. The long-term treatment includes the addition of the Advanced Oxidation Process Water Treatment Plant, as you will see in this tour.

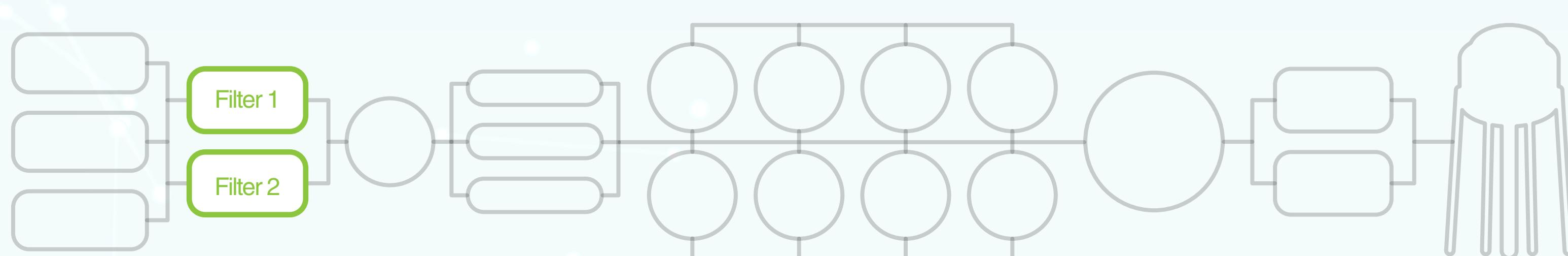


Advanced Oxidation Process (AOP)
Water Treatment Plant



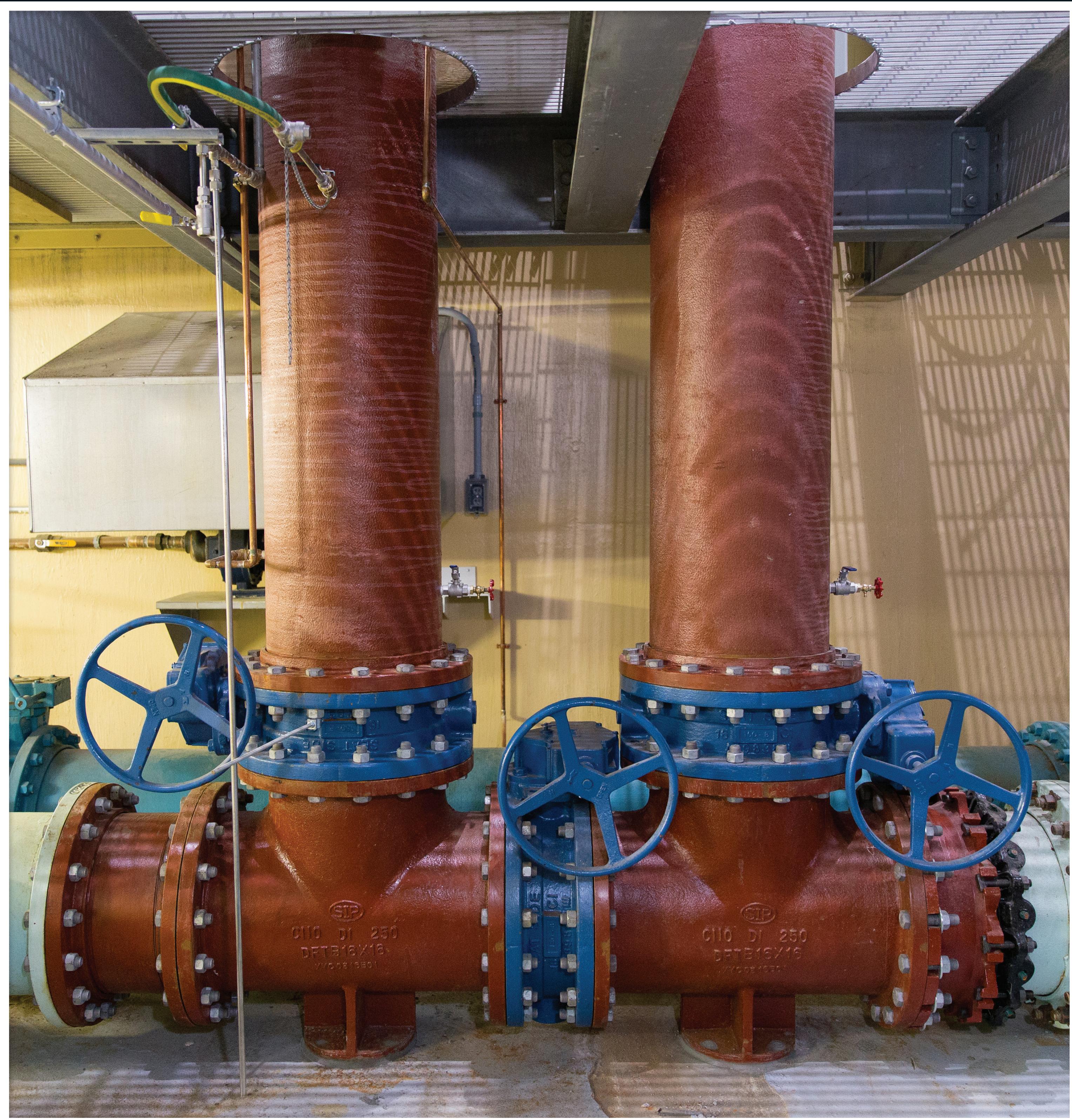
Upon entering the water treatment plant, the untreated (or “raw”) water is pumped into green sand filters. The filters’ main purpose is to remove iron and manganese from the water. Iron and manganese are naturally occurring in the groundwater, and while they are usually not considered health risks, they can cause water to look or taste unappealing.

The filters are cleaned periodically by a process called backwashing. In St. Anthony, the water used during the backwash water is then sent along with stormwater to an underground storage tank outside. The water is then used to irrigate Central Park behind City Hall.

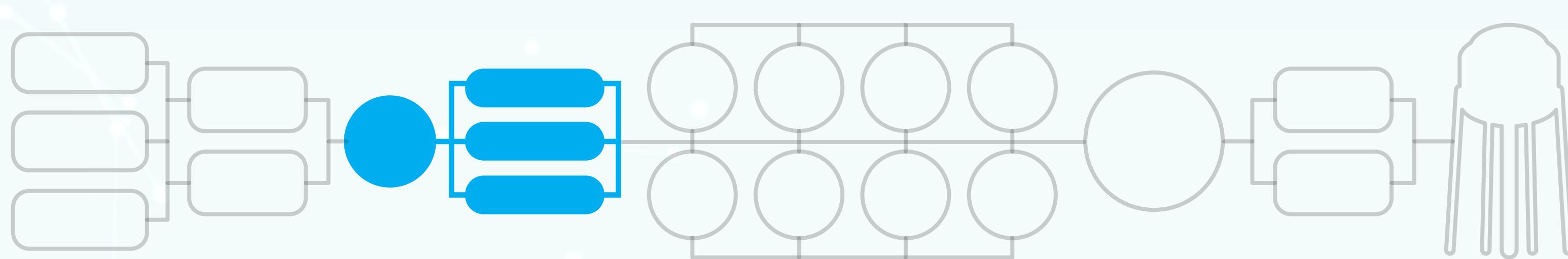


Pressure Filters

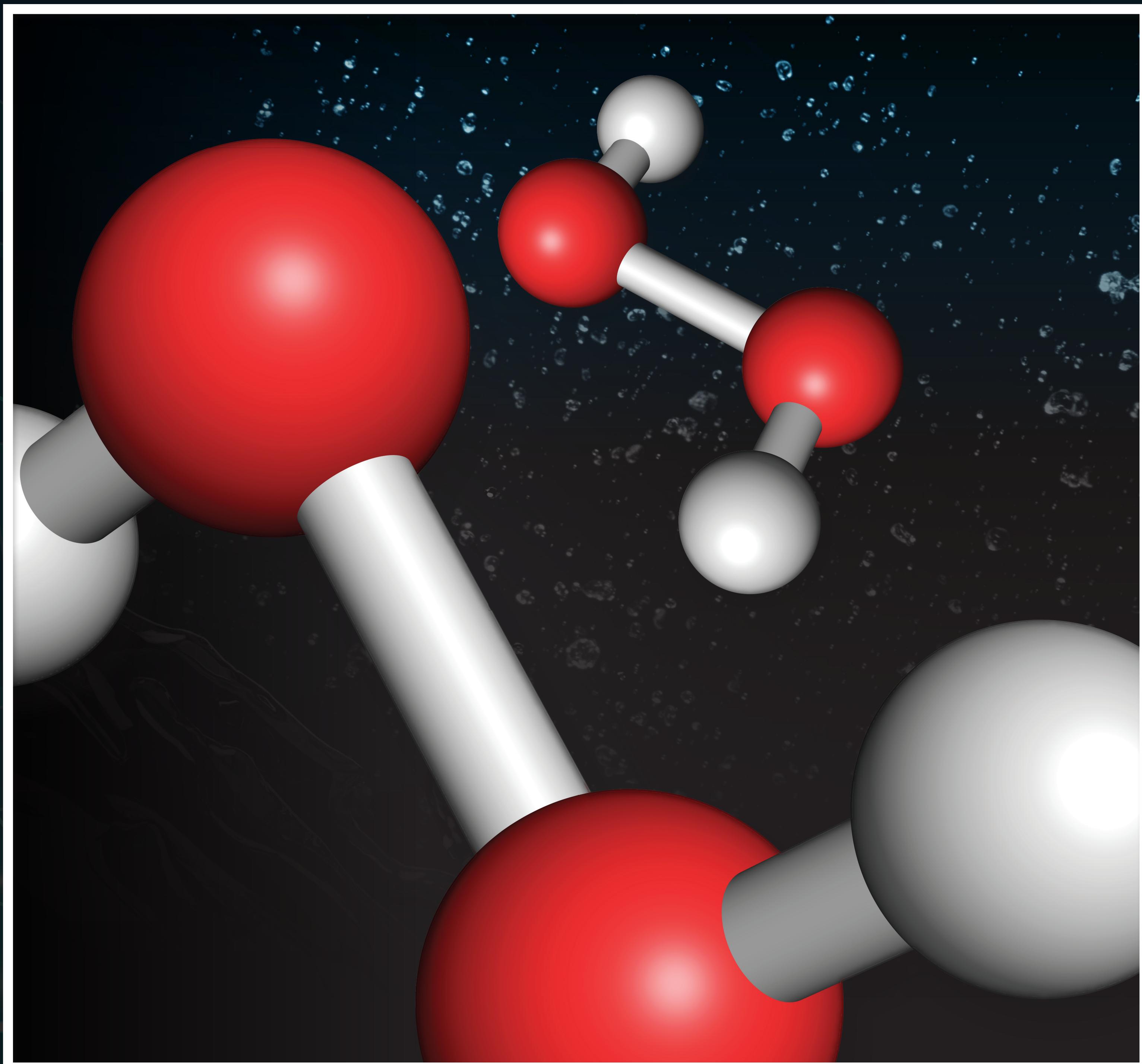
Advanced Oxidation Process (AOP)
Water Treatment Plant



The advanced oxidation process was added in to the middle of the treatment train. After water flows through the sand filters in the previous building, it is diverted to the advanced oxidation water treatment plant. Below the grates, you can see where two new pipes were added, then reaching upwards and extending to the left towards the AOP plant. To begin the AOP process, hydrogen peroxide is added to the water at this location.

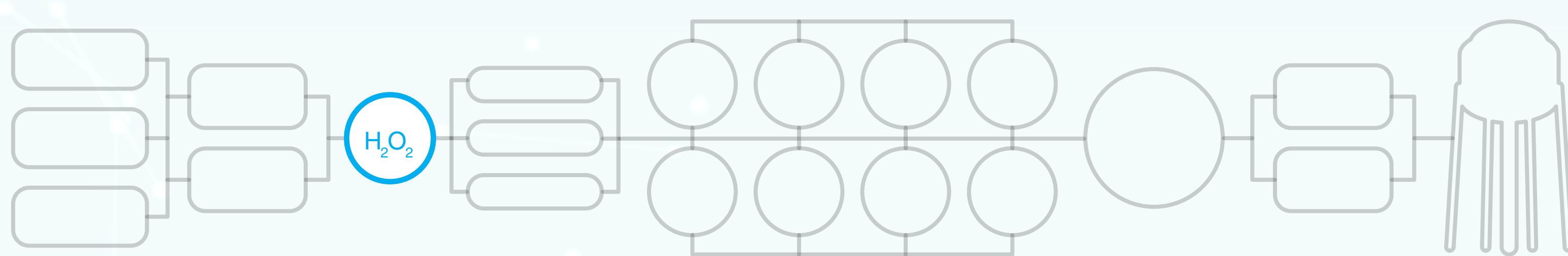


Addition of the AOP



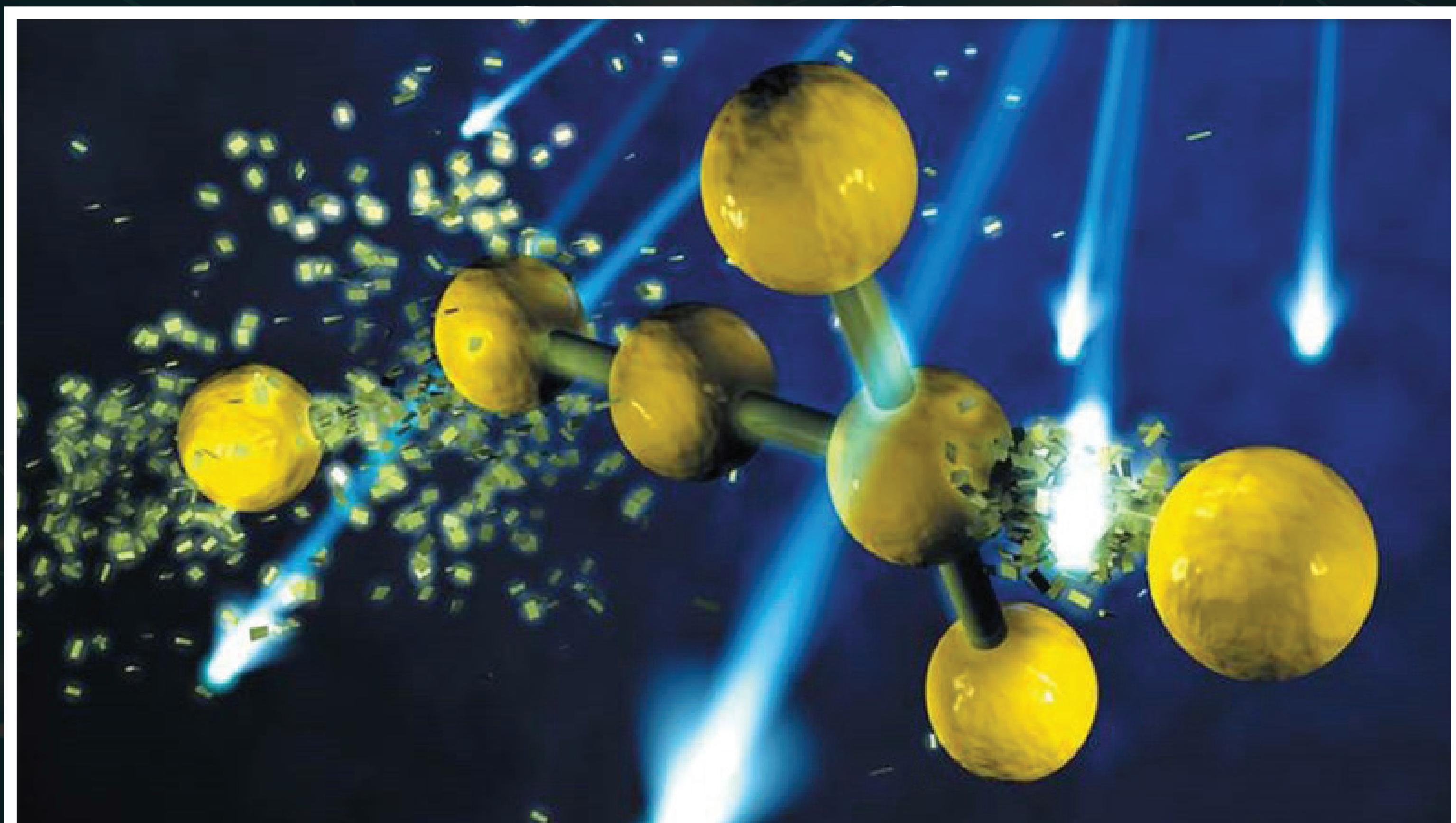
Hydrogen peroxide is added in small doses to the water in the granular activated carbon building. The peroxide is stored in the tanks in this room. Hydrogen peroxide absorbs ultraviolet light (UV) and creates hydroxyl radicals, which are highly reactive atoms susceptible to chemical reactions.

The two large tanks in this room contain 3,000 gallons of hydrogen peroxide each, and the smaller day tank holds 50 gallons of hydrogen peroxide. This room is equipped with its own sprinkler system, containment pit, and fire proof doors to provide protection to city staff.



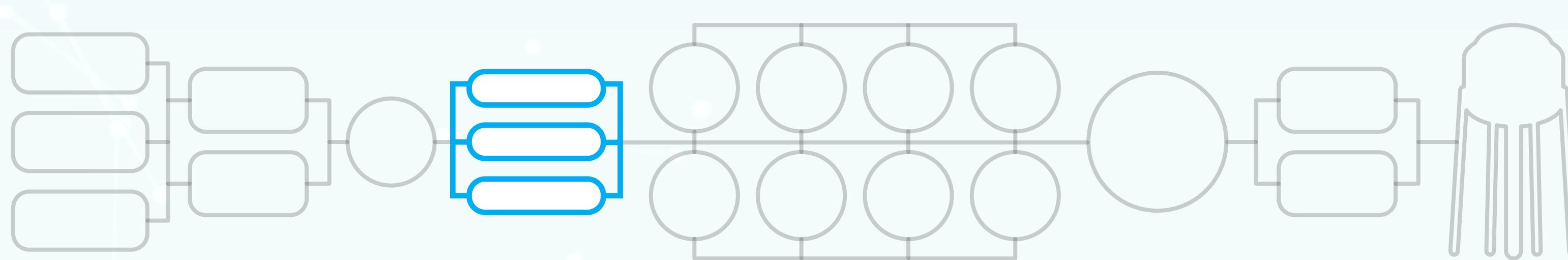
AOP - Peroxide Addition

Advanced Oxidation Process (AOP)
Water Treatment Plant



After the hydrogen peroxide is mixed into the water and hydroxyl radicals are formed, the water flows into one of the three ultraviolet (UV) reactor units in the main room of the AOP building. The tubes each contain 144 bulbs that zap the molecules and destroy the 1,4-dioxane.

The by-products of the hydrogen peroxide reacting with the 1,4-dioxane are water and carbon dioxide! By using this process, we can turn a harmful compound in to two that are harmless and completely remove it from the environment.



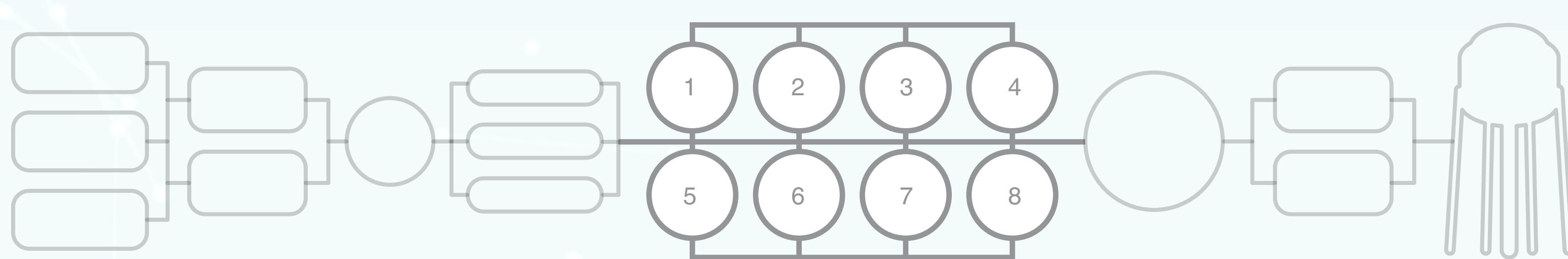
AOP - UV Train

Advanced Oxidation Process (AOP)
Water Treatment Plant



The large vertical chambers in this room are filled with granular activated carbon (GAC). Before the addition of AOP units, the main purpose of the GAC was to remove trichloroethylene, a water contaminant that is present in the same groundwater plume that has 1,4-dioxane.

Now, the GAC units serve another purpose. They will absorb and remove any excess hydrogen peroxide that does not react in the UV units before water is delivered to customers.



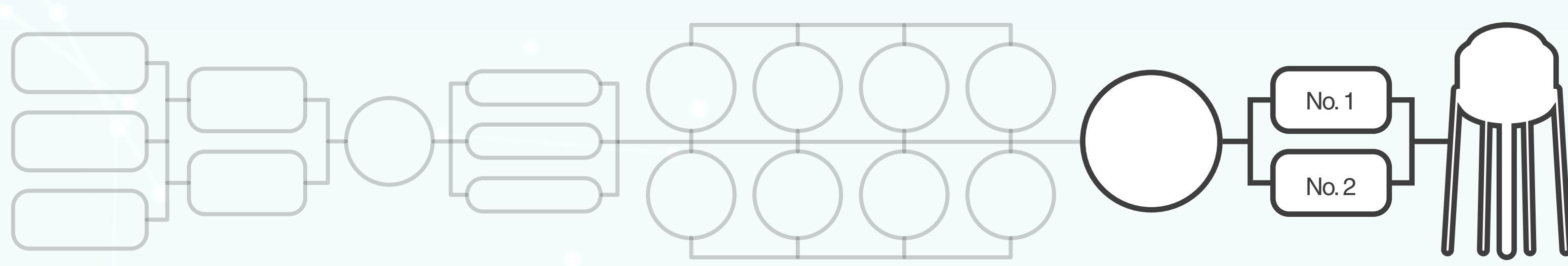
GAC - Activated Carbon Process

Advanced Oxidation Process (AOP)
Water Treatment Plant



Once the water is finished being treated, it is stored in a 2.0 million gallon ground storage reservoir. The exterior was repainted as part of this project, as shown in the photo above. When the water is needed, high service pumps deliver it to the water tower, which maintains water pressure in most of the City.

The City also has one area that is at a high elevation and requires additional pumping to maintain adequate water pressure. This area is served by new booster pumps that were placed in the AOP building during this project.



Ground Storage Reservoir High Service Pump Water Tower