

GROK SURF'S SAN DIEGO

Should San Diego ozonate its wastewater for IPR?
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October 5, 2010



San Vicente Reservoir, August 2010. Water level has been lowered to allow dam raise construction.

As San Diego prepares to embark on its one-year [Water Purification Demonstration Project](#) with the eventual goal of augmenting San Vicente Reservoir with purified wastewater (planned indirect potable reuse, or IPR), the biggest public concern about actually implementing that process — besides the considerable expense — will probably be water quality. The sheer persistence of the terms ‘recycled sewage’ and ‘toilet-to-tap’ in the news media is an indicator of that lingering concern.

To be sure, there’s reasonable certainty that the advanced treatment process is very reliable. Scientific studies have shown that the advanced steps of micro/ultra filtration, reverse osmosis, and UV/peroxide are effective for removal of pharmaceuticals and endocrine disrupting compounds (EDCs) from wastewater. Indeed, the City of San Diego previously completed a

small-scale [18-month pilot testing program](#) to determine the effectiveness of the advanced water treatment process being used in the new demonstration program, with the conclusion that the product water met all federal and state drinking water standards. However, the test is being repeated in this one-year project because the California Department of Public Health wants a test that would use the same size equipment and monitoring devices that we would use for a full scale project, according to Alma Rife, Public Information Officer for the San Diego Public Utilities Department.

Still, although pharmaceuticals and EDCs are held below state and federal thresholds (and are sometimes undetectable) after treatment, [it is known that trace amounts can remain](#) and there's no consensus about their cumulative effect on humans. Further, the effect of EDCs on aquatic ecosystems (e.g., feminized male fish) has certainly been documented.

There's growing awareness in many communities, being downstream from other communities, that treated wastewater already exists in their source water supply. That's called unplanned indirect potable reuse and it's certainly happening in San Diego via its imported water from the Colorado River and Northern California. Consider the following:

“...pharmaceuticals and EDCs have been detected in many water bodies around the world [...] and are now considered ubiquitous wastewater contaminants. Undoubtedly, the major contributor of such widespread contamination is municipal wastewater discharge. Indirect potable water reuse, either planned or unplanned, occurs when wastewater treatment plant discharge comprises a portion of the receiving stream's total flow. In many cases, surface water with some degree of wastewater influence is used as source waters for drinking water treatment

facilities leading to the presence of these compounds in source and finished drinking water. Thus, the propensity for surface water or drinking water contamination will grow with human population growth and generation of additional wastewater.”

*[S.A. Snyder and M.J. Benotti. [Endocrine disruptors and pharmaceuticals: implications for water sustainability](#). *Water Sci Technol.* 2010;61(1):145-54]*

The bottom line is that regardless of the source of our drinking water, whether Northern California or the Colorado River, we're presently doing unplanned IPR. So now that we're now looking at doing planned IPR through reservoir augmentation, is enough being done to address the trace contaminants that have been quietly tolerated in the past?

The treatment regime now contemplated for San Diego's IPR project is: activated sludge, secondary clarification, tertiary precipitation, micro filtration, reverse osmosis, and UV/peroxide. The treatment plan is modeled on Orange County's program because that program has already been permitted by the California Department of Public Health, according to Ms. Rife.

What about ozonation?

Ozonation is more effective than chlorine as a disinfectant and it can eliminate contaminants that even UV treatment can't remove.

One doesn't hear much about ozonation being used to treat wastewater. It's more commonly used for drinking water treatment plants. In fact, a new ozonation facility near completion at San Diego's Alvarado Water Treatment Plant is expected to go online by December (that plant treats water from San Vicente).

But when I visited the Southern Nevada Water Authority and Las Vegas Valley Water District water facilities to get a closer look at their operations, I learned that they just completed a pilot ozonation project at the Clark County Water Reclamation District, where much of their wastewater is treated (you may be aware that Lake Mead is their drinking water source as well as the destination for their treated wastewater).

Since Las Vegas already [uses ozonation for their drinking water treatment plants](#), why also for wastewater?

Doug Drury, Asst General Manager for Water Quality, Research & Technical Services at Clark County Water Reclamation Plant (CCWRP), told me that some of the thinking that went into the decision to add ozonation to the other advanced treatment procedures included:

- Substantial scientific documentation confirms the effectiveness of ozonation towards elimination of EDCs and PPCPs (pharmaceuticals and personal care products)
- In testing, 60 samples for enteric virus were negative after ozonation, but not after UV treatment alone
- Cryptosporidium was found in the Las Vegas Valley in recent summers
- Lake Mead is less than half-full now but treated wastewater inflows remain the same, so there is less dilution and an apparent increase in concentration of contaminants in the reservoir
- Potential environmental impact on aquatic ecosystems
- Downstream water user concerns



HPLC unit at the Southern Nevada Water Authority Water Quality Laboratory

Not only did CCWRP perform that pilot study, but they approved \$50 million for a permanent ozonation system. That's a good sum of money; obviously they're convinced that ozonation is doing something good. Interestingly, it appears they will also phase out reverse osmosis because of the 10-15% water loss involved in disposing of the resulting brine.

Ozonation is [cited in another study](#) as being the "most responsible for the removal of pharmaceuticals and EDCs" and "though many ozone plants also utilize chlorine, ozone is a stronger oxidant."

In San Diego we're looking to augment a reservoir that's a lot smaller than Lake Mead. The San Vicente Reservoir will eventually have a capacity of around 250,000 acre-feet [after the dam raise is complete](#). There's only so much dilution that can occur when you add 16 million gallons per day of treated wastewater to a reservoir that size. So while public perception may find it acceptable to dilute wastewater in a large body of water such as Mead within the flow of the Colorado River, it could well

be that the public will balk at the same thing being done at San Vicente Reservoir — and remember, public perception killed San Diego's IPR project last time it was attempted.

Adding ozone to the IPR treatment regime could ease the public mind, but it's probably a far-fetched idea for us. Ozonation on the wastewater side might convince some people who are still undecided about indirect potable reuse but it would be an extreme expense for what would really be a marginal benefit — and we're already being squeezed with rising prices for water. Besides, we haven't even managed to treat the bulk of our wastewater stream to secondary standards yet.

Ultimately, education will be key to a successful IPR project. The city's public outreach and education program for the Demonstration Project has gotten underway with meetings with neighborhood planning groups, but those are just introductory project overviews. The challenge will be to go beyond the generalities (such as provided in the monthly IPR updates to the NR&C city council committee) and share complete, up-to-date, highly detailed water quality and cost information about IPR regularly and persistently. Tours of the new advanced treatment facility have been promised; the same should be done with the water quality lab. A blog-like news section on the city's project website could help to stream out the details.

Many San Diegans have been squeamish about IPR despite it being a proven and safe technology. Providing access to plenty of information will be vital for overcoming that problem. On that note, this report from the independent [Equinox Center](#) is deserving of wide circulation (reprinted with permission).