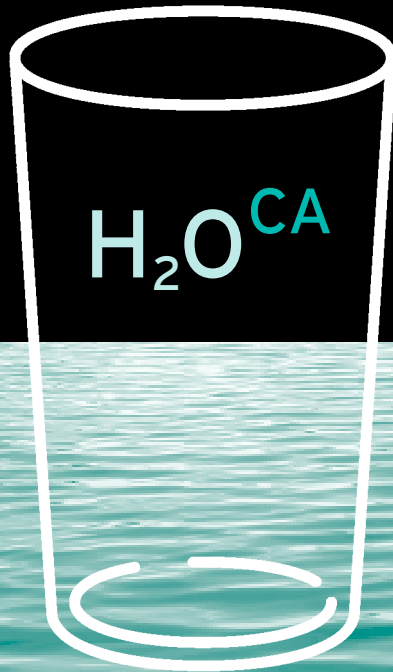


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architecture california
the journal of the american institute of architects
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infrastructure issue

01.4



- * Rising Water, Falling Land
- * Concrete Rivers
- * Sea of Entropy

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Comment

A week or so after the destruction in New York, Washington, and Pennsylvania, I ran into a colleague in the Berkeley Bowl. He asked me if I would address these events in my next Comment. I told him that I was reluctant to do so, and I am. Not being obliged to respond quickly, as some architectural spokespersons were, I escaped the temptation to seize upon the events as an opportunity to point out, to a presumably indifferent public, the importance of architecture. I'm grateful for the reprieve. What these events mean for architecture, or what architecture means in the midst of these events, is not at all clear to me.

In the first place, to lose a loved one in the collapse of a prominent building is not so different from losing a loved one in a plane crash in an empty field or, indeed, on a roadside in the Kyber Pass. The one is not more noble than the other, nor is it less so. To talk proprietarily of buildings is, in this context, so much static.

To talk of the symbolism of buildings as if it were the special and effective province of the architect seems equally impertinent. The emptiness of the reference to Arabic architecture in the World Trade Center's columns we may view as merely ironic. The patent futility of painting a red cross on the roofs of buildings housing relief supplies is anything *but* ironic. In each case, the building is more symbolic in ruin—as is the demolished West Bank home of the widowed mother-in-law of an alleged Palestinian “terrorist,” of which we have lately read.

Neither of the latter two buildings will make it into the architectural history books. Nor, for that matter, will the tents designed for the U.S. Army by an architectural firm whose offices on Chambers Street in lower Manhattan face south to where the Towers once stood.

What I would most regret, in the aftermath of these events, would be the reinforcement of the pernicious dichotomy that Nikolaus Pevsner introduced into architecture, but which is equally destructive in the political or economic sphere: “An Afghan village is mere building; the World Trade Center is Architecture.”

Our current issue looks at California's water-related infrastructure. It is no handbook for mischief; one may look elsewhere in the public domain for technical data. Here, we

focus on paradoxes that have emerged, conflicts that have developed between natural systems and the diverse human interests that have reshaped them. The issue is organized roughly from north to south, beginning with the Sacramento/San Joaquin Delta and ending at the Salton Sea. Because the topic is clearly too vast for our pages, we have included a bibliography and “webiography” to guide you to further resources.

On the water front, it is encouraging to note that Governor Davis recently signed into law a bill requiring developers to demonstrate an adequate water supply for new developments. Evelyn Nieves wrote in the *New York Times* (11 October 2001), “The new law, hailed by its proponents as one of the toughest in the country linking land-use to water supplies, imposes strict requirements for cities and counties in issuing permits for new subdivisions of 500 or more homes. It requires that the local water agency verify that it has enough water to serve the project for at least 20 years, including long periods of drought. The governor signed that bill, written by Senator Sheila Kuehl, Democrat of Santa Monica, and its companion bill, by Senator Jim Costa, Democrat of Fresno, requiring that cities and counties consult their water agencies early in the planning stages of a development.”

A final plug: if you enjoy *arcCA* as much as the readers we've heard from, consider giving a subscription to a valued client or consultant. See the subscription information in the masthead, and note the discount for AIA members. If there are things you *don't* enjoy about the magazine, please let me know. ●

Tim Culvahouse, AIA, editor

Contributors

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Architect and urban designer **William R. Morrish**, a California native, is the Elwood R. Quesada Professor of Architecture, Landscape Architecture, and Urban and Environmental Planning at the University of Virginia. He was previously founding director of the Design Center for American Urban Landscape at the University of Minnesota, where he created a nationally recognized “think tank” for professionals, academics, and civic leaders on issues of metropolitan urban design. In 1994, the *New York Times* hailed Morrish and his late wife, Catherine Brown, as “the most valuable thinkers in urbanism today.”

David O'Donnell is T.R.E.E.S. Project Associate at TreePeople, where he writes grant requests, produces newsletters and educational materials, and puzzles over the arcana of California water issues. He is none the worse for his recent physical contact with the Los Angeles River, from which he collected water samples as part of the effort to establish legally permissible levels of various pollutants.

George Wein, AIA-E, is a retired partner in the Santa Monica architectural and planning firm WWCOT. He is a member of the board of the Metropolitan Water District as well as of the Valley Industry and Commerce Association, where he is a past chairman of the association's water committee. He served on Mayor Riordan's Blue Ribbon Committee on Water Rate Restructure for the Los Angeles Department of Water and Power and chaired the external affairs committee of Metropolitan's Blue Ribbon Task Force.

Jane Wolff is a landscape architect and assistant professor of landscape architecture at the Knowlton School of Architecture, Ohio State University. As a Fulbright Scholar and Charles Eliot Traveling Fellow, she has studied the history, methods, and cultural implications of land reclamation in the Netherlands, research that provides a framework for her investigations of the San Joaquin and Sacramento River Delta. In her *Delta Primer*, she is developing methods that designers can use to encourage and frame public debate about contested landscapes.

Anne Zimmerman, AIA, is principal of AZ Architecture Studio in Santa Monica, a firm focusing on quality designs for the public realm and the under-served, inspired by place and urban issues. She is a member of the *arcCA* editorial board.

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Water in California:

an Overview

George Wein, AIA-E

“Whiskey’s for drinking, water’s for fighting about.”

–Mark Twain

Maldistribution

Tensions over California’s “liquid gold” are as old as European settlement, and they spring from the state’s notorious maldistribution of water. California’s northernmost peaks and valleys receive a bountiful rainfall. More than 100 inches of rain and snow cascade down upon this corner of California annually, nurturing the giant redwoods and the ponderosa and Jeffrey pine that make up the rugged but beautiful big river landscape.

Travel to the west side of the San Joaquin Valley and the landscape is far different. Here you’ll see a thirsty plain covered by the dry stubble of native grasses. Scratch the surface and you will find layers upon layers of incredibly fertile soil deposited over millions of years. All that is needed to make this land fruitful is water, but not much is to be found. In a typical year, only six inches of rain will fall.

The contrast between these two landscapes illustrates the dichotomy that is California, a state that has been quite accurately described as both parched and soggy.

Settlement

The pioneers who settled the Golden State and those who have succeeded them did not choose to build their towns and farms in the fog-shrouded mountains of the far north, where most of the rain and snow fall. Nor did they locate them along the banks of the rivers that empty millions of gallons of water into the sea each day. Instead, they built along the coast next to the great harbors, on the broad coastal plains, and in the many valleys of the state.

Only one major California city, Sacramento, located where the Sacramento and American Rivers meet, has enough water available locally to meet its needs. Other communities—San Francisco, Los Angeles, San Jose, San Diego, Oakland, Long Beach, and a host of others—have had to go elsewhere, singly or banded together, to supplement their water needs.

The same is true of agriculture, an industry that has created greater wealth than the Gold Rush that kickstarted the California dream. The orchards, vineyards, and fields of the Coachella, Imperial, Sacramento, San Joaquin, and Santa Clara Valleys are green and productive because water has been

brought to them to supplement nature's meager supply. To this day, agriculture, still a key industry in the state, uses approximately 80 to 85 percent of all water consumed in California.

Mother Nature's uneven assignment of water is only made worse by the state's climate: a repeating yet unpredictable cycle of drought and rain. The rainy spells can last a long time—the dry ones can last even longer. Because of this, Californians for centuries learned to capture and store water when available and then make it last. It is a strategy we still follow today.

Californians, unable to change the capricious climate, have taken other steps to obtain a reliable supply of water. To transport water to areas of need, we have criss-crossed the state with a network of dams, canals, pipelines, aqueducts, and pumping plants. This work began with the missionaries, who studied the waterways of the ancient Greeks and Romans and diverted creeks and streams to bring water to their fields. As the state grew, individual efforts like theirs gave way to collaborative efforts on a local, regional, statewide, and even federal basis.

But even the most collaborative efforts to find solutions to California's water supply problems feel the strain of the politics that dominate California's waterscape. Conflict over the best uses of water in the state was and is inevitable. Because of its scarcity in certain areas, water has always engendered strong feelings, pitting neighbor against neighbor, region against region, farmer against citydweller.

Today, the state's agricultural, urban, and environmental users of water continue to compete for the limited supply, a drama that plays out every day in the state capitol and throughout the state. Urban areas need water for domestic and industrial use, while others need the same supply for irrigation, for hydroelectric power generation, and for recreation. Flood control is demanded upstream, while downstream requires a steady flow of water to protect fish and wildlife.

Sources

Californians find their two most reliable sources of water to be the Colorado River and the Sacramento/San Joaquin Delta, and many of the great water systems were built to tap into their abundant supply.

But after years and years of unchallenged use, fueling California's growth, these waterways have become less dependable sources.

The Colorado River runs through seven states and Mexico, with nearly 25 million people dependent upon it for their water. (17 million of them live in Southern California.) Every drop of the river is adjudicated to one of these eight parties, but historically, if one state does not use all of its water, it can be used by the next state down the line. California is allotted 4.4 million acre-feet of water from the river each year, but in the past has been privileged to use surplus water over and above its allotment. But, as other Western states along the Colorado, such as Arizona and Nevada, are growing, less water is being left for Californians. An agreement last year with the U.S. Secretary of the Interior gave the Golden State 15 years to scale back its dependence on surplus water from the river and stay within its allocation.

At the same time, concerns about aquatic species in the Bay/Delta compete with urban and agricultural water supply needs. The Bay/Delta provides valuable habitat and migration corridors for many species, including the winter-run salmon and Delta smelt, which are listed under the state and federal Endangered Species Acts. Increasing amounts of Bay/Delta water are allocated not for agricultural and urban uses but for environmental uses to help these and other species recover.

With these two critical sources less reliable than in the past, water agencies and others are looking for new and different solutions, becoming more creative in how we use, reuse, and allocate water.

Changing Attitudes

While the big water projects have served and will continue to serve their purpose, the days of the huge dams and aqueducts are over. Since the first comprehensive State Water Plan was published in 1957, attitudes and ways of managing the state's natural resources have changed. The philosophy of the "greatest good for the greatest number" has been broadened to include the needs of the environment and the wildlife it supports. Today, we know the importance of protecting the fragile ecosystems that surround us, and the projects we build attend to environmental needs.

Today, Californians must look over the horizon for new sources of water and new ways to extend the useful life of the water they have. As we have seen throughout the history of water in California, obtaining a new water supply takes time and planning. It cannot be done overnight. Meanwhile, the state must find new ways to wring more uses from the same amount of water.

Conservation

Water conservation is one obvious way Californians can do more with less, and a long history of drought has trained most to conserve this scarce resource as a way of life. Year after year, the state ranks among the top in the nation for the lowest per-capita use of the precious resource. But the sheer size of the state's population earns it a place among the highest users of water overall.

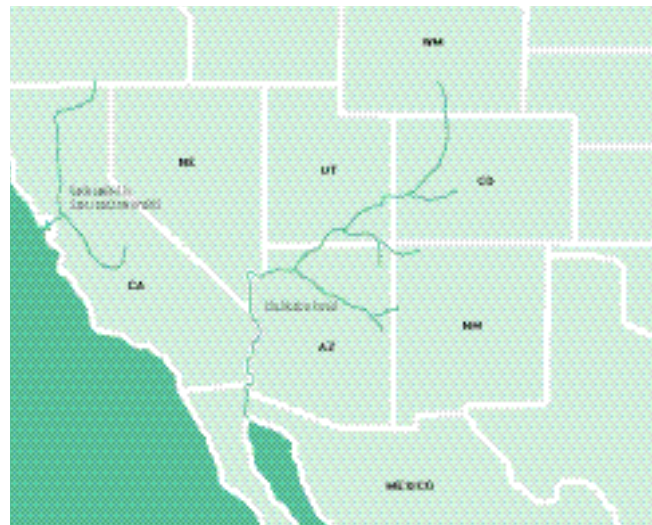
Conservation will continue to be one of the most important ways to ensure water for the next generation, and those who choose to live here will have to continue the legacy of low per-capita water use. But now we must look at other ways to extend the useful life of the water we have, utilizing all of the technology available to meet the demands of urban, agricultural, and environmental concerns.

In response to these challenges, water managers have turned their attention to water transfers, recycling, and continued emphasis on conservation. Also, more attention is being given to solving water problems on a regional basis. Today we know that whatever we do, it must blend with the balance of nature. We cannot do one thing at the expense of another—the balance is too fragile.

Water from the Sea

For those of us in coastal communities, it is hard not to look west at the ocean and think, how can we make saltwater drinkable? Boosting water supplies through saltwater desalination is an obvious option, but an expensive one. Reverse osmosis, the necessary technology for the process, has traditionally proven much more expensive and energy intensive than other sources of water and other types of purification. But that won't always be the case.

While it is still a costly process, reverse osmosis technology has been improving rapidly over the past few years. And, cost aside, desalination has

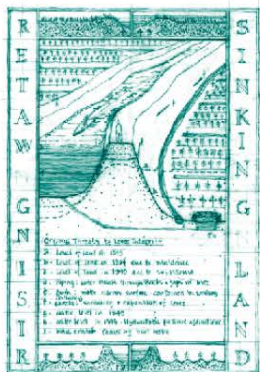


Californians find their two most reliable sources of water to be the Colorado River and the Sacramento/San Joaquin Delta

many advantages over other water sources. The ocean is an abundant and dependable water supply, not subject to feast or famine cycles of snowfall or rain. Taking water from the sea does not deplete groundwater aquifers, nor does it impact salmon and other protected species. And the process generates water so clean it can be recycled several times before being dumped back in the ocean.

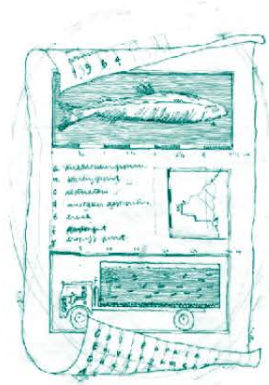
California has benefited from the vision of farsighted pioneers who understood the importance of water and built systems to serve a growing population. The challenge for today's state water managers is to fulfill their role as stewards of this most essential resource, ensuring a reliable and high quality water supply for coming generations. ●

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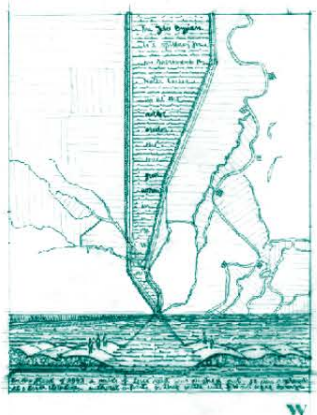
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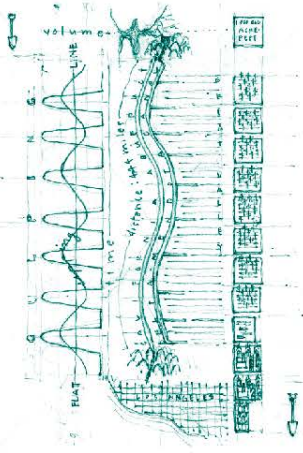


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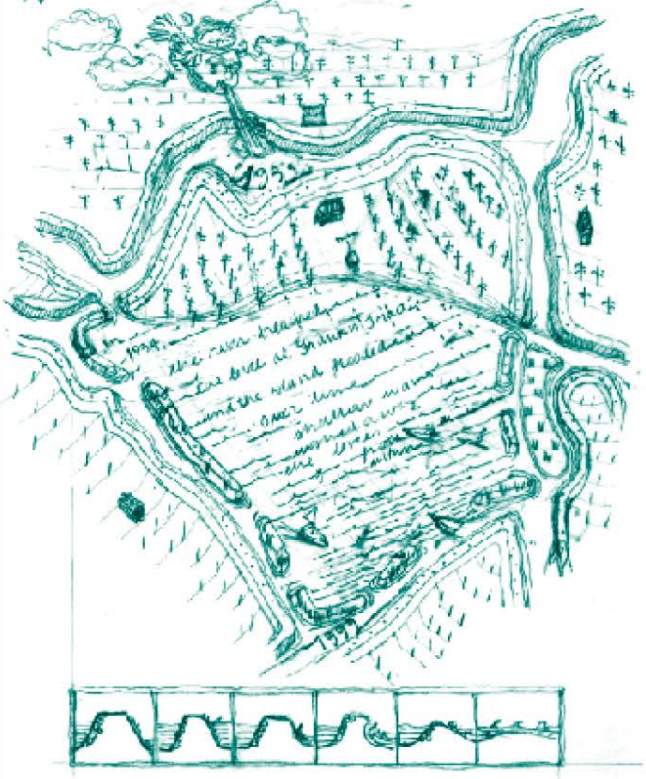
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Rising Water Falling Land

The Evolution of the Delta

Jane Wolff

If you stood in the middle of an island in the Sacramento/San Joaquin Delta, where the Great Central Valley of California drains into San Francisco Bay, you might not know that you were twenty feet below sea level. You might not realize that the rational agricultural geometry around you ended abruptly at the meandering river on the island's edge. You might not understand that the ditches running through the fields were dug for drainage rather than irrigation. You might not think that there was anything strange about the Delta until you saw an ocean-going freighter cruise by in the distance, eighty miles from the Golden Gate and fifteen feet above your head. If you climbed to the top of the levee that separates the island from the river, where you could see land and water together, you might wonder how the landscape became such a paradox. And if you didn't know that a large part of the water in the river was flowing not toward the Pacific Ocean but toward farms in the Central Valley and kitchen sinks in Los Angeles, you might wonder why such a paradox is sustained.

In 1850 the Delta was still wild. The largest tidal estuary on the West Coast and the endpoint of

California's two great rivers, it consisted of low-lying islands among the distributary channels of the Sacramento and the San Joaquin. It was a landscape in flux: river channels moved, water levels varied, and land flooded and dried out with changes in the seasons and the tides. Its current history began that year, when Congress passed the Swamp and Overflowed Lands Act. That legislation made marshlands like the Delta available for settlement on the condition that they were reclaimed for agriculture.

Agriculture required infrastructure. The Delta's settlers built small levees around the islands to stop seasonal flooding, and they drained and cultivated the interiors. These interventions had an unexpected consequence: the land began to sink. The region's peat soils were extremely fertile, but they were unstable. The peat oxidized when tilling exposed it to air, and it blew away as it dried out. The ground began to subside at a rate of several inches a year.

To compensate, farmers made their levees higher. This, too, had an unanticipated result: the rivers began to rise. Because they eliminated the flood plain, the levees increased the volume of water in the river channels during the rainy season. The

The Delta's difficult history and uncertain future rest on the same paradox: infrastructure assumes stasis, and the Delta is a system in constant flux.

channels began to silt up with the alluvial sediment that had formerly replenished the surface of the islands, and the water level rose even when the weather was dry. Flooding became a constant threat rather than a seasonal one.

The consequences of infrastructure (and the need for more infrastructure to address them) became more extreme. The land fell so low that groundwater had to be pumped up and out of the fields. Levees, no matter how high, were subject to shrinkage, cracking, and failure due to hydrostatic pressure; they required constant repairs and additions. The cycle of intervention and reaction has become the Delta's leitmotif. It is endless, and its results are irreversible.

Cultural demands on the landscape have expanded, and so has the infrastructure needed to realize them. Since the Second World War, the Delta has become the centerpiece of the system that delivers water to Southern California. Like the levees that

made agriculture possible, the infrastructure that delivers water has had unexpected and devastating consequences. Its implications are bigger because the scope of the new infrastructure is greater; they are more tangled because the contemporary range of intentions for the landscape is more complicated.

The export canals have transformed the meaning of the Delta's rivers. Before, they served as local transportation infrastructure for farmers and produce; today they are the center of a giant plumbing network that extends for hundreds of miles and serves a distant constituency. The large-scale export of water from the Delta began in 1951, when the Delta-Mendota Canal opened. Funded by the federal government, its purpose was to provide irrigation water for the Central Valley. An ancillary installation, the Delta Cross Channel, carried Sacramento River water to giant pumps that fed the canal. In 1973 the state of California opened another canal, the California Aqueduct, to take water from the Delta to Los Angeles and San Diego. It had its own pumping plant; next to the pumps, a new forebay allowed sediment to settle out of the water before it was sent to the south.

Water export caused unanticipated changes in the Delta's fluctuating ecology. Sending vast amounts of water to the canals instead of the ocean allowed salt water from San Francisco Bay to migrate upstream. That threatened an old Delta interest, agriculture: salty water in the rivers would produce salty groundwater, and land could quickly become unfit for cultivation.

Beyond that, the force of the pumping changed the direction and quantity of the rivers' flow significantly enough to confuse the native fish that migrate through the region. Instead of swimming toward the ocean they went into the pumps, and their population began to decline dramatically. That was unacceptable to a newer Delta interest, the environmental movement. Political pressure developed to reduce the ecological cost of the aqueducts. The California Environmental Quality Act of 1964 made the protection of rare and endangered fish species a condition of water export, and new measures were developed to satisfy the law.

Some of the environmental infrastructure was physical, and some of it might be called behavioral. First, enormous screens were installed to

remove fish from the mouth of the pumps. Then, a protocol was developed to identify, count, measure, and record the collected fish; to take them in specially-adapted tanker trucks across the Delta to a point just above the mouth of the Sacramento, out of reach of the pumps; and to put them back into the river. Even this well-organized, highly choreographed strategy has had unexpected consequences, though. The Delta has a large population of striped bass that were introduced for sport fishing. The fish trucks run on a regular schedule, and they always drop the fish at the same place. The prolific, adaptable striped bass wait at the drop-off point for the trucks, and they eat the fish that have just been rescued from the pumps. So far no interventions have been made to address this development: measures that could eliminate the exotic predators would also destroy the native species whose welfare is a legal mandate.

The interest environmentalists have in protecting endangered fish is not exactly the same as the one that farmers have in keeping their land dry, but both goals share an assumption that people can and should determine an agenda for the landscape and a system of infrastructure to carry it out. The difference lies in what's wanted from the land: in the face of increasing urbanization and overwhelming technology, our society has begun to care about the idea of nature.

This concern has produced the Delta's latest paradox: new nature. Unlike older conceptions of nature, new nature does not imply freedom from human control. Instead, it offers an image of the Delta's past: subsided land is taken out of agricultural production and native wetland plants are grown instead.

New nature is closely tied to new infrastructure. Paying for new nature has become a way of buying more water for export. Funding for many of the projects comes from CALFED, a consortium of state and Federal agencies whose contradictory mandate is to meet the increasing demand for water in Southern California and to maintain and enhance environmental quality in the Delta. CALFED is currently studying the purchase of one of the largest new nature projects, which will transform four very low-lying agricultural islands in the middle of the Delta: two will become wetland areas and two will become reservoirs. In addition, new nature is help-

ing to make possible the development of new infrastructure at the Delta's perimeter. Developers in nearby cities and suburbs can pay for wetlands projects in the Delta to fulfill legal requirements for environmental mitigation.

Ironically, new nature depends completely on the levee system built to overcome wilderness: without the levees, the Delta's subsided islands would flood. What uncontrolled nature would produce today is a wild inland sea. It is possible to see unmanaged nature in the Delta: it exists at Franks Tract, a former island that was reclaimed for agriculture and cultivated until 1936. That year the levee was breached and the bowl-shaped interior flooded. Because the cost of repairing the breach and pumping the land dry again was prohibitive, the island remained inundated. The wind conditions in that part of the Delta created waves strong enough to erode the levee from inside, where it was not reinforced, and it deteriorated into small fragments overgrown with cattails and tules. The island has become an open lake with enough erosive force to threaten the levees that protect neighboring farmland. Its agricultural past is under water, and the marshy ecosystem that came before it is irrevocably lost.

There is no end game in the Delta. The cost and difficulty of maintaining the region's infrastructure are only increasing. On the other hand, if the levees fail and the region is inundated, salt water from San Francisco Bay will migrate upstream. Giving up the struggle would mean losing things that our society wants from the landscape: fertile agricultural land, the remnants of a unique ecosystem, and, not least, the water supply for nearly two thirds of California. Building infrastructure that would guarantee and streamline the export water supply, like a peripheral canal to circumvent the Delta, threatens other uses like agriculture and environmental restoration.

The Delta's difficult history and uncertain future rest on the same paradox: infrastructure assumes stasis, and the Delta is a system in constant flux. Instead of stopping the natural processes at work there, engineering has made them harder to predict. Trying to control dynamic situations has simply produced new dynamic situations. This messiness is what makes the Delta compelling. It shows us the possibilities and the limits of inhabiting, transforming, and using the landscape. ●



At Flat Land

and

Deep Water: California's Ports

Louis Di Meglio, AIA, and Lourdes M. Garcia, AIA

Take off something you're wearing... look at the tag... look at where it was made... how do you think it got here?

Ports are crucial to our economic growth and well being, our quality of modern life. From the time of our earliest settlements, they have provided a means to be supplied with goods (imports) and to collect goods for outside trade (exports). Originally thought of as rough, dirty, industrial areas, unattractive to commercial or residential development and utilization, ports today are considered desirable, vibrant components of the cities they adjoin. This paradigm shift has led to the competing interests of shippers and industrial users and recreational and commercial users vying for access to the same valuable lands. At the same time, the increasing size of port facilities raises important environmental issues. The conflicting needs of these several interests are being reconciled today with strategies for the future utilization of ports.

Ports require unique physical criteria: deep water adjacent to low-lying flat land at the edge of our oceans or rivers. This meeting of flat land and deep water is rare along the California coast. The

topography of the coast limits the development of deep-water ports to a few areas, fixing the location of major industrial nodes. In California, the major ports with these characteristics are San Francisco, Oakland, Los Angeles, Long Beach, and San Diego. Other areas where these features are present to a lesser extent are Port Hueneme, Humboldt Bay, Sacramento, and Stockton. The Coastal Act limits port development to these areas, but, historically, the population/economic base along these nodes was the basis for port establishment and growth.

Originally, ports were mud flats served by small skiffs. Piers and wharves were developed to reach ships anchored in deep water to allow more efficient transfer of cargo to shore. Before the advent of containerization, ships were small. Cargo consisted of loose, palletized or break-bulk loads. Loading and unloading cargo were labor-intensive operations. Infrastructure requirements included finger piers, on-dock transit sheds, warehousing for storage, and rail lines, which influenced surrounding land use patterns. Due to the small radius of delivery service, a large amount of land was needed to service a port. Manufacturing and distribution districts (fisheries, shipbuilding, foundries, etc.) grew in close proximity to the waterfront, as did housing districts for port workers. A relatively small percentage of area was accessible to the general public. The traditional port environment was considered a most undesirable place to be.

Containerization has significantly changed the characteristics of industrial ports. Break-bulk and palletized cargo have been superseded by universal cargo containers that are essentially self-contained 'mini-warehouses' for dry or refrigerated goods. Operations are now mechanization-intensive, not labor-intensive. Vessels are larger, requiring large concrete wharves operated by giant wharf cranes, forklifts, and mobile, rubber-tired gantry cranes that evoke images of *Star Wars* in all their articulated, robotic qualities. Covered storage facilities are no longer necessary; containers are now stored on large, outdoor, container "parking lots."

Again, land use patterns are affected. Manufacturing and distribution can now be remote from the port, creating a large, extending radius of delivery service beyond the port and opening up the availability of port-adjacent land for other uses. Competing interests, at times with incompatible requirements,

vie for this land. Wider cross-sections of people now live, work, and recreate in close proximity to ports. The demand for waterside access and amenities not specifically involved with port operations has increased, and interest grows for the restoration and adaptive reuse of warehouse and distribution districts. Such areas have been transformed into new waterfront commercial, housing, and recreational uses.

Environmental issues are also undergoing changes after containerization. Increased operations have led to tighter restrictions and tougher standards for air and water quality, to control the impact of storm-water runoff, vehicle and maritime emissions, and airborne dust. Increased truck and intermodal rail traffic brings additional crossing and freeway congestion, affecting near-port communities. Larger terminals are needed to accommodate larger cargo surges. Consequently, ports must create additional land area by filling between finger piers and out into portions of the bay, or they must remediate and reuse former industrial sites, such as oil fields and manufacturing areas. More cargo equals larger ships, which need deeper water, forcing most ports to dredge to accommodate the deeper drafts. In the face of such pressures, the preservation of sensitive environmental sites along with growth has become a major port policy issue.

Responding to the Paradigm Shift: the San Francisco Bay Ports

California ports have responded in creative ways to the forces applied by economic conditions and by public regulatory and environmental agencies. Continued growth of port cargo volume and the impact of potential growth in the Far East have ports scrambling for additional area for expansion. The Coastal Commission and San Francisco Bay Conservation and Development Commission (BCDC) play a major role in shaping future port development and waterside access projects, allowing increased input from diverse stakeholders. Competing interests for available waterfront land and the effect of new technology on land use distribution have affected land use patterns. In addition, the recent move from mechanization to automated/information technology will have a far-reaching effect on all facets of port operations, transportation systems, and labor utilization.

The forces directing growth in the case of the two Bay Area ports, Oakland and San Francisco,



are increased cargo volume for Oakland (which has the advantage of easy rail and freeway connectivity) and maximum utilization of the waterfront for entertainment and commercial uses for San Francisco.

Port of Oakland

The Port of Oakland occupies 19 miles of waterfront on the eastern shore of the San Francisco Bay, with 665 acres devoted to maritime activities. It is in the midst of its Vision 2000 (V2K) expansion, the first step in a long-term plan to double the container terminal coverage from 500 to 1,000 acres, to meet regional and national cargo needs into the new millennium.

Since World War II, the former military base has restricted public access to the shoreline of the Middle Harbor. Recently, through the closure of the Army and Navy facilities, additional land has become available for expansion. The southern end of the waterfront development provides commercial/office, entertainment, housing, and recreational facilities. Recent developments have focused on the adap-

tive reuse of warehouse and manufacturing facilities into offices and lofts. The north end of the waterfront contains the industrial port, intermodal rail yard, Middle Harbor, and the innovative Shoreline Park. The creation of the park, mandated by the BCDC as a condition of approval for the port expansion, returns the best piece of real estate to the public. The public will regain access to the San Francisco Bay, with magnificent views of San Francisco; Oakland citizens will have views to the working waterfront; and the environment will benefit from the creation of a new major habitat carved out of former finger piers.

Port of San Francisco

While cargo growth drives the Port of Oakland, tourism and recreation are the forces behind the development of the San Francisco waterfront. The port does, however, retain a small container facility, ship repair, and bulk cargo area at the southern end of the waterfront.

New waterfront development is strongly linked to the existing urban fabric through the reuse of former warehouse and manufacturing buildings, with plazas and open areas provided by new projects. The Embarcadero, a grand boulevard and esplanade, provides the connection to activities along the waterfront, which include entertainment areas, a cruise ship terminal, future recreational piers, and a ferry terminal and transportation node.

The common thread running through the two ports is the development of strong connections between the waterfront and nearby, "downtown" urban uses. Meanwhile, even though these are mature ports, enough adjacent land not in the downtown area has allowed for necessary expansion, and the radius of delivery service infrastructure has remained small, as in a pre-containerization port...

Overall, our California Ports face new challenges with precious few acres available for growth. Our ports are faced with finding creative solutions in the technology and land-use arenas to respond to higher cargo demands as well as providing waterfront access and amenities that respond to public and environmental needs. This new awareness of the waterfront is the beginning of a shift in the perception of desirability and necessity of developing urban experiences at our waterfronts. ●



The L.A. River:

Recent Books Briefly Noted

* *The Los Angeles River: Its Life, Death, and Possible Rebirth*
by Blake Gumprecht
(Johns Hopkins University Press; \$40)

* *Rio L.A.: Tales from the Los Angeles River*
by Patt Morrison
(Angel City Press; \$30)

* *Riverbed*
by David Manning
(Ridgefield Press; \$19.95)

Tom Marble, AIA

Blake Gumprecht's *The Los Angeles River* and Patt Morrison's *Rio L.A.* are part of a long tradition in the literary history of Los Angeles, depicting the city as a sort of Paradise Lost, where greed and selfishness win out over charity and compassion, and where all has gone to hell in a handbasket. This tradition extends as far back as the city's founding but acquired real definition in the latter half of the twentieth century with the work of Carey McWilliams, Kevin Starr, and, more pointedly, Mike Davis. Gumprecht and Morrison follow their illustrious predecessors, paying homage to them and expanding upon their work in new and interesting ways.

The basic version of the Los Angeles River/Paradise Lost myth common to both books goes something like this:

In the beginning, there was the river, and it flowed down from all the mountains, spreading out in swamps across the basin, giving water and life to all. Native Americans came to this place and gathered in villages near the river—but not too near, for they soon learned of the awesome power of the typically docile river during wet winters. The rain would begin falling and not stop; it would wash down the

mountains in torrents and flood much of the plains. It could be relentless and unforgiving, but the native Gabriellino quickly learned its rhythms.

When the Spaniards arrived in the late eighteenth century, it took them a few seasons to understand and respect the river. Once they did, they corralled the Gabriellino into a corner of one of their former villages, and forced them to dig a series of *zanjas* or ditches to divert water to the Spaniards' orchards and fields. Even after the Americans took over, Los Angeles relied on the abundance of the river to sustain itself. The fate of the young city became inextricably linked to its flow and was subject to its whim, shifting from drought to flood and back to drought without rhyme or reason. The Powers-That-Were demanded a more reliable water supply, and they got it through a man named William Mulholland.

Mulholland is said to have remarked that when he saw the river for the first time, his "whole scheme of life was woven." Ironic, then, that Mulholland would commit, if not the original, then certainly the most fatal sin against the river: by initiating a program to transport water hundreds of miles, first from the Owens Valley, and later from the Colorado River and the San Joaquin Valley, Mulholland rendered the Los Angeles River useless as the life source of the budding metropolis. In doing so, he robbed it of any symbolic value it may have had to the inhabitants of Los Angeles and paved the way for further humiliation in the coming decades.

Even before Mulholland, in the late 19th and early 20th centuries, a succession of real estate booms had pushed development across the Los Angeles basin; the river had retaliated with a succession of devastating floods that rallied public sentiment against it. It was the arrival of the automobile, however, that would cause the fundamental shift in the Angeleno perception of space. No longer a city made up of villages nestled between tributaries of a temperamental waterway, its future would be formed by a paved, plaid overlay of streets, boulevards, and highways designed specifically for car travel.

When it became clear that a massive restructuring of the city was required, the Los Angeles Chamber of Commerce vowed to do it right. They hired Frederick Law Olmsted, Jr., the son of the mind behind New York's Central Park, and urban designer Harlan Bartholomew to make a survey of

and proposals for parks, playgrounds, and beaches, with special consideration for the automobile. The resulting Olmsted Bartholomew Plan, finished in 1930, outlined a system of linear parks wide enough to control the river in the worst flooding, yet lushly landscaped for recreation. Integral to this system were parkways—roads with wide, planted medians that moved traffic rapidly in an idyllic setting.

The vision was as compelling as it was complete, but it was ambitious—the estimated cost to implement the plan was said to have been over two hundred million dollars. The report seemed to vanish overnight. "How Eden Lost It's Garden," in Mike Davis's recent book, *The Ecology of Fear*, summarizes the issue, suggesting that real estate developers were upset with the plan because it forfeited too much privately-held, developable land to the city; that the onset of the depression made any sizable allocation of public money suspect at best; and that Los Angeles *Times*-prompted dissension within the Chamber itself prevented agreement. Without a single strong, persuasive leader to promote the plan, it was doomed to obscurity.

Referring to the Olmsted Bartholomew Plan as a "window into a lost future," Davis brings the plan back into public consciousness. It was republished recently in *Eden by Design* (Greg Hise and William Deverell, eds., Berkeley: UC Press, 2000) and achieved the status of a kind of talisman, a magical document that promised redemption for sins against the river but that, in its rejection, condemned Los Angeles to a darker fate. Within a decade of its publication, federally funded flood control channels were being built by the Army Corps of Engineers, pouring a concrete lid over the 51-mile long Los Angeles River from Canoga Park to Long Beach.

Gumprecht and Morrison both pick up the story at this point and attempt to divine a final chapter. Morrison uses clever graphics, an abundance of photographs, and florid prose to persuade the reader that deliverance is upon us. Describing several grassroots efforts aimed at making the river more natural, she ends with a plea to "parole" the river from its concrete prison, to return it to a natural state, presumably along its entire length. I appreciate her enthusiasm for the project and her inventiveness in articulating a plausible scenario. She stops short,



however, of a vision of true redemption, for, if the fall occurred when the city decided that the river could no longer quench the thirst of unbridled growth, wouldn't salvation require a complete repudiation of the aqueduct system of Mulholland and his followers? The concrete straightjacket restraining the Los Angeles River would have to be removed, certainly. But, in a *Paradise Regained*, wouldn't all development within the broad, ancient floodplain have to be sacrificed as well?

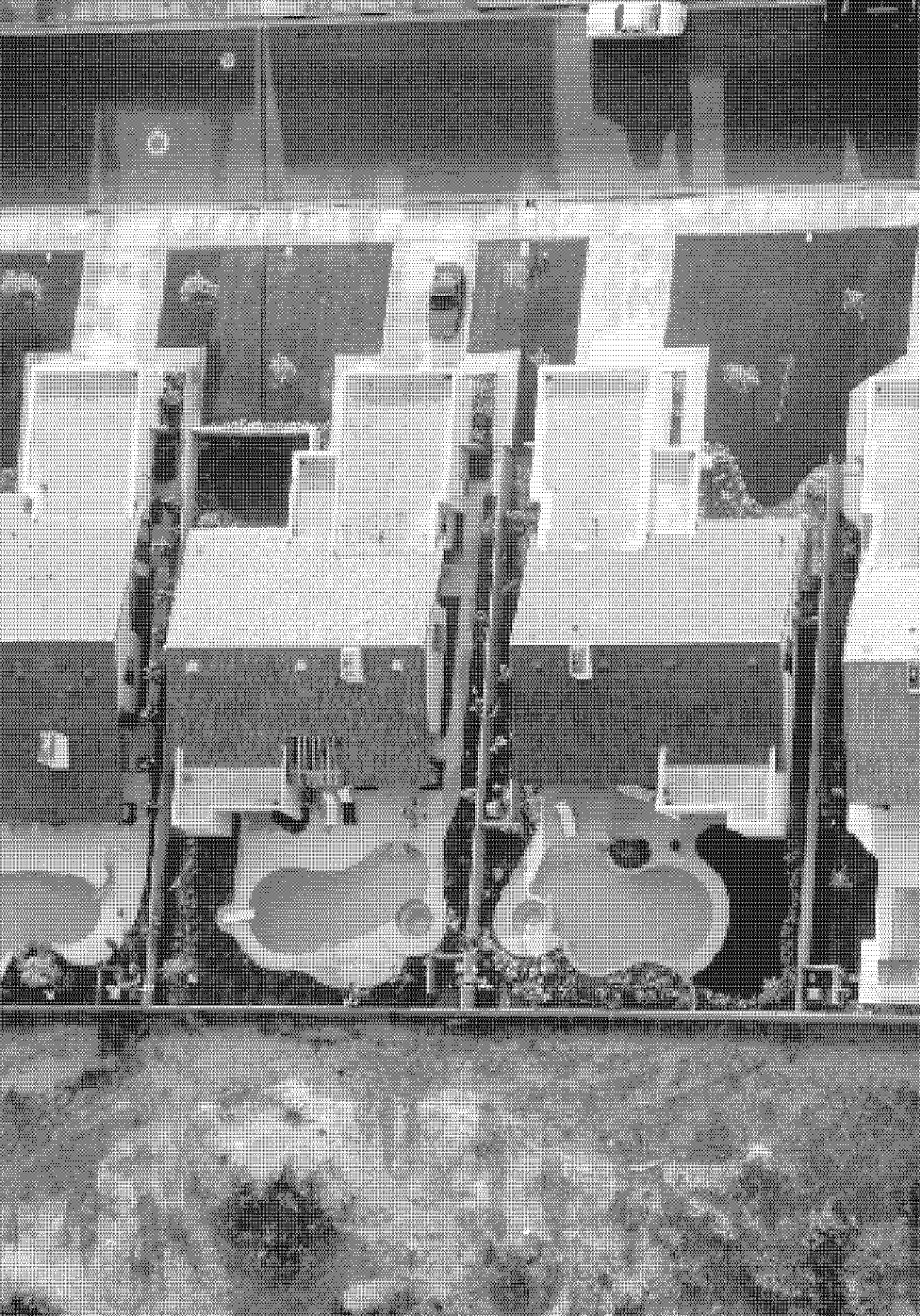
Blake Gumprecht is more measured. He piles fact upon dry, academic fact in a sober, yet nonetheless fascinating, way. Where Morrison appeals to one's emotions, Gumprecht makes a pragmatic argument. In offering no easy answers, he suggests that the river is acceptable just as it is, with no resolution, no redemption—and no happy ending. Unlike Mike Davis, who sees conspiracy in his morning cup of coffee, Gumprecht confronts the cold, hard fact that it was not the clandestine machinations of an evil power structure that ruined the Los Angeles River incrementally over decades; rather, it was the utter indifference of an entire populous that let its paradise slide, bit by bit, into the inferno that now defines it.

David Manning's new book, *Riverbed*, is a revealing counterpoint to these two books. In his latest noir tale set in a parallel-universe Los Angeles, the former LAPD detective follows the case of missing anthropologist Evangeline Rice, whose body is discovered after an El Niño storm deposits it in a remote stand of sycamores in a fictitious Riverside Park.

The story is mundane cops-and-robbers fare, but it comes to life in its descriptions of the settings, all of which magically occur along the length of the Los Angeles River and its tributaries. Manning invents a credible version of what the city would be like if it had been designed with today's awareness of watersheds and ecosystems, with an effective master plan firmly in place. He imagines his victim as an important force in a progressive Arroyo Seco/Occidental University culture thriving along the banks of that ill-fated river. He summons from extinction a society of dire wolves—whose curious carcasses so densely populate the La Brea Tar Pits—living within the marshy woodlands of the Las Cienegas Park (in our universe, Beverly Hills). He envisions schools of trout making their way up the river from the Ballona Slough to spawn in Tujunga. And he suggests that in such a world one could take a raft and float down the entire length of the river, never once encountering even a hint of civilization, save the occasional bridge.

So striking are his descriptions that they totally overwhelm the story, the plot of which now escapes me. In fact, this particular novel was instrumental in curing a bout of insomnia that had afflicted me since I began researching the Los Angeles River. I found it somehow fitting that such a depiction of paradise left this reader uninterested, indifferent, and ultimately bored. Because, in the end, how engaging would such a Los Angeles River be without the pathos that its tragic history arouses?

We tell stories to naturalize the horrible. We use them to reconcile our bad behavior with the image of goodness we have of ourselves in our minds. For the native Angeleno, it is customary—no, essential—to engage in a little therapeutic myth-making from time to time; how else could we live with what we've done to our river, to each other, and ultimately to ourselves? Thanks to Blake Gumprecht and Patt Morrison, perhaps now we can acknowledge our sins, forgive one another, and move toward a more realistic redemption. ●



Concrete Rivers and T.R.E.E.S.

David O'Donnell

One of the ironies of modern urban life is that municipalities spend millions of dollars each year to contain and dispose of stormwater, millions more to acquire the fresh water they need. The irony is especially pronounced in the American West, where scant rainfall can be nonetheless destructive and population centers are often far removed from adequate water supplies. Though the average viewer might require interpretive signage to understand them, some of the results are observable from any of the landmark bridges spanning the Los Angeles River. Most of the year, a trickle of water flows down the narrow center groove of the river's concrete box. But during the rainy season, the box sometimes fills almost to overflowing with a juggernaut of water, lethal to anyone foolish or unfortunate enough to enter it.

The river can be deceptive as well as dangerous. Most of that dry-season trickle is effluent from L.A.'s sewage treatment plants. Accordingly, very little of it originates in the watershed of the river that's carrying it. Instead, it has traveled hundreds of miles from one of the three places that provide 70 to 85 percent of Los Angeles' fresh water: the Central

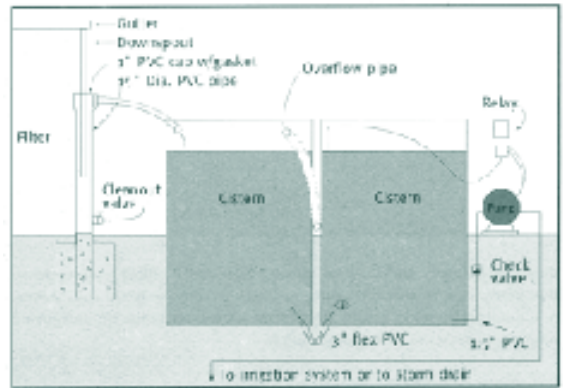
Valley, the eastern Sierra, and the Colorado River. Only 15 to 30 percent comes from local aquifers.

The concrete box, often referred to as the river's tomb, came about as a direct result of floods that regularly devastated the basin, notably in 1914, 1934, and 1938. The U.S. Army Corps of Engineers and the County Flood Control District were charged with one of the largest public works projects ever undertaken: to contain the runoff from the 100-year storm and free the low-lying environs of the river from the threat of flooding.

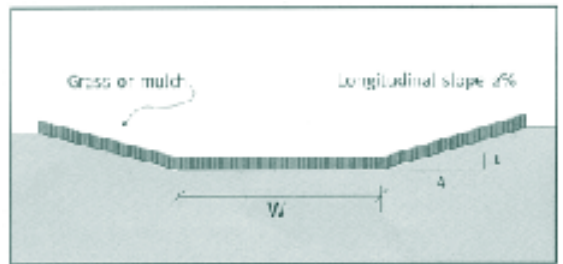
The project was completed in the late '60s. Within twenty years, there was reason to suspect that the system of retention basins, channels, and levees might, in some places, be capable of containing only a 25- or a 40-year storm. The designers had simply been unable to imagine the rapid urbanization of the watershed and the proliferation of hardscape that took place after the war. In particular, they had thought that the upper watershed, the San Fernando Valley, would remain largely agricultural. The reality is that about two thirds of the surface of the City of Los Angeles, including the Valley, has now been covered with impervious materials. Less exposed soil is available to absorb stormwater, which therefore runs through the streets and into the flood control channels. The lost opportunity for groundwater recharge is also an issue of major concern in an increasingly tight water market.

The persisting threat to property values and human life could not be ignored. In the mid-90s, the Corps of Engineers and the county Department of Public Works (heir to the Flood Control District) proposed the LACDA (Los Angeles County Drainage Area) Project, which would answer the threat by topping the levees along the river's lower twelve miles with concrete parapets. The ultimate futility of fighting the effects of concrete with more concrete provoked debate about the underlying watershed management issues, and, in May 1995, three environmental groups sued to stop the project.

The suit, filed by Friends of the L.A. River, Heal the Bay, and TreePeople, was unsuccessful; the LACDA project is scheduled for completion late this year, and the Federal Emergency Management Agency is gradually eliminating building restrictions and flood insurance requirements over large areas of the floodplain. But one condition of the settlement



Cistern collection system - A cistern collects rainwater from rain gutters and stores it for irrigation during dry months. The double cistern at the demonstration site is made of polypropylene, a plastic that is plentiful in Los Angeles' waste stream and is recycled locally by ARCO. The water is pumped out by an electric pump on a timer system to irrigate the yard.

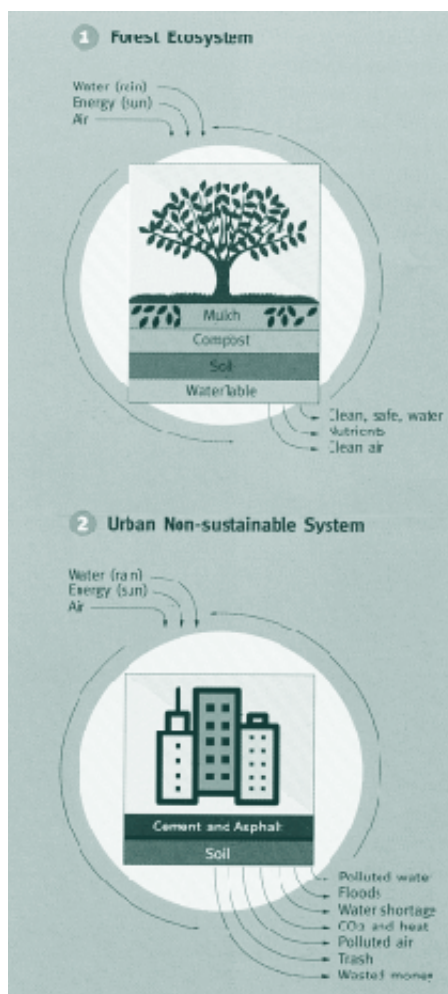


Vegetated / mulched swale - A swale is a low-lying or depressed stretch of land. It is used at the demonstration site to create an attractive and functional space that also performs a vital function in waste reduction. This mulched swale is composed of recycled greenwaste from the property. It is designed to slow the flow of stormwater and to filter pollutants, so that the water can be absorbed into the earth and the toxic substances removed. A swale can be used in any residential setting and may be composed of grass, vegetation, or mulch. If made of grass, it requires irrigation in dry months and regular mowing.

was that the County Department of Public Works investigate alternatives, such as the ones advocated by the petitioners in the suit, to traditional stormwater management. An active and increasingly influential Los Angeles and San Gabriel Rivers Watershed Council, in which Public Works is an important participant, was one outgrowth of the controversy.

Another was TreePeople's T.R.E.E.S. Project. The organization had been a reluctant petitioner in the LACDA suit; its strength was working *with* public agencies to inspire communities and individuals to take responsibility for the quality of their environment. Tree planting was, and is, the focus for that inspiration. But where TreePeople views trees as watershed management infrastructure, agencies and the general public tend to see them simply as decoration. The T.R.E.E.S. (Transagency Resources for Environmental and Economic Sustainability) Project promotes strategic tree planting and a range of other watershed best management practices (BMPs) as sustainable alternatives to river channelization and other practices that treat only symptoms and do nothing to replenish scarce resources. The LACDA controversy had also made it clear that infrastructure agencies were working independently on related problems in the watershed, with little communication or sharing of resources. There are substantial economic, environmental, and social benefits to be derived from a cooperative approach to designing and maintaining our urban landscape. The purpose of the T.R.E.E.S. Project is to demonstrate the feasibility of such an approach and to facilitate the cooperation.

The first step was to point the way toward redesigning urban sites to function as watersheds. A 1997 charrette brought together for that purpose some of the nation's foremost landscape and building architects, engineers, hydrologists, urban foresters, government officials, and community leaders. They worked intensively for three days on plans for five representative urban sites—a single-family home, a multi-family dwelling, a high school, a commercial site, and an industrial site—with an eye to addressing the area's environmental concerns. Among those concerns, each typically addressed by a separate authority, are wasteful use of potable water, stop gap flood control policies, water pollution from storm runoff, costly water importation and the desertification of exporting areas, high rates of energy con-



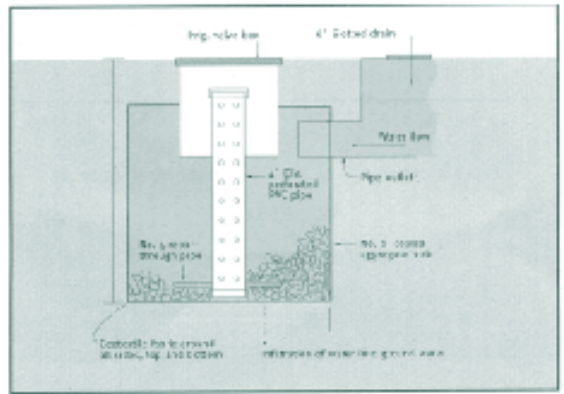
sumption for cooling, large amounts of green waste using up landfill space, urban blight and its destabilizing consequences, and youth unemployment.

The tangible outcome of the charrette process was a collection of designs for retrofitting individual properties to function as watersheds. Each site design addressed several of the environmental issues in question, each with a specific mix of BMPs. The results were published in 1999 under the title *Second Nature: Adapting L.A.'s Landscape for Sustainable Living*. But the participants also came away with a new inspiration: we can indeed achieve sustainability, beautify our environment, and employ citizens as its caretakers. And we can do so at less than the cost of current piecemeal strategies that fight, rather than work with, nature's cycles.

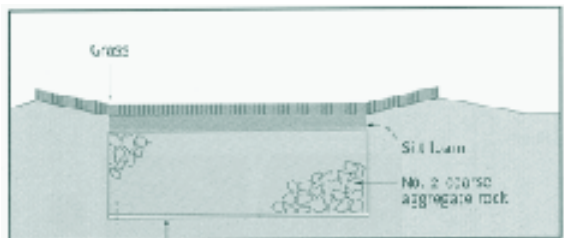
The Hall House, a private single-family residence in South Central Los Angeles, was the first of the five sites to be built. It has been retrofitted to capture and retain onsite the runoff from a 100-year storm event and to reuse all the site's green waste. Some of the water is stored for irrigation; the rest is available for direct groundwater recharge. The yard waste is recycled as mulch, eliminating the need for transport to and space in a landfill (green waste accounts for 30% of the household waste stream). The watershed BMPs employed at the site include a roofwater washing unit that diverts the contaminated "first flush"; a partially buried 3600-gallon fence-line cistern; a vegetated and mulched swale; retention grading in the front and back yards; and a dry well that filters runoff from the driveway before returning it to the groundwater.

TreePeople and the USDA Forest Service are conducting a two-year study to record weather information and monitor the performance of the BMPs at the home. A weather station, flow meters, and a data logger have been installed at the demonstration site, and an adjacent property is the control site. The push for sustainable watershed management having moved from the naysaying to the investigative stage, the data gathered here will help determine which BMPs suit which conditions, how well they work, and how they might be improved.

Influenced in part by the Second Nature charrette and the demonstration at the Hall House, the L.A. County Department of Public Works recently tabled plans for a \$42 million storm drain, intended



Driveway drywell - This drywell system serves the dual purpose of retaining and cleansing rainwater, giving it time to percolate into the ground rather than carrying motor oil and other pollutants into the storm drain system and out to our beaches and bays. Rainwater flowing down the driveway runs through the grate into a box containing sand and crushed rock that capture pollutants.



Retention grading - The front and backyard retention grading is essentially a "sunken garden" that holds rainwater until it can be absorbed into the ground. This type of grading works best in highly permeable soils (Los Angeles type 2 and 3). At the demonstration site, the runoff from the front roof panels is directed into a six-inch depression in the front lawn, while one quarter of the back of the roof drains to the back yard. These structures are capable of handling a 10-inch flash flood that could occur during a 100-year storm event. During a more intense storm, excess rainwater would flow into the existing storm drain system. The grading can also be placed over coarse aggregate rock to achieve a higher infiltration rate.

to solve a chronic flooding problem in a San Fernando Valley sub-watershed. Instead, it has lent its support to retrofitting the entire 2700-acre Sun Valley watershed in accordance with T.R.E.E.S. principles. This turnabout presents an ideal opportunity to show that new watershed management protocols can control flooding by addressing causes instead of effects. At the same time, they offer multiple benefits to draw participation and funding from a range of agencies: improved water quality (by reducing polluted runoff), augmented water supplies (through increased groundwater recharge), greening of the community (with tree planting and retention/detention basins that double as parks), creation of jobs in retrofit construction and BMP maintenance, and improvements to the general quality of urban life.

Agencies, elected officials, civic groups, non-profit organizations, and businesses convened as the Sun Valley Watershed Stakeholders Group late in 1998. Its stated mission was “to determine the feasibility of solving the local flooding problem while retaining all stormwater runoff from the watershed; increasing water conservation, recreational opportunities, and wildlife habitat; and reducing stormwater pollution.”

The Group’s overall watershed retrofit plan was first presented to the public in August 2000. County Public Works Deputy Director Carl Blum and TreePeople President Andy Lipkis presented a vision of a green and sustainable Sun Valley, where stormwater would be transformed from liability to asset. The stakeholders would pool their resources and retrofit the watershed with retention basin parks, cisterns, strategic tree planting, permeable pavement, and groundwater infiltrators. Other strategies, such as pavement removal in schoolyards and parking lots and the widespread use of mulch, would also be part of the mix. A successful demonstration project at this scale would constitute a milestone in watershed management and could be expected to draw international attention.

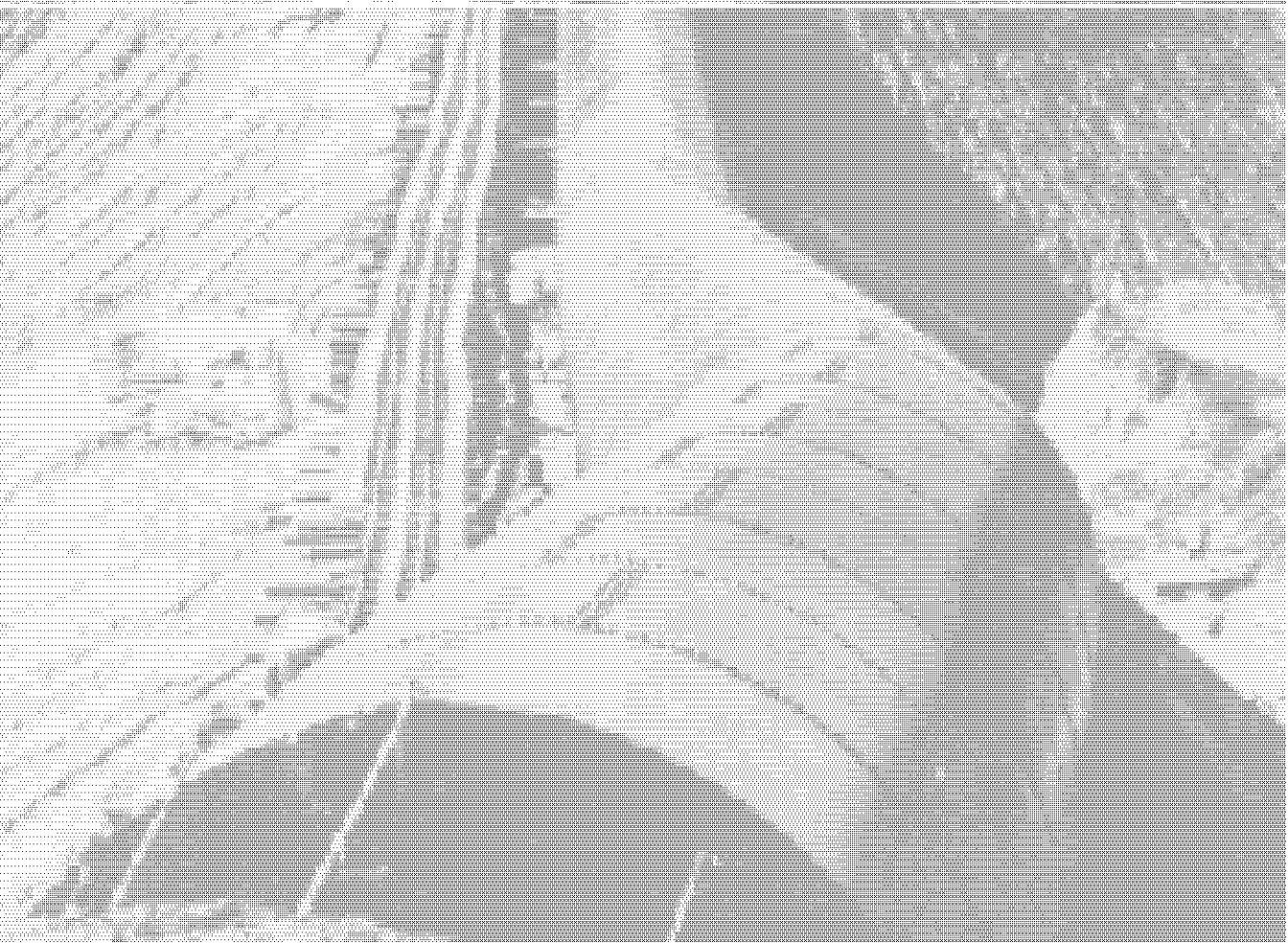
Recently, having determined that its general plan was indeed feasible, the Group amended its mission statement to reflect a new resolve: it now intends to solve the flooding problem. Current movement is on two tracks. One emphasizes outreach to the community and education on watershed issues. Its purpose is to develop the public support necessary



Aerial rendering for T.R.E.E.'s vision of Sun Valley with large-scale retrofitting with stormwater BMPs.

to ensure the project’s success. The other is the implementation of pilot projects in the watershed. They will lay the groundwork for the retrofit of the entire watershed, which is expected to take 10 to 15 years.

The narrator in John Shannon’s detective novel, *The Concrete River*, observes, “Few people in L.A. noticed the natural features that were still there beneath the grid of streets—like the slope a mile north of Rose that had been the north bank of the floodplain. He had once enjoyed knowing things like that, the broken geography under the asphalt and the lost flora and fauna.” It’s true we don’t usually notice these natural features until we’re rudely reminded of them, but the folly of ignoring them is becoming increasingly evident. The broken geography may not be completely repairable, the specific flora and fauna restorable, but they provide clues toward a more sustainable city, if we’re willing to follow them. ●



Urban Spring: Formalizing the Water System of Los Angeles

an excerpt

William R. Morrish

“To a considerable extent, the problem of water in Southern California is a cultural problem. By this I mean that newcomers to the region, who have always made up a majority of the population, have never understood the crucial importance of water. Crossing the desert, they arrive in an irrigated paradise in which almost anything can be grown with a quickness and abundance that cannot be equaled by any other region in America. There does not seem to be a water problem. Nor are they told there is such a problem, for Southern California has always been extremely reluctant to discuss its basic weakness.” –Carey McWilliams (1946)

✱ The freeway, the most famous symbol of Los Angeles, hovers over the landscape like the aqueduct system of ancient Rome. In contrast to the freeway, the water system of Los Angeles, which is much older and fundamentally more critical to its existence, is not as well known. One key reason is that the freeway is a public space and the water aqueduct is not. Daily, thousands of drivers keep their eye on the road and their ear to the radio, listening for SIG ALERTS, warnings of accidents ahead on the freeway. The ritual of the freeway is an everyday activity for residents of Los Angeles. The consumption of water is also an everyday ritual, but one which has been removed from our daily consciousness. This loss of consciousness is primarily due to the removal of the aqueduct from public sight. The ritual of water is no longer a public activity like commuting.

Los Angeles is an excellent example of a man-made desert oasis. Its present day physical form, however—like that of Phoenix, San Diego or other cities in the American Southwest—does not effectively celebrate the water system that nurtures its existence. Most residents thoughtlessly assume that their garden paradise merely comes from “turning

on the tap.” In reality, a gigantic system of aqueducts, pumps, reservoirs, canals, and pipes delivers water from 500 miles away. To the average person’s perception of the city, this labyrinth remains hidden from view, except when he receives the monthly water bill or when he has to vote on water-related bond issues. Here, we... will explore the possibilities of externalizing the hidden water aqueduct system into a set of public spaces, activities, and monuments. Potentially, these new public spaces could be the articulated intermediate scale of urban spaces now missing from the Los Angeles landscape. New and existing developments can begin to infill and reorient themselves to the water places, rather than to the scale of the home or freeway.

✱ Using the water aqueduct system as a test case, the goal of our design is to create a set of specific urban sources in and around Los Angeles, which will simultaneously provide utilitarian service, spatial clarity, and ritual places which celebrate a city created from water and sand. The method for this search we can call the design scenario—a process by which statements of policy are translated into three-dimensional architectural or city building programs.

Our method takes the statements of policy and poses the question: What if the information were expressed as architectural spaces or public monuments? The results of this process will generate two types of information. From the first, we can begin to see the effect a policy has upon the physical structure of a place. From the second, we can identify a spatial vocabulary. The following design scenarios look at the potential ritual places that can be created to celebrate both the spiritual and the utilitarian relationship of the city to its water system.

The First Ritual: The Point of Intake

The aqueduct begins hundreds of miles away from the city boundaries. At the Point of Intake, water is pooled from the natural watercourses into holding channels. At one end, the large pumps of the aqueduct lift station draw water up out of the pool, into the pipes of the aqueduct, and on to the distant city. At this point of transference, the water leaves the wilderness, or rural state, and enters the geometry of the city. To many, the lift station can be seen as the gateway to the city. To others, it is the outermost tentacle of the city as it stretches into the countryside.

The lift station, or Point of Intake, also symbolizes the battle for control of water resources, in which there are two participating parties. The first is composed of those who feel they have control over the water because of *riparian rights*. Since they own land from which the water originates, they feel that they should be in control of its future. The other party usually lives outside the area of the water's origins and argues that an area's water resources should not be limited and controlled by the few who own the land at its source. The water should be put to maximum use. They claim the need for *appropriation rights*. Two hundred years of litigation, legislation, and emotional arguments have been generated by this conflict over the control of limited water resources. This argument is rooted in the historic American conflict between rural virtue and urban intellectualism.

In order to ensure that no other remote region would face the fate of the Owens Valley, the State Legislature passed the County of Origin law in 1931, prohibiting the draining of one area's water in order to supply other areas. This law helps small counties stop larger municipalities from looting local water resources.

In interpreting the law, the Point of Intake can be seen as the middle ground of the debate. It is proposed that a line be drawn between the intake lift station and the water pool of the natural water system, on which a building called the Basilica of Origin will reside. From this point, the basilica mediates between the values of the rural and wilderness landscapes and the geometric aqueduct lines of city, which terminate here.

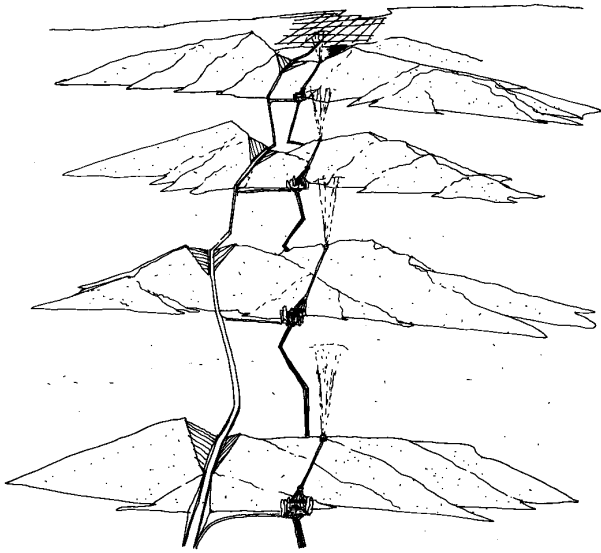
In the Basilica of Origin there would be two icons representing the two sides of the water debate: those of the city and those of the county of origin. The basilica would create a place for the debates about balancing water supplies. It would be the formal space where the process of deciding the amount of water entitlement would take place annually.

Each year, lawyers, officials, and citizens from both sides would gather at the Basilica of Origin and act out the ritual of balancing the area's water resources. This Act of Entitlement would be debated and recorded within the Basilica of Origin at each aqueduct. These basilicas would be created at the Delta, the Colorado River, and the Owens Valley, and each would represent the debate particular to that area of origin.

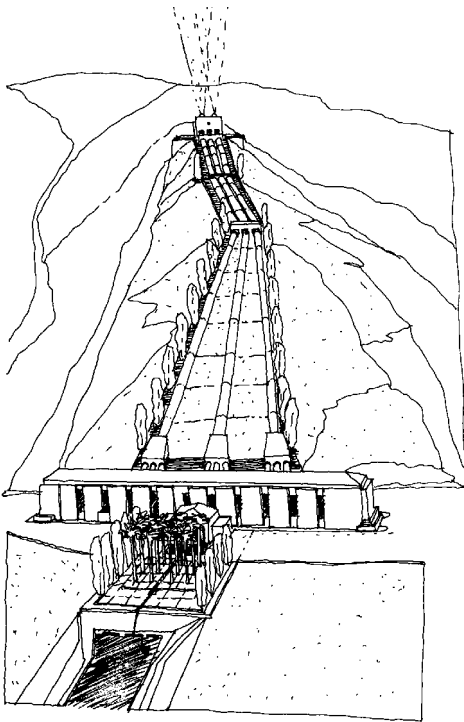
The Second Ritual: Lines of Transport

As it leaves the Point of Intake, tunnels, canals, conduits, and siphons carry the water across the dry landscape of the Southwest. These Lines of Transport tell the story of the land they traverse—a dry landscape marked by broad, open valleys, which lie between high, rocky mountains. The lines of transport zigzag across the desert floor and at times lift their cargo up and over rocky routes. These are the same routes taken by early settlers; today they are followed by travelers on the freeways that parallel the water system. These Lines of Transport act as ritual passageways from the open land and its ridges to the garden cities of Southern California.

The Lines of Transport unleash their power onto the landscape, a power that has been contained and withheld from the parched land it has just passed over. Each line is unique in its technology, its historical moment of construction, and the terrain it traverses. With its own rite of passage, each is perceived differently by the participants of the passage. To some, the Owens Valley Aqueduct represents a



"City Fingers" Lines of Transport, traversing the desert landscape with the interstate paralleling the path.



Oasis Lift Station of the Lines of Transport

period of ruthless political exploitation. To some, the Colorado River Aqueduct represents the collective work spirit of the WPA. Finally, there is the California Aqueduct, which, to those of Northern California, represents the power and the insatiable thirst of the southern part of the state. Whatever the image, lines of transport act collectively as fingers extending the city into the distance, carrying with it the image and characteristics of that city. The symbolic functions of the City Fingers are to demarcate the distance and passage of time across the landscape and to inform the traveler of the past and present effect of the city upon the land, by creating a three-dimensional time line.

This scheme can be realized by visually externalizing the system on the land. During the day, at the bases of these ridges, the lift station can be landscaped with compact stands of trees, creating an oasis that demonstrates the life-giving power of the cargo carried in the lines. At night, when the drive across the landscape can be quite monotonous, the lift station can be lighted to create a focal point in the darkened landscape. The traveler counts off the illuminated ridges, assuring himself, "Only a few more before I get home." It is a point on the horizon, marking time and distance and extending a fragment of the city into the desert. Thus, the monotonous landscape takes on meaning and texture.

The Third Ritual: Pools of Collection

Each aqueduct delivers its water to a reservoir. Like the water cisterns and fountains of Rome, which collected, stored, and distributed the water from the aqueducts, the Los Angeles reservoirs can represent both urban-entry landmarks and neighborhood fountains.

Located at the outer edge of the city, reservoir pools perform a utilitarian function by distributing the aqueduct's water to the homes and gardens of the city. They also represent a transition from the linear aqueduct axis of the Lines of Transport to the spreading grid of the distribution system. A transition from the open, expansive scale of the surrounding mountains and desert to the more articulated individual scale of the irrigated city—from wilderness to civilization. Paralleling the terminus reservoir, the major interstate freeways breach the surrounding mountain walls of Southern California and Los Angeles. At this point, where water and traveler

Rather than follow the Jeffersonian or Spanish grid, the city of Los Angeles and other cities of Southern California follow the pattern of irrigation and water distribution.

pass into the garden, the terminus pool can be developed into a formal entry space. This pool would be emblematic of both the land it is entering and the journey taken to get there.

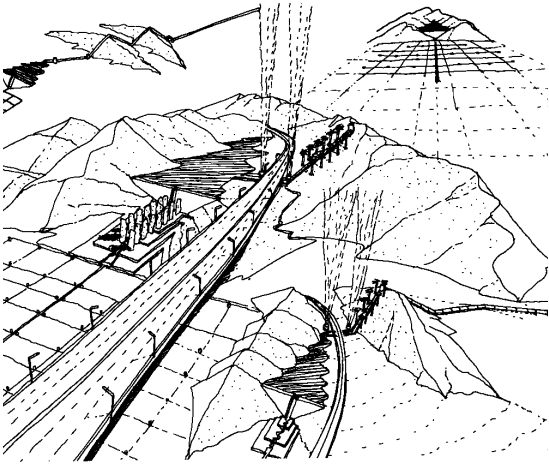
Like the previous two rituals, these junctures can celebrate each aqueduct differently by representing the unique qualities of the particular system they serve—for instance, their geographic and historical origins. To the east of the city, the Colorado River Aqueduct greets those who have just crossed the desert. To the north, the terminus pool can be formed to greet the traveler who has traversed the mountain pass from the agricultural grid of the San Joaquin Valley. Finally, the terminus pool represents a potential gateway to the presently inarticulated sprawl of Southern California cities.

Spread out over the landscape of the city are Pools of Collection which could articulate distinctly different areas in the environment. As part of the distribution system, each terminus pool passes water into a series of smaller distribution reservoirs. These Pools of Collection are interrelated as parts of a larger distribution system, yet each should be distinct. Physically, they could be seen as landmarks, perhaps as super-scaled fountains like their antecedents in ancient Rome.

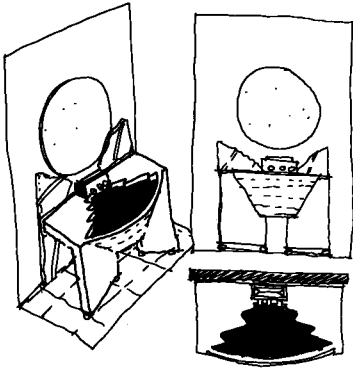
The Fourth Ritual: The Grid of Distribution

Fed by the Pools of Collection, the Grid of Distribution transports water to the individual consumer. It further reduces the scale, breaking down into a fine-grained complex of pipes and pumping stations that bring water to each house and garden.

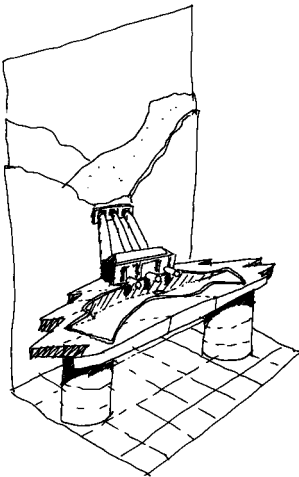
Los Angeles and its environs are created by three overlapping grid systems: one from the Owens Valley Aqueduct, one from the Colorado River Aqueduct, and another from the California Aqueduct. Each is operated by a separate agency, but they are tied together to provide supplementary water as needed. Historically, city development has responded to the grid pattern of each system. At the smaller scales, growth has clustered around the major supply lines of the distribution system. Field patterns of agriculture have become large blocks of residential neighborhoods. At a larger scale, the shape of the cities of Southern California has followed each aqueduct system. The Owens Valley Aqueduct system caused the city of Los Angeles to extend northward



The Pools of Collection, Terminus City Gateway Pool



Reservoir Sink



Grand Canyon Sink

from the original pueblo site rather than to the coastline in the west. The Colorado River Aqueduct allowed development to fill in the valley extending from the coastline on the western edge and eastward to Riverside. Rather than follow the Jeffersonian or Spanish grid, the city of Los Angeles and other cities of Southern California follow the Grid of Distribution pattern of irrigation and water distribution.

The Grid of Distribution is the lifeblood of the city. It could be said to represent the dialogue between the natural environment and its man-made settlements. To make its importance evident, Water Parks could be placed throughout Los Angeles and other communities to commemorate the rapport between man's irrigation system and the ecology of Southern California. Each park would have three functions. The first would be to exhibit the wise utilization of water in a dry climate. The second would be to commemorate the bringing of water to the specific neighborhood. The design of each water park would reflect the origin of its water, such as the Colorado River, for example. The third function of the Water Park would be that of civic landmark. Each park would be site-specific and at the same time regionally tied, thus giving further definition of space to the Southern California plain, devoted not just to the domestic landscape, but to one of community.

The Fifth Ritual: The Private Spring

The homes and gardens on the grid plan of the San Fernando Valley sit like private oases. Faucets, sprinklers, appliances, and other fixtures provide pleasure, life-sustaining fluid, and cleanliness, with minimum inconvenience to the individual. Even in the arid climate, water to quench one's thirst is never far away. The city is made up of millions of these Private Springs, each catering to individual ritual patterns.

While bathing in a household spring, there is little to remind one of the water's sources. Actually, the faucet and water fixtures can be seen not only as utilitarian conveniences, but as connections to the community and to the distant landscapes at the end of the water aqueduct. Water in Beverly Hills is actually drawn from the Colorado River or the San Joaquin Delta. Across the street in West Hollywood, the tap water comes from the Owens Valley.

Domestic habits tie into the whole system of water rituals from the Point of Intake down to the



California Aqueduct, San Luis Reservoir, aqueduct storage.

individual faucet tap. Therefore, the design of the individual spring could reflect, through its image and usage patterns, the form and significance of the larger aqueduct system. The citizen is reminded daily of his debt to the entire water system. The Private Spring can achieve these ends by:

1. Shaping the home and garden into patterns reminiscent of the components of the water system.
2. Redesigning water usage fixtures to recall the origin of the water sources, such as a sink shaped like the delta reservoir of the Colorado River.

3. Re-adapting the garden to plant material and patterns that utilize and represent irrigation techniques. The Private Spring terminates a long line of water transportation and thus, in many ways, is a representation of all the issues and physical patterns of the water system. If the Private Spring is designed properly, it can be a source within the city from which residents can reflect on the balance of water usage in their city in relation to other rural and urban areas.

Conclusion: Urban Places

* The Pools of Collection, the Basilica of Origin, and other points of ritual along the water aqueduct system provide just a few examples of possible public activities that can be associated with the water system in Los Angeles. It is hoped that the design alternatives in this article will stimulate interest in the potential of developing urban places in the arid western city.

* These design exercises emphasize that each aqueduct is part of a unique system, constructed to carry out the same tasks: the transportation and distribution of water. Each system must convey water a long distance from its source and also represent its historical and geographical origins. It is this collision between the utility of water transport and its contextual response that creates a set of structures that are simultaneously universal in principle and specific in response to locale. For example, each aqueduct might have a Basilica of Origin, but the articulation of that building would be different for the California Aqueduct than for the Colorado Aqueduct, since the former has its source in the lush river delta, and the latter is located on the edge of the desert.

* The aqueduct system of Los Angeles... and the five ritual sections of the water celebration are design elements that provide inspiration for the future planning and shaping of the city and its architecture in the western oasis of Southern California. This exploration, which is not typically part of the architect's repertoire, redirects traditional elements of architecture into new relationships. The West is a gigantic unyielding landscape: it should be used as an architectural context from which to develop the future shape of the city. ●

This excerpt from "Urban Spring: Formalizing the Water System of Los Angeles," originally published in *Modulus*

(The University of Virginia Architecture Journal), no. 17, 1984, is reprinted by permission of the author and publisher.

The Sunol Water Temple

In the preceding article, William Morrish describes possibilities for celebrating the sequence of thresholds that make up Los Angeles’s water system. Near San Francisco, an example of such celebration exists, recently restored. **Eric Althoff** tells us about it. –Editor

❖ At his funeral in 1924, a friend eulogized famed architect Willis Jefferson Polk as a man whose “vision, to the last, was always of this city of San Francisco as the most noble architectural opportunity of the New World.”

Polk’s prestigious life as an architect brought him from humble beginnings in Kentucky and St. Louis to his start as an architectural apprentice in Chicago. Eventually, Polk found his way west to the city upon which he would leave his indelible and unique designer’s mark.

Perhaps Polk’s most famous structure is the Sunol Water Temple, constructed in 1910 and located in a 200-acre public park overlooking San Francisco Bay. Clearly influenced by Polk’s frequent visits to Europe (and Rome, in particular), the 60-ft.-high pavilion marks the nexus of three major water sources: the Alameda Creek, De La Laguna Creek, and Pleasanton Wells, which all flow into the Sunol Valley.

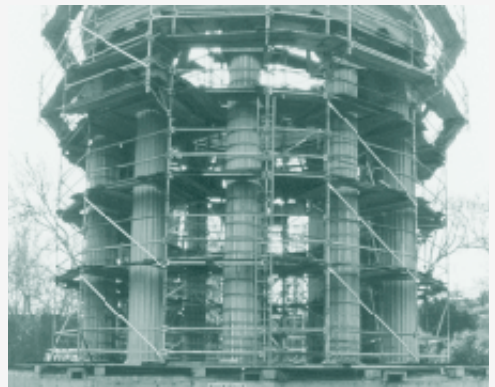
Polk designed the classical structure as a tribute to the Temple of Vesta outside Rome, built in deference to the source of ancient Rome’s water supply. For 65 years after he was gone, the temple stood as a monument to Polk’s aesthetic sensibilities and continued to watch steadfastly over the city that he loved.

Until 1989.

At 5:02 p.m. on October 17 of that year, the Loma Prieta Fault shook, sending a magnitude 7.1 earthquake rocking through the Bay Area, causing billions of dollars in damage and claiming 62 lives, homes, freeways, and Game 3 of the “Battle of the Bay” World Series between the San Francisco Giants and the Oakland Athletics.

Polk’s beloved Sunol Water Temple was not spared. Although it remained intact after the quake, the temple sustained substantial damage and was closed to the public.

It would be nearly a decade before the temple’s owner, the San Francisco Public Utilities Commission, committed nearly \$4 million to restore the fallen icon to its early 20th century glory. Approximately \$1.2 million would be spent to restore the structure, with another \$2 million to \$3 million being spent on landscaping and construction of a small museum for the historic monument. ●



Historic preservation architects: Carey & Co., San Francisco. General contractor: LTM Construction Co., San Francisco.

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Sea of



Entropy

Thom Faulders

The artist Robert Smithson once described the natural phenomenon of entropy in the following manner: imagine a child running between two sand boxes, one with white sand and the other with black sand. As the child continues to run in a clockwise direction between the two, the sand increasingly mixes into a uniform gray. He is then told to run in a counter-clockwise direction, though one discovers that this will not undo the previous mixing and re-sort the colors. Given an infinite amount of time the sand could never reorganize—the process of entropy will irreversibly continue.¹

A similar observation can be made regarding the physical and social interactions that shape the ongoing saga of the Salton Sea, a 40-mile stretch of inland salt water in the Southern California desert, east of San Diego and 30 miles north of the Mexican border. Accessible by car, it is a surreal index of a sea created by an artificial canal gone awry, vacation communities stopped dead in their tracks, and water so toxic as to create coastal sands made entirely from bones. Mistakenly, the sea appears to be a life-giving oasis (a mirage?) within its arid and rocky setting, and is a mere thirty-minute drive from the

super-irrigated green golfing lawns of Palm Springs (a constructed mirage, to be sure). The Salton Sea is out of control in an entropic interplay between organic forces and artificial interventions.

Accidental Rupture

As the Baja California peninsula began its Miocene shift away from the continental mainland, the Golfo de California and the Salton Trough were formed. Formerly part of the gulf sea, the dry trough sank further into the earth, creating the Salton Sink, an isolated depression of land hundreds of feet below sea level.

Fast-forward to 1905, when a man-made irrigation canal, built to divert fresh water from the Colorado River to agriculture in the Imperial Valley, abruptly broke its levees due to an unanticipated overflow of storm water. Through this catastrophic rupture, the entire irrigation flow from the Colorado River spilled into the Salton Sink, force-filling it with fresh water.² In due time, the levee was successfully dammed (reportedly using scores of discarded railroad cars as filler), but the Salton Sink had become a permanent body of water, renamed the Salton Sea.



Adding further distinction to this new aquatic feature, the Salton Sea's water elevation is 236 feet below sea level, putting it in the same "low" class as the Caspian and Dead Seas.

During the 1950s and '60s, the Salton Sea was vibrantly promoted as a vacation oasis within this desert where summer temperatures routinely reach above 120 degrees Fahrenheit. Situated between the aptly named Chocolate Mountains (home to the military's Chocolate Mountain Impact Area and off limits to civilians due to live aerial bombing) to the east and Anza Borrego State Park to the west, the sea offered stunning views and a bounty of affordable sea-side land. The water was stocked to attract sport fishing, and the sea was advertised as a boating and water-skiing paradise. The sea's coast sprouted speculative communities, the largest being Salton City on the western shore. Names like Mecca Beach, Oasis, and Slab City were sure to attract the curiosity of newcomers, and areas like Bombay Beach (rumored to have been named after a bomb was dropped, creating a small bay) were established as year-round trailer park living environments within the unforgiving landscape. Perhaps in the ultimate spirit of optimism, architect Albert Frey (a longtime resident of Palm Springs who designed experimental

desert structures alongside Richard Neutra, John Lautner, and Donald Wexler's all-metal housing), completed the North Shore Yacht Club in 1959, adding a central pulse to the sea's new-found existence.

Tainted Waters

The topographical qualities that gave birth to the sea were also indirectly threatening its longevity as an asset in the otherwise harsh environment. Lacking any natural source of replenishment other than runoff from sporadic local precipitation, the sea most likely would have dried up, returning to its original, arid state. As it turns out, however, increased agricultural activity in the hyper-productive Imperial Valley region has brought steady irrigation runoff, flowing downhill into the low level sea and guaranteeing an abundant supply for the recreational waters. Unfortunately, this "nourishment" has come with a paradox: the irrigation water is heavily laced with herbicides, pesticides, and additional topsoil salts, which exacerbate the already high salinity caused by mineral salts seeping from the sea floor. The result over time has been catastrophic to the marine and recreational life of the Salton Sea, with fish and bird-life dying off in debilitating numbers and visitors flocking elsewhere.

Along with the rise in contamination, the water level itself has continued to rise with the increased agricultural development, creating permanently flooded communities and forcing many remaining residents to flee. Not to be defeated, the Bombay Beach community constructed earthen dikes between its village and the sea, with sump pumps strategically placed to guarantee dry land for its occupants. Presently, it rests approximately 10 feet below the water level, and visitors find themselves driving up to the beach. Half-submerged mobile trailers and cars litter the coast, and telephone and power line poles march perpendicularly out to sea, indexing underwater roads. A road map of the region still touts the Salton Sea as a vacation haven, yet warns water enthusiasts (those brave enough to enter this murky fluid) to be aware of such underwater obstacles as trees, structures, and automobiles when boating or water skiing.

The panoramic beauty of the sea provides a contradictory façade to what lies beneath. Enormous

algae blooms have voraciously multiplied, sucking available oxygen from the water and killing fish strong enough to survive the rising pollution and salt levels. A walk along the water's edge provides a curious yet startling realization: the aggregate crunching beneath one's feet in many places is not sand, but the crushed ribs, spines, and scales of dead fish—an animal sand. Many more fish float lifeless in the water. A rank, pervasive stench rises from the water and lingers in the air.

Emblematic of the convoluted relationship between nature and the man-made, the Salton Sea National Wildlife Refuge and the Salton Sea Military Test Base approach within a mile of one another at the sea's southern end.

Zone

In Andrei Tarkovsky's 1979 film, *Stalker*, a small group of truth seekers ventures into the "zone," an area of wasteland surrounding the ruins of a nuclear power plant. Though spoiled by its past, the landscape is rumored to contain hidden forces worth seeking and protecting, and thus its torment creates its attraction. The visitor to the Salton Sea region confronts the same enigmatic presence. The sea's crises, though serious and many, have nevertheless intensified this area into one of the most provocative landscapes in California.

Further layers complete the picture: the San Andreas Fault lies directly under the Salton Sea's eastern shore; its northern vicinity is one of the windiest places in the country and home of the Tehachapi Valley Windmill Farm, the second largest windmill cluster in the world. Nearby Slab City, surprisingly designated on a regional map, is a nomadic "non-city" where residents park their mobile homes on concrete slabs that are the residue of military buildings long since demolished. Marking the entrance to this surreal desert conglomerate is Salvation Mountain, providing a colorful beacon amidst the beige desert sands. It is the creation of a desert eccentric, who for years has been painting an entire hillside with a concoction of house paint, mud, and straw in dedication to the afterlife.

Today, Albert Frey's yacht club stoically stands, boarded shut, its outdoor pool and walkways cracked and contorted. Undeterred visitors and high-way nomads stop to inspect this once hopeful relic



Derelict and half-submerged trailers and structures.



Beach made of fish bone and floating dead fish.



North Shore Yacht Club, Architect Albert Frey. Boarded up structure.

and to gaze upon its silent land and seascape. Across the water, Salton City lies poised for a future that has not yet arrived: most of its infrastructure of roads, sidewalks, and street lights remains empty and silent at water's edge, awaiting new occupants who surely will never come. Robert Smithson created an active exchange between artificial and organic forces with his "Spiral Jetty" earthwork in Utah. Visitors to the Salton Sea are treated to the same entropic interplay, but on an extreme scale. It is high-speed geography, appearing to change between every visit. ●

Notes

1. As discussed by Rosalind Krauss in Yve-Alain Bois and Rosalind E. Krauss, *Formless, A User's Guide* (New York: Zone Books, 1997), pp. 73. From Robert Smithson, "A Tour of the Monuments of Passaic, New Jersey," *Artforum*, December, 1967.
2. Center for Land Use Interpretation (www.clui.org), 2000.



Carbon Fiber Vortex

Tim Culvahouse, AIA

Bruce Tomb's toilet and high tank are a reshaping of the conventional home fixtures as autonomous pieces of furniture. They join a series of explorations by this San Francisco-based architect and artist into the form and mechanics of domestic functions. Others in the series include a granite cooktop, a bath cart, a self-contained "bedroom," and a lavatory.

Unlike most toilets, which operate by the siphon jet principle, Tomb's toilet operates on the principle of the vortex. The form of the bowl makes visible the innately sculptural phenomenon of the vortex. The toilet's refined, esoteric materials—carbon fiber for the bowl, urethane for the seat, and stainless steel for the armature—contrast with the more traditional materials of the accompanying high tank, built like a barrel or a water tower and proportioned to the human figure.

Tomb's toilet and high tank are in the collection of the San Francisco Museum of Modern Art. His lavatory, "Basin," is available commercially at www.infinitefitting.com.



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Webiography

at <http://www.amazon.com>, use the search category, "Water resources development"

Water Librarians' Homepage, <http://www.wco.com/~reeter/waterlib.html>

CALFED Bay-Delta Program, <http://calfed.ca.gov>

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California Urban Water Conservation Council (CUWCC), <http://www.cuwcc.com>

California Rivers Assessment (CARA), <http://endeavor.des.ucdavis.edu/newcara>

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<http://www.epa.gov/OWOW>

Friends of the LA River, <http://www.folar.org>

Hetch Hetchy Water and Power, <http://www.ci.sf.ca.us/puc>

for the San Francisco Public Utilities Commission,

then select "Departments/Bureaus," then "Hetch Hetchy Water and Power"

Los Angeles Department of Water and Power, <http://www.ladwp.com/home.htm>

Metropolitan Water District of Southern California,

<http://www.mwd.dst.ca.us/mwdh2o/index02.html>

Ocean Arks International, <http://www.oceanarks.org>

River Resources, <http://riverresource.com>

USGS Water Resources of the United States, <http://water.usgs.gov>

T.R.E.E. People, <http://www.treepeople.org>

Credits

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Coda

Los Angeles Department of Water and Power's John Ferraro Building



Anne Zimmerman, AIA

In recent years, the Los Angeles Department of Water and Power's John Ferraro Building, at 111 North Hope Street in downtown LA, has not stood out as a civic landmark. The motley Bunker Hill high-rises of the 1970s and 80s have drawn attention away from the Civic Center that comprises an anemic axis, linking (visually more than physically) the newly restored and renovated City Hall, other government buildings, and the Music Center complex. The Ferraro Building terminates this axis.

Now, with the new Disney Hall to one side and the new Raphael Moneo-designed Cathedral to the other, this civic axis will be invigorated, and the Ferraro Building will attain a stature it never dreamed of.

A. C. Martin & Associates conceived the building in the mid 1960s, not just as functional offices for 4000 employees, but as a symbol of the department's dual kingdoms of water and power. At night, the building glows like a gigantic lantern, reflected in the water-filled moat surrounding the building, and, in the daytime, the building appears to float upon that water, which hosts families of seagulls and ducks.

The water's value is not, however, merely scenographic. It provides, as well, cooling capacity for a third of the building's air conditioning load. Along with recaptured heat from the interior lighting, which eliminated the need for space heating, the pool is an early, forward-thinking example of sustainable design. A recently added solar array extends and makes more visible the building's conservation measures. Beautiful but low-key, the John Ferraro Building maintains a vision of sustainability for the "new" downtown. ●