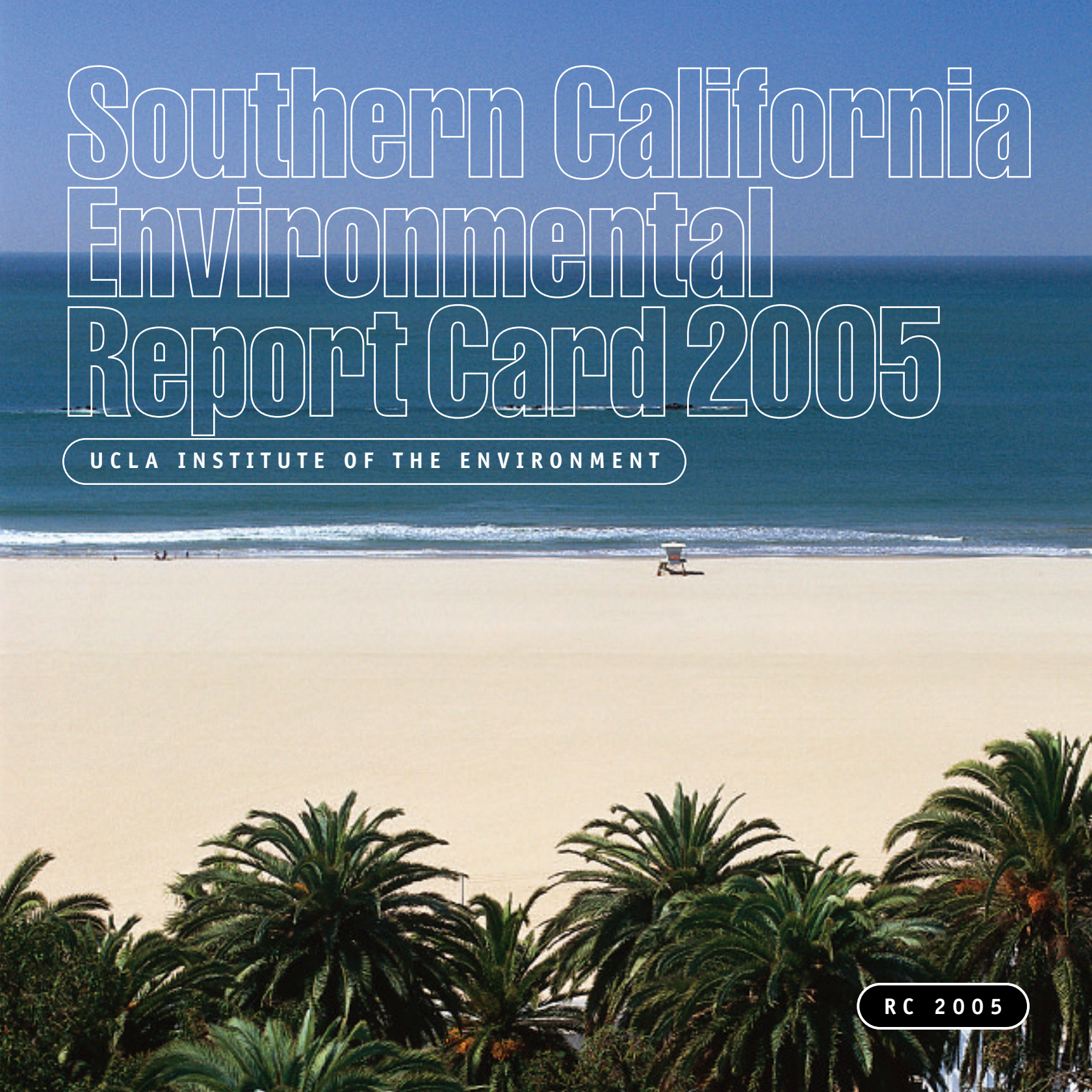

Southern California Environmental Report Card 2005

UCLA INSTITUTE OF THE ENVIRONMENT

RC 2005

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GRADES A to F
Water
Quality

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As the previous article demonstrates, water *supply* is of extraordinary concern to the long term health, welfare and economy of Southern California. But supply is not our only concern. The *quality* of the water we use—to drink, to swim, to irrigate—is also key to the region's future. Our previous Report Cards have dealt in various ways with the quality of our water: wastewater treatment plants and water conservation (1998), stormwater (1999), drinking water (2000), bottled water (2001), reclaimed water (2002) and stormwater regulations (2004). These reports have generally praised our region for its efforts to manage our water quality, although each report details at least some problems that require innovative solutions. But each of these Report Card articles examined only an individual piece of the water quality picture. In this report we integrate issues described in the previous Report Cards and discuss how water research, regulation and treatment systems are crucial not only for the Southern California environment but also for our long term economic health.

WASTEWATER TREATMENT

Southern Californians live primarily on the coastal plain. In order to provide adequate sewage treatment for our regional population, various jurisdictions have created large treatment plants, called coastal plants, that service this community. These plants discharge effluent into salt water through submerged pipelines that are several miles long. Traditionally, these plants have operated at lower efficiency than inland plants, based upon the belief that ocean discharge and the large dilution provided by the long pipe lines would mitigate environmental impacts. Inland communities are served by smaller plants, generally operating at higher efficiency and in many cases, providing source water for reclamation facilities.

In RC 1998, we gave treatment plants inland to the coast of California A grades because of their high treatment efficiency needed to provide reclaimed water. Since 1998, new regulations have required these plants to improve even more and to remove nitrogen, an important stimulus to eutrophication and a potential toxic material to human infants, fish and wildlife. The Sanitation Districts of Los Angeles County (LACSD) have largely completed the conversion of their inland plants for nutrient removal. The Inland Empire Utilities District has also met the challenge. The City of Los Angeles has begun conversion of its two inland plants. The "A" grade for inland plants in RC 1998 was well deserved and our treatment agencies have continued to build and maintain advanced technology wastewater treatment plants for environmental protection and water reclamation.

By contrast, the grade for coastal wastewater treatment plants in 1998 was low, only a C. The Report Card article described a long protracted process of legal battles, delays and expensive or failed projects. Major treatment agencies such as the City of Los Angeles and LACSD had not met Clean Water Act (CWA) goals other cities had generally achieved in 1977. The Orange County Sanitation Districts and the City of San Diego were operating with permits requiring only partial secondary treatment.

This situation has dramatically changed in the intervening seven years. The City of Los Angeles and LACSD

The Hyperion Wastewater treatment plant was the first large plant in the United States to achieve new EPA standards for land application of biosolids. The new "egg-shaped" digesters at the plant, while not required for thermophilic digestion, facilitate high temperature digestion by providing better mixing and reduced cleaning frequency.

Thermophilic digestion reduces Hyperion's power consumption from outside sources by 75 percent.

have each implemented full secondary treatment at their two major coastal plants and are now tackling the associated problems of secondary treatment—energy conservation and biosolids disposal. The City of Los Angeles has done well in being one of the first major US cities to achieve Biosolids A treatment. Biosolids A is a US EPA classification for biosolids that meet especially high standards for reduced pathogen and heavy metal content, and is generally required before biosolids can be applied beneficially for uses such as soil amendments. The City received an award for its use of high temperature solids treatment, called thermophilic digestion, at its Hyperion Treatment Plant. The plant recovers energy from biogas by treating it to remove sulfur compounds and burning it at the City's Scattergood power plant. This reduces Hyperion's power consumption from outside sources by 75 percent.

The situation has improved in other southern California locations as well. Voters in Orange County approved the conversion of county treatment facilities from partial secondary to full secondary. This contrasts with experience in Los Angeles that involved a 22-year legal battle. The Orange County Sanitation District is moving quickly to implement full secondary treatment at its two major treatment plants. The City of San Diego, while still believing that secondary treatment is not necessary, has been proactive in testing new technologies for secondary treatment in the event the City is required to upgrade its major plant at Point Loma. These plants are also participating in water reclamation projects, which are discussed below.

The treatment agencies are also making progress in reducing chlorine usage at treatment plants. Chlorination has traditionally been the most effective and least expensive way of disinfecting effluents. Over the past 20 years, however, research has shown that byproducts of chlorination can be harmful to the environment. Transportation of the chlorine from production facilities to consuming facilities is also a problem, and one or more fatal chlorine spills are reported each year in the United States. We are pleased to report our treatment agencies are making good progress to reduce chlorine usage by adopting more advanced technologies such as ultraviolet (UV) light disinfection. This technology is more expensive but has the advantage of reduced byproducts and the elimination of the transport of a hazardous chemical.

The Ballona Wetlands and the fresh water marsh, a facility designed to treat stormwater runoff from surrounding areas and protect the salt water marsh from excessive fresh water intrusion.

We concluded in the RC 1998 article on wastewater treatement that the region's environmental regulatory agencies had to "drag our treatment agencies, screaming and kicking" into new construction programs. The situation is quite different now, with goals accomplished in Los Angeles and Los Angeles County, and pro-active voters in Orange County voluntarily seeking improved wastewater treatment.

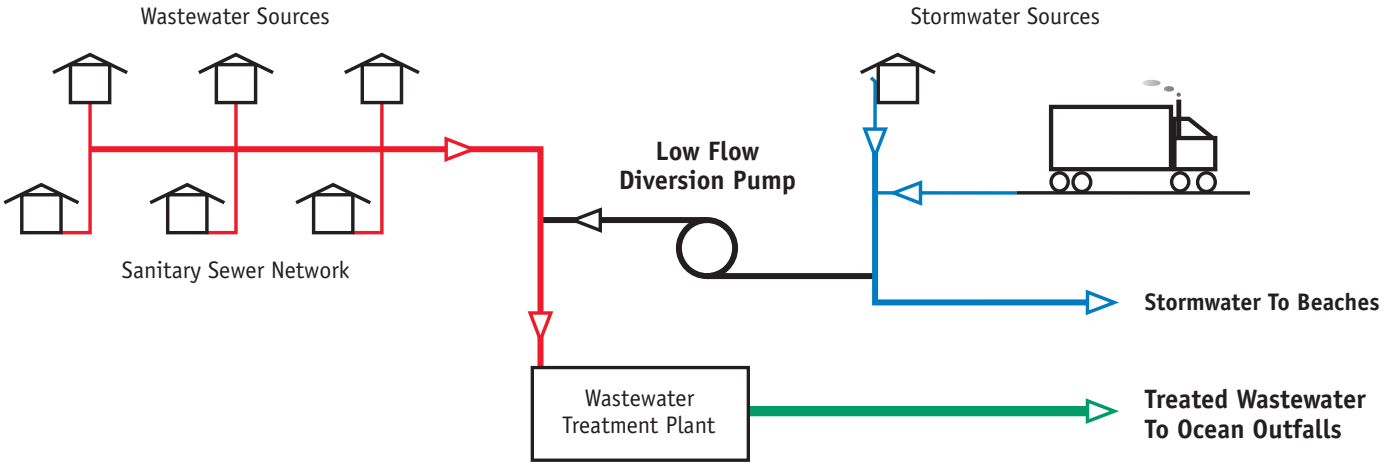
STORMWATER MANAGEMENT

We described Stormwater management in RC 1999 and RC 2004, noting major challenges, many of which were institutional as opposed to technical. We are pleased to report progress on all areas of stormwater management.

A major advance in stormwater management occurred when the Los Angeles Regional Water Quality Control Board enacted runoff controls for new and modified developments. In the past, new developments had no special requirement to mitigate stormwater runoff, other than to ensure no flood damage occurred. Every new development—by increasing impervious surfaces that do not absorb water—increases runoff to the Santa Monica Bay and taxes the existing surface drainage systems. This situation changed when the Regional Board required all new developments to treat or mitigate the impacts of the first 0.75 inches of rainfall. This means 60 to 70 percent of all storms will be completely treated, and the larger storms will be partially treated.

The new regulations have been criticized by developers as being too costly and having undefined benefits. Developers also criticized the regulations for being unscientific in failing to differentiate between high and low rates of rainfall, which may require different types of mitigation techniques. We disagree with these criticisms and believe the regulations are a large step forward for environmental protection. Though the new regulations cannot reverse the amount of impervious surface created by development, they will cap total runoff rate. And many of the stormwater management options required to implement the regulations, called best management practices (BMPs), will provide additional benefits. Grassy swales and infiltration areas create open space and, in the case of very large projects, habitat for birds.

A good example of environmental mitigation on new developments is the Playa Vista Project in Playa del Rey.



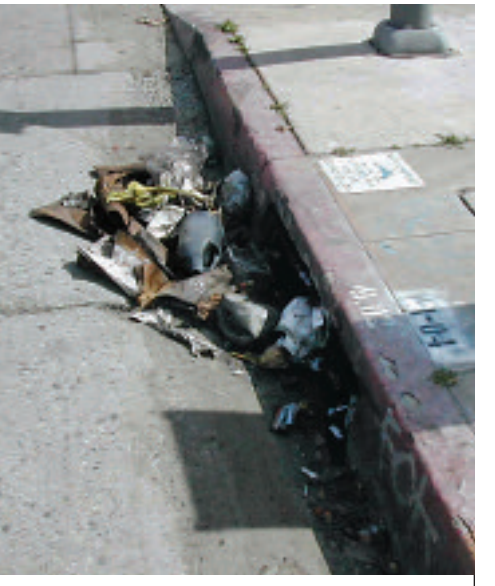
The separate sewer systems in Southern California are being converted to "hybrid systems" in order to divert summer low flow runoff into the wastewater treatment system via low flow diversion pumps.

Although the project was highly controversial and the topic of extensive litigation, it created several important environmental benefits that have been overlooked. The first is the stormwater management controls installed by the developer, which far exceed those required of other developments and set a good example for future developers to meet. The second is the construction of a freshwater marsh. The marsh was controversial because it occupied space formerly occupied by salt water marsh. The marsh provides treatment for runoff from the Playa Vista Project as well as surrounding areas such as Loyola Marymount University. In the case of the Playa Vista Development, runoff is treated by state-of-the-art source controls even before it enters the fresh water marsh. The fresh water marsh provides habitat, buffers the runoff flow rate, and improves its quality before being released to Ballona Creek. Bird watchers are already "seeing" the benefits of the new habitat. Finally, the fresh water marsh also protects parts of the salt water wetlands from fresh water runoff, which can be toxic to a salt water marsh.

There are other accomplishments. The City of Los Angeles has committed to providing the low flow diversions of runoff to the Hyperion treatment plant for its storm drains entering Santa Monica Bay. This technology and several others were described in RC 1999. This is an example of a simple technology that utilizes existing infrastructure in a new and innovative way, at low cost to taxpayers. This method of treating low flow runoff in a separate sewer system, called a hybrid sewer system, is being copied around the State, and other agencies, such as the Orange County Sanitation District, have adopted the concept. The days of stormwater puddles on public beaches, like the beach south of the Santa Monica pier, from stormdrains like the Pico-Kenter drain, are over.

Beach water quality continues to be a problem, but we are making progress. New regulations enacted by AB411 require more frequent and improved monitoring. The regulations created more postings and it initially appeared our beach water quality was getting worse. Closer examination of beach postings and closures, such as those in Huntington Beach, revealed that many problems were either long term issues exposed by the new regulations, or problems the reg-

It is remarkable that litter management remains an environmental problem. It is entirely preventable.



Accumulation of litter at a storm drain in downtown Los Angeles.

ulations created. For this reason the results have been mixed and technological barriers remain.

Beach water quality is quantified by a suite of bacterial measurements. The two most common are coliforms and enterococcus, which are not true pathogens but associated with pathogens, and for this reason are called indicator organisms. Coliforms (strictly fecal and thermo tolerant coliforms) were used over the past century with great success in predicting the pathogenic content of drinking water and treated wastewater. They are problematic in surface waters such as stormwater, and often appear even when pathogens are not present. More importantly, they require too much time to measure. An analysis by the Southern California Coastal Water Research Project (SCCWRP) showed that as many as 70% of the beach postings due to high bacterial counts could be in error. The reason is described as follows: a sample is taken on day 1 and analyzed by a laboratory; on day 2 the laboratory reports a high bacteria count, the beach is posted and additional samples are collected; on day 3 the laboratory reports that the bacterial counts are low, the beach is safe and the posting is removed. The problem is that the beach should have been posted on day 1 when counts were high, but was posted on day 2 when counts were low. Our technology is not adequate to implement the spirit of the new regulation.

In spite of this problem, the new regulations have had major benefits. They have exposed chronic infrastructure problems at Avalon, on Catalina Island, which have now been repaired. In some locations they have quantified the positive impacts of BMPs such as low flow diversions. They have stimulated research on new methods for quantifying beach water quality, and we look forward to rapid, molecular biology techniques to cure the monitoring problems. The topic of beach water quality will be explored more fully in a future Report Card article.

We continue to struggle with other stormwater problems. In RC 2004, we described the total maximum daily load (TMDL) regulatory concept, and the benefits it is providing. Litter management was one example. We continue to struggle with litter and the TMDL is still opposed by some cities and groups. It is remarkable that litter management remains an environmental problem. It is entirely preventable. The photo above shows an all too familiar situation. Caltrans also reports the most common items recovered in highway litter are cigarette butts. The enactment of a one cent per pack tax on cigarettes or other high litter potential items, with revenues given to the agencies responsible for clean up, such as Caltrans, would help mitigate our litter problems.

TMDLs are being used by regulatory agencies to create consensus solutions to reduce pollution emissions at reduced cost. In RC 1999, we noted the major source of many pollutants was stormwater, and suggested focusing efforts and funds on solving stormwater problems

rather than on improving wastewater treatment for those plants that have achieved full secondary treatment and implemented nutrient removal. The new TMDL for mercury pollution enacted in the San Francisco Bay area is a good example of how the process can work. There are many sources of mercury, as well as legacy pollution from past practices such as gold mining that are still having significant impacts. The TMDL reviewed known sources of mercury and found the most cost effective and most sustainable methods to reduce mercury discharge. An old mining area was identified as a high emitter, stormwater runoff was targeted—taking advantage of the BMPs that will be implemented to reduce emissions for a large number of pollutants—and pollution prevention practices were stressed. Reducing emissions from dental amalgams, reducing the mercury content of fluorescent bulbs and ensuring they are properly recycled, are all promising alternatives. The discharges from treatment plants were not reduced, recognizing that emissions were already low and additional reductions would not be cost effective. A challenge still exists from mercury emissions from coal-burning power plants. This is another example of how more scientific regulations can help us attain our goals.

The most gratifying report we make is on the passage of Proposition O. Last year Los Angeles voters approved by a 74% majority the expenditure of $500 million for environmental improvements. This is undeniable proof the public wants, and will pay for, environmental improvements. This measure, and the others discussed, go a long way toward making it safe to swim in Santa Monica Bay after a storm.

WATER RECLAMATION

RC 2002 described water reclamation efforts in Southern California, giving agencies an A for their efforts and the public a failing grade for not understanding the technology, and its risks and benefits. Water reclamation is an important resource because of the water supply problems described in the previous article.

There is some positive water reclamation news to report. The pioneering work at Water Factory 21 by the Orange County Water District, which reclaimed wastewater to prevent salt water intrusion and augment ground water supplies (a technology called indirect potable reclamation, see RC 2002) is being replaced by a project that is more than 10 times larger. The new project will receive treated wastewaters from the Orange County Sanitation District, reducing their discharge to the ocean. The new plant will treat the wastewater with new technologies, including micro-filtration, reverse osmosis and UV disinfection. The net result will be increased water supplies, reduced environmental impact on ocean waters, and reduced construction costs associated with deferring the need for an additional ocean diffuser.

Another example is the West Basin project, near El Segundo, which is using Hyperion Treatment Plant effluent to produce Title 22 reclaimed water, barrier water and industrial use water. Three major refineries have displaced large fractions of their fresh water use with reclaimed water. Ironically, this was done not to save money, but to create a secure water supply during the next drought.

The failure of the East Valley Water Reclamation Project has taught us that we need to better inform the public and politicians about the safety, risks and benefits of water reclamation.

Agencies like the West Basin Facility will be providing water even during the next serious drought. This is one example of environmental improvements creating a better climate for business—a sustainable water supply.

Another positive development is the experience we have gained with failed projects. The failure of the East Valley Water Reclamation Project has taught us we need to better inform the public and politicians about the safety, risks and benefits of water reclamation. The plan died when it became a political football, with candidates for City offices wooing voters with statements like "toilet to tap" (see RC 2002 to learn why water reclamation is not toilet to tap). Voters and candidates need to understand that our water supplies already contain reclaimed wastewater, that we need to reclaim more in the future, and that it's low risk.

THE GRADES

We give mixed grades for the various responsible parties.

- The wastewater treatment agencies receive an **A** for complying with the Clean Water Act, being proactive in building new treatment plants and committing to improvements without lengthy legal fights.
- Our regulatory agencies, such as the Los Angeles Regional Water Quality Board, receive an **A** for adopting far reaching strategies that are sustainable, and using newer, more scientific approaches to regulation.
- The public receives a mixed grade—an **A** for supporting environmental improvements, such as Proposition O and secondary treatment at the Orange County Sanitation District, but an **F** for not working harder to solve problems like litter.
- Researchers receive a **C** for not being able to provide the needed technology to implement beach water quality regulations.

Michael K. Stenstrom is a Professor in the Civil and Environmental Engineering Department at the University of California, Los Angeles. He has a Ph.D. in Environmental Systems Engineering from Clemson University (1976) and is a registered professional engineer in California. He has been with UCLA since 1977 and has served as Chair of the Civil and Environmental Engineering Department, Director of the Institute of the Environment, and Associate Dean of the Henry Samueli School of Engineering and Applied Science.

He teaches courses in water and wastewater treatment, mathematical modeling of environmental systems, and laboratory analysis. He has published over 200 papers in journals and conference proceedings. Stenstrom's most recent research focuses on stormwater management in highly urbanized environments such as Los Angeles.

Prior to joining UCLA, he worked for the Amoco Oil Company where he designed wastewater treatment facilities. He has won several awards including the Harrison Prescott Eddy Prize for innovative research (Water Environment Federation), the Walter L. Huber Award (ASCE), the Best Dissertation Award (Association of Environmental Engineering and Science Professors), the Dow Environmental Care Award, the Los Angeles Basin Section (California WEF) Research Award, and the EWRI Service Award.

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