

Water reuse has always been a top priority of the Orange County Water District (OCWD) and Orange County Sanitation District (OCSD). This commitment, along with the need to ensure enough safe, high-quality water for the future, came to the forefront nearly a decade ago when the two public agencies proposed the Groundwater Replenishment (GWR) System.

The GWR System will provide a new supply of reliable, high-quality water for north and central Orange County by purifying highly treated sewer water through state-of-the-art microfiltration, reverse osmosis and ultraviolet light and hydrogen peroxide treatment. The result will be water of near-distilled quality. The GWR System will be dedicated in spring 2006.

To underscore the agencies' commitment to safety and quality, OCWD and OCSD commissioned water quality studies on the project in 2000. The studies were intended to provide additional information on the safety of the proposed treatment process and the use of water from the GWR System to replenish the groundwater basin underlying north and central Orange County. The water quality study tested the proposed treatment processes on the same source water as that for the full-scale GWR System. Real operating data (not a textbook study) was used as the basis for the water quality evaluation.

Published Findings Confirm Safety

In findings released in 2001, the studies concluded that the water produced by this system would be safe for consumers and actually improve the groundwater basin's overall quality. The findings were published in a report called the "Groundwater Replenishment System Water Quality Evaluation."

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OCWD and OCSD also appointed an independent advisory committee to provide an additional level of expertise and a review of the studies. The advisory committee concurred with the report's findings. The advisory committee was composed of recognized experts in the

fields of public health, microbiology, environmental engineering, toxicology and risk assessment, including professors from UC Davis, UC Berkeley, and the University of North Carolina.

Even before the water quality studies were completed, the GWR System had undergone rigorous scrutiny by interested citizens, water experts and local, state and federal officials. The first extensive study, an environmental impact report/statement prepared in 1998-99, found the project will have no significant adverse environmental impacts and noted that "the quality of the recycled water is expected to be better than that of alternative water supplies" available to Orange County.

Following the environmental review, OCWD and OCSD decided to further confirm these findings and took the additional step of conducting the water quality studies.

Conducting the Studies

The purpose of the studies was to compare waters representative of two alternatives. Under one option ("No Action"), the groundwater basin would continue to receive water from the Santa Ana River and the county's two imported supplies, the Colorado River and Northern California, just as it does today. Under the other alternative ("Proposed Action"), water produced by the GWR System would be added to the existing blend.

"Groundwater Replenishment System product water is projected to pose much less risk...from bacteria, parasites and viruses..."

The experts who conducted the studies employed methods consistent with the U.S. Environmental Protection Agency's guidance for risk assessment. They used estimates of the relative risks to human health associated with each water source to compare the supplies. They analyzed samples from the three sources and identified constituents of potential concern in each.

Conclusions Concerning Public Health

In keeping with standard practices in such analyses, the studies divided the possible health risks associated with the three water supplies into three categories: non-carcinogenic, carcinogenic and microbiological contaminants. In brief, the conclusions drawn about the three categories follow:

Risks associated with non-carcinogenic health effects. Water from any of the three sources should not cause significant non-carcinogenic risk to public health. Indeed, the potential risk posed by GWR System water is lower than the other two sources.

Risks associated with carcinogenic health effects. The carcinogenic risks associated with direct consumption of water from the GWR System should be lower than that associated with either Santa Ana River or imported (purchased) supplies from the Colorado River and Northern California.

Arsenic is the constituent that accounts for the majority of the risk in both alternatives ("No Action" and "Proposed Action.") However, the levels of arsenic in all three water sources are below the existing regulatory minimum levels for public safety.

N-nitrosodimethylamine (NDMA) and 1,4 dioxane, which are used primarily as research chemicals, present more carcinogenic risk than any other constituent identified in GWR System water. (At the time this study was performed, the California Department of Health Services had not established regulations regarding maximum levels of NDMA or 1,4 dioxane in drinking water. It should be noted, however, that the newer membrane technologies – microfiltration and reverse osmosis – along with the addition of ultraviolet light and hydrogen peroxide that will be used in the GWR System will remove emerging compounds such as NDMA and 1,4 dioxane.)

Risks associated with microbiological contaminant health effects. GWR System water is "projected to pose much less risk than Santa Ana River or imported water supplies from bacteria, parasites and viruses, provided that all processes in the system treatment facility are operating fully and properly," the report said.

It is important to note that for purposes of the studies, the experts assumed that each supply was consumed directly, before being used to recharge the groundwater basin. In fact, GWR System product water will be percolated into the groundwater basin where it will remain for at least one year. This will allow the GWR System water to undergo the natural filtering process while blending with water from the Santa Ana River, Northern California and the Colorado River.

Recommendations Concerning Operations

The conclusions about public health risks assume that the full-scale GWR System produces water of a quality similar to that evaluated in the studies. To ensure such production, the study concludes that the system should incorporate a detailed monitoring program to ensure ongoing reliable operations in both treatment and pipeline conveyance. The program should include a plan to dispose of water that does not meet standards, the study said. (The GWR System will include constant monitoring programs.)

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Conclusion of Independent Advisory Committee

The independent advisory committee reviewed the report and summarized the findings. The committee agreed with the report's findings and concluded that “the health risk associated with the quality of recharge water expected under the ‘Proposed Action’ (GWR System) will be less than or equal to that associated” with the status quo.

Preparation of Risk Assessment

EOA Inc., an environmental and public health engineering firm based in Oakland, conducted the risk assessment studies. In addition, OCWD and OCSD organized the independent advisory committee. The committee members were:

- Robert C. Cooper, Ph.D., professor at UC Berkeley (microbiology, virology, public health).
- George Tchobanoglous, Ph.D., P.E., professor at UC Davis (environmental engineering).
- Eddie Wei, Ph.D., professor at UC Berkeley (toxicology).
- Douglas Crawford-Brown, Ph.D., professor at University of North Carolina (environmental science).
- Margie Nellor, M.S., Los Angeles County Sanitation District (health effects).

OCWD and OCSD also assembled a group of six ex-officio advisors to ensure that local stakeholders and staff from the appropriate health and regulatory agencies understood and accepted the assessment. The advisors represented the California Department of Health Services, the Santa Ana Regional Water Quality Control Board, the City of Anaheim and also included a Congressional Fellow.

To see a copy of the Executive Summary of the report, please contact the Orange County Water District Public Affairs Department at 714-378-3206. Copies of the full report are in the OCWD Technical Library.

How the System Works

The Groundwater Replenishment System, a joint project of the Orange County Water District and the Orange County Sanitation District, will use state-of-the-art membrane technology and ultraviolet light to produce water of near-distilled quality that exceeds state and federal drinking water standards. The water will then be used as another source to replenish Orange County's groundwater basin, along with water from the Colorado River, Northern California and the Santa Ana River.

The process will begin with highly treated sewer water from OCSD's Fountain Valley facility. This water will undergo several additional treatment steps, also referred to as an "integrated treatment process," that includes microfiltration, reverse osmosis and ultraviolet light and hydrogen peroxide treatment.

After undergoing this additional treatment, the water will be used to replenish the groundwater basin underlying north and central Orange County. The purified water will be pumped to spreading basins and travel the same natural filtering path that rainwater takes as it moves underground. It also will be used to expand the Seawater Intrusion Barrier that keeps the Pacific Ocean out of the groundwater basin.

Once in the basin, the purified water will blend with other groundwater from the Santa Ana River and imported sources.