

OPTIMIZE WELL FIELD PERFORMANCE



Our Groundwater Action Plan offers a multifaceted approach to optimizing well field operations and maximizing yield. It's a practical companion to a water master plan that focuses on:

- Increasing and preserving well field capacity
- Prioritizing actions around systemwide service objectives
- Planning and budgeting to meet regulatory, safety and maintenance requirements

What do you want to achieve?
Because communities face a diverse range of challenges, our action plan methodology targets your utility's unique needs. Each plan is a framework, formulated to achieve your specific goals, yet constructed in a context that preserves and protects the three major components of a healthy well field: capacity, water quality and reliability.

Capacity	Water Quality	Reliability
Current and target requirements	Water quality problems	Criticality and condition
Potential improvements	Threats and alternatives	Opportunities on a well-by-well basis
Rehabilitation and replacement activities	Short- and long-term actions	Maintenance schedules

Let us show you how a Groundwater Action Plan can be a cost-effective investment to preserve your well field's future. Contact Martin Steinpress at (925) 210-2408, or msteinpress@brwncald.com

BROWN AND
CALDWELL

P.O. Box 8045
WALNUT CREEK
CALIFORNIA 94596-1220

PRESORTED
STANDARD
U.S. POSTAGE PAID
SAN FRANCISCO, CA
PERMIT NO. 1734

ADDRESS SERVICE REQUESTED



Spring 2004, Volume 33, Number 1

WATER ISSUES . . .

BROWN AND
CALDWELL



QUARTERLY

Marketing Communications Director	Terry Peckham
Editor	Susan Wels
Art Director	Calvin Ng
Copy Editor	Dan Foscalina
Illustration	Francisco Loureiro

Photography
Jack Andersen, Christ Chavez, LOTT Wastewater Alliance, San Diego State University NPACI Education Center on Computational Science and Engineering, SANDAG - San Diego Association of Governments, Orange County Water District

Writers
Susan Wels
Terry Peckham
Dan Foscalina

Distribution
Kristy Oshiro

Printing
Bacchus Press

To speak with a Brown and Caldwell representative, call us at (800) 727-2224 or visit our web site at www.browncaldwell.com.

Brown and Caldwell provides environmental engineering and consulting services to public agencies, the federal government and industry.

Quarterly is published by Brown and Caldwell, P.O. Box 8045, Walnut Creek, CA 94596-1220; tel. (925) 937-9010. Subscriptions are free. © Brown and Caldwell 2004. Please contact Terry Peckham at (925) 210-2514 or tpeckham@brwnncald.com for permission to reprint.

Brown and Caldwell is an equal opportunity employer and values work force diversity.



Printed on 100% recycled paper

1

CREATIVITY ON TAP

More utilities are thinking outside the box when it comes to sourcing and managing drinking water supplies

2

PROTECTING THE SOURCE

The City of San Diego is safeguarding its water supply with new guidelines aimed at limiting watershed pollution

6

DESALINATION: THE NEXT WAVE?

Advances in reverse osmosis technology are creating new sources of potable water for a growing number of communities

Waterproof Watershed Poster Inside See page 8

10

QUARTERNOTES

- BC meets tight budget and schedule to renovate a fish hatchery
- In managing commercial demand for water, many districts say conservation is good business
- Storm water flow simulations predict the cost and effectiveness of phosphorus reduction in the Florida Everglades
- A proactive asset management plan is helping Asheville, N.C., improve water treatment and save millions
- Orange County, Calif., breaks ground on its pioneering Groundwater Replenishment System
- Oro Valley, Ariz., assesses water supplies with a Groundwater Action Plan

17

BUSINESS IMPROVEMENT STARTS AND ENDS WITH THE CUSTOMER

Utility-focused business improvement guides highlight the essential need to connect with customers about service levels and expectations



CREATIVITY ON TAP

Clients are using inventive strategies to source and manage their drinking water supplies

MANY UTILITIES ARE PUSHING THE ENVELOPE, LOOKING BEYOND STANDARD SOLUTIONS

a valuable resource that can augment existing water sources.

Utilities are also looking at better ways to manage their groundwater and surface water resources. In some areas, for example, clients are losing drinking water wells due to water-quality issues such as migrating pollution in the groundwater. We're working with them to assess the quality and quantity of their wells and develop comprehensive groundwater action plans to ensure they maintain reliable, long-term supplies.

Other clients are depleting their groundwater resources by overpumping. We're helping them develop smart "conjunctive use" approaches that balance their available groundwater and surface water supplies. These strategies call for reducing pumping during wet years when plenty of surface water is available, and increasing groundwater use when rivers are running dry, along with increasing reliance on additional supplies like recycled water. These plans can also help clients deal with increasingly stringent drinking water standards and potential well shut downs by developing dependable, alternative water sources.



Cindy Paulson
Water Resources Practice Leader



Bob Willis
Potable Water Practice Leader

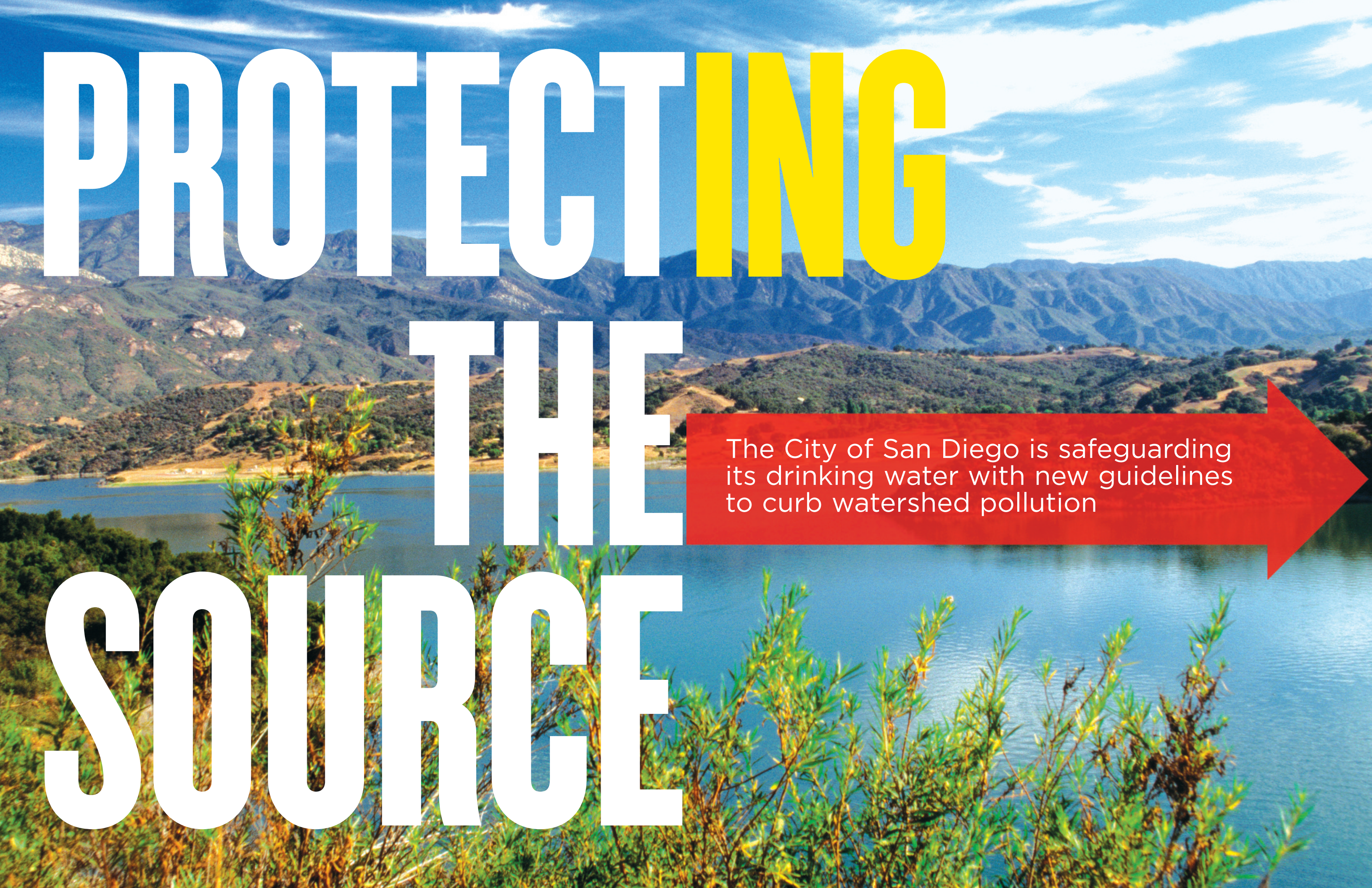
Environmental demands are also adding to the pressure on supply for many clients. Some utilities, for example, are agreeing not to withdraw river water during midsummer drought periods, when low river flows can threaten salmon runs. As a result, these agencies face even greater need for auxiliary water supplies so they don't come up short in a dry year.

Resources and regional solutions

To maximize all their water resources, of course, utilities need to have the right infrastructure, including wells and water treatment facilities. As a result, rates and funding are increasingly big issues for our clients. Some are meeting the challenge with creative, regional solutions—sharing costs, planning and infrastructure with other water districts on a regional basis.

At Brown and Caldwell, we're helping clients meet their water resource challenges by emphasizing solid science and creative, integrated approaches. We see all water as a resource, whether it's in the ground waiting to be pumped, in pristine mountain streams, in runoff (urban, agricultural or other) or discharged from a wastewater treatment plant.

In this issue, we've assembled a wide array of articles that reflect the water issues that many of our clients are facing and the creative strategies and solutions they're employing. Our approach, in each case, is to help them develop efficient, innovative and integrated strategies that can balance supply and demand, cost-effectively, for the long term.



PROTECTING

THE

SOURCE

The City of San Diego is safeguarding its drinking water with new guidelines to curb watershed pollution



Recent studies cite urban runoff from construction projects and development in the watershed as large sources of reservoir pollution—a problem directly related to population growth and increased development. The satellite images above and on the opposite page show urban growth in the San Diego area since 1982.

IN October 2003, raging wildfires in San Diego County claimed at least 12 lives, destroyed hundreds of homes and blackened more than 380,000 acres. The largest blaze—the Cedar Fire—did more damage than any fire in California’s history. Fanned by heavy winds, the wildfires devastated developed areas, as well as major watersheds that provide drinking water to the City of San Diego.

“The city’s two biggest reservoirs, El Capitan and San Vicente, were seriously affected—90 percent of their watersheds were burned,” says Brown and Caldwell storm-water quality expert Nancy Gardiner.

The devastation had dire consequences for water quality. Runoff from a rainstorm two months later, she recalls, washed mud, ash and blackened wood and vegetation into both reservoirs. “The surface of the lakes were brown and filled with charred debris,” Gardiner says. “It was an awful sight.”

It also dramatically showed how vulnerable the city’s reservoirs are to pollutants in rain runoff—from organic

carbon and nutrients to man-made chemicals—that can degrade the quality of drinking water at the source.

“The reservoirs aren’t just at risk during catastrophes,” Gardiner explains. “They’re also vulnerable to everyday pollutants that are increasing as population and development expands rapidly in the region.”

The San Diego Water Department (SDWD) has taken the lead in developing new regional watershed development guidelines that will safeguard the city’s drinking water and water-supply system and reduce the cost of water treatment. Although the guidelines don’t address fire-related impacts, they’ll guide land developers in designing projects in the watersheds and help city staff and local agencies manage land use and planning in the regions.

Relying on runoff

Designed up to a century ago, the City of San Diego’s nine raw water storage reservoirs were built to capture local rain runoff, a source that provides up to 20 percent of the city’s drinking water. Water imported from

“The goal is to guide development in the watersheds in ways that protect the quality of runoff that fills the reservoirs and recharges the groundwater basins.”

the State Water Project and the Colorado River, piped through aqueducts and stored in the reservoirs, supplies the remaining 80 percent of the city’s needs. The problem, Gardiner says, is that the quality of the city’s drinking water is at risk because of pollutants that drain into reservoirs as runoff.

“Recent studies,” she says, “have shown that one of the largest sources of reservoir pollution is urban runoff from construction projects and development in the watershed. The problem will only increase as the area’s population grows and development encroaches on these lands.”

While most of the reservoirs are located in regions that remain largely rural and undeveloped, there are growing urban areas in several of the watersheds, and extensive residential and commercial development is expected in almost all the regions over the next two decades.

“There’s a lot of potential for pollution when you pave roads, put up buildings and introduce the widespread use of cars and household chemicals,” Gardiner says. Unfortunately, however, the city’s ability to control development around the reservoirs is limited. Their watersheds are located almost entirely outside the city’s jurisdiction—on federal, county and American Indian lands, and in the nearby cities of Escondido and Chula Vista.

As a result, Gardiner says, the City of San Diego has no authority over land-use planning, zoning and building codes in those watersheds. Although the SDWD evaluates and comments on new developments in those regions, it has little direct control over most new construction that occurs outside the city’s boundaries.

“Even though the city can’t stop or control development, since it doesn’t own the land,” Gardiner explains, “the SDWD is working with other agencies and stakeholders to develop a regional solution.



“The goal,” she says, “is to guide development in the watersheds in ways that protect the quality and quantity of runoff that fills the reservoirs and recharges the groundwater basins.”

Watershed development guidelines

The utility’s new voluntary guidelines include best management practices (BMPs) for construction and new development. They also offer recommendations for long-term maintenance and monitoring of BMP effectiveness, as well as public information and outreach strategies. An SDWD task force—led by Water Department Director Larry Gardner, Project Manager Bob Collins and Lead Technical Staff Jeff Pasek and Rick Fox—established clear, quantitative objectives and measures for water quality conditions. A Brown and Caldwell team, led by Gardiner, spearheaded design, research and technical assistance for the project.

“These guidelines are unusual,” Gardiner notes, “because they focus on drinking water protection.” By contrast, most municipal storm-water regulations in Southern California are concerned with safeguarding the recreational use of beaches and waterways—controlling coliform bacteria, sediment, oil and grease from roads and heavy metals.

“The pollutants of concern for potable water,” she points out, “are very different. With drinking water, you worry mainly about algae blooms, taste and odor issues, organic carbon and a variety of pollutants that can affect treatment plant operations. No one has really looked at how to manage new development in ways that control these pollutants in rain runoff, and we did a significant amount of research to create the guidelines.”

INDICATOR POLLUTANTS FOR DRINKING WATER QUALITY

Primary pollutants of concern for SDWD’s reservoirs include:

Nutrients, including phosphorous and nitrogen compounds, that can stimulate algae growth in receiving waters.

Taste and odor compounds that are commonly produced in drinking water reservoirs by blue-green algae.

Total Organic Carbon (TOC), including live algae and decaying plant and algal material, that can lead to the production of suspected carcinogens.

Total Dissolved Solids, or salinity, that can lead to unpalatable mineral tastes, higher water treatment costs and physiological effects in drinking water consumers.

Suspended solids and turbidity from runoff that can reduce the efficiency of water treatment plants.

Pathogens from human contact, livestock, wildlife, urban runoff, septic systems and wastewater discharges.

The resulting recommendations offer several increasing levels of protection, depending on the:

- proximity to the reservoirs/tributaries
- potential to generate substantial runoff
- potential to generate pollutants of concern for drinking water
- size and type of development

They’re also consistent with local land-use, zoning and building-code regulations and practices.

Collaborative process

Stakeholder involvement, she stresses, was critical in formulating the guidelines, since they’ll only be effective if they’re widely used. As a result, the team consulted closely with local land-use and planning staff and land developers.

“More than a dozen stakeholders joined our technical advisory committee that met regularly over the past year,” Gardiner says. “It was a crucial forum for getting consensus and technical direction.” The team also reached out to developers and contractors to test the practicality of the proposed guidelines, field-testing them in a public workshop.

“Our goal from the beginning,” Gardiner says, “was to establish a firm scientific basis for the guidelines and gain buy-in and support from local planning agencies, the development community and the public.” The guidelines, she adds, are presented in a concise, easy-to-use, interactive CD format that summarizes research and includes decision trees, worksheets, flow charts and web links for additional information.

“We’ve created a thinking tool, not a giant manual,” she says, “that’s designed specifically to help agencies and developers get answers quickly.”

The guidelines, she adds, represent a proactive, planned approach to protect human health, reduce water treatment costs and increase the reliability of existing supplies. “They’ll also provide a road map,” she says, “for sustainable development and a model for other utilities that need to protect their vital source-water supplies.”

For more information, contact Nancy Gardiner at (858) 571-6742 or ngardiner@brwnclad.com.



DESALINATION

THE NEXT WAVE?

Advances in reverse osmosis technology are creating new sources of potable water for a growing number of communities.

As costs shrink, many see desalination as a promising way to boost water supplies

Persistent drought has hit the City of El Paso hard. On average, treated surface water from the Rio Grande River accounts for half the Texas city's potable supplies. Over the last two years, however, ongoing drought in the river's watershed in New Mexico and Colorado has cut surface water supplies to 25 percent of normal. Faced with this severe drop, El Paso's mayor and council imposed Stage 2 Drought Restrictions for the city in 2003.

PHOTO BY JACK ANDERSEN



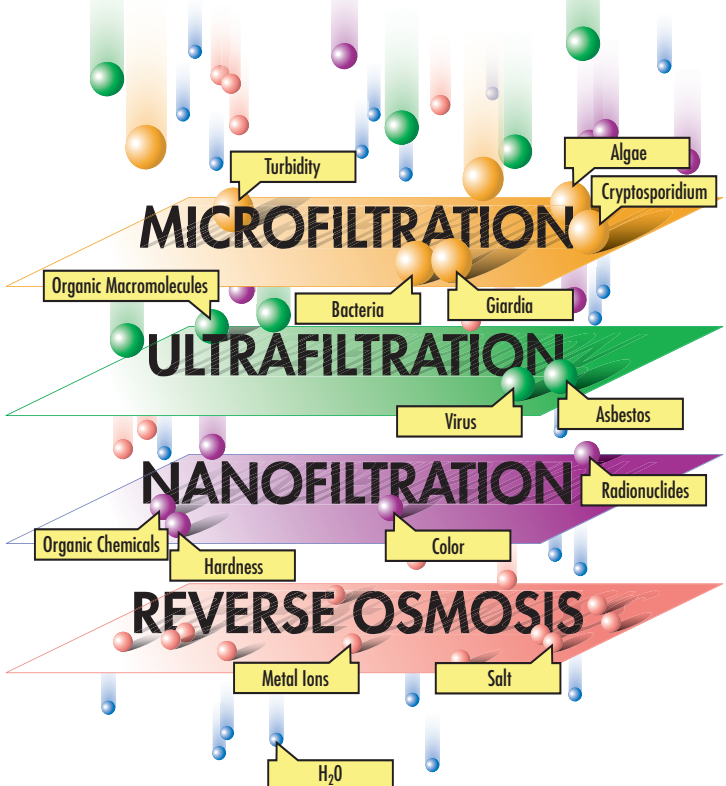
"Our design and construction team has dubbed this project 'The Fast and the Furious,'" says Steve Morgan, project manager for Brown and Caldwell. "The \$8-million construction project was scheduled to be

This trend is relatively recent, according to BC teaming partner Kevin Alexander of

That's especially true, he adds, in parts of the West and Midwest where explosive growth has outstripped water supplies. In 1902, the population of the western United States was

“As a result of that technical improvement,” he explains, “desalination operating pressures dropped tremendously, and the energy requirements of the process were cut in half.” Since then, he adds, industry experience, standardization and competition have

To increase their water supplies to meet growing demand, more and more cities are turning to desalination. Before 1993, Thomas notes, 61 percent of all desalination took place



Brown and Caldwell designed 11 portable well-head RO units. Collectively, they are capable of producing 8 mgd of potable water by desalinating brackish water from EPWU's existing wells.

Once considered prohibitively expensive, technical improvements to RO, along with industry experience, standardization and competition, have dramatically reduced the cost of desalination. As costs drop, RO is becoming more cost competitive in an ever increasing number of applications for producing potable and recycled water.

RO technology uses hydraulic pressure to drive water molecules through a permeable membrane. Salt ions and other contaminants are blocked by the RO membrane, which allows only pure water to pass through it. Feed water sloughs these salts and contaminants off the membrane surface, producing concentrate, which is collected and disposed.

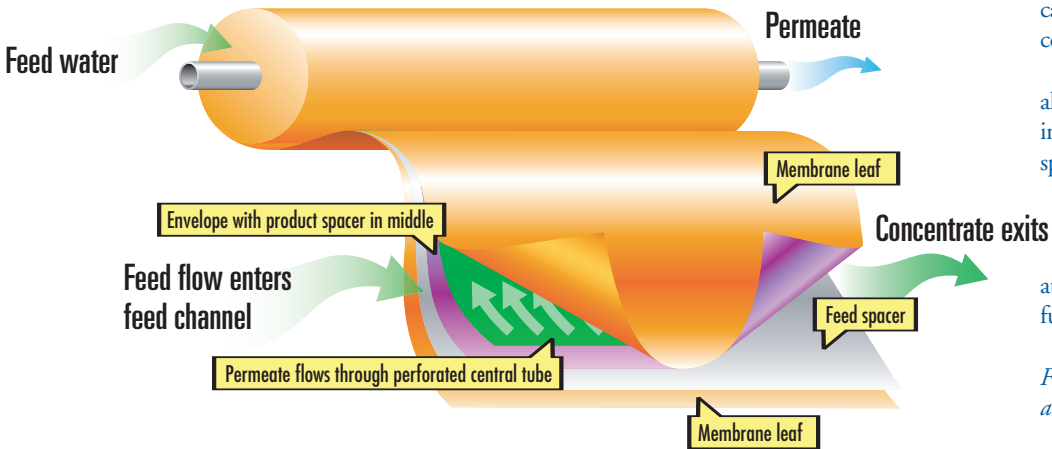
Desalination, he acknowledges, is still more cost-effective in some areas than others. “But over time,” he says, “it will be increasingly competitive with alternative approaches.”

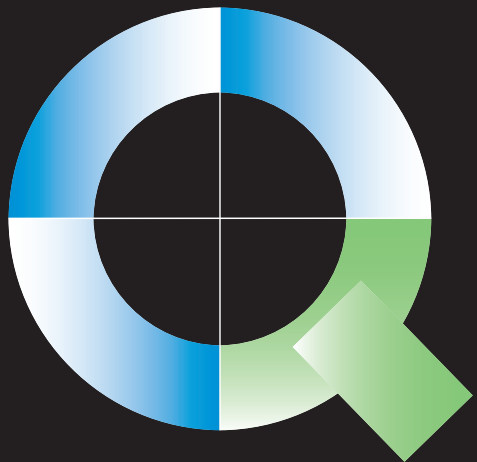
The residue left by desalinated water is a concentrated slurry containing some water and a high level of dissolved solids. Traditionally, many desalination plants have disposed of this concentrate in sewers or surface waters such as rivers, canals, lakes or oceans. Other plants, mainly in Florida, have disposed of it through deep-well injection into

By co-locating desal plants with power plant facilities, he says, cities can benefit from joint use of feed water and discharge infrastructure, reduced electric transmission and line losses, use of the power plant cooling-water system and the ability to dilute brine concentrations with power-plant discharge.

“Desalination,” Thomas says, “is already a viable option for managing and increasing a water supply portfolio. As we speak, more states are bringing desalination plants on line, and the size of their facilities is increasing. Desalination is a water-supply solution that will only become more attractive and cost-effective in the near future.”

*For more information, contact Harold Thomas
at (602) 567-3920 or hthomas@brwnald.com.*





QUARTERNOTES

New Site for Salmon

Fish hatchery renovation meets tight budget and schedule

In California's San Joaquin County, thousands of chinook salmon return each fall to spawn at the Mokelumne River Fish Hatchery, owned by the East Bay Municipal Utility District (EBMUD) and operated by the California Department of Fish and Game. Built as mitigation for the construction of Camanche Dam, the 35-year-old hatchery needed complete reconstruction to improve its spawning facilities for salmon and steelhead trout and to upgrade working conditions.

"EBMUD's budget wasn't enough to cover the original upgrade plan, so we totally reengineered the project to bring it within the district's financial resources," says Brown and Caldwell Project Manager Bill Faisst.

The renovation team, led by Brown and Caldwell, also managed to complete the design and construction on a tight schedule to accommodate the annual salmon and steelhead runs.

Upgrades and amenities

The renovation expanded the hatchery's water-supply system, upgraded its egg-gathering and rearing facility and added 20 football-field-length rearing raceways, as well as a new cleaning and waste disposal system. To protect the fish from birds, otters and other wildlife, the raceways were enclosed by four acres of nets and fences.



Brown and Caldwell's renovation of the Mokelumne River Fish Hatchery was completed on a tight schedule to accommodate the annual salmon and steelhead runs. The 35-year-old hatchery, pictured at right before the renovation, was originally built as mitigation for the construction of Camanche Dam. The new and improved hatchery, shown at lower right, has a new water-supply system, an upgraded egg-gathering and rearing facility, and 20 football-field-length rearing raceways.

At the end of the \$8-million construction project, Faisst adds, there was money left over for visitor amenities such as landscaping, information kiosks, a patio and fountain area, and a self-guided tour program featuring custom graphics.

"This project," he says, "was a successful large-scale, design-to-cost-and-schedule effort that met multiple needs and some very challenging conditions."

For more information, contact Bill Faisst at (925) 210-2384 or bfaisst@brwnncald.com.



Optimizing Operations

In North Carolina, a utility is improving water treatment and saving millions with a proactive asset management program



In Asheville, N.C., city officials and members of the regional water authority are using a proactive asset management plan to improve water quality and save millions at three water treatment plants.

To meet increasingly strict drinking water standards, a North Carolina utility—the Regional Water Authority of Asheville, Buncombe and Henderson (RWA) — is upgrading operations at three water treatment plants, bringing them into compliance with proposed turbidity standards.

The utility is also taking a systemwide look at its assets and operations to reduce long-term costs and develop sustainable operations, says Brown and Caldwell Project Manager Rick Carrier. By assessing the RWA system as a whole, BC helped the utility develop a comprehensive program that meets water quality goals and saves millions of dollars in capital investments and operating costs.

Systemwide approach

The optimization program, Carrier explains, is focused on four key areas. One objective is to optimize the utility's two direct filtration plants to meet current and future turbidity standards. By piloting several inexpensive chemical treatment and filter changes, the RWA developed an upgrade strategy that will enable its plants to consistently meet proposed drinking water regulations while cutting \$7 million in capital costs from the program.

A second area of focus is a water audit and drought-management program designed to enhance revenue and reduce leaks from the utility's aging system. "The audit is analyzing whether it actually makes economic sense to reduce those leaks aggressively," says David Hanks, Water Resources director for the City of Asheville. The RWA, he adds, is one of the first utilities in the country to employ new International Water Association methodology to assess the economic impact of water loss.

The drought-management program helped frame the water-audit results and demonstrated that, if properly managed, the RWA has adequate capacity for years to come. Part of the new management strategy is to operate two of the smaller RWA plants only during times of need, leading to projected cost savings of more than \$500,000 a year.

Asset management

An asset management evaluation will also help RWA plan infrastructure maintenance, refurbishment and replacement. The utility is using a replacement planning tool to predict rehabilitation and replacement costs and develop a funding strategy for sustainability and reliability. Other elements of the asset management program include an integrated asset database, detailed asset plans and optimized maintenance programs.

"By looking at the utility's entire system," Hanks explains, "we can put in place best practices that will not only meet proposed water quality standards, but will also keep rates low, save money and protect the RWA and City of Asheville's assets and investment for the future."

For more information, contact Rick Carrier at (704) 373-7112 or rcarrier@brwnncald.com.

Water Conservation is Good Business

Managing commercial and industrial demand for water

To conserve water supplies, several water districts are moving beyond residential programs and encouraging businesses and industries to use more water-efficient practices.

Especially in times of drought, or where new supplies are very expensive or too environmentally sensitive to develop, some municipalities are asking local businesses and industries to reduce their water consumption. "When companies respond and cut their water use," says Brown and Caldwell Senior Engineer Lisa Maddaus, P.E., "many also save significant amounts of money, as well as energy and other resources. It's a win-win move that can have multiple benefits."

Plant and process changes

Many companies can reduce the amount of water they use in landscaping, irrigation and industrial processes through steps such as onsite water recycling and reuse in cooling towers, heat exchangers and steam-recovery systems. Some municipalities, she adds, offer financial

incentives for companies that put conservation measures in place. In Southern California, for example, the Metropolitan Water District pays companies as much as \$154—for up to five years—for every acre-foot of water that they save through process changes.

Stopping the leaks

Brown and Caldwell, Maddaus says, has the experience and expertise to perform industrial water surveys, identify water-saving opportunities and implement conservation projects. One survey, she notes, proved that a client's tank was overflowing at an estimated 100 gallons per minute.

"Correcting the problem saved the client more than \$143,000 and 52 million gallons of water annually," Maddaus says.

"The savings," adds BC Managing Engineer Jim Doane, P.E., "are often so great that it gives businesses that conserve a competitive edge. For many companies, saving water not only lowers sewer and energy costs



but also increases the sustainability of both their own and utility operations alike. Even in regions that are water-rich, water efficiency can increase economic efficiency."

For more information, contact Lisa Maddaus at (916) 853-5317 or lmaddaus@brwnncald.com.



Building the Future

Orange County's pioneering Groundwater Replenishment System is under construction

In 1994, Southern California's Orange County Water District (OCWD) embarked on an innovative joint project with the Orange County Sanitation District (OCSd) to recharge a large groundwater basin with highly purified wastewater that is similar in quality to bottled water.

The purified water, which meets federal and state drinking water standards, will keep seawater out of the county's groundwater basin and replenish deep aquifers, eventually becoming part of the county's drinking water supply.

On budget and on time

The \$450-million Groundwater Replenishment (GWR) System—the largest water purification project of its kind in the United States—is scheduled to be on-line in 2007, and the first components are now under construction. "We're in a very exciting phase of the work," says OCWD General Manager Virginia Grebbien. "The design is completed, and now we're going out and starting to build."

The program, she adds, is on budget and on schedule. "Everything's been going extremely well," she says, "even though this is a logistically



challenging project involving two public agencies and several major consultants." Brown and Caldwell is part of the project design team, along with CDM and Tetra Tech.

The first elements of the system include an initial 6-mgd water purification facility (pictured). The plant will provide water to feed existing reverse osmosis water purification membranes and ultraviolet light disinfection facilities for the seawater intrusion barrier until an advanced 70-mgd water purification plant is completed for the system.

Parts of a 13-mile pipeline, along with a power substation, are also under construction.

Communication critical

Constant communication and public outreach, Grebbien says, has been essential to the program—both to minimize neighborhood disruption during construction and inform the public about the purity and safety of the water.

"We've been doing a tremendous amount of communicating throughout the process, making sure that everyone in the community understands the value of the project."

As a result, she adds, "the people we talk to feel good about what we're doing and appreciate that we're creating a secure water supply for the county's future."

Other municipalities in arid regions, she adds, should consider reuse projects like GWR. "Orange

County is on the leading edge, but there's no reason that other municipalities can't do it. Recovering water and using it over and over again in this way," she says, "is an increasingly cost-effective strategy. The keys are identifying the need, putting together the right solution and partnerships and then communicating."



To increase awareness of health and safety in the office and field, Brown and Caldwell has restructured its program and approach over the last two years. "We've evenly distributed our health and safety resources around the company," says Safety Manager Linda Henry,

High Marks for Health and Safety

BC's restructured H&S resources earn client kudos

"taking them to the regional and office level. We also enhanced our corporate health and safety team by adding individuals at the office level who have passion and expertise about these issues."

Walking the talk

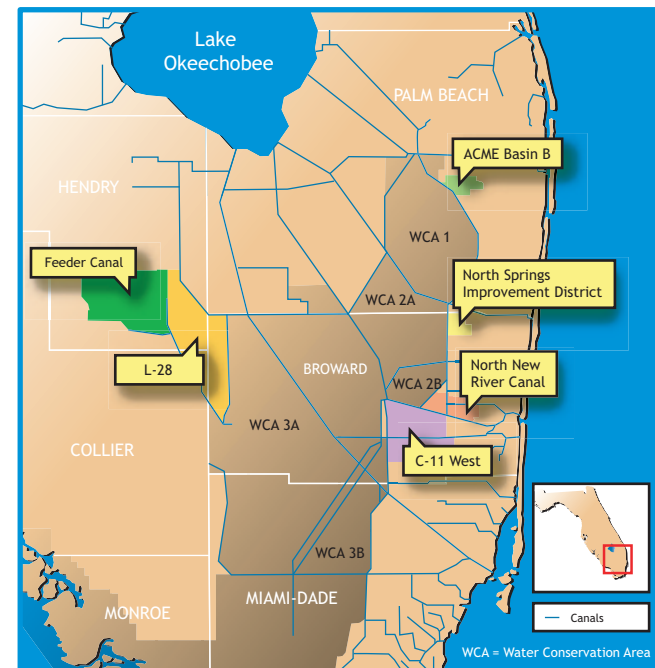
The results have earned high marks, according to a Contractor Safety Review conducted by the El Paso Corporation. The client's internal audit showed that BC "walks the talk" when it comes to health and safety.

"We value the expertise that Brown and Caldwell offers our remediation team, from the corporate level down to the field office personnel assigned to our projects nationwide," says El Paso Safety Manager Tom Alvarado. "We look forward to our valued partnership in continuing to meet and exceed the safety goals that both our corporations have established."

Be SHARP!

Furthering its commitment to creating and maintaining safe work environments, BC this April launched "Be SHARP"—its new Safety and Health Awareness and Responsibility Partnership. The program builds on the company's nationwide network of safety professionals by boosting safety awareness and emphasizing training opportunities. For the rollout, all employees have been asked to participate in an online survey to assure that personal safety training is up to par with the type of situations that each individual is likely to encounter on the job.

For more information, contact Linda Henry at (925) 210-2362 or lhenny@bruncald.com.



In the Flow

In Florida's Everglades, storm water flow simulations are predicting the effectiveness and costs of phosphorus reduction

To restore and protect the fragile Everglades ecosystem, the South Florida Water Management District (SFWMD) is planning and implementing source controls, treatment facilities and regional programs. These measures are designed to ensure that water discharged to the Everglades Protection Area meets the strict water quality goals set by Florida's Everglades Forever Act (EFA) of 1994. Those objectives include very low levels of phosphorus—as low as 10 parts per billion—explains Brown and Caldwell Engineer Emily Mott.

As required by the EFA, the district has already constructed thousands of acres of treatment wetlands, or Storm Water Treatment Areas (STAs). Together with source controls, the STAs have removed more than 1,400 metric tons of phosphorus from storm water runoff since 1994.

For the past several years, Mott adds, the district has been researching ways to further reduce phosphorus loads in storm water that drains into the endangered Everglades. To help the district assess which reduction strategies would be most effective and estimate their long-term costs, BC used the research to model a variety of approaches, including natural and chemical treatment systems and diversion alternatives for storm water in six urban and tributary basins (see callouts in graphic above).

Groundbreaking approach

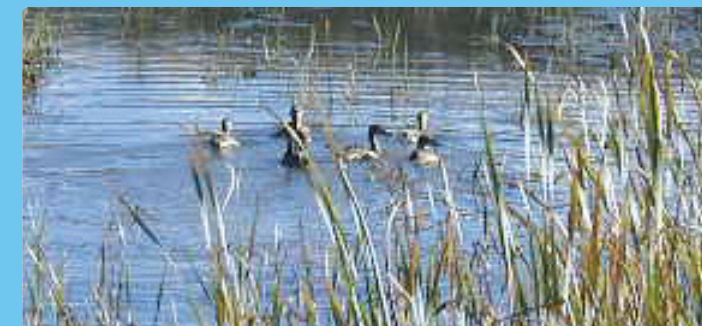
"For the first time in history," Mott says, "simulated, basin-specific storm-water flows and phosphorus loads were used to determine the optimal strategy to achieve long-term water quality goals for the Everglades."

Based on the results of BC's technical analysis, the SFWMD is now implementing phosphorus reduction strategies in the basins. The information from BC's assessment, she adds, will help the SFWMD satisfy the long-term water quality objectives of the EFA.

For more information, contact Emily Mott, P.E., at (561) 684-3456 or emott@bruncald.com.

A Regional Approach to Urban Runoff

In Los Angeles County, the construction industry is exploring new solutions for runoff pollution



To control pollution from urban storm water, Los Angeles County has passed new measures requiring on-site treatment of runoff in new development or redevelopment sites. As a result of these regulations, developers expect to spend millions of dollars over the next several years to treat storm-water runoff at thousands of individual, small-scale facilities.

According to the Construction Industry Coalition on Water Quality (CICWQ), this may not be the best way to reduce pollutants, since new development is limited within the county and the regulations don't address runoff from areas that are already developed.

Regional, watershed approach

As an alternative, CICWQ is proposing a large-scale regional solution that would treat the runoff from all sites in a watershed.

"We see a window of opportunity for regional approaches to storm-water quality," explains Tim Piasky, director of Environmental Affairs for the Building Industry Association in Southern California. "We'd like to see the funds go toward real water quality improvements, through more comprehensive, watershed-based solutions." CICWQ has sponsored a feasibility study for this approach, which Brown and Caldwell completed.

According to BC Vice President Michael Drennan, large-scale, regional facilities are important alternatives to consider in urban settings because they can provide a greater array of benefits when compared with on-site facilities. "Regional facilities can provide opportunities for multiple-use areas, such as greenspaces, ball fields and wildlife habitat, that can be real assets to local communities."

These facilities have lower unit construction costs than on-site systems. They also reduce the cost burden for individual agencies, since the costs can be shared among flood-control, water-quality, water-supply and parks and recreation departments.

CICWQ's goal, Piasky says, is to reduce pollutants in urban storm-water runoff in the most effective, economic manner and encourage discussion of alternatives.

"We're presenting regional approaches as an opportunity for all stakeholders to come together," he says, "and talk about what we can do to improve the quality of urban runoff."

Managing storm-water resources

Drennan adds that regional facilities can also capture and treat urban runoff for reuse—an increasingly important element of runoff management. The City of Santa Monica, for example, is evaluating alternatives to retrofit its storm-water system to treat and recycle urban runoff in order to augment the city's non-potable water supply.

"Through the use of multi-purpose projects and innovative technologies," explains City Project Manager Spiros Lazaris, "the urban runoff management project in the City of Santa Monica will decrease urban runoff, increase groundwater recharge, reduce urban runoff pollution into the Santa Monica Bay and increase recreational opportunities throughout our city." Brown and Caldwell is preparing the alternatives analysis for Santa Monica.

"Water," Drennan observes, "is a precious commodity, particularly in semi-arid areas. Instead of something to get rid of, storm water can be managed as a valuable resource. That's really the wave of the future."

For more information, contact Michael Drennan at (310) 309-4332 or mdrennan@bruncald.com.



Managing Wastewater Resources

On Puget Sound, wastewater planners have developed a sustainable, flexible management program

Lapping at the shores of Olympia, Wash., Budd Inlet in Puget Sound has suffered from pollution due to urban storm-water runoff and discharge from a sewage treatment plant. To reduce dependence on marine discharges, the regional wastewater utility, LOTT (the cities of Lacey, Olympia and Tumwater and Thurston County), has developed a sustainable, adaptable management program focused on water recycling, conservation and groundwater recharge.

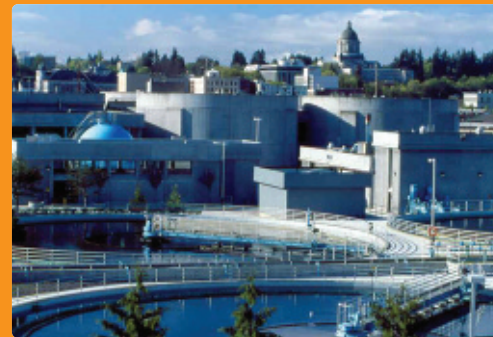
“LOTT is one of the few wastewater districts in the country with such a flexible, comprehensive approach,” says Brown and Caldwell Project Manager Chris Cleveland. “It’s a strategy that gives it the ability to respond cost-effectively to growth, as well as changing conditions.” Brown and Caldwell conducted a three-year, multidisciplinary planning effort to develop the region’s new wastewater management program.

Reclamation and conservation

To reduce the volume of discharges into Budd Inlet, the wastewater treatment plant—beginning in spring 2004—will treat a portion of its flows to Class A Reclaimed Water standards for nonpotable uses.

LOTT also plans to build up to three satellite reclaimed water treatment plants in the next two decades to add wastewater capacity and divert flows out of the main facility on Budd Inlet. The first plant, scheduled to be on-line in 2005, will treat one million gallons per day to Class A Reclaimed Water standards for nonpotable purposes and groundwater recharge.

LOTT will also focus on reducing the region’s wastewater flows and the need for new



LOTT’s main facility on Budd Inlet along the shores of Olympia, Wash.

capacity through ongoing conservation strategies such as appliance and fixture replacements.

“As the region grows and develops,” Cleveland says, “LOTT realizes it won’t find new places to discharge its wastewater flows, but it will find new ways to reclaim and recycle water. That’s the best, most economic way for the utility to build capacity.”

For more information, contact Chris Cleveland at (360) 943-7525 or ccleveland@bruncald.com.

A Standard of Service

BC’s national ES program satisfies client needs with local expertise, companywide quality



Environmental Services (ES) clients with sites in numerous states can expect local expertise and companywide quality, thanks to BC’s National Client Program.

“Environmental regulations are typically applied and enforced at the local level, and the level of enforcement for those regulations can vary dramatically in different cities and states across the country,” explains Executive Engineer John Fields. “Our National Client Program allows consistent delivery of quality services and local, specialized talent that clients deserve when dealing with ES issues. And it provides service and support the way clients want it, whether they have a centralized, corporate approach to managing their environmental affairs or a more local and decentralized structure.”

Consistency, expertise and flexibility

The program’s hub-and-spoke design teams a national BC “client service manager” with regional experts who intimately understand local compliance and permitting requirements. “We can deploy our best and brightest wherever a client needs them, while providing consistent quality, communications and project oversight,” says National ES Practice Leader Ed Ricci. “One of our key market differentiators is the way we plan, organize and execute around our client’s multifacility, multigeographic and service needs.”

General Dynamics (GD), for example, has almost 100 facilities nationwide, in all regions of the country, and a decentralized approach to environmental and health and safety management. To meet GD’s specialized needs, the national program gives BC’s local project managers complete autonomy to access companywide talent and resources. BC has worked on compliance-related and other kinds of multidisciplinary projects for General Dynamics in California, Florida, Arkansas, Illinois, Virginia, Louisiana, Rhode Island and Ohio, and is currently assisting GD with an aerospace facility decommissioning in Oklahoma.

Other clients, like Flying J Inc.—with travel plazas and fuel stops in 41 states—take a more centralized approach. To meet their ES needs, client service managers, specifically selected by the client, can distribute project work to BC offices around the country while keeping central control over quality, project oversight, billing, client satisfaction and accounting.

“Wherever our clients have sites and however they choose to do business,” Fields adds, “Brown and Caldwell is ready to respond.”

For more information, contact John Fields at (858) 571-6704 or jfields@bruncald.com.



Bridging the Supply Gap

With a Groundwater Action Plan, municipalities can ensure an adequate, reliable, long-term water supply

As an alternative to surface water supplies—which are under increasing pressure from drought, growth and environmental regulation—many cities are looking to develop their potential groundwater resources.

“Groundwater can be a very good way to augment surface water sources and provide important backup in case of drought or emergency surface-supply interruptions,” says BC’s Chief Hydrogeologist Martin Steinpress.

To help clients assess and develop their groundwater supplies, Brown and Caldwell has developed a new Groundwater Action Plan (GAP) tool kit. The dynamic GAP tool speeds budgeting and planning for well drilling, as well as maintenance and rehabilitation. “GAP helps clients assess their production requirements,” Steinpress says, “identify future well needs and determine the annual costs of their groundwater facilities.”

Meeting future needs

In Arizona, the Town of Oro Valley, near Tucson, used the GAP tool to improve its well field pumping capacity and reliability over a 10-year planning horizon.

“In the last four years,” Steinpress explains, “Oro Valley’s water supply wells have been heavily stressed as a result of drought and heavy turf irrigation requirements.” Using GAP, the town learned that it could best meet its projected production capacity by rehabilitating or replacing existing wells and upgrading pumps and motors.

Other clients, he adds, use GAP to help manage their surface water and groundwater supplies conjunctively as a single resource, employing drought planning, groundwater recharge and conservation. “With the costs of surface water rising,” he says, “groundwater is an alternative supply that increasingly deserves a second look.”

For more information, contact Martin Steinpress at (925) 210-2408 or msteinpress@bruncald.com.



Breaking New Ground

BC opens offices in Cincinnati and Raleigh

Brown and Caldwell is pushing farther into Ohio and North Carolina with new offices in Cincinnati and Raleigh. Municipalities, private companies and government agencies now have local access to the company’s national network of environmental and engineering expertise.

Tim Koch, P.E., who heads the Cincinnati operation, has more than 27 years of experience across the Midwest in the planning and design of municipal and industrial water and wastewater systems. Also on board is Rich Engle, P.E., a 25-year veteran specializing in water, wastewater and storm-water systems.

Managing the Raleigh office is Ken Bruce, P.E., who’s got more than 16 years of wastewater experience with agencies across North Carolina and Virginia. His specialty is alternate delivery systems in the municipal and industrial markets. Also on staff is Marshall Taylor, P.E., a 27-year



Tim Koch



Rich Engle



Ken Bruce

industry veteran who will lead the company’s Carolinas Water Resources Practice.

BC’s new Ohio office is located at 144 Merchant Street, Executive Plaza I, Suite 225, Cincinnati, OH 45246; for more information call (513) 618-6410. The new North Carolina office is located at 5400 Trinity Road, Palisades I, Suite 305, Raleigh NC 27607; for more information call (919) 233-9178.



Decision Maker

New cutting-edge modeling system speeds water-resource planning and cuts costs



Brown and Caldwell helped complete a yearlong feasibility study of the South Platte River Basin to create a decision support system for the Colorado Water Conservation Board.

To boost the efficiency of its planning, management and operations in the South Platte River Basin, the Colorado Water Conservation Board (CWCBC) has developed a new, cutting-edge decision-support tool.

The system pulls together data and computer models based on factors such as streamflow, reservoirs, surface water rights, groundwater pumping, geology, aquifers, climate and land use.

Speeds planning

"Integrating all this information in a single, powerful decision-support system will save the CWCBC a significant amount of money and help it better manage water resources in the basin," says Brown and Caldwell Project Manager Leo Eisel, Ph.D., P.E. Brown and Caldwell worked with three other engineering consulting firms to complete a

yearlong feasibility study for the system.

A similar modeling tool for the Colorado River, Eisel notes, helped water resources managers find an extra 20,000 acre-feet per year to protect four species of endangered fish. Brown and Caldwell used the system to identify operational changes that managers could make in reservoirs to produce the additional flows without harming other water users.

"The system's integrated data sets sped the research and decision-making process, saving more than \$500,000," he adds. "These systems recoup their investment many times over and should be of interest to other water resources managers around the country."

For more information, contact Leo Eisel at (303) 239-5400 or leisel@bruncald.com.

Smooth Operator

Designed with extensive feedback from plant operators, Cheyenne's new water treatment facility is state of the art

To keep up with population growth and changing water quality regulations, the City of Cheyenne, Wyo., needed to replace two aging water treatment plants, one of which was built in 1915. The solution was to build a new, state-of-the-art facility that was designed with input and ideas from plant operators.

"Operators attended every single one of the design meetings," recalls Bud Spillman, Water Division manager for Cheyenne's Board of Public Utilities. "As a result, a lot of the design reflects their practical experience."

Easy to run

The new 35-mgd R.L. Sherard Water Treatment Plant, designed by Brown and Caldwell, can be easily expanded to 50 mgd to meet future demand. And while its main method of disinfection is chlorination, it's fully equipped with new ozonation technology to meet increasingly stringent water quality regulations.

In response to operators input, BC designed the facility with an enclosed truck bay, for unloading chemicals and protecting personnel from the area's strong winds. The plant also features a complete pilot system that can test any chemical or process change and thoroughly analyze its impact on the operation.

"It's an excellent facility that's easy to operate and produces very high-quality water," says Herman Noe, engineering manager for the Cheyenne Public Utilities Commission. "It should do the people of Cheyenne a great service."

For more information, contact Bob Ferguson at (303) 239-5440 or bferguson@bruncald.com.

Business Improvement Starts and Ends with the Customer



Craig Goehring, PE, CEO

"Customer focus," "customer-centric," "customer success" – these widely used calls-to-action, however phrased, usually constitute a critical component of any business improvement initiative. This assertion is pretty much universal in private business, but not so in the public services sector. Most public utilities have long considered *good* customer service to be a given, but at what cost and with what effectiveness? In other words, what are the real choices?

A host of new guides and techniques have emerged to help utility directors and their management teams get a firmer handle on the true cost of providing service, but with an important effect: managers, and ultimately their customers, are having to define what *good* service actually means. We see this calibrating of expectations most clearly in our asset management work where, for example, utilities are defining customer service *levels* and factoring them into performance improvement plans. This is a significant advancement in "running more like a business."

Sustainable water infrastructure

When industry leaders convened last year for the EPA-led forum on "Closing the Gap: Innovative Responses for Sustainable Water Infrastructure," they outlined a strategic call to action that puts the utility customer in a central role. The alarming "gap" in spending versus the investment needed to sustain the nation's water infrastructure had been clearly benchmarked, and EPA officials outlined four "Pillars of Sustainable Infrastructure" required to meet this challenge and close the funding gap:

- **Better Management:** employing practices like asset management, environmental systems, consolidation and partnerships, into which *customer expectations*, service/cost trade-offs and performance indicators factor heavily
- **Efficient Water Use:** improving water efficiency through consumer education, incentives, and such best practices as metering, since smart water use depends on *customer behavior*
- **Full-Cost Pricing:** recognizing that either as ratepayers or taxpayers (*read customer*), the full cost of delivering water and wastewater service will need to be paid
- **The Watershed Approach** – looking at water resources more broadly to optimize their use across different *customer groups*

This is strong guidance that could very well form a powerful framework for a national agenda or campaign. To engage customers/ratepayers in meaningful dialogue and decision making with regard to infrastructure, these four strategies involve direction, action, resolve, improvement, and commitment – essential elements for gaining customer confidence and competing effectively with other national issues for voter/ratepayer attention.

Integrating improvement initiatives

In February, utility leaders and advisors authored "Continual Improvement in Utility Management: A Framework for Integration," which addresses the challenges of simultaneous performance improvement (better management)

across multiple areas within a utility. In every aspect of this work, from drivers for management change and vision statements to the Balanced Scorecard and asset management, the customer figures prominently. And its integrating framework – a Plan-Do-Check-Act continuous improvement cycle – also spotlights the *internal customer* by promoting more effective performance through cross-functional teams.

Setting Customer Service Levels

In their just-published three-part series, "Setting Customer Service Levels," Kevin Young of Hunter Water Australia and our own Ken Harlow, senior business consultant, promote the importance of setting customer service levels. Their insight comes directly from our work with U.S. utility clients on their asset management programs and Hunter Waters' decade-long experience on setting, measuring and balancing service level and cost trade-offs. Reliable service is a hallmark for most utilities, yet applying a methodology for measuring service levels and testing cost trade-offs is relatively new territory.

Young and Harlow set the stage by characterizing the more discriminating customers of the future, who even now want to understand the value they are receiving for their increased "investment." The authors offer practical, field-tested approaches to connecting with customers and getting started in setting service levels (performance indicators are included).

A.M. and service levels go hand in hand

For the foreseeable future, *good* customer service, as perceived by both customer and utility, will be negotiated by service level/cost trade-offs, a concept that is inherent in the definition of asset management: meeting customer and environment service levels at the lowest lifecycle cost. Also inherent in that definition is a concept of sustainability, whereby not only is asset life maximized through careful planning, but so too is the viability of the utility and the vitality of the communities it serves.

A common denominator in what EPA, AMSA/AMWA, Ken and Kevin are all pointing to in their business improvement guides is the essential need to make the basic connection with customers about service levels and expectations, both locally and at the national level. And it makes sense that organizations that have adopted asset management systems and principles, and are acting upon the data, will find these discussions to be highly productive and decisive. Why? Because only with accurate, hard-dollar data on the cost of service and asset life can customers accurately calibrate their expectations and can elected leaders be expected to do the right thing and make long-term investments.

The papers referenced in this article and a sample Customer Service Level BMP can be found at www.browncaldwell.com/customer.

Tidal Wetlands Restoration



The South Bay Salt Pond Restoration project, in San Francisco Bay, is the largest tidal wetland restoration project on the West Coast. It will restore more than 15,000 acres of commercial salt ponds to tidal marsh, mudflat and other wetland habitats, while enhancing flood management, water quality, public access and recreation opportunities. Brown and Caldwell is planning and designing the project, in

conjunction with three other consulting firms and stakeholders including the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, the California Department of Fish and Game and the California State Coastal Conservancy. The project includes review of existing pond conditions, extensive planning, acquisition of regulatory permits and development of final design for the initial implementation phase.