

**SEWER AUTHORITY MID-COASTSIDE**

Staff Report

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**Subject / Title**

Discuss and Possibly Take Action on Recycled Water

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**Staff Recommendation:**

Discuss and Possibly Take Action on Recycled Water.

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**Fiscal Impact:**

None.

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**Discussion/Report:**

This agenda item is regularly agendized to allow the Board to continue discussion on recycled water.

The final draft of the California Recycled Water Policy was scheduled to be published January 23, 2009 (after this agenda was published) and is planned to be adopted February 3, 2009 by the State Water Resources Control Board. SAM staff will post this draft on SAM's Recycled Water webpage as soon as it becomes available and will send a link by email to SAM Directors

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## **STAFF REPORT**

**To:** Coastside County Water District Board of Directors

**From:** David Dickson, General Manager

**Agenda:** January 13, 2009

Report

Date: January 9, 2009

**Subject:** Water Reclamation – Status and Next Steps

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### **Recommendation:**

None. Information only.

### **Background:**

#### **Status of Efforts Toward Partnership with SAM**

The CCWD Board recognized at its August 12, 2008 meeting that the most logical next step in developing a water reclamation project would be to form a partnership with SAM as the recycled water producer. Starting with my letter to SAM Manager Jack Foley on August 18, CCWD has aggressively pursued the effort to bring about a joint meeting with SAM representatives to discuss reclamation. To date, SAM committee members have not been available for such a meeting.

My letter to Jack Foley expressing the District's continued interest in working with SAM toward a water recycling partnership and requesting that he give us meeting dates as soon as possible is attached.

#### **Next Steps**

The most important next step we need to take is to form a productive working relationship with SAM. I do not believe either SAM or CCWD has a realistic prospect of successfully implementing a water reclamation project without the consent, cooperation, and support of the other.

Acknowledging that developing a partnership with SAM will require some time, these are the next steps I feel the District should take in keeping with our role as the retail water supplier and recycled water distributor:

1. **Analyze CCWD's Water Supply Needs:** We will need a comprehensive, quantitative analysis of the District's water supply picture in order to

determine the benefits additional supply realized through reclamation will provide to existing water customers.

2. **Develop Preliminary Reclaimed Water Pricing and Terms Scenarios:** Financing recycling capital and operations costs will require that recycled water customers sign long-term agreements to buy recycled water at specified quantities and prices and that the District's other customers, through their water rates, provide a subsidy for recycled water and assume some degree of risk associated with securing the financing. Developing preliminary pricing and terms will give us a basis for opening commercial discussions with key reclaimed water users.
  
3. **Initiate Discussion with Key Reclaimed Water Users:** Four District customers (Ocean Colony Partners, Skylawn, Nurserymen's Exchange, and Bay City Flowers) are the primary customers for reclaimed water. The project's feasibility will depend on whether these users will commit to long-term agreements based on the reclaimed water pricing and terms we are able to offer.

Staff will bring specific proposals for accomplishing these next steps to the Board at the February meeting.

January 9, 2009

Mr. John F. Foley III  
Manager  
Sewer Authority Mid-Coastside  
1000 N. Cabrillo Highway  
Half Moon Bay, CA 94019

**Re: CCWD-SAM Partnership for Water Reclamation – Joint Committee Meeting**

Dear Jack:

With nearly five months having passed since Coastside County Water District first reached out to Sewer Authority Mid-Coastside with a request to work with us on water reclamation, we still have not been able to take the first step toward that objective. I am writing to express CCWD's continued interest in working with SAM on water recycling and to request that you provide us as soon as possible with dates on which SAM representatives could participate in a joint meeting.

As we have discussed, the CCWD Board of Directors feels that the best way to realize the benefits of water reclamation for the coastside is through a partnership between SAM as the recycled water producer and CCWD as the recycled water distributor. The District Board appointed a Water Reclamation Committee on August 12, 2008 for the purpose of meeting with a similar committee from SAM to work toward such a partnership. On August 18, I wrote to you requesting that the SAM Board consider doing the same.

We were pleased with the SAM Board's decision at its November 24 meeting to authorize the SAM Water Recycling Committee to participate in a joint session with CCWD's Water Reclamation Committee. On December 1, we gave you nine possible meeting dates in December. The SAM representatives were not available on any of those dates, and I understand from our phone conversation yesterday that you are still working to identify a date when the SAM Water Recycling Committee members might be available for a joint meeting.

We look forward to hearing from you in the near future.

Sincerely,

A handwritten signature in black ink, appearing to read "David R. Dickson". The signature is fluid and cursive, with a long horizontal stroke at the end.

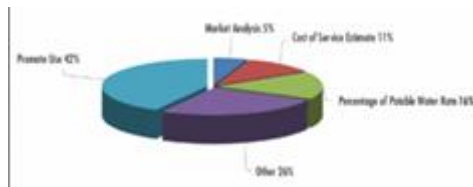
David R. Dickson  
General Manager

## Survey Examines Reclaimed Water Rates, Charges

By Dina M. O'Reilly and Cil Pierce

Planning for future potable water supplies has become an increasing concern for utilities nationwide. Water reuse has become an important means of meeting future supply requirements and more stringent wastewater regulations. However, the pricing and recovery of costs associated with reclaimed water has been an obstacle for many utilities.

In 1999/2000, the American Water Works Association and Water Environment Federation joined forces to survey 500 water reuse utilities throughout the United States. The purpose of the survey was to create a national database on the different approaches the utilities used to finance their water reclamation programs and how rates were being set. In 2007, twenty-three key questions from the original survey were chosen to update the original survey.



### *Rate Development*

Responses were received from 10 states, with approximately 48% from California and 16% from Florida. Utilities in Arizona, Colorado, Georgia, Hawaii, New Mexico, Nevada, Texas, and Washington also provided responses.

The majority of survey respondents served retail customers for both surveys, as opposed to wholesale or both. This is an important point as historically, reclaimed water has been used for specific purposes (i.e., golf courses, industrial, etc.)

A majority of respondents produce their own reclaimed water (84%), while a small percentage purchase. Of the 109 participating utilities (2000), 71% were public or municipal utilities.

The driving force for the reclaimed water programs appeared evenly split among stringent regulatory concerns, economic factors, conservation, and

lack of potable water supplies. Environmental factors play a small part in the decision of some utilities. Creating a sustainable water source and improving water quality were factors in promoting a reclaimed water program.

## **Funding, Rates and Charges**

Improving wastewater treatment facilities to supply reclaimed water is costly and funding options vary.

One possible option is a direct contribution or financing from a major user of the project.

Other funding sources include long-term debt instruments and grants. These may include revenue bonds, low interest loans and grants.

## **Cost Recovery**

Agencies were asked about annual operating costs recovery. In both the 2000 and 2007 survey, the majority of utilities were recovering less than 25% of their annual operating costs. Generally speaking, if reclaimed water rates were set at the cost of service, they might be higher than potable water rates and would discourage reuse consumption. The costs for reclaimed water may be greater than potable water costs due to the increased treatment required along with the cost of a non-potable distribution system.

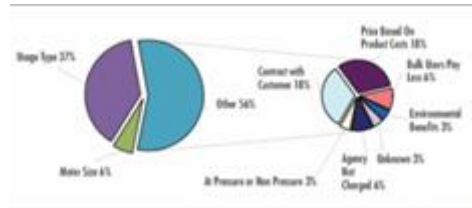
Reuse rates are typically set at a level less than the potable water rate. Any cost difference between actual cost of service and a set rate will have to be generated from some other source, whether through the potable water rate, wastewater rate, or other subsidy. In the 2007 survey, 24% recovered revenue from the potable water customers, 58% from wastewater and 18% from a municipal or regional subsidy.

## **Categories of Benefit**

Benefiting parties should be responsible for any revenue short-fall. In that respect reclaimed water can:

- Benefit a utility's existing water customers by deferring or eliminating the need to develop new sources of supply. Customers pay for the reclaimed water system through water bills.

- Benefit existing wastewater customers if no or fewer upgrades are needed for the system to meet regulatory requirements because of reuse standards. This can defer, reduce or eliminate the need to develop additional treatment capacity. Existing customers pay for the reclaimed water system through wastewater bills.
- Benefit new water customers only. New customers need new sources of supply. The utility's new potable water customers pay for the reclaimed water system through system development charges.



### *Price Variance Type*

These options are not mutually exclusive, but can be combined based on the proportion of benefits received in each category.

### **Development of Rates, Charges**

As water reuse became more prevalent, many utilities were looking for examples of how other utilities charged for this resource.

A quarter of the utilities in 2000 set rates to promote the use of reclaimed water. For some utilities promoting use is more important than recovering the full cost of reclaimed water. Other utilities determined rates based on market analysis (9%), cost of service estimate (14%), or as a percentage of potable water rates (19%). This last method is more common. Those who answered "to promote use" also have set the rate at some percentage of the potable water rate. Of the 34% of utilities who answered "other" nearly half did not charge for their reclaimed water. By 2007, nearly half of respondents set their reclaimed water rates to promote use.

Most market research indicates the maximum rate at which to set reclaimed water rates is the potable water rate. In both surveys, rates for reclaimed water varied from 20% to 100% with the median rate being 80% of the potable water rate.

## Rate Design Considerations

Traditional rate making dictates that different considerations may be taken into account as rates are being set. Establishing a cost-based rate is one of the more important traditional rate setting criteria. As discussed previously, the full cost of reclaimed water may not be collected. Instead, the utility must determine its overall policies, goals and objectives and develop a rate structure that best meets those needs.

When setting reclaimed water rates, the impact to potable water revenue also should be considered. As more reclaimed water is used, less potable water may be consumed and revenues will be impacted.



*Uniform Rate Structure*

## Rate Structures

There are various “generally accepted” rate structures used to develop rates. Generally, a rate is composed of a fixed charge and a volumetric/variable charge. Fixed costs are collected as a fixed charge on a monthly basis (e.g., \$5 per month/meter) regardless of the customer’s level of consumption. Not all utilities may charge a fixed charge during the non-irrigation season when reclaimed water is not generally used, but may charge during the irrigation season. Utilities may also charge solely on a volumetric rate.

Variable charges are generally based upon metered consumption and charged on a \$/unit basis. The two most common rate structures for variable charges for reclaimed water are a uniform charge, and an inverted block charge.

The rate structure concepts noted above may be combined used to form various rate design options that meet the utility’s needs. For example, in the Southwest, where even reclaimed water resources are limited, additional consumption is discouraged and an inclining block rate may be used.

The 2007 survey indicated that a uniform rate structure is most commonly used. This was relatively unchanged from the 2000 survey, with a small percentage having inclining rate structures. A growing number of utilities are setting inverted block rates, to recognize the increased costs of reuse, and avoided costs of new potable water resources.

## System Development Charges

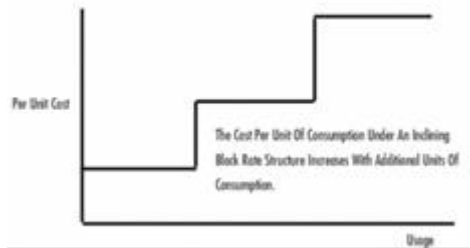
Reclaimed water system development charges for new customers connecting to the systems are a means of collecting revenue to help offset the capital needs of the system. Care must be taken to develop these fees accurately. In both surveys, more than 70% of the utilities did not include a system development charge for new customers. SDCs for the 26 utilities who did charge them ranged from \$225 up to as much as \$43,000 depending on the size of the meter and demand from the customer.

## Survey Billing Results

When it comes to billing customers, policies varied for the initial survey respondents. Some customers, 37%, were billed on usage, while 6% were billed on meter size. The majority of the respondents answered "Other". Billing information did not change dramatically between surveys.

## Conclusion

The uses of reclaimed water, financing, cost recovery policies, and rate design strategies vary greatly throughout the country. Utilities do agree on the benefits and need for reclaimed water. Reclaimed water is a key to successfully planning future water resources, or as one respondent said, "It just makes sense."



*Inclining Block Rate  
Structure*

Thanks go to Guy Carpenter, Shawn Koorn, Christopher Haney, Gary Jacobi, Gary Grinnell, Craig Riley, Alan Rimer, Kenneth Thompson, and Don Vandertulip for their contributions to this report. For more information, the full report can be found at [www.awwa.org/waterwiser](http://www.awwa.org/waterwiser). WW

*About the Authors:*

*Dina M. O'Reilly is a management/financial analyst with HDR. Cil Pierce is a senior financial analyst with HDR. Both are based in the firm's Bellevue, WA, office.*

*WaterWorld* December, 2008

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# Blue is the New Green

Forget for a moment about carbon emissions. The world is facing a more immediate crisis -- it is running out of clean water. The prospect of widespread shortages is creating a new kind of new economy. Meet 11 entrepreneurs who are ahead of the curve, finding opportunity in the largest emerging market the world has seen in some time.

**From:** [Inc. Magazine, November 2008](#) | **By:** Adam Bluestein

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First, some numbers. The United Nations estimates that by 2025, two-thirds of the world's population will face periodic and often severe water shortages. And the problem is not limited to the developing world. Here in the U.S., water managers in 36 states are predicting significant shortfalls within the next decade. Even in regions that do have sufficient supplies, aging infrastructure, inadequate treatment facilities, and contamination pose more problems. No surprise, then, that battles over water rights are becoming commonplace, pitting states and sometimes nations against one another in increasingly bitter conflict.

Analysts estimate that the world will need to invest as much as \$1 trillion a year on conservation technologies, infrastructure, and sanitation to meet demand through 2030. As in the past, most of the large capital-intensive projects will be done by the usual multinational corporations and engineering firms. But the extent of the problem and the demand for new technology to address it present -- pardon the metaphor -- a kind of perfect storm for entrepreneurs. "Small companies with intellectual property, significant know-how, and a product that's scalable can stake out a niche below the radar of the large companies," says Laura Shenkar, a water expert and consultant in San Francisco. "This is an opportunity that will generate Googles."

In the pages that follow, *Inc.* examines the emerging water economy and takes a trip along the water trail, from source to sewer. Our guides on this journey: 11 extraordinary entrepreneurs who are creating radical change at every step of the way. Some of their innovations are striking in their simplicity. Mark Sanders's AQUUS System uses water from bathroom sinks to fill toilet bowls. Others push at the limits of science and technology. Fatemeh Shirazi, for example, is "training" microorganisms to kill pollutants in water. What they share is a vision, a drive, and an address -- the sweet spot at which blue meets green.

## Increasing the Supply

Born in Swaziland, raised in Zimbabwe, and educated in South Africa, Amanda Brock knows what water scarcity looks like. "I have seen and lived through waterborne diseases, childhood mortality, cholera, typhoid," she says. "I have lived the poverty that comes from inadequate access to a fundamental resource like water. And with global warming, it's getting worse."

The desire to do something about it is what led the former Enron executive and water-industry consultant to take the CEO spot at Water Standard, a start-up founded by Florida entrepreneur Andrew Gordon. Water Standard plans to bring water to dry regions in a new way: by installing state-of-the-art desalination plants inside retrofitted tankers and delivering freshwater, via pipeline or by ship, to thirsty cities on the shore.

The ships, which Brock says can be outfitted in less than a year at a cost of about \$150 million, will be anchored from one to five miles offshore and will be capable of producing up to 75 million gallons of freshwater a day -- enough to meet the basic residential water needs of a small city. And because they will operate in deep water rather than close to shore, the ship-based plants should promise to virtually eliminate the negative environmental side effects often cited by critics of desalination.

Specially designed intakes will draw seawater from a greater depth and at a slower speed than typical desalination facilities, thus reducing injury to aquatic life, and the concentrated brine produced in the desalination process will be thoroughly and rapidly diluted before it is returned to the sea, far from the more ecologically sensitive zone close to shore. While the ship-based plants will have a carbon footprint -- initially, they will run on marine-gas turbines or new emissions-compliant diesel generators -- Brock hopes eventually to generate energy using ocean-current or wave-action turbines.

Freshwater already is exported via tankers between France and Algeria and Turkey and Israel. And smaller-scale barge-based desalination systems operate in the Middle East and India. Tom Pankratz, a desalination consultant and the editor of *Water Desalination Report*, expects mobile barge- and ship-mounted systems to play an important role in increasing the supply of freshwater -- whether by addressing site-specific environmental concerns or space limitations, getting facilities up and running faster than the two to seven years it takes to construct a land-based plant, or responding to emergency or temporary needs.

Investors seem to like the idea. In March, Water Standard secured \$250 million in venture funding, one of the largest investments to date for a water start-up. The company's first vessel -- a tanker that's currently used to transport vegetable oil -- should be ready to sail sometime in 2009. And thanks to recent regulations requiring that oil tankers be double hulled, there is an abundance of older single-hulled ships that are perfectly suited to join the fleet. Brock has spent much of the past year meeting with investors and potential customers in the Middle East, Chile, Cyprus, India, and China.

Whether based on land or at sea, almost all desalination plants built after 2000 use a technology called reverse osmosis, or RO, to get the salt out. Water is pushed at high pressure through a membrane that lets freshwater pass through but blocks salt and contaminants. RO technology is generally more efficient than other desalination methods that use heat to evaporate and distill water, but it still requires a lot of energy -- at seawater plants, almost half the costs are for the electricity required to push water through the membranes. This makes desalination one of the most expensive ways to produce freshwater: The cost of producing 1 cubic meter (264 gallons) of desalinated water ranges from about \$1 to \$1.50, compared with 10 cents to 20 cents to obtain water from a reservoir or well. (Average U.S. daily household use is about 350 gallons.)

The Los Angeles-based start-up NanoH2O is working on a way to make the process a lot more efficient. The company was founded in late 2005 by Robert Burk, an engineer with extensive experience on water and wastewater projects, and current CEO Jeff Green. It is now ramping up for mass production of a nanocomposite membrane based on technology developed by researchers at UCLA led by Eric Hoek, a professor of civil and environmental engineering. In pilot studies, it has proved nearly twice as productive as existing membranes -- meaning you can get almost twice as much water with the same energy input or the same amount of water for half the energy -- and has the potential to reduce the total expense of desalinated water as much as 25 percent. That would make it a far more attractive proposition for communities looking to diversify their water portfolio.

Unlike traditional RO membranes, which are just filters made of a dense polymer, NanoH2O's polymers interact with "thirsty" nanoparticles to draw in water and repel salt and contaminants as well as the organic materials and bacteria that tend to adhere to conventional membranes and decrease efficiency over time. The technology was an academic research project when Burk and Green, a serial entrepreneur who previously founded the software start-ups [Stamps.com](http://Stamps.com) and Archive Inc., came across it in their search for a water-related technology to build a company around.

Why water? It's where the action is, Green says. Software, he believes, has largely become commoditized. With water, on the other hand, "core technology and intellectual property are still differentiators," he says. "As an entrepreneur, when you see the scarcity issues, and you see that technology can make a difference and that it's still a little early on the curve, all those factors led to a decision that it would be a good time to start to look into this."

Green and Burk moved quickly to secure the intellectual property through UCLA's tech transfer program and closed a seed round to speed up work. In 2007, the company received \$5 million from Khosla Ventures, the clean-tech investment group led by Sun Microsystems co-founder Vinod Khosla. In August, it got \$15 million more from Khosla and Oak Investment Partners. Now, with 11 employees and several prototypes being tested in the field, NanoH2O is in the process of shifting from a research and development venture to an operating company, with the goal of bringing a product to market by the end of next year. The market for RO membranes is dominated by big players -- including Dow, General Electric, Koch Industries, and the Japanese companies Nitto Denko and Toray. But Green is unfazed. "As big as Dow or GE are, they don't apply all their energies to reverse osmosis -- if you have the resources to stay independent, you can compete for that segment," he says. "For me as an entrepreneur, it's an exciting place to be."

Desalination, of course, is well and good for communities that are close to the ocean and that can afford relatively expensive water. In the villages of sub-Saharan Africa, that's not the case. Forty-two percent of the region's population lacks access to a safe water supply, and the impact of waterborne diseases on public health is staggering: Of the 396 million cases of malaria every year, the majority are in sub-Saharan Africa; 90 percent of those who die from the disease are children under 5. About 100 million Africans are infected with the parasitic disease schistosomiasis, which kills tens of thousands annually, also mostly children. The death toll from diarrheal diseases is probably much higher. What's more, a lack of reliable, clean water precludes meaningful economic development. By one estimate, some 40 billion hours a year are spent

collecting water in sub-Saharan Africa -- or roughly a year's labor for the entire work force of France. The work usually falls to women and children, who are left with little time for things like growing food or going to school.

Moving Water Industries, an 82-year-old, family-owned manufacturer of water pumps based in Deerfield Beach, Florida, has been selling portable pumps for irrigation and flood protection in Nigeria for more than 30 years. But its mission in Africa has taken on a new focus: addressing the problem of safe drinking water in rural villages. The company's solution is the SolarPedalFlo, a solar- and pedal-powered pump that can provide filtered and chlorinated water for thousands of people a day -- three to four times the amount that can be produced from a borehole equipped with a hand pump. Each unit costs about \$15,000.

Working with local governments, nongovernmental organizations, and the U.S. Agency for International Development, MWI has been able to install hundreds of the pumps in 12 African countries. The company is just introducing the technology in Central and South America and has one unit installed in the Philippines. With the hopes of speeding adaptation in Africa, it is in discussions with Green WiFi, a U.S.-based volunteer group that is working to install solar-powered Wi-Fi networks in the developing world. Together, the companies would be able to offer a compelling infrastructure two-for-one: clean water and Internet access powered by the same set of solar panels. William Bucknam, MWI's vice president and point man in Africa, hopes that pressure to meet the U.N.'s Millennium Development Goals -- decreasing the number of people without access to safe drinking water by half by 2015 -- will encourage more of the public-private partnerships that will be needed for the technology to spread. "It's a huge problem," he says, "and we believe we have the answer."

## **Treating It**

In spring 2007, the Department of Homeland Security issued an alert about a new terrorist threat: chlorine truck bombs. At least five had been exploded in Iraq, killing scores of people and injuring many more who inhaled toxic fumes. The insurgents who carried out the attacks probably stole the chlorine from water-purification and sewage treatment plants, which use the chemical for disinfection. Authorities here worried about the 2,000 or so U.S. water systems that store Environmental Protection Agency -- regulated quantities of chlorine. More than 100 treatment facilities are in densely populated areas, where an explosion could expose more than a million people to toxic gases.

Some say the threat was overrated. But the underlying facts were real -- and for at least one company, the heightened awareness was good news. MIOX, an Albuquerque-based outfit founded in 1994, makes compact generators that allow water treatment facilities to produce a liquid chlorine -- based solution on-site, using only water, salt, and electricity, eliminating the need to store or transport hazardous chemicals. (The company also makes a hand-held battery-powered version of its generator, used by backpackers and military personnel.)

The gold standard of disinfection for more than 100 years, chlorine kills bacteria, viruses, and other pathogens, and it has played a key role in eliminating diseases such as typhoid and cholera in the U.S. And chlorine's benefits in water are twofold: it not only disinfects but also remains at

a residual level in the water, preventing reinfection by viruses or bacteria during transport, storage, and distribution. For that reason, the EPA and state regulators require that all municipal drinking water contain a measurable chlorine residual. So even as new disinfection methods, such as using ozone and UV light, gain popularity, they continue to be used with some kind of chlorine-based treatment.

Safety and security alone might have been sufficient drivers to propel MIOX's technology. But since joining the company as CEO in 2005, Carlos Perea, a veteran of the semiconductor and telecom industries, has been highlighting other benefits. Water quality is one: Using freshly generated chemicals helps avoid the development of undesirable chlorine byproducts. And because the MIOX generator can produce a "mixed oxidant" (hence the company name) that disinfects water with less chlorine, treated water has less chemical taste and odor, and there is less buildup of biofilm and algae in the treatment system. But cost and carbon savings are an even bigger selling point. "It doesn't make sense to transport chemicals when you can generate them yourself at a fraction of the cost and a fraction of the impact," Perea says.

In August, the 77-employee company received \$19 million in Series C funding from several venture capital firms, including DCM, Sierra Ventures, and Flywheel Ventures. Water utilities in Santa Fe, New Mexico, and other cities now use MIOX generators. The U.S. Navy also uses them on some of its ships. For some large beverage makers, MIOX equipment is the first disinfection step in their bottling processes. Other industrial and commercial customers are looking to use the system as a component in self-contained water recycling systems to disinfect water before it is reused for, say, landscape maintenance or cooling. "Moving water is so power intensive, such a huge energy user, that it doesn't make sense to continue to treat it one place, pump it, live with losses and degradation, and move it someplace else to dispose of it," says Perea. "If you have a swimming pool, you don't fill it up and dump it out every time that you use it; it just wouldn't make sense."

In a developing country like India, the ability to treat one's own water at home can be a matter of life and death. According to a 2002 World Health Organization study, 782,000 deaths, or 7.5 percent of all deaths in India that year, were caused by diseases related to unclean water. Even in places where municipal tap water is available, quality is unreliable, and the water runs for only part of the day. Much of the population gets drinking water from vendors who sell it from tanker trucks.

Those with limited means often purify water by boiling it or mixing it with iodine tablets. Those who can afford it use home water-purification systems. One of the companies capitalizing on demand for such systems is Eureka Forbes, India's largest manufacturer of home water-purification systems. And since 2006, a Bothell, Washington, company, HaloSource, has played an integral part in Eureka Forbes's effort to make such systems much more affordable.

HaloSource manufactures a sort of turbocharged version of the cartridge that goes in your Brita pitcher at home. But whereas the Brita cartridge merely filters water, thus improving appearance and taste and removing some contaminants, the HaloPure biocidal cartridge -- packed with tiny polystyrene beads that have bromine ions chemically bonded to their surface -- disinfects it, eliminating viruses and bacteria.

Eureka Forbes is using HaloPure cartridges in gravity-fed countertop water purifiers that let a family treat and store up to 6.5 gallons of water at a time. Unlike ultraviolet purifiers, countertop water purifiers don't require electricity to work, and their lower cost -- \$40 to \$60, versus \$200 to \$300 -- puts them within reach of India's burgeoning middle class.

HaloSource also manufactures products used for recreational water treatment and storm-water management, as well as antimicrobial coatings for textiles. But the company, which has annual revenue of more than \$10 million, sees its biggest opportunities in water purification. HaloSource has partnered with the Brazilian consumer-device maker Everest, which will use HaloPure cartridges in countertop water purifiers, and the Chinese manufacturer Chanitex, which uses them as a component in reverse-osmosis purifiers for homes and businesses. HaloSource now has manufacturing facilities in Bangalore and Shanghai, as well as in Washington State.

In 2007, the company secured \$15 million in funding from the Abu Dhabi-based Masdar Clean Tech Fund. "In China and India combined, you've got close to three billion people who will be looking for consumer-product solutions to problems they've dealt with for generations," says Andrew Clews, HaloSource's vice president of marketing and business development. "Access to clean, safe drinking water is certainly one of those issues."

## **Storing It**

It's nice to imagine that water flows magically from a pristine reservoir or spring to your home faucet, but that's simply not the case. As we have seen, it is disinfected and pumped along through a sprawling network of water mains and pipes. The U.S. water network, much of it built in the 1950s and '60s, will require some \$277 billion worth of construction, upgrades, and replacement in the next 20 years, according to EPA estimates. With scarcity driving water agencies to fix leaks -- by some estimates, about six billion gallons per day in the U.S. are lost through literal cracks in the system -- companies making high-tech metering and leak-detection technologies are doing well for themselves.

San Rafael, California-based PAX Water Technologies, founded in 2006, is focusing elsewhere, on a relatively overlooked niche in the distribution chain: water storage tanks. Though the numbers are hard to tally, there may be as many as 400,000 storage tanks in use in the U.S. today, according to PAX Water's vice president of marketing, Jason Oppenheimer, who came to the company after nearly a decade of working on water infrastructure projects as a civil engineer.

After being treated, drinking water can spend as long as 100 days in the distribution system before reaching an end user. That's not necessarily a bad thing, but when water sits in a tank too long, it begins to stagnate and settle into layers of different temperatures, as in a lake. In warmer layers at the top, the disinfectants used in treatment are burned off, which increases the potential for contamination. Even when the water is being used, poor tank design can create an uneven distribution of disinfectant and encourage uneven aging, allowing water at the bottom of a tank to be replenished more quickly than water at the top.

The traditional solution is to dump more disinfecting chemicals into the holding system, which has environmental and economic costs and can lead to the formation of chemical byproducts.

Water agencies also use energy-intensive "operational cycling" -- basically pumping moving water around from tank to tank -- or even dump some water at the end of the line to allow fresher water to flow into a stagnating system.

The energy-efficient, inexpensive, and elegant solution proposed by PAX Water is called the Lily impeller. Featured in a 2008 design exhibit at New York City's Museum of Modern Art, the Lily -- a spiral propeller whose shape calls to mind a calla lily -- is not just pretty but powerful. When installed on the bottom of a storage tank, the impeller, which weighs less than 70 pounds, can mix up to seven million gallons of water while drawing the same amount of energy as three 100-watt bulbs. Mimicking natural convection currents, the mixer evenly circulates water in the tank, thus reducing or eliminating the need to add disinfectant. Several states require new and retrofitted storage tanks to include some kind of mixing system -- a potential boon for PAX Water.

The water mixer came to market in 2007 and won the People's Choice Award in the New Product Technology Showcase at the American Water Works Association convention. The same year, PAX Water launched a beta program in California. That helped open up the market, and by mid-2008, the company had about 25 of the \$30,000 units installed in municipal storage tanks. Dan Heimel, a water quality specialist in Redwood City, California, which participated in the pilot study and subsequently purchased a mixer for a troublesome water tank, says the system solved the city's thermal stratification problem.

But for Oppenheimer, storage tanks are just the beginning. A floating solar-powered impeller, for example, could improve surface water to be treated for drinking or even provide basic wastewater remediation in an off-grid environment. "We think that our technology has huge potential to help natural remediation of water bodies and all sorts of applications around the world," he says.

## **Conserving It**

As a kid, Mark Sanders hated brushing his teeth with cold water. But watching all that clean, drinkable water run down the drain as it warmed up bugged him. So at the age of 9, he began thinking about ways to capture it and save it for some other purpose -- say, flushing the toilet. Three decades later, during a visit with his wife's family in drought-stricken Oklahoma in 2000, he took up the problem again with a newfound sense of urgency.

On the plane ride home to Louisville, he made a sketch of a water recycling system that would take used water from the bathroom sink, disinfect it, and reroute it to the toilet tank for flushing. Back home, he took the drawing to a friend who did home remodeling, and two weeks later -- with a hot glue gun, some PVC pipe, and a Tupperware container -- the friend had a prototype working in his own home. Sanders, a CPA by trade and at the time the CEO of a large medical practice, patented the system, built a basic website, and began touting the system to anyone he thought might be interested. The result: thousands of hits for the site and affirmation that the interest was out there.

In 2003, Sanders left the medical practice and founded WaterSaver Technologies; he picked up a partner, Tom Reynolds, along the way. After the two spent a couple of years raising money and testing prototypes, the system, dubbed AQUUS, made its big-time debut at a water-industry trade show in 2006. Sanders describes the response as "incredible," especially from water companies in the increasingly parched South and Southwest, excited at the prospect of adding another water-saving device to the arsenal of products for which customers already receive rebates.

Indeed, utilities have found that offering customers rebates for things such as low-flow showerheads and toilets and efficient front-loading clothes washers has been a reliable and cost-effective way to curb water use -- and the related cost of energy to supply and treat water and wastewater. (In California in 2005, for example, about 19 percent of electricity use, 30 percent of natural gas consumption, and 88 million gallons of diesel fuel were used to move and treat water.) Thanks to such efforts, total U.S. per capita water use has declined from a high of 1,950 gallons per day in 1977 to 1,480 gallons per day in 2000, according to the Pacific Institute, a nonprofit research group.

The AQUUS System -- named one of the 100 best innovations of 2007 by *Popular Science* magazine -- uses standard plumbing parts and can be installed by a professional plumber in about two hours. Priced at \$395 (before rebates), it can save up to 6,000 gallons of water a year in a two-person household. Cutting-edge green architects use AQUUS in their home designs, and Sloan Valve -- the world's leading manufacturer of water-efficient plumbing devices -- recently agreed to distribute the product. "People are just now beginning to be aware of the value of water and the dollar savings they can achieve," says Jim Allen, head of Sloan's water-efficiency division. Sanders and Reynolds -- who remain the company's only employees for now -- aim to sell 5,000 to 10,000 units in the first year of the Sloan deal, ramping up to as many as 300,000 after five years. Allen expects the market to swell as more states mandate water-efficient technologies.

That kind of regulation -- coupled with compelling economics -- has already helped Falcon Waterfree Technologies, another pioneer in restroom efficiency. If you are male, and you have recently heeded nature's call at Dodger Stadium, the Hollywood Bowl, the "Bird's Nest" at the Beijing Olympics, or the Taj Mahal, you may be familiar with its product. Falcon, founded in 2000, claims about 90 percent of the worldwide market for water-free urinals and revenue of more than \$15 million a year.

Like WaterSaver, Falcon, headquartered in Los Angeles and Grand Rapids, Michigan, piggybacks on the existing sales and distribution networks of established partners in the sanitary equipment industry (it, too, has a partnership with Sloan in the U.S.). "In many respects -- on a significantly smaller scale -- we're really not unlike Intel," says James Krug, Falcon's CEO. "We are the technology that powers the urinals."

Here's how it works: Urinal manufacturers create the "bowl with a hole" -- a porcelain or metal unit designed with a smooth, easy-to-clean surface. A stainless-steel housing provides a perfect seal between the opening and a patented cartridge containing a biodegradable liquid with a specific gravity lighter than water. As soon as urine passes through the cartridge, this lighter liquid covers it and creates an airtight seal, blocking any escaping odor of urine and sewer gases.

Unlike with conventional urinals, there is no "flush plume" to spread bacteria and no moving parts that require maintenance; cartridges just need to be replaced every 7,000 uses or so. "Pound for pound, our system is probably the most effective water-conservation device out there," Krug likes to brag. "It doesn't reduce water use by 10, 20, or 30 percent -- it's a 100 percent reduction. Each urinal saves about 40,000 gallons of water a year."

Falcon is backed by some very heavy hitters. Its founder and lead investor is Marc Nathanson, a cable entrepreneur and chairman of Voice of America in the Clinton administration. In 2006, Capricorn Management, an investment group founded by Jeff Skoll, eBay's first president, bought 25 percent of Falcon. And its board of advisers includes Al Gore, Richard Gephardt, and former Los Angeles mayor Richard Riordan.

Acceptance of a waterless urinal was once the challenge. Now the challenge is competition, including new rivals such as Kohler and Zurn. Still, Krug believes that by continuing to invest heavily in R&D, he is keeping ahead of the curve. And competition has its advantages, too. "When everyone else joins in," he says, "you know you've gone from fringe to mainstream."

Here's a fact: According to the American Water Works Association, 58 percent of urban water goes to landscape irrigation. And as much as half of that is lost or wasted because of evaporation, wind, or improper irrigation design, installation, maintenance, and scheduling.

Chris Spain, co-founder and chairman of Petaluma, California-based HydroPoint Data Systems, saw an opportunity in those lost 3.5 billion gallons. After selling a software start-up in 2000, Spain and two partners began plotting their next move. Water was especially attractive. "One, it seemed to be a huge issue that a variety of macro trends were driving to a crisis point," says Spain. "And two, there seemed to be a huge absence of focus, investment, and innovation."

They came across a company in Petaluma that had patented a compelling technology -- a system that used live weather data, rather than preset timers, to tell sprinklers when and how much to water crops, lawns, and commercial landscapes. They acquired the company, raised funds from angel investors, and went to work upgrading the technology. Now known as WeatherTRAK, the system uses data retrieved from the National Oceanic and Atmospheric Administration satellites that gather information from 40,000 weather stations across the country. WeatherTRAK's database and servers can accurately map weather conditions -- wind, humidity, and temperature - - for any given square kilometer in the U.S. Subscribers to the system (commercial users pay \$225 per year) need only set a sprinkler controller with some information about the plants and topography of their site, and the system takes over, sending weather updates via satellite to automatically adjust watering needs to real conditions on the ground.

There are some 45 million irrigation controllers nationwide, and according to a survey by the American Water Works Association, most still have the same settings they had when they left the factory. The result: overwatering, often accompanied by runoff into neighboring surface waters. By watering landscapes just enough, the WeatherTRAK system cuts water use up to 59 percent.

Agriculture would seem to be an obvious market. But long-term contracts for purchasing water give farmers extremely low prices, so they generally have little incentive to invest in conservation. So HydroPoint has focused on commercial and institutional clients. Among its 15,000 subscribers: Wal-Mart, Coca-Cola, Google, Lowe's, and the cities of Newport Beach, California, and Charleston, South Carolina. In 2007, those 15,000 customers saved a combined 6.7 billion gallons of water. Lockheed Martin estimates it saves \$1 million a year using WeatherTRAK at its two Silicon Valley campuses.

## **Keeping It Clean**

Though drought is one of the more obvious consequences of climate change, water experts are equally worried about the problems caused by extreme storms and flooding that many, if not most, scientists believe are another consequence of global warming. Long underregulated and undermanaged, storm-water runoff has become a concern for its effect on surface and ground water, as well as the additional burden that it puts on already creaky wastewater treatment facilities when it is treated.

Glenn Rink, founder and CEO of Scottsdale, Arizona-based AbTech Industries, first used his Smart Sponges -- made from a synthetic polymer -- in 1997 to clean up oil spills from tankers at sea. In 1999, when he turned his attention to storm water, most regulation was focused on runoff from new construction. "No one was really doing anything about dealing with the billions of gallons of rain that come down on the roads and go into our flood-control devices and are contaminated on the way through," he says. So Rink figured out how to mold the sponge material into different shapes that would fit into street-level storm drains and catch basins, soaking up oil and debris and letting clean water pass through. Later, he developed a way to coat the sponges with an antimicrobial agent so they would disinfect water as well. The next iteration will add the ability to capture heavy metals, herbicides, and pesticides.

Long Beach, California, installed 2,000 AbTech filters in June 2004. Tom Leary, the city's storm-water compliance officer, was primarily concerned with cutting bacterial pollution at beaches. Tests showed the Smart Sponges effectively eliminated bacteria. And in the unusually rainy year following the sponges' installation, they also caught almost 92,000 pounds of trash and debris and 3,600 gallons of waste oil. Leary likes the technology, because unlike UV treatment or mechanical debris catchers, "it's not outrageously expensive, and it's easy to move around. You don't smell them, hear them, or see them."

Today, AbTech has 13,000 installations in 36 states and seven countries, and its 2008 revenue is expected to be 2,000 percent higher than last year's. Seventy percent of its business is with municipal customers. But private developers and commercial entities are increasingly part of the mix. British grocery giant Tesco recently installed an AbTech system to treat runoff at a new 88-acre facility in Riverside, California. Smaller operators are employing the technology to solve niche problems -- in bus depots and fast-food drive-throughs, to cite two examples. Airports, too: The ones in Newark, New Jersey, and New York's Westchester County are among those that have installed AbTech sponges, which typically need to be replaced every two to four years; used sponges are sent to waste-energy plants and burned as fuel.

Road runoff is one problem. But pollutants from other sources are even more insidious. Hundreds of U.S. water utilities, for example, are dealing with high levels of the chemical perchlorate, a rocket-fuel ingredient that has been found in the lower Colorado River, which provides water for more than 15 million people in the Southwest, and in dozens of ground-water wells throughout California. Though the EPA has yet to set a drinking-water standard for perchlorate, Massachusetts and California have, citing health risks to developing fetuses. The gasoline additive MTBE is another troublesome ground-water pollutant, as is nitrate, a common agricultural contaminant, which at high enough levels in water causes serious illness or death in infants.

A new technology being commercialized by a company called Microvi Biotech literally eats these pollutants up.

Eliminating challenging pollutants from water has traditionally involved using mechanical filters or chemicals. Recently, researchers have experimented with using genetically modified organisms to degrade water pollutants. But until now, all these methods have had at least one major drawback: the production of a secondary waste stream of concentrated pollutants or sludge that must be incinerated or otherwise disposed of. In eliminating one kind of pollution, they create another.

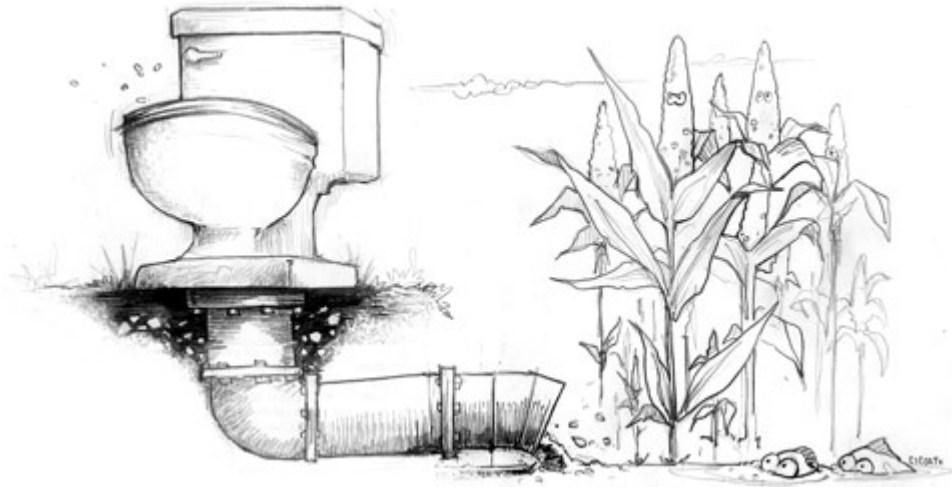
Microvi's founder, Fatemeh Shirazi, has developed what she and others believe is a safer, more efficient, and cleaner method -- using so-called biological reactors that house colonies of natural microorganisms "trained" to feed off particular pollutants in water. Inside the reactor, Shirazi explains, microorganisms are "packaged" in materials and configurations that protect them from the die-off common in other treatment methods. Most remarkably, the system is self-cleaning -- when the microbe population reaches a critical stage, it stops growing and cleans house, with living organisms feeding off dead ones. As a result, there is no fouling and buildup inside the reactor and no waste to dispose of -- all that comes out is clean water.

"It's unique," says Michael Dimitriou, president of the consulting firm WaterInnovations. He discovered Shirazi's work when he was asked to review it for a multinational water company. "It does something that's been tried before but no one could do." Shirazi has developed reactors that target about eight specific pollutants, including PCE, a chemical used in dry-cleaning and other industries, MTBE, perchlorate, and nitrates. The novelty of her technology was recognized with a first prize in the water category at the 2007 California Clean Tech Open competition.

Shirazi earned her Ph.D. in environmental engineering from Oklahoma State University, got her first U.S. patent in 2002, and incorporated Microvi in 2004 in Overland Park, Kansas. With \$1.8 million in grants from agencies including the National Institutes of Health, she worked to troubleshoot issues with the technology. Now headquartered in Union City, California, the company has 11 employees and is beginning its first large-scale implementations. In addition to working with public water and wastewater facilities to treat emerging pollutants, Shirazi anticipates a market in treating water discharged by various industries -- including the paper industry, which produces wastewater high in toxic chlorinated phenols, and the food and beverage industry, which discharges water high in organic pollutants and nitrate.

"We are in such a big mess today partly because we never thought about the consequences of discharging water that was full of pollutants," says Shirazi. "It never made sense to me that in the name of cleaning up those pollutants, we've kept coming up with solutions that also have a negative impact on the environment. The idea of using biotechnology -- using concepts from nature -- to do this is very appealing."

*Adam Bluestein is a Burlington, Vermont-based freelance writer*



## **Is Reclaimed Wastewater Too Contaminated to Use, or Too Valuable to Waste?**

**Love That Dirty Water**

Thursday, December 18, 2008

### **Recycled Wastewater Contaminates Crops**

Recycled water is being used extensively for irrigation in the Salinas Valley. There are about 12,000 acres of leafy green and other consumed raw crops in that area, and the reclaimed water from the Monterey sewer plant goes out to these crops. Salinas is an area that has experienced numerous problems with pathogen-contaminated foods, but the state has seldom, if ever, looked at recycled water as part of the problem. Why? Answer, in part: too much political capital at risk.

In Orcutt, part of the Santa Maria Valley, recycled water is used for irrigating strawberries and broccoli. The county owns the sewer plant that produces this water. When I explained to officials there why we—myself, with a few other interested scientists—were testing the water, they refused to allow us to test, and then I was contacted by county counsel. We have looked at six other sewer plants that are licensed by the state to produce similar water under Title 22, and all produced chlorine-resistant bacteria that were released in the final product.

We looked more closely at two, Santa Barbara's and Goleta's, and noted multidrug-resistant bacteria coming through in the finished product. In the case of Santa Barbara, our Kirby Bauer test has 12 antibiotics—Santa Barbara's finished recycled water contained bacteria that were resistant to 11 of the 12 antibiotics and also were chlorine-resistant. This is water used on school playgrounds and parks. The state allows cities that produce recycled water to force its use on new developments. In the case of Santa Barbara, the city took the Montecito Country Club to court and forced it to accept recycled water for the golf course. The club apparently had refused on grounds of liability, which, considering the levels of pathogens, was a reasonable response. Nonetheless, the city prevailed.

In the Santa Rosa area, there is a push to irrigate thousands of acres, mainly vineyards, with recycled water. I've been told that the main underlying reason is that the effluent, when released to the Russian River, does not and cannot meet water quality standards. A similar situation prevails in Santa Paula—the water cannot meet standards and thus cannot be released to the river.

Thus the solution is to shunt it to ag. This has several advantages from an economic perspective. It will allow further development based on the saved potable use—the salvaged potable water can now go to new housing, thus enhancing tax revenue for cities in the area. Additionally, it can be sold or traded on the market to, say, Las Vegas, at very high prices.

As the drought increases, there will be more pressure (economic and political) to use recycled water on ag. This makes, to the untrained (the average politician), good sense. But as it now stands, this water is a risk to public health, and to clean it up according to the standards necessary to protect public health will make this water very expensive.

In many cases, that clean-up cost is associated with the mix of materials that reach the sewer plant. As it now stands, industrial waste is discharged to sewers, which causes the liability that would accrue to such toxic materials if put into a toxic waste dump to just disappear. This is a major liability, if you track the costs that fall back on industry, which are associated with, for example, failed toxic waste dumps like Casmalia. Thus, if something can be sewerred, this liability falls to the wayside. There is a great deal of political capital associated with continuing this free ride and with keeping the information out of the public arena.

As the levels of drug-resistant bacteria expand, more will wind up in the sewer, and along with this the drugs needed to combat them. It is a revolving door that will empty onto the crops that we all consume. That will drive up the need for irradiating food, but that is a double-edged sword. As it becomes easier to nuke foods, the industry will then drop its sanitation levels to save money and the quality of the water used for raising crops consequently will fall.

The drought and consequent economics will push the system toward this eventuality. In many cases, the regulatory agencies that are supposed to be looking out for the citizens are clientele captured by the very industries that they were established to regulate. I see this on a daily basis; protecting the public's health falls into a diminishingly unimportant position when compared to industry profits, bureaucratic needs, and bureaucratic comfort. — *Edo McGowan, Ph.D., former medical geo-hydrology consultant for the U.S. Department of State and other agencies.*

## Recycled Water Is a Critical Resource

Water purveyors in California constantly are searching for new sources of water — to slake the thirst, wash the bodies and cars, carry the wastes, fill the pools, and irrigate the gardens and crops of the seemingly unstoppable hordes that represent the overpopulation and overdevelopment we live with. Many of these water purveyors clearly recognize that the cheapest, most easily available source of “new” water is not new at all — it is reuse of the water we are now throwing away as wastewater.

Such use of “recycled water” is an emotionally charged issue, due to the “yuck factor” reaction of many uninformed people and due to the very real possibility that wastewater may contain pathogens that have not been properly identified or sufficiently treated. The “yuck factor” reaction has been expressed by the slogan “No Toilet to Tap,” which has been used to successfully block recycled water projects whose design was technically sound. The pathogen issue is one that is technically solvable and must be addressed correctly, but which also applies to any water source, since both surface water and groundwater may be contaminated with pathogens.

In fact, with the very minor exception of water emitted by deep-sourced volcanoes like those in Hawai‘i, there is no “new” water on the surface of the earth. It has all been recycled countless times in the hydrologic cycle of precipitation, runoff, and infiltration, discharge to oceans and lakes, and evaporation and transpiration.

In places that are not on a coast, wastewater is discharged to rivers and is reused by people living downstream with few exceptions and few problems. Such discharge occurs to the Sacramento River, which is the source of the State Water Project water that is exported from the Delta, so “State Water” users, which may include the majority of the population, are in fact drinking and using “Toilet to Tap” water, albeit unknowingly. In some areas of California, recycled water has been used to recharge aquifers for many years, and in others it has been used for irrigation of both food and non-food crops — all without causing disease outbreaks.

The proper use of recycled water clearly requires technically adequate treatment and testing, but it is a resource that is too valuable to keep throwing away. Its use will certainly increase in the future, and the “yuck factor” reaction must be overcome through education. In the final analysis, this reaction makes no more sense than one of several statements attributed to W.C. Fields as to why he never drank water: “Fish [fornicate] in it.” — **Barry Keller, Ph.D, a professional geologist and certified hydro-geologist.** (*Keller sits on the City of Santa Barbara Water Commission, but this does not represent a statement on behalf of the city.*)



Tuesday, Dec. 16, 2008

## Sewage That's Clean Enough to Drink

By Bryan Walsh

The world has a water crisis — [that much is undeniable](#). But it's also our own doing. Although just a tiny fraction of the world's 326 quintillion gal. of water is usable by humans, we would have more than enough to go around if we took care of it. We don't. From industrial accidents like the benzene spill in northeastern China three years ago, which contaminated the drinking water of millions of people, to the lack of toilets (or proper sanitation) throughout much of the developing world, we're making good water unusable. As a result, our supplies of viable water for agriculture, industry and drinking are dwindling, even as population demands continue to grow. We don't just have a water crisis, according to Maude Barlow, who last week was named the first U.N. senior adviser on water, "we have a clean-water crisis."

That makes what's happening in Orange County, Calif., all the more important. One of the richest residential areas in the country, the Los Angeles suburb is known for swimming pools, golf courses and lush lawns — all of which need water. But like much of Southern California, Orange County is dry and getting drier, and the aquifer from which the county pumps much of its water is slowly draining. Importing water from wetter Northern California is an option, but an expensive one (at least \$530 per acre-foot, or about 326,000 gal., of water). Meanwhile, population growth means that officials have to do something with the increasing amount of wastewater that residents and businesses are producing. ([See the world's most polluted places.](#))

Orange County water officials decided to solve both problems at the same time. The result is the Groundwater Replenishment System (GRS), a glistening, \$480 million facility that sits next to an older sewage-treatment plant. The GRS takes in about 70 million gal. of wastewater a day, puts it through a multistep cleaning process, then discharges the treated water into Orange County's aquifers. About half forms a barrier against seawater, which has been infiltrating groundwater sources as the county has dried up, while the other half slowly filters into the aquifers that supply drinking water for the county's 2.3 million residents. The GRS is believed to be the world's largest facility dedicated to what's known as indirect potable reuse (if you're in favor of it) or toilet-to-tap (if you're not). But there's a better term: water recycling, and it might be the world's answer to the clean-water crisis. ([See pictures of the world's water crisis.](#))

Whether or not we know it, most of us drink water that has had contact with sewage at some point. Municipal water authorities discharge treated wastewater — and in times of

heavy rains, untreated water — into rivers like the Colorado or the Mississippi, where the sheer volume of water dilutes any remaining contaminants or pathogens. Orange County, however, is trying something different. Because some of its treated wastewater is injected directly into its reservoirs, residents are effectively drinking water that is mixed with highly treated sewage. It's not surprising then that it took years for the GRS to go forward in the face of public unease. "There was the yuck factor," admits Michael Markus, general manger of the Orange County water district.

A visit to the plant shows those fears to be unfounded. Orange County's wastewater undergoes more stringent treatment than almost any water source on the planet. First, the dark beer-colored sewage is pulled through a series of tubes stuffed with thousands of fibers pierced with holes 1/300th the size of a human hair. Anything larger than 0.2 millionth of a meter — which includes suspended solids and bacteria — is left behind. The cleansed water is then forced at high pressure through hundreds of tubes that are filled with tightly wound plastic membranes. Reverse osmosis, as the process is called, stops nonwater molecules — including viruses and pharmaceuticals. (The last part is particularly important; an Associated Press investigation earlier this year found trace amounts of prescription drugs in the drinking water of more than 40 million Americans.) Lastly, the filtered water is treated with the disinfectant hydrogen peroxide, and then dosed with ultraviolet light, which neutralizes anything that might remain. What's left is as pure as distilled water — and I can say from personal experience that it tastes perfectly fine. "This is the future of water treatment," says Markus.

Water-strapped Singapore already uses a similar process to augment its reservoirs, and water managers from around the globe have been visiting Orange County to study GRS. Especially in the drier parts of the world — such as the American Southwest, northern China and the Middle East — water recycling could be a way to allow development without turning to even more expensive methods of water reclamation, like desalinization. But what we really need to do is treat water as the limited resource it is, first by limiting pollution, then by reusing it as much as possible. The U.N.'s Barlow — whose mandate is to increase access to clean water for the 1.7 billion people worldwide who now lack it — is doubtful about the cost of recycling programs like Orange County's, especially for poorer countries. She'd like to see more focus on keeping water sources clean in the first place. But she knows recycling is a necessity. "Water is far, far too precious to waste," she says. "It's a universal human right." We just have to treat it as one.

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JANUARY 14, 2009

## In California, Hot and Dry Conditions Stir Drought Concerns

By [STU WOO](#)

SAN FRANCISCO -- The past two days have felt like summer in California, as unseasonable warmth sweeps the state -- possibly presaging a third straight year of drought, a worrisome possibility for a state already hit hard by the economic downturn.

Another dry year could mean water rationing for businesses and individuals. It could also slow business expansion and affect the agricultural industry, ski resorts and efforts to keep firefighting costs down, after a year in which state and federal officials spent \$1 billion combating wildfires.

Temperatures jumped to 90 degrees in parts of California on Monday and Tuesday. With no rain forecast for the next week, the state is on track for one of its driest Januarys ever, said state climatologist Michael Anderson.

Even before this week, the state was facing a water shortage, said Sue Sims, chief deputy director for the state Department of Water Resources. Reservoirs are well below normal levels, and snowfall in the Sierra Nevada mountain range, a primary source of water for the state, is down to about two-thirds of normal so far this year, said Mr. Anderson.

"We got a state where water falls in the north, but most of the population is in the south. Unlike some of the East Coast states, where it rains pretty much year-round in most of the state, we have a hydrology here that depends upon a winter snowpack and being able to move water north or south," Ms. Sims said.

The water shortage is forcing municipal governments to reconsider issuing new business licenses, Ms. Sims said. "If you can't be certain you got a water supply, I think there's no doubt that jobs in the business sector get impacted," she said.

Municipal water boards may need to ration water use this year, Ms. Sims said. Typically, they would implement a pricing structure in which, say, 80% of the water normally used is kept at current rates, while any water use over that would be charged a premium rate.

Such pricing would affect California's agricultural industry, which sold \$37 billion of products last year and accounts for 15% of the nation's crops, said Mike Jarvis, spokesman for the state's Department of Food and Agriculture. "It'll also change the market a little bit, of what people will plant," Mr. Jarvis said. Water rationing could also hit secondary industries dependent upon agriculture, Mr. Jarvis noted.

Ms. Sims said many Silicon Valley manufacturers also require clean water sources.

Ski resorts could also feel the double impact of a slow economy and little precipitation, although Bob Roberts, executive director of the California Ski Industry Association, said business has been good this winter, thanks to a pre-holiday-season storm.

State firefighting officials are also hoping for rain. Last year, because of dry conditions and an unusual dry-lightning storm, state and federal officials spent \$1 billion to fight wildfires.

"So in combination with the budget condition, drought, from a fire perspective, is not something we want to be in," said Ruben Grijalva, the state firefighting chief. "It means longer fire seasons, it means increased staffing levels, it means increased fire risk for the community."

The state is encouraging individuals and businesses to restrict outdoor water use and to buy water-efficient products. In Los Angeles, the Department of Water and Power is using another tactic: having civil representatives issue citations to people who have violated new water ordinances.

The "water conservation team," as David Nahai, the chief executive and general manager of the water department, calls it, expanded in August to 15 members from six. Around the same time, the new water ordinances kicked in: Residents are prohibited from watering their lawns between 9 a.m. and 4 p.m., and can't wash driveways, sidewalks or other pavement at any time. So far, the city has issued about 900 citations, but only 10 have carried a fine. Mr. Nahai said the focus of this program is to raise awareness, not revenue.

Making problems worse are federal restrictions on how much water can be pumped out of the Sacramento-San Joaquin Delta in Northern California, the source of some water for two-thirds of the state, said Ms. Sims. A judge ordered pumping from that delta to be restricted starting in December 2007 to protect endangered species.

The possibility for a drought comes at a bad time for the state, which is facing rising unemployment and foreclosures along with a projected \$42 billion budget deficit -- largely caused by decreased revenues from a slumping economy -- over the next 18 months.

To avoid a dry year, "we need a pretty wet February and March," said Mr. Anderson. But that may not happen, he added, because conditions reflecting an oceanic and atmospheric condition known as La Nina are appearing, creating a high-pressure system that could keep storms out of California.

Droughts of three years or longer have been rare over the past century in California, said Mr. Anderson, the state climatologist. The state has had two notable droughts: in the 1930s during the Dust Bowl era, and a six-year drought from 1987 to 1992. He said it is nearly impossible to determine how long this drought will last, or whether global warming is a factor. "These things are best evaluated in hindsight," he said.

**Write to Stu Woo at [Stu.Woo@wsj.com](mailto:Stu.Woo@wsj.com)**

## Petaluma's sewage now flowing to new plant

Lakeville Highway site begins treating wastewater six months before full operations begin

By [Corey Young](#)

ARGUS-COURIER STAFF

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With about 500 turns of a big T-wrench last week, a valve opened into a new pipe and

Petaluma's sewage headed east to flow through a new \$110 million treatment plant.

As of Thursday, the city is operating the Ellis Creek Wastewater Recycling Facility on Lakeville Highway, pumping 5 million gallons of sewage through a variety of equipment to make it clean enough for a new use.

In the winter, the city can discharge treated wastewater into the Petaluma River. In the summer, when the 262-acre plant is fully operational, it will produce recycled water to irrigate nearby farms, parks and golf courses.

“Just to get this part of it started up, there was an incredible amount of effort,” said Mike Ban, the city's director of water resources and conservation.

Construction on the plant began in October 2005 after 17 years of debate about how to replace the current facility on Hopper Street, which was built in the late '30s.

The Ellis Creek site, south of the Kaiser medical offices and adjacent to Shollenberger Park, is expected to serve Petaluma for the next 100 years.

Using everything from microbes to UV rays to algae-filled wetlands, the plant will treat Petaluma's sewage to “tertiary” standards — safe enough to water playing fields and home landscaping.

In future years, a \$55 million distribution system paid for by connection fees will deliver the recycled water to new homes and businesses in town.

The plant will begin producing tertiary water in February, said Margaret Orr, the project manager. At first, that water will be used to charge fire sprinklers and fill toilets at the new plant, but plans call for 55 locations throughout Petaluma to eventually receive recycled water.

Depending on water demand and state regulations covering when and where certain types of recycled water can be used, “We can route water in a lot of different directions,” Orr said.

When it is fully operational, the plant will produce 464 million gallons of recycled water a year — enough to offset the water use of 1,400 single-family homes, the city said.

Walking trails, wildlife viewing areas and public art will also be part of the site when it opens this summer.

(Contact Corey Young at [corey.young@arguscourier.com](mailto:corey.young@arguscourier.com))

## Where Water Reuse Isn't a Dirty Word



Purified sewage flows down a spillway into a tributary of the Occoquan Reservoir in Northern Virginia. The concept is being considered to boost drinking water supplies in arid San Diego. Photo: Rob Davis

By [ROB DAVIS](#)

**Wednesday, Jan. 7, 2009** | Centreville, Va. -- Tucked behind evergreens, down a long lane in an otherwise anonymous stretch of this Washington, D.C. suburb south of Dulles International Airport, sits a facility that provides San Diego with the best evidence that it's safe to fill drinking water reservoirs with purified sewage.

Here, a treatment plant has been purifying sewage and dumping the clean water into the Occoquan Reservoir, a source of drinking water for 1 million residents of Northern Virginia's densely populated suburbs in Fairfax and Prince William counties.

And they've been doing it 30 years.

The sewage arrives here at the Millard H. Robbins Jr. Water Reclamation Plant from the toilets of 275,000 nearby residents. A day-and-a-half later, after being disinfected and stripped of its contaminants, it washes down a wide concrete spillway into Bull Run, the Occoquan Reservoir tributary made famous by its Civil War battles.

In dry weather, that purified sewage spends three months meandering and mixing in the sprawling tree-lined reservoir, making its way 17 miles downstream to a dam, where a local water provider draws it out, treats it to be safe for human consumption -- it picks

up contaminants along the way from urban runoff -- and pipes it to homes.

The facility's existence directly counters one of the talking points Mayor Jerry Sanders has frequently recited as a reason for objecting to the City Council's plan to recycle sewage as a drinking water source. Sanders has claimed that San Diego would be the first municipality anywhere to pipe purified sewage into a drinking water reservoir. He made that claim in October and again in December when articulating his opposition to the council's \$11.8 million pilot study of recycled sewage. "I want to make it very clear," Sanders said at a Dec. 4 press conference. "No one else has done what we're being asked to do. People confuse us with Orange County, people confuse it with a lot of other places. No one else has ever talked about putting recycled water into a reservoir and then using it for drinking water. That's what we'll be doing testing on to see if that can even work."

In Northern Virginia, that conversation happened in the 1970s. And the region found that recycling sewage is effective and safe, said Charles Boepple, executive director of the Upper Occoquan Service Authority, which operates the sewage recycling facility.

"We have been doing exactly what San Diego is exploring for 30 years," Boepple said.

Bill Harris, a Sanders spokesman, said the mayor was referencing San Diego's place as the first in California to use recycled sewage to fill a drinking water reservoir.

"If you add the two words -- in California -- it becomes perfectly relevant," Harris said. "That's the background understanding of what we're up against. We've always had to talk about getting approval from [the state Department of Health Services]. We will clarify it from this point forward and make certain those two words get added."

Sanders' opposition could be softening. Bruce Reznik, executive director of San Diego Coastkeeper, a sewage recycling supporter, said he is optimistic the mayor will support the concept once the city's pilot study advances. The U.S. Environmental Protection Agency [recently urged](#) San Diego to develop a long-range plan for reusing sewage; Coastkeeper is negotiating with the city about that plan.

San Diego would be the first in California to fill a drinking water reservoir with recycled sewage. The city has frequently been contrasted with Orange County, which moved forward with the technology without being tripped up by the polarizing toilet-to-tap label that ended San Diego's 1990s recycling effort. While San Diego and Orange County would use a similar purification method, it's more appropriate to compare San Diego's concept with what Virginians decided was acceptable back in the mid-1970s.

In Orange County, which began recycling sewage last year, the purified sewage filters into the ground and winds up in an underground aquifer. It stays at least six months, mixing with the water that naturally fills the basin, before getting sucked out, treated and, ultimately, swallowed again.

In Virginia, the purified sewage goes straight from the plant into the reservoir. San Diego is studying the same idea: Pumping straight into the San Vicente Reservoir.

Virginia turned to recycled sewage in the 1970s as a way to improve water quality in the Occoquan Reservoir. In the late 1960s, gooey algae began growing in the reservoir. Too many nutrients were feeding the water, the result of 11 small sewage-treatment plants that dumped partly treated sewage there.

Officials needed a solution to the bad color and gross taste that residents got from the reservoir water. Those residents were already drinking partially treated sewage; with state approval those smaller plants were closed and an improved sewage purification plant was opened. Officials had debated other less-desirable alternatives: Limiting housing growth or pumping the treated sewage outside the area. But water is a precious resource even in Northern Virginia, which averages 41 inches of rainfall annually (San Diego averages 10 inches but imports most of its drinking water). Ultimately, they settled on purified sewage.

"Some fairly bold thinkers said: I think this resource is too valuable," Boepple said. "You can help supply the population increase with water because you're reclaiming. Otherwise this region would have a tough time."

The plant offers a double benefit. It provided needed sewer service to residents at the same time helping meet the water demands of Northern Virginia's exploding population. Since opening in 1978, the plant has expanded three times. A 2005 upgrade brought the treatment capacity to 54 million gallons a day -- just more than the planned Carlsbad desalination plant would produce.

"This has been a monumental success," said Tom Grizzard, director of the Occoquan Watershed Monitoring Laboratory, an independent agency that studies the reservoir's water quality. "When you develop a supply, the cardinal rule is to go to the water of the highest quality. It's the highest quality available. It's better than natural drainage in every respect."

While the plant's 30-year success has attracted visitors from 70 countries, no other localities in the United States dump purified sewage in their drinking water reservoirs. Boepple blames the "yuck factor" -- the visceral reaction people have to the idea of drinking sewer water.

"The focus needs to be on the science and what we've achieved," Boepple said. "If they separate the irrational fears, they'll see it's a viable alternative for water-short areas."

On a typical day, about 5 percent of the Occoquan Reservoir's flow comes from the sewage recycling facility. Boepple said the facility has provided as much as 80 percent of the reservoir's flows during prolonged drought. The rest comes from rainfall. In a watershed filled with cattle farms, homes, roads and agriculture, that rainfall is dirtier than the recycled sewage -- it washes contaminants such as cow manure, brake dust and herbicides into the reservoir. The sewage plant's water is so clean it actually gets dirtier as it mixes in.

The facility has spilled raw sewage into the reservoir during storms. Boepple said early

2003 was the most recent problematic time. Heavy spring rains and a contractor's failure to complete an expansion on time led to a sewage spill that totaled several hundred thousand gallons, he said.

Sewage recycling in San Diego wouldn't be subjected to that same problem. If heavy rains were overpowering the system, the flow could be diverted to the existing sewage plant at Point Loma. San Diego would have the luxury of filling the San Vicente Reservoir only when conditions were right. The city estimates it could create enough water to supply 52,000 homes for a year.

San Diego's recycling system would also include an additional safeguard that the Virginia facility doesn't: Reverse osmosis membranes. With that, sewage is forced through thin membranes with holes so small that water molecules are about the only things that get through. It's the same technology used to desalinate seawater and stops just about everything. (The handful of chemicals it doesn't stop is destroyed in a final disinfection stage.) The technology wasn't commonly available when the Virginia facility opened.

The Virginia plant also offers evidence that sewage could be recycled for less than Sanders has estimated. The Orange County sewage recycling facility produces water for \$850 an acre foot (enough to supply two families for a year). Grants and subsidies cut the cost to about \$550 an acre foot, close to the price of pumping in imported water from the Colorado River and Sacramento Delta, San Diego's two main sources.

The Upper Occoquan facility produces water for about \$700 an acre foot. That figure, which does not include past construction costs, is borne by sewage customers, who pay about \$40 a month.

Sanders has estimated that San Diego's cost to recycle sewage may be as high as \$1,882 per acre foot. Those figures, originally drafted in 2006, are being revised as part of the city's ongoing sewage recycling pilot study.

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## 1969 | Tahoe's record-setting winter

January and February saved the Sierra snowpack, and then some. Santa was good to Tahoe this Christmas. By mid-December there were few ski resorts open due to a lack of snow, but then the Pacific storm door blew open and powerful cold fronts pounded the Sierra. In the second half of December, Squaw picked up 123 inches of snow; Alpine Meadows and Mammoth Mountain each reported about 13 feet. Kirkwood Mountain Resort just south of Lake Tahoe is now reporting a base nearly 9 feet deep.

Despite good news from the resorts, officials from California and Nevada are worried. You can sum it up with one word, water. On Dec. 30, snow surveyors conducting the first survey of the season found the snowpack's water content 83 percent of normal. Lake Tahoe is so low it is feeding very little water into the Truckee River. It's critical this winter be wetter than normal to help recharge the watershed because the last two years have been drier than average.

January is historically the wettest month with more than 9 inches of precipitation (rain and snowfall water content combined) expected near Donner Pass, which is about 18 percent of the annual total. Storms during January normally produce 81 inches of snow, fully one fifth of all the snow expected for the season.

There is still plenty of winter left, but a developing pattern change in the Pacific Ocean is causing some concern. Sea surface temperatures in the equatorial regions are cooling, indicative of a La Nina event. Persistent high pressure in the eastern Pacific is often associated with the La Nina event, which often diverts the storm-steering jet stream north into Canada, bringing wet conditions to the Pacific Northwest and dry conditions to California. The sea surface cool down indicates an unusually late starting La Nina and the Climate Prediction Center is now forecasting below average precipitation in the southwestern states.

It's true the region is slightly off pace for precipitation to date, but it's too early to panic. Sometimes winter gets off to a slow start. Forty years ago, the record-setting winter of 1968-69 also opened up late. With only 2 to 3 feet of snow at the resorts by

mid-December, there was just enough for skiers to whoop it up but then, similar to this year, heavy snow and wind gusts in excess of 100 mph tore into the region around Christmas. Snowfall was plentiful, but not extreme. Squaw Valley picked up a total of 105 inches during December 1968.

On the winter solstice, the shortest day of the year, temperatures plummeted. Reno broke a 71-year-old record with a morning low of 3 degrees below zero. Carson City reported a bitter 18 below, which was exceeded by Truckee at minus 19 degrees. That week 50 people were trapped on the Pioneer lift at Slide Mountain Ski Resort when gusty winds hooked a chair into a tower and bent the cable wheel. Night was approaching and temperatures falling toward zero as ski patrol crews worked to rescue the stranded skiers. It was dark when the last shivering skier was belayed down by rope, an hour and a half after the accident.

The Sierra Storm King worked more magic throughout January and February. Snowfall totals soared to nearly 300 percent of normal as a powerful jet stream drove storm after storm into the mountains. A juicy impulse that hit on Jan. 13 hammered Soda Springs with 45 inches; 10 days later more than 70 inches fell in 48 hours. That second system piled 75 inches of fresh snow on the Mount Rose Ski Resort, setting Nevada's all-time single-storm record.

At Donner Pass, snow fell continuously for 11 days, which added another 13.5 feet to the pack. By the end of January ski areas were reporting impressive snow depths. Squaw Valley was struggling with 23 feet; Mount Rose had 25 feet, while the Boreal Ridge ski area near Donner Pass reported it was buried under massive drifts 18 to 40 feet deep.

The active weather pattern set several Nevada snowfall records that still stand. On Valentine's Day, the Silver State's 24-hour snowfall record was broken when 3 feet buried Daggett Pass near the Kingsbury Grade, east of Lake Tahoe. A total of 139 inches of snow fell on Daggett Pass during February 1969, and the maximum snow depth there reached 14.5 feet, both new state records.

In late February, two snow surveyors near Big Whitney Meadow in the Southern Sierra measured 12 feet of new snow in just 48 hours! Persistent storms and huge snow drifts as high as 40 feet closed the Mt. Rose road (Route 431) for 37 days. The season total at Mt. Rose of more than 59 inches of precipitation (rain and melted snow combined) set a new record for Nevada's wettest calendar year.

In California, the winter snowpack topped out near 100 inches deep in Tahoe City, but ski areas on Donner Summit boasted depths more than twice that. In February, the percentage of mean monthly snowfall in the Central Sierra reached nearly 1,000 percent of normal.

On April 1, Squaw Valley ski resort reported about 30 feet of snow on the upper mountain and declared they would keep their lifts running until July 7.

The big storms of 1968-69 set plenty of weather records in Nevada and dumped 601 inches of snow at the Central Sierra Snow Lab near Donner Pass. The amazing thing was nearly all of the snow came after New Year's Day.

— Mark McLaughlin's column, "Weather Window," appears every other week in the Sierra Sun. He is a nationally published writer and photographer whose award-winning books, are available at local stores. Mark, a Carnelian Bay resident, can be reached at [mark@thestormking.com](mailto:mark@thestormking.com)

<http://www.sierrasun.com/apps/pbcs.dll/article?AID=/20090116/NEWS/901169972/1051&title=1969%20%20Tahoe&template=printart>

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## Recycled water to be pumped to fields at Hemet park

10:00 PM PST on Thursday, January 15, 2009

By GAIL WESSON  
The Press-Enterprise

A new booster pump station and pipelines under construction in Winchester will help move lower-cost recycled water to new sports fields at a community park in south Hemet and likely to a retirement housing development in west Hemet in the future.

Completing the nearly \$3.3 million Eastern Municipal Water District project means some traffic lane restrictions on Simpson Road near California Street in Winchester and trenching for installation of recycled or treated sewage water lines in K Hovnanian's Four Seasons development.

Recycled water from the station is bound for Valley-Wide Recreation and Park District's Diamond Valley Lake Community Park, just east of the reservoir.

Story continues below



Construction worker Romeo Martinez checks the measurement of the reclaimed water lines Thursday that are being installed at Valley-Wide's Diamond Valley Lake Community Park.

The park already is home to the district's regional aquatic facility. In this phase, three soccer fields and eight ball fields are being developed on 35 acres, Jeff Leatherman, Valley-Wide general manager, said by phone.

He said of the recycled water, "With a park that size, it's a huge money savings for the district."

Recycled water costs about one-third the rate of fresh water, according to a report by Peter Odencrans, a water district spokesman.

Story continues below



Sierra Landscape Co., of Palm Desert, received a \$2.4 million contract for concrete, irrigation and field grading at the park and Inland Construction of San Bernardino has a \$379,000 contract for the buildings.

Leatherman said fundraising events held by Hemet/San Jacinto Exchange Club and donations from the nonprofit Friends of Valley-Wide Foundation augment parks fees collected from new development and annual park maintenance assessments. Community supporters are organizing a day to lay sod at the park in the spring.

Once the fields are finished in spring, more teams may be added to recreation rosters, said Gustavo Bermeo, Valley-Wide's public relations and special projects supervisor.

Meanwhile, at the Four Seasons retirement community, Roy Brennan, chairman of the facilities committee for the homeowners association, said recycled water also means savings for the development.

"It's basically a cost savings we're looking at, trying to keep our water bill about the same as the cost (of water) goes up," Brennan said by phone.

*Reach Gail Wesson at 951-763-3455 or [gwesson@PE.com](mailto:gwesson@PE.com)*

January 20, 2009

## House Plan for Infrastructure Disappoints Advocates for Major Projects

By [MICHAEL COOPER](#)

When President-elect [Barack Obama](#) announced last month that he would revive the economy with the largest public works program since the dawn of the Interstate System of highways, advocates for the nation's long-neglected infrastructure were euphoric.

Some hoped that the time had finally come to bring high-speed rail to the United States, or to wean the nation from its dependence on foreign oil with new or transformed public transit systems, or to take bold action to solve the problems of rising populations and falling reservoir levels across the Southwest.

But those hopes are fading. As the details of the plan come into focus, big transformative building projects seem unlikely. And the plan does not begin to provide the kind of money that civil engineers believe is needed to bring the nation's aging bridges and water systems and roads and transit systems to a state of good repair.

Less than one-third of the \$825 billion plan that was introduced Thursday in the House would go to infrastructure, and much of that would go to high-tech projects, rather than traditional concrete-and-steel building and repair work. The rest would go to tax cuts and aid to help states pay for health care and education. At a time when the American Society of Civil Engineers has estimated that \$1.6 trillion is needed to improve the nation's crumbling infrastructure, the proposal calls for spending \$30 billion on roads and, to the consternation of transit advocates, only \$10 billion on transit and rail.

(The House bill, though, was only the opening salvo in the push to pass a bill quickly, and some senators are already talking about adding money for more transit programs.)

The requirement that the money be spent quickly, in order to get it coursing through the parched economy, means that many ambitious projects that require more planning will have to give way to smaller ones considered “shovel ready.”

The plan also calls for using existing federal formulas to send transportation money quickly to the states, giving policy makers in Washington little say as to where or how the money should be spent.

Gov. [Edward G. Rendell](#) of Pennsylvania, who, with Mayor [Michael R. Bloomberg](#) of New York and Gov. [Arnold Schwarzenegger](#) of California formed a group called Building America’s Future to push for more infrastructure spending, called the plan a good first step but warned that it fell far short of what was needed.

“Anybody who thinks — if the president-elect thinks, or the team thinks — that this is the answer to America’s infrastructure needs is in a different universe,” said Mr. Rendell, a Democrat who noted that his state was full of aging, deficient bridges.

Mr. Rendell said in an interview that the proposal would help upgrade the nation’s electrical grid and water systems, modernize schools and expand broadband access to rural areas.

But he noted, regretfully, that it contained less money for more traditional transportation projects than a House proposal last year, and he worried that Mr. Obama’s campaign call for creating a new national infrastructure bank to evaluate big projects and set priorities had so far not been included in the plan.

Other planners agreed with his assessment.

“It’s a drop in the bucket,” said Robert D. Yaro, the president of the [Regional Plan Association](#), which has shaped long-term planning in New York, New Jersey and Connecticut since before the New Deal.

Some advocates said they feared that the pressure to spend more on infrastructure — which has risen since the levees failed in New Orleans after Hurricane and the Interstate 35W bridge collapsed in Minnesota, and as old water mains have burst and submerged streets around the country — would ebb now that some money had been allocated for such projects.

Still, there are areas where Mr. Obama's plan would break ground.

Mr. Obama wants to computerize the nation's medical records to make health care more efficient and less expensive, and expand rural broadband internet access. He plans less-visible, but perhaps more critical, improvements to water and electric systems. He wants to repair and modernize schools, and make federal buildings more energy efficient, a priority that gets more money in the House bill — \$31 billion — than aid to roads and highways.

But proponents of mass transit, which has had a significant increase in riders in recent years, even as the recession is forcing many major transit systems to reduce service — had hoped that much more money would be devoted to transit projects.

Phineas Baxandall, a senior analyst for tax and budget policy at the United States Public Interest Research Group, a liberal advocacy organization, noted that highways still stood to get three times as much aid as rail and transit systems.

“Money included to modernize and expand public transportation networks will put thousands to work while reducing our nation's dependence on oil, traffic congestion, and [global warming](#) pollution,” Mr. Baxandall said.

The demand for more public transportation has been evident recently. Voters authorized spending more money on mass transit and rail projects in local ballot measures last November. Californians voted to authorize \$10 billion in borrowing to begin bringing high-speed rail to the land of the freeway.

But those kinds of projects are hard to get under way quickly. Using existing formulas to distribute the money will also make it hard for policy makers in Washington to make sure it goes to the areas with the greatest needs.

Robert Puentes, a fellow at the Metropolitan Policy Program at the [Brookings Institution](#), analyzed some of the lists of state projects that have begun to emerge, and found that the 100 biggest metropolitan areas, considered the economic engines of the nation, were not getting priority.

Although Mr. Obama has said he would not tolerate bridge-to-nowhere projects, there is nothing to keep states from taking political considerations into account when deciding how to spend their share of the highway money, say, by doling out some of it to each lawmaker's district instead of to more beneficial projects.

The plan will include a use-it-or-lose-it provision to force states to spend the money they get quickly, or risk forfeiting it. But that can be hard to do.

Jack Wells, the chief economist at the Department of Transportation, said that the Federal Highway Administration had analyzed how long it took before money from transportation projects was paid out to workers, and found that 27 percent of it was paid in the first year and 41 percent in the second year.

# **ACWA Issues Statement on Delta Smelt Biological Opinion**

## **Stage Set for Dire Water Supply Impacts, Possible Conflicts With Other Species**

Last update: 8:17 p.m. EST Dec. 15, 2008

SACRAMENTO, CA, Dec 15, 2008 (MARKET WIRE via COMTEX) -- Association of California Water Agencies (ACWA) Executive Director Timothy Quinn issued the following statement today on a new biological opinion for Delta smelt. U.S. District Court Judge Oliver Wanger ruled in 2007 that the previous opinion was inadequate, and ordered state and federal fish agencies to issue a revised one by today. The opinion, which forms the basis for new operating rules for the State Water Project and federal Central Valley Project, could result in permanent restrictions on water deliveries through the Delta, reducing deliveries by up to 50% in some years. The projects serve more than 25 million Californians and millions of acres of farmland.

"All Californians should be deeply concerned about the decision regarding Delta smelt announced today by the U.S. Fish and Wildlife Service. The decision will have tremendous impacts for 25 million people in the Bay Area, Central California and Southern California, with no guarantee that the fish and the ecosystem will benefit.

"Last month, a group of thoughtful Californians released a Delta Vision Strategic Plan that called for comprehensive water policies based on the co-equal goals of ecosystem health and a reliable water supply. Today's action demonstrates how far we are from achieving those co-equal goals.

"This decision focuses on a single species when, instead, we need to focus on the entire ecosystem. It regulates only water project operations when the science clearly indicates that other stressors -- including exotic species, land uses and pollution -- play a major role in the demise of the aquatic ecosystem. Further, this decision will do nothing to solve the underlying structural causes of the conflict between the needs of the aquatic environment and the state's water system.

"The benefits to Delta smelt are highly speculative because of the very limited approach being taken. What is not speculative, however, is the very real impact on our economy these actions will have. This will certainly add to on-farm jobs losses, push additional businesses into failure, and further burden our urban and agricultural economy at a time when the state and the nation are in an economic tailspin.

"What's happening here is a single-species, single-stressor approach using half-century-old infrastructure that pits species protection against the California economy -- all under the control of a federal judge. It's an approach inherited from the past, and frankly we need new leadership.

"It should be apparent to everyone that we are on the wrong train. This single-species, single-stressor train left the station decades ago and has yet to produce satisfactory results for any species or our long-term water supply reliability. There is no reason to think the next round of narrowly focused actions will be any more beneficial for fish than the last one -- and we know it's more bad news for water supplies and the state and national economy. This week it is Delta smelt, last week it was longfin smelt, and in a few months it will be the salmon. The requirements of these decisions will almost certainly be in conflict with each other, and everything will be in conflict with a healthy economy.

"The only way forward is to get off this train and board a new one with the right destination -- a comprehensive approach that focuses on the ecosystem and a portfolio of solutions, including actions to address all stressors and structural improvements in the water supply system, including conveyance and storage, to reduce conflict between the aquatic environment and water supply reliability. We need to move, on an urgency basis, to adopt such a comprehensive approach that can work for the environment and our economy.

"This must be a priority for the new administration in Washington, D.C. Every day we stay on the wrong train is another day of further ecosystem decline and lost water supplies."

ACWA is a statewide association of public agencies whose 450 members are responsible for about 90% of the water delivered in California. For more information, visit [www.acwa.com](http://www.acwa.com).

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