

CASE STUDIES



Photo courtesy of OCWD/Jim Kutzle.

## The Groundwater Replenishment System, Orange County, California

The Groundwater Replenishment System (GWRS), located in Orange County, California, USA, provides purified recycled water for aquifer recharge to replenish supplies and to prevent seawater intrusion. A joint project between the Orange County Water District (OCWD) and the Orange County Sanitation District (OCSD), it is the largest indirect potable reuse project of its kind in the world. The GWRS treats and reuses wastewater that, in the past, had been discharged to the ocean. The water is reused to provide protection against drought and as a means of achieving a sustainable water supply.

The full-scale Advanced Water Purification Facility takes filtered secondary effluent from the neighboring OCSD wastewater treatment plant and converts it to water that exceeds all drinking water quality standards. The microfiltration (MF), reverse osmosis (RO), and the TrojanUVPhox<sup>®</sup> UV-oxidation/treatment system (see **Figure 1**) treats up to 100 million gallons per day (MGD).



### TREATMENT CHALLENGES

While MF and RO provide treatment for a variety of organic compounds, there are some contaminants which can pass through RO membranes. With this in mind, the California Division of Drinking Water (DDW) mandated that RO be followed by an advanced oxidation system to provide a final treatment step. The advanced oxidation system must demonstrate a 0.5-log removal of 1,4-dioxane, a relatively difficult-to-treat surrogate contaminant that passes through RO. The UV-oxidation system at the GWRS also removes N-nitrosodimethylamine (NDMA), present at the GWRS as a by-product formed by upstream wastewater treatment processes. The NDMA molecule is considered to be carcinogenic at very low concentrations and is broken down by UV light through a photochemical process known as UV-photolysis. Further, the system also breaks down other contaminants, such as pharmaceuticals or industrial contaminants that have been shown to be present in secondary effluent of the wastewater treatment plant.

In addition to breaking down chemical contaminants, the DDW states that the treatment processes used at the GWRS must combine to demonstrate 12-log, 10-log, 10-log removal of microorganisms, *Cryptosporidium*, and *Giardia* respectively. The high intensity TrojanUVPhox at the GWRS is granted the maximum allowable treatment credits that can be provided for a single treatment step, a total 6-log inactivation of all three groups of microorganisms for partial completion of this requirement.

**Plant Name:** Groundwater Replenishment System (GWRS)  
**Location:** Orange County, California  
**System:** TrojanUVPhox<sup>®</sup>

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In summary, the treatment objectives accomplished by the TrojanUVPhox are:

1. Reduction of 1,4-dioxane as mandated by the California DDW
2. The break down of NDMA, pharmaceuticals, personal care products, and industrial chemicals
3. Microbial inactivation (6-log *Cryptosporidium*, *Giardia* and virus inactivation credit)

### THE TROJAN SOLUTION

The TrojanUVPhox system consists of a UV chamber array, a hydrogen peroxide storage and metering system, and a Trojan OptiView<sup>®</sup> UV transmittance monitor. The low-energy TrojanUVPhox minimizes electrical consumption by using high-efficiency amalgam lamps. It effectively meets the peak flow demand within the design space constraints.

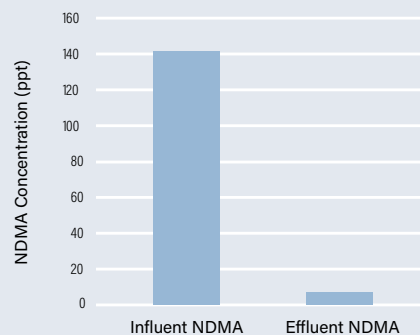
With over 10 years of successful operation since the original installation was commissioned, the OCWD has established the foundation for potable water reuse as a feasible option for sustainable drinking water supply in drought-prone regions. In doing so, they have garnered widespread public support for the project. In addition to the multiple-barrier treatment process, another key element to the success of the GWRS has been the highly active public outreach and education resources the OCWD has continued to develop throughout the lifetime of the project.

For more information, visit [www.ocwd.com/gwrs](http://www.ocwd.com/gwrs)

### PROVEN PERFORMANCE

The performance of the TrojanUVPhox has exceeded the California Division of Drinking Water treatment requirements. As illustrated in **Figure 2**, the system effectively reduces NDMA to below the 10 ppt treatment notification level established by the DDW.

**Figure 1** The TrojanUVPhox at the GWRS.



**Figure 2** Log of the influent and effluent concentrations of MS2 (representative test with less than 20% of the total system in operation).

### SYSTEM DESIGN PARAMETERS

<b>TREATMENT METHOD:</b>	UV
<b>ORIGINAL FLOW CAPACITY:</b>	70 MGD
<b>CURRENT FLOW CAPACITY:</b>	100 MGD
<b>FUTURE FLOW CAPACITY:</b>	130 MGD
<b>DESIGN NDMA REDUCTION TARGET:</b>	1.2-log
<b>DESIGN 1,4-DIOXANE REDUCTION TARGET:</b>	0.5-log
<b>ULTRAVIOLET TRANSMITTANCE (UVT):</b>	>95% at 254 nm

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