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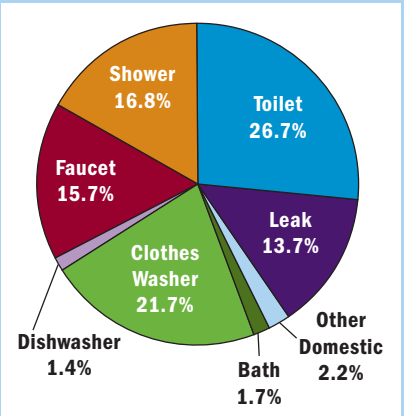
High-Desert City Decreases Water Scarcity Problems

Faced with a dwindling water supply, Albuquerque, N.M., launched an aggressive multifaceted program to address conservation, sustainability, and treatment. BY JERRY SCOTT AND GERMAN ANDRADE

ALBUQUERQUE, N.M., sits on a high desert mesa. Despite an arid climate and annual precipitation averaging less than 10 in., citizens believed a vast underground reservoir provided an adequate water supply. However, a 1993 US Geological Survey report revealed alarming news: the reservoir was being drained faster than it was being replenished, and, without significant changes, water availability would be seriously threatened. Studies revealed the water level had dropped about 160 ft since 1960, and only half the water removed from the aquifer was being replenished.

Figure 1. Indoor Water Use
Toilets and clothes washers use the most indoor water in Albuquerque.



The situation prompted the Albuquerque Bernalillo County Water Utility Authority, the largest water utility in New Mexico, to launch a multifaceted program to address sustainability. The utility uses about 32 bil gal/year from surface and groundwater resources to provide water and wastewater services to the greater Albuquerque metropolitan area, servicing more than 200,000 customer accounts and about 580,000 water users.

PROGRAM DETAILS

The program included water conservation, commissioning a surface water plant to supplement deep wells, a recycling and reclamation program, and conversion to on-site hypochlorite generation for water disinfection.

Conservation. The utility began by implementing a conservation program. Because Albuquerque citizens were using more than 40 percent of their drinking water for landscape irrigation, the utility implemented strong incentives to reduce indoor and outdoor use. Current conservation measures include

- Restrictions on use of sprinklers between 11 a.m. and 7 p.m., April through October, to reduce water loss from evaporation and wind drift
- Month-to-month watering schedule guidelines
- Free xeriscape design templates, lists of suitable xeric plants, online "how to" xeriscaping guides, and xeriscape and landscape seminars
- Discounts, rebates, and credits for attending the utility's irrigation efficiency class, improving sprinkler and irrigation systems, removing "thirsty" lawns, and implementing rainwater harvesting
- Campaigns that emphasize reduced time commitment for yard work and cost savings associated with xeriscaping
- Free water-use audits for residential and commercial customers to help them improve efficiencies, usually resulting in post-audit savings of 8 percent
- Information reflecting average family use of indoor water flow and indoor water use
- Rebates for low-flow appliances, including toilets, showerheads, washing machines, and hot water recirculation systems, targeting more than 65 percent of the most common indoor water consumption points

Utility technicians (left to right) Jose Trevino, Jaime Soto, and Mark Mora work on the Albuquerque Bernalillo County Water Utility Authority's new on-site hypochlorite generator. The system treats 9,000 gpm of water from four wells and provides up to 200 lb per day of free available chlorine, using only salt as a feedstock.

PHOTOGRAPHS: ALBUQUERQUE BERNALILLO COUNTY WATER UTILITY AUTHORITY

- A reporting system for water-waste violations, followed by scheduled field inspections
- Associated fees for proven violations, with progressively heavier fines for repeat violators

The conservation program has been highly successful. Customers who've attended the irrigation efficiency class have reduced their water use about 20 percent vs. customers who haven't attended. Daily water use had a historical peak of 214 mil gal in 1993. Since then, water consumption has been decreasing steadily, with 2009 peak day consumption of only 163 mil gal despite a growing population. Per capita water use has been reduced from approximately 250 gal per capita/day (gpcp/d) in 1995 to 157 gpcp/d today—nearly a 38 percent reduction.

Surface Water Plant. Until recently, all water was supplied via deep wells drawing from the underground reservoir. A new surface water treatment plant was commissioned in December 2008 to allow the aquifer to recharge. The surface water plant provides up to 75 percent of water demand today. Surface water, imported from the Colorado River Basin, flows through a tunnel under the Continental Divide and down the Chama and Rio Grande rivers to Albuquerque's north side.

Recycling and Reclamation. The utility also reclaims wastewater and industrial water to irrigate golf courses and public parks, supplying about 10 percent of total annual consumption. When facility expansions are complete in mid-2011, the utility will operate New Mexico's largest wastewater re-use program, ultimately saving 977 mil gal of drinking water/year. The utility has already identified 14 schools and parks, six recreational areas, seven landscape areas, and one industrial customer that will use the reclaimed water.

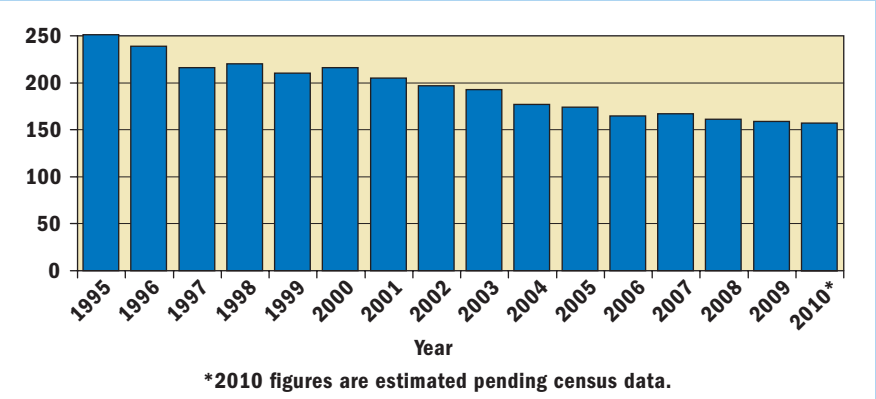
"By polishing and reusing wastewater to irrigate turf, we can save our high-quality drinking water and continue to reduce our reliance on nonrenewable water from our underground aquifer," says Trudy Jones, chair of the utility's governing board.

On-site Hypochlorite Generation. The utility's sustainability initiative is also reflected in its disinfection scheme, which uses on-site hypochlorite generation (OSHG), a process that applies an electrical charge to a salt solution, converting the brine to a dilute bleach that's seven times less concentrated than household bleach. The only feedstock is salt, which means—unlike conventional disinfection options—no hazardous chemicals are stored or transported. OSHG provides a safer environment for residents and workers and offers significant cost savings, which frees funding for other sustainability efforts.

Water-level data indicate the aquifer has already begun to recharge, allowing this valuable resource to be held in reserve for times of drought.

Figure 2. Daily Water Use

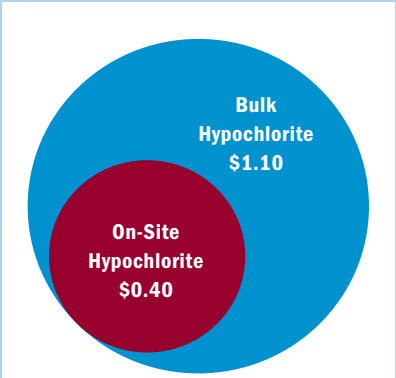
Albuquerque has reduced its average per capita water use by 38 percent in the last 15 years.



*2010 figures are estimated pending census data.

Figure 3. Average Cost for Disinfection

On-site hypochlorite costs about one-third of the price of bulk hypochlorite.



When deciding to eliminate chlorine gas in 1997, the utility tested 12 percent bulk hypochlorite. However, problems with leaks and solution degradation prompted the utility to choose on-site generation of 0.8 percent hypochlorite. The first OSHG system was installed in 1997, and all wells were soon operating with OSHG. The decision to implement an OSHG system was a good one. Today's operating costs of about $0.40/lb free available chlorine (FAC) is about one-third the average cost of 12.5 percent bulk hypochlorite. During the last decade, advances in technology have further enhanced cost savings, safety, and maintenance requirements.

As of late 2010, one-quarter of the utility's well fields were converted to new hypochlorite generators. Ease of maintenance sealed the deal for Senior Engineer Bob Sidhu. "The previous OSHG system had a bulky cell that was difficult to remove," relates Sidhu. "The new system cell is a lot easier to manage. It can be removed and cleaned quickly. In addition, most of the parts can be purchased in town."

The utility has implemented other innovations to complement on-site hypochlorite disinfection. Doing its own design and installation work, the utility can tie the systems into its supervisory control and data acquisition system and existing plumbing.


Trucks usually deliver salt in 25-ton loads.

Using an innovative pneumatic method, the utility also delivers bulk salt to each well house. The salt supplier delivers a 25-ton truckload of bulk solar salt to a large storage bin located at the surface water treatment plant, and utility staff uses a 7,400-lb truck to move smaller quantities of salt to each hypochlorite generation system. The salt is blown pneumatically into smaller brine generators. The procedure reduces the amount of labor formerly required with loading and unloading 50- or 80-lb bags of salt, as well as potential injuries.

SHAPING THE FUTURE

The utility's success to date has relieved pressure on the aquifer. US Geological Survey water-level data indicate the aquifer has already begun to recharge, allowing this valuable resource to be held in reserve for times of drought. The utility plans to remain on the cutting edge of technology and conservation options in years to come. Future projects include aquifer storage and recovery, as well as landscapes irrigated with harvested rainwater.