



### Customer Story

## Water, Anyone?

*With the help of modern science, California's Orange County Water District is a global leader in reclamation strategies to quench the thirst of a growing population.*

### Background

On a planet composed mostly of water, it may come as a surprise to learn that only about 2.5 percent of it is fresh—and most of that is too deep underground to be of much use. Worse still, from a water perspective, billions of us simply live in arid regions, where fresh water is scarce and our own numbers are swelling. Even when we do find fresh water, it is usually in the wrong place, at the wrong time, in the wrong form. With one in eight of the world's population already deprived of clean drinking water, experts predict those numbers could quadruple over the next two decades and lead to a devastating global crisis<sup>1</sup>.

Amid such dire forecasts, one bright spot is Orange County, California. The Orange County Water District (OCWD) has been working with local, state, and federal officials since 2008 on an innovative solution that could one day help satisfy the world's thirst for clean drinking water.

### Reclaiming a Precious Natural Resource

"Toilet to tap" may be a real headline grabber when talking about Southern California's water reclamation efforts, but it is also largely misleading, says Michael Markus, OCWD general manager. Since 2008, OCWD's state-of-the-art water reuse facility near Huntington Beach has purified over 149 billion gallons of treated wastewater from the Orange County Sanitation District (OCSD) that would have otherwise been discharged into the Pacific Ocean. Named the Groundwater Replenishment System (GWRS), the facility pumps the purified water back into the region's groundwater basin and seawater intrusion barrier to protect and replenish the basin. The vast majority of that treated wastewater comes from more than 2.4 million household sinks, showers, washers, bathtubs and sprinklers throughout the district's service area. Only about 20 percent is actually toilet water.<sup>2</sup>

Even then, the wastewater is so thoroughly filtered, treated, and continuously tested at OCWD's Advanced Water Quality Assurance Laboratory in Fountain Valley, it is actually cleaner than it was in its natural state and meets or exceeds state and federal drinking water standards. The result is enough purified water for 600,000 people. That will soon expand to 850,000 people when the OCWD expands the facility to treat an additional 30 million gallons a day by mid-2015. With California now in its third year of an extreme drought and more shortages predicted for the future, residents are getting over the so-called "yuck" factor to see the GWRS for what really is -- an innovative technology that is helping to solve the region's historic water woes<sup>3</sup>.

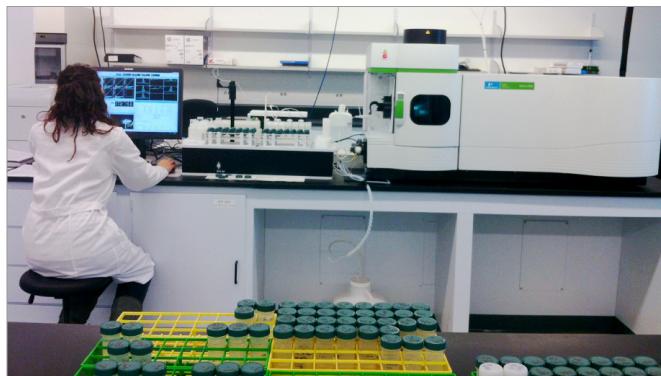


Figure 1. Orange County Water District's Advanced Water Quality Assurance Laboratory located in Fountain Valley, CA.

## How It Works

In many respects, OCWD's reclamation process replicates the circle of life. Wastewater flows through sewer pipes to the OCSD. It is then piped over to the Advanced Water Purification Facility, where it is again purified through a series of processes involving microfiltration, reverse osmosis, and ultraviolet light with hydrogen peroxide to disinfect the water and destroy any remaining low molecular organic compounds.

From that point, about half of GWRS' daily treated water is injected under pressure into wells along the Seawater Intrusion Barrier, which helps push intruding salt water back into the ocean. The remaining water is pumped along a 13-mile pipeline into three spreading basins that recharge water into the groundwater basin<sup>4</sup>.

According to OCWD's Michael Markus, the biggest cost in the process is energy, which he recently told CNN's Kieron Monks "is coming down all the time," thanks to emerging technologies<sup>5</sup>.

## Keeping It Safe

To assure the safety of recycled water, the OCWD collects thousands of samples each year to screen for a wide variety of contaminants, from seawater and hazardous waste to toxic residuals and heavy metals. Using both inductively coupled plasma optical emission spectroscopy (ICP-OES) and inductively coupled plasma mass spectrometry (ICP-MS), scientists at OCWD's state-of-the-art Advanced Water Quality Assurance Laboratory in Fountain Valley, California, conduct more than 400,000 analyses annually. The facility tests for all regulated and unregulated inorganic constituents as well as many organic compounds including, but not limited to, 1,4-Dioxane, purgable organic compounds, selected perflourinated alkyl acids, emerging contaminants, and hormones that are monitored at trace levels in the parts per billion<sup>6</sup>.

## The ICP-OES Advantage

OCWD researchers utilize the PerkinElmer Optima® 8300 ICP-OES because of its better handling of samples with higher total dissolved solid content. Offering both radial and axial viewed plasma, it also increases the instrument's sensitivity without compromising its range. That, in turn, allows scientists to reduce the number of sample preparations and reagents needed, helps to simplify data and report generation, and increases lab productivity. With an emphasis on high quality assurance and



Figure 2. The World's Largest Wastewater Recycling System for Indirect Potable Reuse. Photo Credit: Jim Kutzle, Orange County Water District.

quality control for all protocols and procedures, the Optima 8300 ICP-OES5 is proving itself to be a trusted partner in the OCWD's public commitment to providing safe drinking water to millions of Southern California families every day now and well into the future.

## References

1. <https://freshwaterwatch.thewaterhub.org/content/world-fresh-water-supply>. See also, Kieron Monks, "From toilet to tap: Getting a taste for drinking recycled waste water," (May 1, 2014), <http://www.cnn.com/2014/05/01/world/from-toilet-to-tap-water/>
2. <http://www.nbclosangeles.com/news/local/Orange-Countys-Wastewater-Purification-System-Worlds-Largest-Expands-211900901.html>
3. Kathy Chu, "From Toilets to tap," *USA Today* (March 3, 2011). For details on the GRS process, see, <http://www.gwrsystem.com/>
4. <http://www.gwrsystem.com/>
5. Kieron Monks, op. cit.
6. [http://california.construction.com/features/2010/1201\\_qualityassurancelaboratory.asp](http://california.construction.com/features/2010/1201_qualityassurancelaboratory.asp)

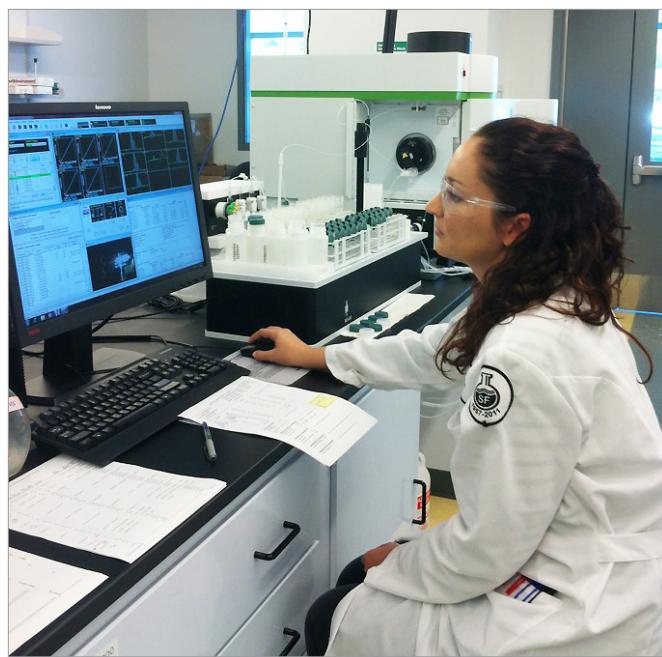


Figure 3. PerkinElmer Optima 8300 ICP-OES at Orange County Water District Advanced Water Quality Assurance Lab.

For additional information on PerkinElmer's ICP-MS and ICP-OES solutions, please follow these links:

[http://www.perkinelmer.com/CMSResources/Images/44-134581APP\\_NexION300Q-US-EPA200-8-Drinking-Water.pdf](http://www.perkinelmer.com/CMSResources/Images/44-134581APP_NexION300Q-US-EPA200-8-Drinking-Water.pdf)  
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