Inland Empire Utilities Agency:

65 Years of Making Every Drop Count

Preface

During the past 65 years, the Inland Empire Utilities Agency has served as a shining example of how a small agency can transform into a regional custodian of water resource reliability and resiliency. This book celebrates the Agency's history and the innovative, bold steps taken to ensure high-quality water is, and always will be, available for residents, industries and agricultural users.

Joe Grindstaff,
IEUA General Manager

In the early 1900s, the Chino Valley became an agricultural powerhouse with its fields of sugar beets, citrus groves and vineyards. Then came the dairies. At one point, the valley had more than 300,000 dairy cows and was touted as the largest milk-producing community in California. By the mid-1950s, people had discovered the region was an ideal place to raise families and start businesses, and the population grew in leaps and bounds.

The Inland Empire Utilities Agency was formed as the Chino Basin Municipal Water District on June 6, 1950 by popular vote. The Agency's focus was to secure supplemental water from outside the region because the burgeoning population and thirsty agricultural enterprises were draining the valley's local groundwater source. As a member agency of the Metropolitan Water District of Southern California, the new water district was able to secure water conveyed from the Colorado River and, later, from Northern California via the State Water Project.

In the 1960s, the Agency began to expand, first treating industrial wastewater from cities and then assuming region-wide wastewater treatment responsibility. It was one of the first districts in California to recycle its treated wastewater to irrigate crops, golf courses and parks. And it took risks to find a solution to the tons of dairy cow manure, putting the waste through a process to turn it into energy that powered treatment plants and also converted it into rich, natural compost.

The District changed its name in 1998 to the Inland Empire Utilities Agency to reflect its regional approach. In 2015, as the Agency celebrated its 65th anniversary, it did so with the reputation as one of the most progressive agencies in the California.

"I want people to understand the challenges of water resource management," said Joe Grindstaff, the Agency's general manager, "and to recognize the work of the people throughout the region who've made tough decisions in the past to ensure we are where we are today. In addition, the boards of directors deserve credit for making difficult decisions and having the vision to look ahead and say we'll step up to do what needs to be done."

Inland Empire Utilities Agency
A MUNICIPAL WATER DISTRICT

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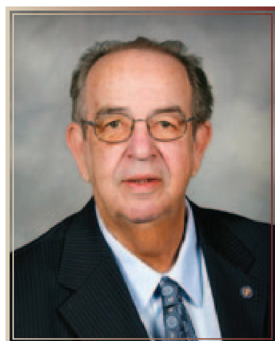

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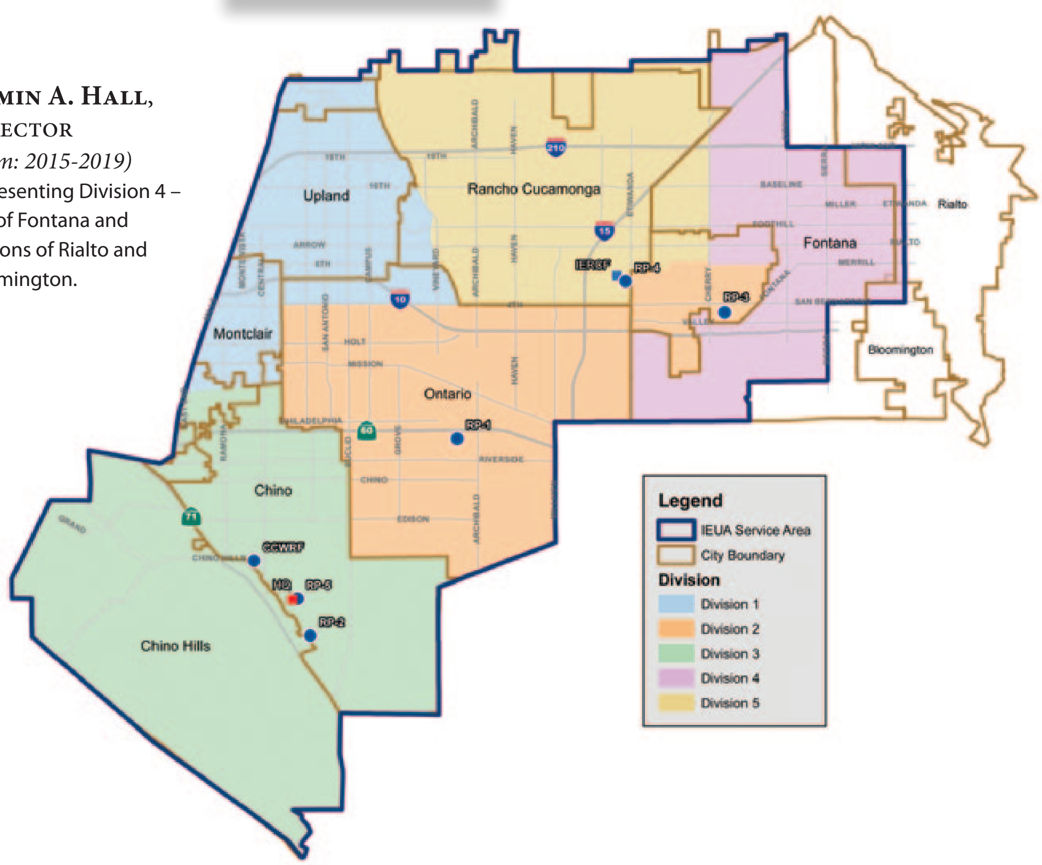

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Contents

Chapter 1
Tapping the Basin

In the shadow of Mt. Baldy in the San Gabriel Mountains lays the Chino Groundwater Basin. The spiking peaks slope down to form a wide, fertile alluvial plain. Creeks carved into the mountainside carry water downhill; water that eventually sinks into the Chino Valley's vast underground aquifer, one of the largest in Southern California. This is the backdrop to a fascinating story of intrepid souls who, in the face of a changing landscape, had the wherewithal to ensure that the region's residents, businesses and farmers would thrive.


Isaac Williams

Good soil and ample water. Pioneers arriving in the 1800s found the valley ideal for growing crops such as tomatoes, sweet potatoes, summer squash and strawberries, and orchards of peaches and walnuts. By the turn of the century, sugar beets and sweet corn were a significant part of the economy.

In modern times water supply would become a crucial concern. Yet in the mid-1840s, a waning water supply was the furthest thing from the mind of rancho owner Isaac Williams as he sat atop his horse on the hills above present-day Chino and marveled at the scene below. His rancho of 3,200 acres sprawled as far as the eye could see. Thousands of cattle grazed in grassy pastures with sycamores and willow trees growing along the banks of streams that flowed from the snow-capped peaks.

The valley received an average of only about 15 inches of rain a year and about 45 inches of snow-melt from the mountains. To Williams, that must have seemed enough. The creeks and the wells, which he dug into the basin, provided ample irrigation for his crops of grape vines and rows of wheat that he planted across the vast landscape. He probably never even imagined that pulsing just beneath the earth was one of the largest groundwater aquifers on the West Coast that stretches 235 square miles.

First to Tap the Source

Prior to Williams and other pioneers, the first inhabitants of the valley were drawn to the creeks for the life supply. Around 1200 A.D, the Kukamonga Native Americans built their settlements of about 10 to 30 dwellings along creeks by what is today the Red Hill area in Rancho Cucamonga. Some 500 years later, the Tongva-Gabrieleño tribe built domed reed huts near the same streams, providing easy access to fishing, light farming and harvesting of native plants, acorns and berries.

One of 50 flowing water wells on a Chino ranch around 1903-1905.

It was during the rancho period – between the 1780s and the mid-1800s – that water in the basin actually began to be tapped, engineered and conveyed to maximize emerging land uses such as raising cattle, sheep and horses, and later growing crops and orchards. Like the Tongva, the ranchers built their adobe homes near streams.

For example, in 1839, the earliest rancho in the Chino Basin, El Rincon, sprawled over 4,431 acres south of present-day Chino. Owner Juan Bandini located his adobe at the confluence of Chino and Mills creeks on a high bluff along the northwest side of the Santa Ana River where Prado Regional Park now sits.

In 1841, Antonio Maria Lugo was granted rights to the Rancho Santa Ana del Chino. He built an adobe house on Chino Creek, where Boys' Republic High School now sits in Chino Hills. Lugo granted his son-in-law, Isaac Williams, an interest in the property. A few years later, Williams petitioned for an additional 13,000 acres on the north and west, and eventually secured full ownership of the entire Chino Rancho, comprising some 36,000 acres.

On his rancho, Williams dug down 100 to 400 feet to tap artesian wells in different locations. Artesian wells are favored due to a natural pressure that produces a constant supply of water with little or no pumping. In addition, he built a ditch system around the property to divert irrigation water from the creeks. The constant supply of water supported diverse endeavors: thousands of cattle were raised for their meat, hides and tallow; wheat was grown on more than 1,000 acres, and other crops included beans and peas, as well as vineyards and orchards of fruit trees. Williams also constructed a gristmill to grind grain into flour and built a soap factory to process the tallow.

The Shift from Cattle to Dairy Cows

The Hispanic ranch system began to fade leading up to the 1850s, a tumultuous time. When the Mexican War ended in 1847 California's statehood was declared in 1850 and the Gold Rush had everyone moving north to strike it rich. In the Chino Valley, the final blow to the prosperous rancho life came when tens of thousands of cattle died in an 1862 flood followed by another devastating drought from 1862-1864.

"The years 1863 and 1864 were years of great financial stress, especially in Southern California," noted *The History of Pomona, California with Biographical Sketches*. "Though far from the active scenes of the Civil War, the general depression of the country was keenly felt. Three years of drought – three succeeding seasons almost without rain – had wrought terrible havoc in a country whose sole production practically was of grain and cattle, and at a time before irrigation was known, save at one or two points in a very small way. Horses and cattle died by the thousands and there was no possibility of the sale of land."

The valley's resurgence came in the 1870s as new immigrants of Anglo-American descent moved into the basin and purchased small farms. They launched a diversified farming tradition founded upon two factors. First, they had a dairy tradition whereas the Hispanic rancheros did not. The old demand for olive oil was replaced by demand for butter, and, to a lesser extent, cheese. The second major contributing factor was that the farmers had control of relatively small amounts of land compared to the vast ranchos, which created the need for a more efficient agricultural system. Significant numbers of milk cows could be raised on small parcels, fed on grain and were able to produce butter that could augment the farm's cash income. In addition, the skim milk, which remained after the butterfat and curd (for cheese) had been removed, was fed to the pigs. Interestingly, people didn't drink much milk in those days and they didn't drink skim milk at all.

Into the 1880s, local farmers kept only a few cows and used the butter for their own household consumption. As more farmers moved into the basin and added cows, there was more milk produced than individual households could use. In 1889 Daniel Durkee established the "Rincon Creamery," where local farmers would bring their milk each day to be separated and made into cream. The creamery was so successful that by 1892 it was the largest in San Bernardino County. At the turn of the century, Louis Richenberger opened the area's first cheese factory in the village of Rincon, where farmers would also bring their milk. Specializing in "Rincon Cheese," the factory's output is said to have averaged 200 pounds per day. As such, the milk cows spurred new industry in the basin, encouraging farmers to increase the number of their cows and putting the Chino Basin on the road to becoming a dairy capital.

The Model Colony of Ontario

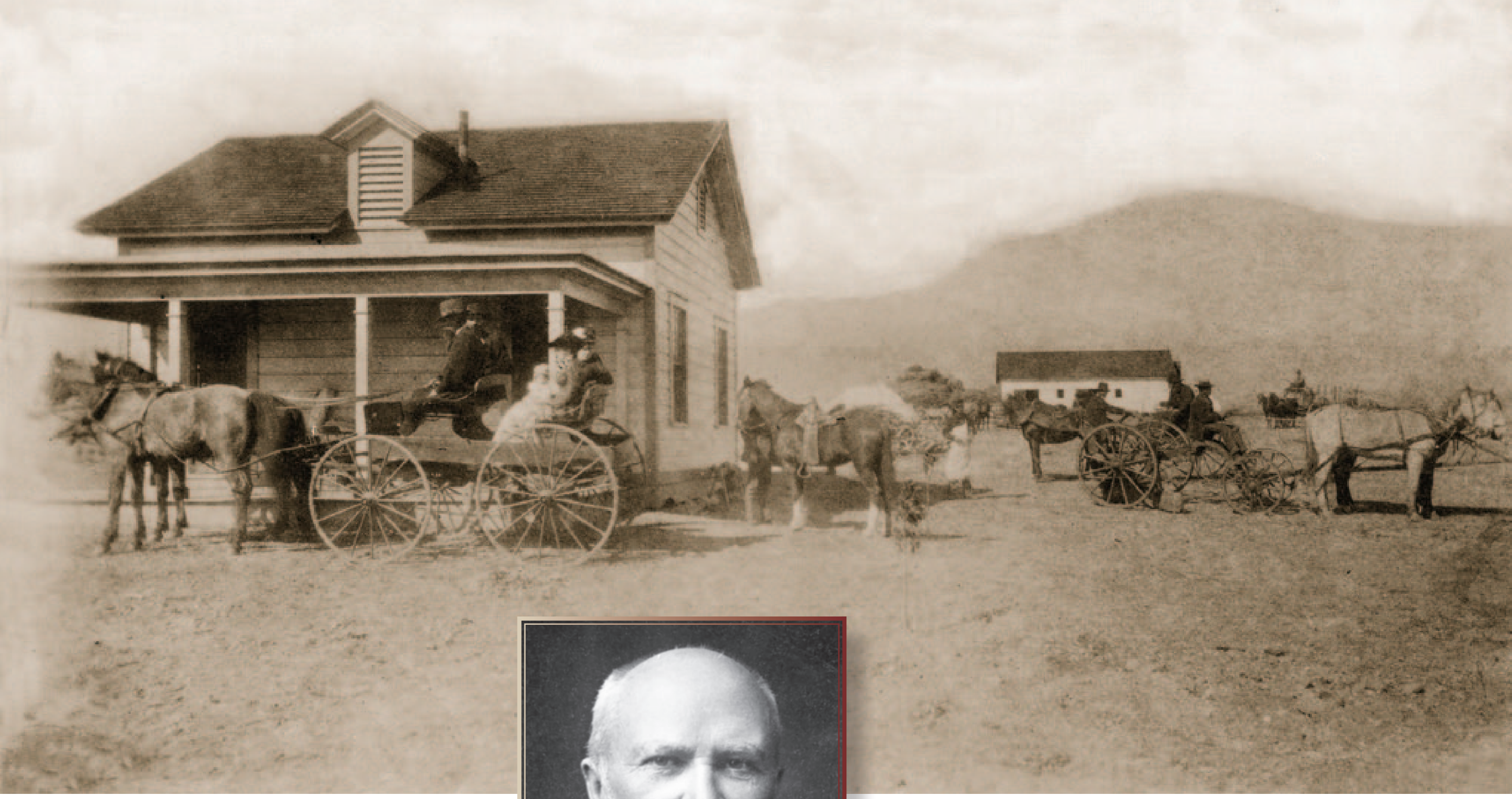
In 1881, George Chaffey, a visionary Canadian engineer, set his sights on creating a "model colony" in the heart of the Chino Basin, which would later become Ontario and Upland, two cities that would be key 70 years later to forming the Inland Empire Utilities Agency's predecessor district. The colony was to be an agricultural utopia, separated into 10-acre plots on a grid, with an innovative irrigation system and modern luxuries, such as electric lights and a telephone line.

The land that Chaffey and his brother William bought was described as a "barren wasteland" in many accounts. For $60,000, they purchased 6,216 acres and water rights of the Cucamonga Rancho, which included 1,000 acres of the Garcia Rancho they intended to subdivide into small fruit farms. The brothers also purchased 114 acres of the Kincaid Rancho, which included water rights to San Antonio Canyon.

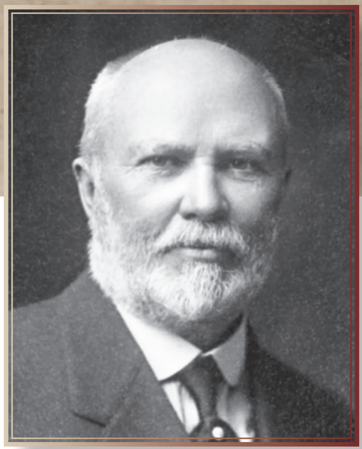
Chaffey understood that to successfully develop an agricultural community in a semi-arid valley they would have to create an irrigation system to bring in a reliable supply of water. After surveying the area they realized that this could only be accomplished by routing water from San Antonio Creek, a major stream flowing from Mount San Antonio, better known as Mt. Baldy.

On December 11, 1882, the first cement pipe was laid as part of a system that would total 60 miles. Through these cement pipes, water was made available to every parcel of land in the colony.

A pulley was used to lift milk cans up from horse-drawn milk wagons waiting below at the Chino Valley Creamery Association circa 1900.



The first house in Ontario, built by the Chaffey brothers in 1882, stood on Fourteenth Street and Second Street in back of Euclid Avenue.



George Chaffey

Engineering was one thing, but Chaffey needed to appeal to potential land buyers. He and his brother created a "mutual water company" in which each landowner became a stockholder. The water would become the property of the landowners. To top it off, the Chaffeys sold all their water rights to the company to reassure their land buyers that they were not selling more land than they had water for. On May 2, 1882, the brothers formed the Etiwanda Water Company – the first shareholder-owned water company in California to deliver water to thirsty farmers and families in the valley. In 1986, that water company would become part of the Cucamonga Valley Water District, among the first agencies to become a member of the Inland Empire Utilities Agency's predecessor district.

Later in 1882, the Chaffey brothers purchased large tracts of land known as the original Colony Lands and on October 25, 1882 they invested $1.5 million to form the San Antonio Water Company as a private, nonprofit water utility. That utility was too large for a buyout and, even today, continues to provide water using the shareholder-owned model the Chaffey brothers devised.

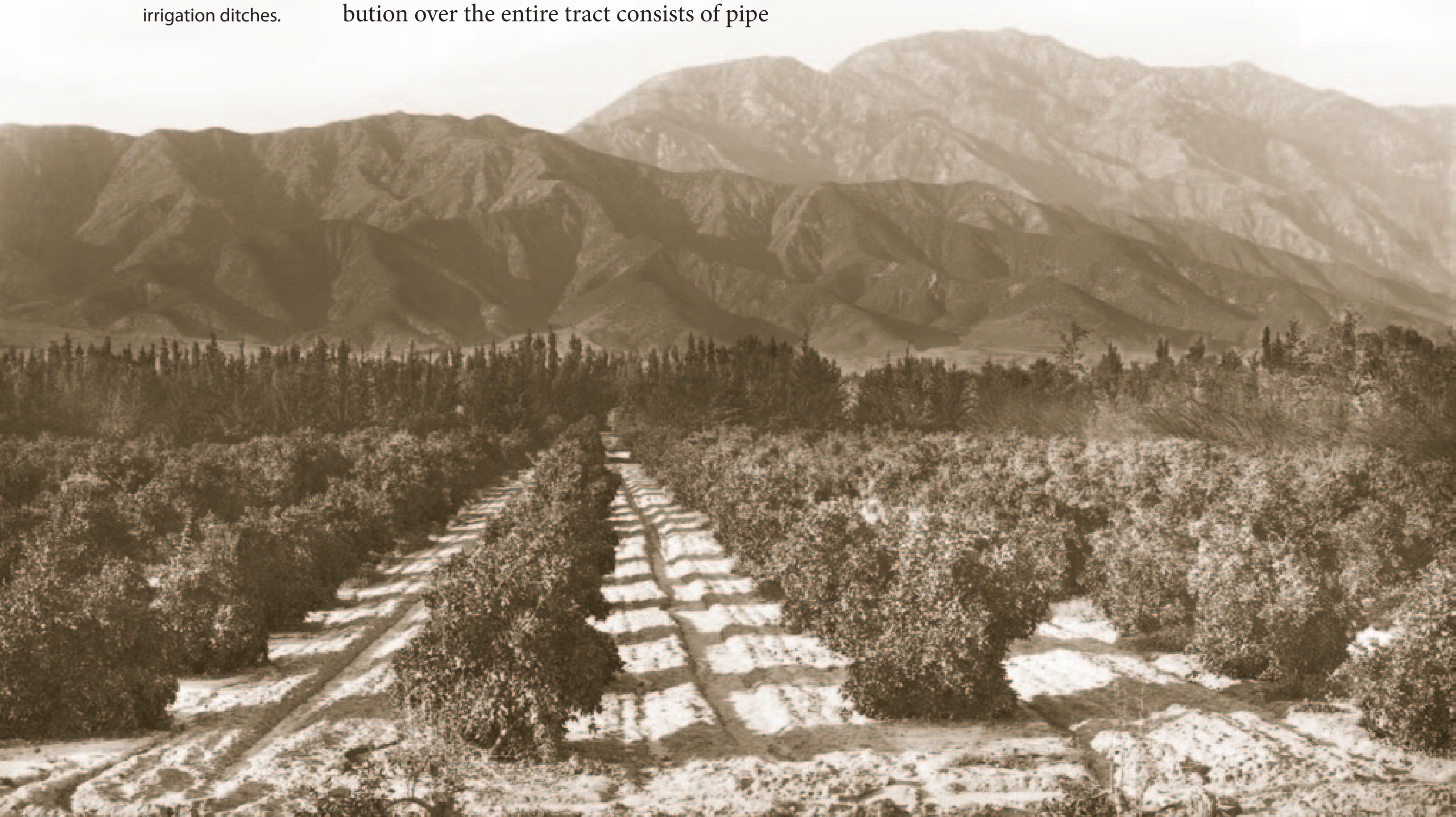
The Chaffey brothers developed the mutual water company model because they realized traditional riparian rights – where owners of property that sit beside a stream have rights to take that water – wouldn't work in often-dry Southern California where water needed to be transported away from the source.

Under the Chaffey's mutual water company system, people who purchased an acre from the brothers' land company received one share in the water company, which managed and delivered water. In addition to ensuring equitable distribution the method also promoted conservation since each shareholder was only entitled to a specific amount of water each year based on the water produced. The brothers also pioneered the use of pipes to deliver water underground rather than through open irrigation ditches, which lost a lot of the precious resource to evaporation. In fact, a Chaffey-constructed tunnel to tap naturally filtered underground water from San Antonio Creek is still in use today. Water from this source is so good and pure that the company bottled some of it in 2010 in honor of its 125th anniversary.

The innovative water system was described in the Volume I edition of the *History of San Bernardino and Riverside Counties* by John Brown and James Boyd, published around 1920: "For the purpose of supplying the tract … the water rights including the overflow and underflow of which had been purchased, being in the San Antonio Canyon, about two miles to the northwest of the colony tract. For the first one-half mile, the water is conveyed in a cemented ditch to the main pipe line at the base of the mountain, where the water enters the largest main. The system of distribution over the entire tract consists of pipe lines, about sixty miles or more in extent, varying in size from six to twenty-two inches in diameter."

The history also noted the efforts of Chaffey to secure extra water by digging a mile-long tunnel to tap groundwater. Construction took five years at a cost of nearly $75,000: "Considerable water has been developed by a tunnel extending up the canyon more than a half mile and tapping the underflow. When the colony was started, it was thought the San Antonio Creek in connection with its underflow would furnish abundant water for irrigation. … It was demonstrated for years that an average rainfall insured Ontario a series of years remarkable in the history of California for light rainfall, and it was deemed advisable that precautionary measures be taken by the water company which accordingly purchased additional water rights and land and proceeded to make developments."

With these purchases and developments the San Antonio Water Company became the possessor of four sources of water supply:



Citrus groves in north Ontario around 1900-1910 depended on irrigation ditches.

first, from the San Antonio Creek; second, from the tunnels; third, artesian water; and fourth, water pumped from numerous wells.

The colony was a success from the start. By summer of 1883, 7,000 orange trees were planted. Orange trees take years to mature, so farmers planted other crops and orchards while waiting for the citrus to be productive. In 1884, nursery owner D.A. Shaw reported that there were "40,000 peach trees, 29,000 pear trees, 15,000 seedling apple trees, 16,000 grafted apple trees, 1,000 cherry trees, and 16,000 grape cuttings set out in orchards and vineyards."

Records note farmer L.S. Dyer planted the first orange grove on San Antonio Avenue between Fifth and Sixth Streets in today's Ontario. But it was Fred L. Alles who was credited by the *Los Angeles Times* with plucking the actual first orange from his tree in 1885. The article noted a plaster cast was made of it to commemorate the milestone.

By 1893 5,000 acres of citrus were planted and bearing fruit. Ontario was ranked as having the second largest citrus acreage in the state. As the crops and groves grew, so did the prosperity of the farmers and the communities they were building. The region's combination of industry and an innovative water system drew the attention of the nation long before the Inland Empire Utilities Agency was established, and continued drawing attention for its leadership in water recycling and ways to tap local resources to provide a resilient water supply.

Chaffey had ambitions beyond simply creating a reliable water supply; he engineered the irrigation system so it could generate electricity, a move that would foretell the region's later efforts with renewable energy. Chaffey was the first in the Southern California area to wire his home. The Ontario Electric Company was set up through the San Antonio Water Company (and ultimately owned by the landowners). An electric plant was built that used the water to generate electricity.

Chino Welcomes the Beet Industry

In 1887, Richard Gird, a mining magnate from Tombstone in the Arizona territory, purchased Rancho Santa Ana del Chino, which became the site of the city of Chino, and established the Chino Land and Water Company.

Gird's goal was to turn the town into a money-making industrial powerhouse. The question was, what crop would bring in the most money? After experimenting, he decided to promote sugar beets, a large bulb that is drought-resistant, making it ideal for a semi-arid environment with a limited water source.

In 1890, Gird convinced four wealthy brothers – Henry, Benjamin, James and Robert Oxnard – to fund a sugar beet facility. The Oxnards had sugar beet operations in the Midwest and Northern California, and literally bought into the venture.

The Chino Sugar Co. factory was constructed where downtown Chino is situated today, along Central Avenue between F and G streets. Its opening on August 20, 1891 drew hundreds of workers and their families to town. Many other immigrants settled in Chino to work in the fields. By 1900, the plant was turning out 12,000 tons of sugar each season, and Chino was on the map as a key source of sugar in the United States.

The citrus and sugar beet industries were bolstered by the arrival of the California Southern Railroad, a subsidiary of Sante Fe, which had arrived in 1886. The railroads opened up an entirely new market for the Chino Basin. And within two decades the result was felt in a land boom, which saw about 30 new communities spring up, including the town of Prado/Rincon along the tracks. Within a matter of years after the railroad arrived, Chino was rated the second-largest freight depot outside of Los Angeles in the volume of freight handled.

On the cusp of the new millennium, the Chino Basin was evolving as an agricultural hub. A multitude of crops filled the fields and groves of citrus grew strong and hardy. Small dairies were spreading throughout the land, and industries that provided a backbone for the agricultural way of life were prospering. Towns were forming, and community spirit was high.

Yet, the crops, the cows, the industry and the towns all were competing for water in a semi-arid landscape. The precursor to future water problems might have been no more than a mention in an 1890 report generated after the 11th Census in 1890: In San Bernardino County in 1890 there were 301 artesian wells, ranging from 65 to 700 feet in depth, that were being used on farms, with each having an average discharge of 283 gallons per minute. "The water of many of the larger of these wells is piped to the various towns, giving them ample supply of clear, pure water. A few of the wells are used for purposes of irrigation, an average of 20 acres being watered to each well thus employed. A large number of wells have been put down by land companies in order to ascertain the extent and amount for the artesian supply, and the resources of the county in this direction are quite well explored. A few of the farmers complain that these large wells, which have been allowed to flow freely for months or years, have resulted

The sugar beet processing plant in Chino around 1906 was a primary employer.

Lithographer H.S. Crocker & Co created a view northward from the town of Ontario in 1891.

in the drying up of the shallow wells near the edge of the basin."

On the ground, a visionary named A.B. Miller was learning about the water challenges firsthand. Together with three others, he leased 8,000 acres in the little settlement known as Rosena. In 1905, he purchased 20,000 acres of Rosena land, which would later become Fontana. Miller planned to plant fruit trees and vineyards. It was a grand idea, yet he was faced with the problem of getting water to the new area.

The land purchase had included 75 percent of the water flow in Lytle Creek, but distributing the water to fields and orchards proved to be difficult. Miller realized the surface flow of the creek changed with the seasons and was not a dependable source. He also knew that a system of ditches he had already put in place was inadequate because of the loss of water to evaporation and seepage. What was left was groundwater. Digging 85 feet below the surface, Miller constructed a pipeline one mile in length to pump and convey water to his crops. Still, there was not enough water available for irrigation. He began drilling deep shafts called "inverted wells" in various locations to collect excess winter flow of water below Lytle Creek.

Miller was later to get out of the farming business and use his knowledge of the local water challenges to organize 10 water and electrical companies, including the Fontana Union Water Company, in which today the Cucamonga Valley Water District is the majority stockholder. The modern era of water delivery had begun. The challenges were just a step behind.

Chapter 2
Transforming the Basin

By the mid-1900s, the desert-like basin was transformed by verdant crops, vineyards, citrus groves and bustling industry to support agriculture. World War II brought additional industry to the area as, for example, Henry Kaiser built the largest steel mill west of the Mississippi in Fontana to provide material for shipbuilding.

Other larger enterprises included the Chino Airport, which was owned by the federal government from the early 1940s until 1948 and used for flight training and aircraft storage; the General Electric Flatiron Facility that manufactured clothes irons, was located at 234 East Main Street in Ontario and operated from the early 1900s to 1982; and, the California Institution for Men, a state correctional facility located in the city of Chino that opened in 1941.

In addition, the Southern California climate and the economic prosperity made the area ground zero for the post-World War II boom. Tens of thousands of people flocked into the region. New housing developments

Two large employers: In 1947, when Ontario had a population of 20,000, 1,300 employees worked at the Hotpoint/General Electric plant. Kaiser Steel built the largest steel plant on the West Coast during World War II in Fontana.

and businesses were transforming sleepy communities into bigger cities.

Nearly everything in the Inland Empire was on the rise; everything except the amount of water available for drinking, irrigation and for industrial processes. As growth and expansion continued, it became clear the local water supplies – both surface creeks and groundwater – were being depleted. The area's successes were draining it of its most valuable resource, which would help lead to the establishment of the Chino Basin Municipal Water District.

Steel Strengthens the Economy

In 1942, Fontana was selected as the site for a mill to provide steel for wartime shipbuilding efforts. With a loan from the Reconstruction Finance Corporation, Henry J. Kaiser built an integrated blast furnace and rolling mill of 700,000 tons annual capacity. By the time Fontana was incorporated in 1952, Kaiser Steel was the leading producer of steel and related products in all of California.

For the war-weary populace of Southern California, the dedication of Kaiser Steel's Fontana blast furnace a few days after Christmas of 1942 was a patriotic extravaganza. A 1987 *Los Angeles Times* article reminisced:

> "College students sang. A young radio reporter named Chet Huntley acted as master of ceremonies. And storied industrialist Henry J. Kaiser watched as his bountiful wife Bess, sporting a large orchid, threw the switch to fire up the blast furnace that Kaiser named after her in a sentimental moment. With that, the first complete steel mill west of the Rockies roared to life."

Richard (Dick) Hall, who served as general manager and chief engineer of Chino Basin Municipal Water District from 1960-1970, recalled the importance of the steel mill to the region. "Kaiser Steel was a very important, big employer in the area," Hall said. "And Kaiser needed the water. When you make steel out in the middle of the desert, it takes a lot of water."

How much water? Two studies showed vastly different amounts used on average, but it is still a significant amount. A 1964 report (with a small sample of five U.S. regions, including Kaiser Steel in Fontana) indicated the average water intake by the steel industry was 17,311 gallons per ton of steel. Yet a report by the U.S. Senate Select Committee on Water Resources (U.S. Congress, 1960) estimated water intake in 1954 was 31,842 gallons per ton of steel. The large difference between these two figures results from different methods of calculation.

Agriculture Puts Chino on the Map

Even as the city of Fontana was moving to industry, agriculture remained a mainstay of the economy in nearby Chino. Advances in irrigation technology and the increase of water wells in the Chino Basin made it possible for farmers to grow a vast array or crops and orchards. In addition, the number of dairies was increasing, and the basin was beginning to earn its reputation as key dairyland.

Small farms with a few dairy cows for personal needs had given way to larger dairy farms with hundreds of cows producing milk to sell. This fledgling dairy industry, which would become one the nation's largest within decades, was founded by dairy farmers who were being displaced by the urbanization of southeast Los Angeles after World War II.

Like steel manufacturing, maintaining a dairy took water.

How much water? For example, to make a pound of cheese, it takes 381 gallons of water; 665 gallons to make a pound of butter and 122 gallons of water for one gallon of milk.

Citrus Blossoms into a Primary Industry

As dairies began to settle in around Chino, the citrus industry was in full bloom and thriving in Ontario and Upland. Citrus trees stretched as far as the eye could see, and the industry was profitable, especially because growers had discovered varieties that ripened in both spring and fall, creating a year-round citrus industry.

This allowed for a permanent population of agricultural workers, who became integrated into their communities. The year-round work also supported packing houses, such as on Mango Avenue in Fontana, which bustled around the clock. The 1940s were the boom period throughout the Inland Empire, which at its peak was producing 75 million cases of citrus a year. The fruit was railed to the east coast and even shipped to Europe. Fontana's packing house (used by the Fontana Unified School District Transportation Department today) on Mango Avenue was bustling as shifts of workers took turns packing the fruit for delivery across the country. Locally, residents could buy a crate for about $1.

Citrus is not considered a water-chugger, although year-round production boosted the amount of water needed. Plus, doing the math, a crate of oranges weighing 40 pounds would take 2,680 gallons of water to produce. In its citrus hey-day of the 1940s, the Inland Empire shipped 75 million cases a year.

Vineyards Appear Early On

Vineyards in the Cucamonga area had an early beginning, first planted in 1838 at the Cucamonga Rancho by a Spanish land grant that went to Tiburcio Tapia. In 1859 rancher John Rains planted more than 125,000 vines in Cucamonga, virtually pushing out cattle and sheep raising and introducing agriculture on a large scale to the area. By 1917, Secondo

The citrus industry remained a staple industry in Ontario, and during the 1950s the Sunkist plant was bustling.

Guasti was proclaiming his vineyard was, "the largest in the world," spreading over more than 20,000 acres.

"As Los Angeles started urbanization and property values went up these pioneers of the wine business in California started moving elsewhere. And one of the places they moved to around the turn of the century was the Cucamonga Valley," said Don Galleano, owner of Galleano Winery on Wineville Avenue in Mira Loma, in the southern part of the valley. His family winery was founded in 1927, when Domenico Galleano purchased 160 acres of the historic Cantú ranch.

Curiously enough, when the Congressional 18th Amendment established prohibition of alcohol from 1920 to 1933, the Cucamonga wine industry thrived, because it tapped into a novel market – producing grapes for home winemaking across the country, which was permitted under U.S. law.

"There were a great number of people planting and shipping table grapes here because there's a dry, warm climate that the grapes would mature naturally without having a lot of the molding problems associated with more coastal climates," Galleano said.

By 1940, the Cucamonga Valley had about 50,000 acres devoted to vineyards for about 60 wineries. In a season, more than 61,000 tons of grapes were crushed to produce about 6 million gallons of wine.

How much water does it take to make wine? It takes about 32 gallons of water to produce one glass of wine; that's about 160 gallons per bottle.

The Second Gold Rush Creates Cities

Surface water flowing down from the San Gabriel Mountains could not support the water use of the burgeoning region now dotted with dairies, vineyards and citrus

Cucamonga Valley vineyards spanned more than 20,000 acres, more than in Sonoma and twice as many as Napa County when Prohibition arrived in 1919.

orchards so folks began to depend more heavily on the groundwater and tap it with deeper wells. With the end of World War II in 1945 came the so-called second Gold Rush, with a steady stream of people moving into the Chino Basin. Like the rush in the late 1840s when prospectors surged to the California Sierra foothills in search of gold and to strike it rich, the post-war hordes were after their own pots of gold – looking to settle in affordable communities where they could buy homes, secure jobs and raise families.

The populations of the towns in the Chino Basin began to increase dramatically by 1950. For example, Ontario, which was founded in 1891 with 722 people, now had a population of 22,872. Chino, incorporated in 1910 with 1,444 people, had expanded to 5,783. Upland, established in 1906, saw its population increase from 2,384 in 1910 to 9,203 by 1950.

Prado Dam Protects from Floods

Feast or famine, flood or drought. The Chino Basin has been greatly shaped by response to the elements. Floods have been part of the Santa Ana River as long as time. The river is the lifeblood of the region. It drains the largest watershed (2,255 square miles) in Southern California. The river, itself, flows 69 miles from its headwaters in the San Bernardino Mountains to its outlet at the Pacific Ocean near Huntington Beach.

Through millions of years, fierce storms have flushed the riverbed, sending a wall of water and sediment from the mountains downstream, slowly forming a coastal plain that today is home to millions.

In 1862, 40 days of uninterrupted rain submerged much of Orange County downstream of Chino in the lower watershed. Floodwaters swept over cropland and drowned herds of cattle.

In 1915, J. B. Lippincott, a Los Angeles park commissioner and engineering consultant, proposed a comprehensive flood control plan to protect downstream communities. His plan included dams, a widened river channel and reinforced levees. The centerpiece was a 70-foot dam capable of holding a reservoir of 174,000 acre-feet of water at the location of today's Prado Dam, south of Chino. Lippincott's ideas were met with interest, yet nothing happened.

Then in 1916 another flood swept through the watershed, destroying crops and washing away homes and businesses. Residents began demanding protection. Even though the floods were intermittent and drought years were more common than flood events, when the river's water rose and rushed, devastation lay in its wake.

In 1927, 1,000 feet of water burst through a flood channel and rushed from San Bernardino County to the ocean through Huntington Beach taking with it buildings, crops and livestock. Again, residents pleaded with officials to protect them. This time Congress listened. A dam at Prado was authorized by the Flood Control Act of June 22, 1936.

Construction, however, couldn't happen fast enough. Another devastating flood hit in 1938. It started innocently enough – rain began to fall all over Southern California on January 27, 1938. It just never seemed to stop. Nervous residents began to watch the Santa Ana River, as more and more water gushed into it during late February and early March. On March 2, the water surged. Floodwaters from Carbon Canyon had already arrived in Anaheim, and most of the area north of Wilhelmina Street was already under water.

The Santa Ana River showed its force after more than 8.5 inches of rain fell in the last few days of February into the first week of March. The Chino Valley acted like a huge drainage trough for the San Gabriel mountains. The water rushed into the valley, flooding many streets and causing much damage. The valley terrain then funneled the stormwater into the Santa Ana River and its tributaries and directed it downstream in a deadly flow.

Around midnight on March 2, flows exceeded 100,000 cubic feet per second and created an 8-foot wall of water that roared out of Santa Ana Canyon downstream of Prado in Orange County. Accounts indicate the Santa Ana River rose 5 feet in 30 minutes at the dike east of Atwood. At 2:30 a.m. the river sliced through its dike north of the Yorba Bridge (where Imperial Boulevard is located today) and began to obliterate neighborhoods. Homes were shredded, and 19 people lost their lives, many of them while they slept and the flood water and debris washed over them. It was the most destructive flood Southern California would see in the 20th century, causing $12 million in damage. Officials hoped it would be the last and started working toward the goal of building Prado Dam. Not unexpectedly, the extent of the property acquisition behind the dam site caused controversy with landowners; some did not want to give up their property. Yet, under law, the project would prevail.

The construction contract for the earth-filled dam was awarded in September 1938, and the work was completed by May 1941. The dam and reservoir, which stretch across Riverside and San Bernardino counties, are located on the Santa Ana River about 15 miles south of Chino near the city of Corona and some 30 miles upstream of the Pacific Ocean.

Prado Dam construction was in full swing when this March 31, 1939 photograph was taken.

The crest of the constructed dam had an elevation of 566 feet and the top of the spillway was at 543 feet. The flood control basin covered 9,741 acres, including the town of Rincon, the railroad tracks and numerous local farms. Many of the existing wood-frame houses and barns were removed and publicly sold by the government.

Prado Dam and reservoir were later expanded to provide additional space storage for flood waters and sediments. Authorized by Congress and based on the plan recommended by the Los Angeles District of the U.S. Army Corps of Engineers, the modification of raising the dam's embankment and constructing the new outlet works were completed in June 2008. The total improvement plan has an estimated cost of $740 million and included the following ongoing work: Raising the spillway crest from elevation of 543 feet to 563 feet, constructing new levees and dikes, acquiring more than 2,300 acres of property rights for reservoir expansion, relocating and protecting 30 utility lines, increasing reservoir area from 6,695 acres to 10,256 acres and increasing-the reservoir capacity from 217,000 acre-feet to 362,000 acre-feet.

Chino Basin Municipal Water District is Born

The industrial and agricultural growth, urbanization and dry conditions meant water demands were at an all-time high leading up to 1950. Cities in the area soon realized they needed some help finding water for their customers. The local supplies – surface water from the mountains and groundwater stored beneath the basin – were already tapped. Local sources alone would not be able to meet the growing communities' needs.

Also, there was increasing general awareness that the groundwater tables were dropping. Even in the south portion of the valley, where artesian water supplies historically spewed high-quality water year-round, the water was not as plentiful.

"The artesian wells had been south of the 60. You put a hole in the ground, and water would come up," said Joe Grindstaff, IEUA's general manager. "Yet the water tables began to drop significantly, so people were thinking we have to do something to secure water supply. That's when the push for the Chino Basin Municipal Water District came."

The time seemed right to form an entity charged with finding additional water to meet future needs. On April 18, 1950, the *San Bernardino County Sun* newspaper declared in a headline "Voters will Ballot on Water Project." The accompanying article stated: "The San Bernardino County board of supervisors yesterday unanimously adopted a resolution scheduling the special election along with the primaries at the request of the Chino Basin water supply committee which is backing the proposed district. Formation of such a municipal water district is necessary so the area can be annexed to the Metropolitan Water District, which brings Colorado River water to Southern California."

Metropolitan Water District of Southern California (Metropolitan) had become a chief provider of imported water during the 1940s, securing water from the Colorado River and conveying it via a 242-mile long aqueduct to urban Southern California. The catch was Metropolitan had stopped taking cities as members after it realized the growing number of communities meant the potential of having hundreds of members if cities were allowed to become members. Instead, it desired larger, more regional municipal water districts, according to Grindstaff, "and as a result, municipal water districts began to spring up all over."

The move to create Chino Basin Municipal Water District came as a petition request. Deputy Election Registrar Walter V. Combs said the petitions carried 2,334 signatures, more than enough to qualify it for a vote of the people. On June 6, 1950, voters overwhelmingly chose to bring supplemental water to the region – 11,921 in favor to 1,866 opposed. As a result, the Chino Basin Municipal Water District, a public agency, was formed. The name would change to Inland Empire Utilities Agency in 1998.

On July 3, 1950, the County Board of Supervisors passed a resolution to divide the new Chino Basin Municipal Water District into five districts, each roughly equal in population, from which members are elected to serve on the Board of Directors.

About the same time the Chino Basin Municipal Water District was formed, voters some 40 miles away in Perris approved the creation of Eastern Municipal Water District. In early 1952 voters in Riverside approved Western Municipal Water District.

District's First Priority

The District's first job was to find water to import to the region to meet the domestic and agricultural needs of about 80,000 people, primarily in the towns of Ontario, Chino, Upland, Fontana and Montclair. For that, it would turn to Metropolitan for supplemental water, dependent on another vote by the District's local citizens.

Unlike in San Bernardino, where there was staunch opposition to annexation to Metropolitan for a numbers of reason, Chino Basin voters seemed keen to contract with the large water district headquartered in downtown LA.

Hall, who took the helm as general manager in 1960, had worked prior to that to generate support for annexation to Metropolitan. He recalled the proposal was well-received. "This deal was a good deal," he said. "I remember making a lot of speeches at service clubs who had questions about it. But there was no opposition to annexing to Metropolitan."

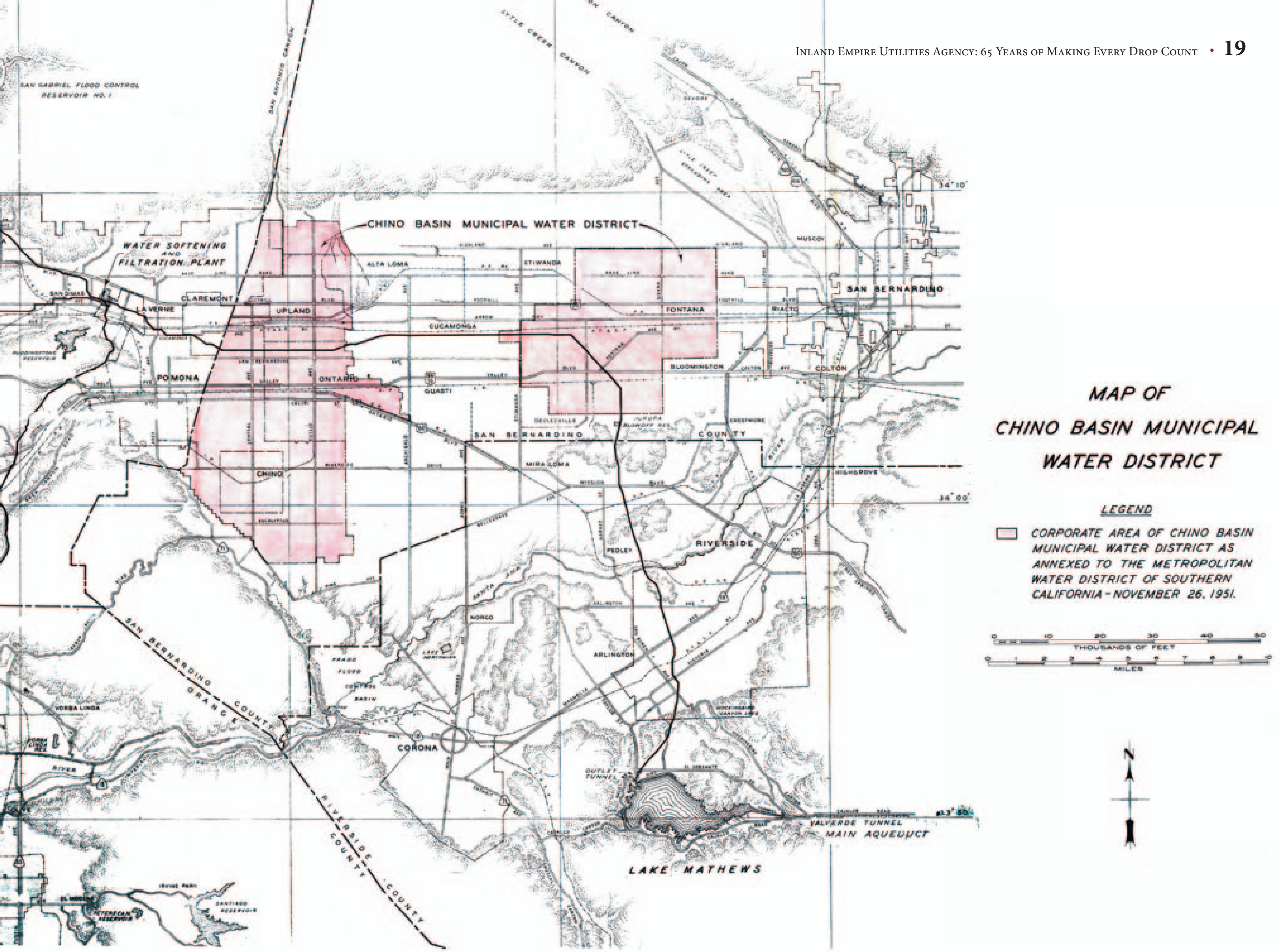
According to an October 15, 1951 article in the *San Bernardino County Sun*: "Voters of the Chino Basin Municipal Water District will go to the polls tomorrow to determine if the district will be annexed to the Metropolitan Water District. Kaiser Steel Corp., the Fontana Chamber of Commerce and many civic organizations have endorsed annexation of the area to M.W.D. The Chino Basin board of directors have declared that annexation of M.W.D. would assure Fontana sufficient water in the future despite rapidly increasing population and industrial growth."

A few days later, the newspaper followed up: "Voters of the Chino Basin Municipal Water District yesterday voted overwhelmingly in favor of annexation."

Metropolitan Water Flows

In 1950, Metropolitan offered different types of water: either untreated or filtered and softened. Untreated water for domestic purposes cost $8 an acre-foot. Domestic filtered and softened water cost $20 an acre-foot. An acre-foot typically provides two families of four with enough water for household use for a year.

Chino Basin Municipal Water District contracted with Metropolitan in 1951. Once the contracts were in place, getting imported water to the Chino Basin from the Colorado River was a matter of plumbing. Metropolitan had completed its aqueduct in 1935, and water first flowed on January 7,



1939. The aqueduct was an incredible feat. Designed by Metropolitan's Chief Engineer Frank E. Weymouth, it was the largest public works project in Southern California built during the Great Depression. The aim was to take water that originated as snowmelt in the Rocky Mountains and flowed down the Colorado River, then divert it through a man-made aqueduct from Lake Havasu, on the California-Arizona border, west across the Mojave and Colorado deserts to the urbanizing regions of Southern California. In all, it took 30,000 workers during an eight-year span to complete.

The aqueduct terminated at Lake Mathews, located in Riverside. From there, the water was conveyed to the Chino Valley via Metropolitan's Upper Feeder. Constructed in the 1930s, the feeder included tunnels, mortar-lined pipelines and buried steel pipelines. The welded steel pipeline varied in diameter from 136 to 152 inches and, in total, extended 63 miles from Lake Mathews to the Eagle Rock Control Facility in Los Angeles.

To get to Chino Valley, the untreated water was conveyed via the Upper Feeder northerly through the headworks at Cajalco to a point near Fontana and then in a northwesterly direction through Cucamonga, Ontario and Pomona to the F. E. Weymouth Water Treatment Plant in LaVerne. Once there, the treated water was distributed to the area's cities through their own pipelines.

The pink areas of the Chino Basin Municipal Water District map were annexed to Metropolitan Water District of Southern California on November 26, 1951.

Getting Hooked Up

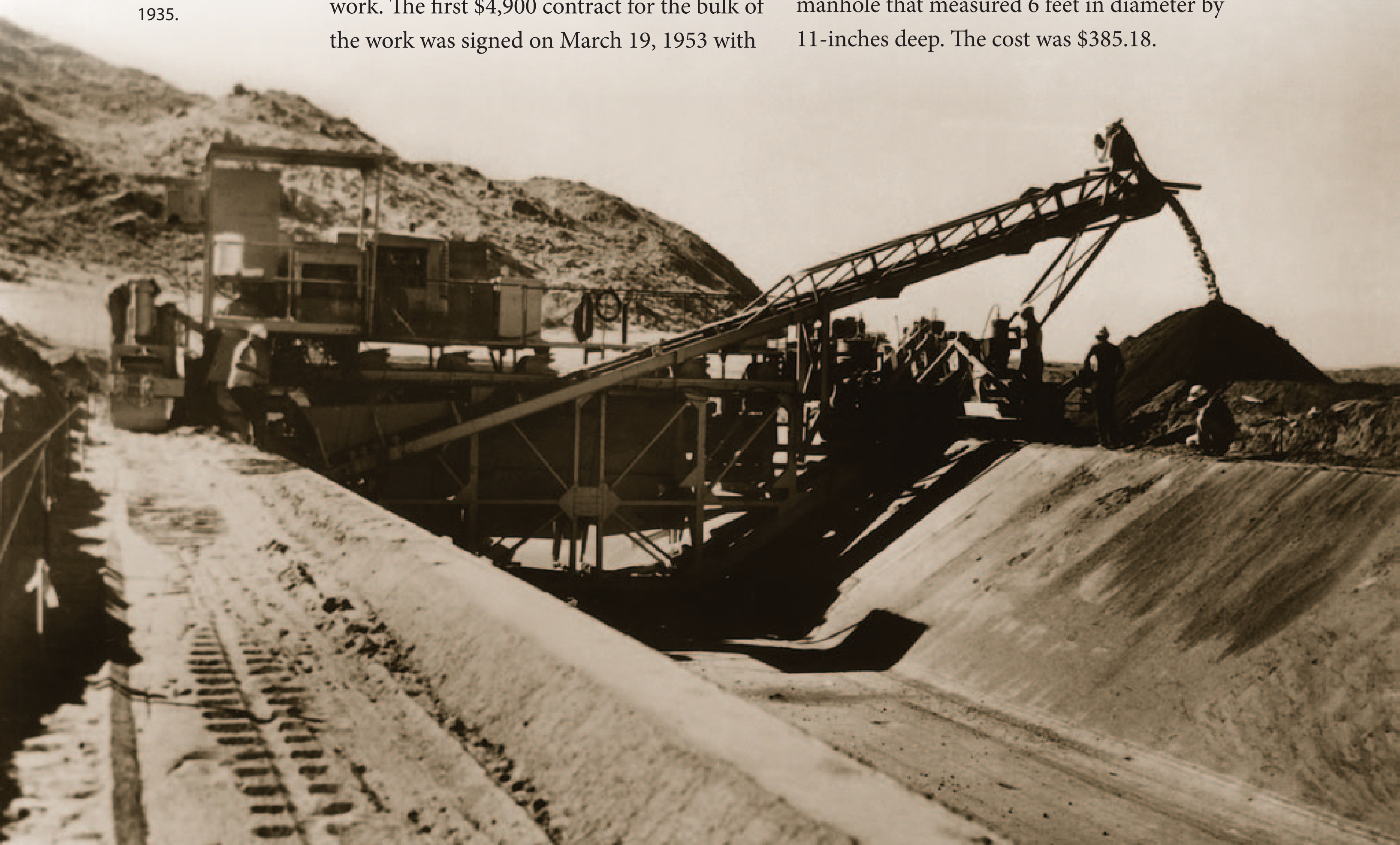
The Chino Basin Municipal Water District, with its office located at 121 North Plum Avenue in Ontario, started constructing connections to access the imported water moving through the Upper Feeder. To begin, the District's Board of Directors issued Resolution No. 151 in 1953, requesting Metropolitan to construct a service connection at 5th and Berlyn Streets in Ontario, where the District could tap the Upper Feeder.

The District put out a call for bids from local contractors. The *Daily Report* newspaper in Upland published an advertisement inviting companies to bid on the work on the project. The ad noted the winning bidder would need to provide 669 feet of 24-inch pipe, one 24-inch flanged end gate valve, one 6-inch air release valve, three 24" Dresser Unions and three 24" blind flanges in 3/8" steel.

The District hired three contractors for the work. The first $4,900 contract for the bulk of the work was signed on March 19, 1953 with Consolidated Western Steel Division, based in Los Angeles.

The next day, choosing from among 11 bids, the District board chose A.B.C. Construction Company, Inc., based in Norwalk, California, for additional work. H.W. Anderson, president of A.B.C. Construction, wrote to General Manager Clark to confirm his quotation, and added: "I propose to install 50 feet of pipe at the Ontario Outlet for the lump sum of $850. We will also furnish all labor, materials and equipment required to construct a 4 foot brick manhole which will house the 24 inch gate valve, for the lump sum of $400.00. Very truly yours, H.W. Anderson, President."

To complete the project, a third contract, dated July 7, 1953, was issued to install a manhole, which proved too troublesome to incorporate into the primary contracts. A contract was made with Stanfield Company in Pomona to supply labor and materials for a manhole that measured 6 feet in diameter by 11-inches deep. The cost was $385.18.



Colorado River Aqueduct culvert construction around 1935.

Overall, construction of the District's first major service connector went well. There were a few hitches, however. For example, for the 5th Street connection to the Upper Feeder, the District had to handle bills for $230 and also for $27.50 when the distributing line – the 24-inch diameter pipe – was laid between a curb and the property line owned by "Flett." "He had curb and gutter, and flowers growing, watered by a sprinkler system. These improvements had to be removed in way of construction and became useless except for the sprinkling system which later was re-placed," noted a supplemental information document dated December 14, 1953. "The Contractor was not obligated to replace, as negotiations with the property owner who is very exacting, could better be handled locally. The City of Ontario, Building Department, takes deposits and arranges for the work. The length of the work was disputed after the first deposit and the owner was proven right in demanding 11 feet more of curb and gutter, which was paid for."

The District had set up a credit deposit of $360,000 with Metropolitan for financing part of the cost of the feeder lines and connections to the Upper Feeder. While the local agency would bear all costs of construction, it could, and did, later request reimbursement from Metropolitan.

Today, people just turn on a tap and water flows. It is hard to appreciate the work necessary to get that pipe from the water source to a home. On December 30, 1953, the District applied to Metropolitan for a service feeder to get water to Chino. The pipeline connection was to be near the intersection of Monte Vista Avenue and Margarita Avenue, then an unincorporated area of western San Bernardino County. Metropolitan's Board of Directors approved that request on January 12, 1954.

Colorado River Aqueduct workers celebrate finishing work on a tunnel around 1945.

Next, in early 1954, the Monte Vista Water District requested a service connection to the Upper Feeder. On May 27, 1954, Clark was directed by the District board via Resolution No. 249 to prepare specifications for labor and materials necessary for the construction of a feeder line on Benson Avenue in Montclair, and work with Metropolitan to get final approval.

The Chino District Expands

It didn't take long for the original 92-square-mile District to expand, thanks to the population boom and service connections that brought water to new areas. Like elsewhere in the greater Los Angeles Basin suburbs boomed in the Inland Empire. In 1954, the San Bernardino Freeway (later part of Interstate 10) was completed – at that time easing the commute to Los Angeles and encouraging more people to live in the Inland Empire. That also was the year the District began to accumulate more property to expand its service area and also the types of services it offered. First, the 132-square miles of land nestled between the Fontana and the Ontario-Upland areas were annexed into the District. Then, in the same year, District officials undertook their first major project: the Benson Avenue Feeder to transport drinking water to the San Antonio Water Company near Upland.

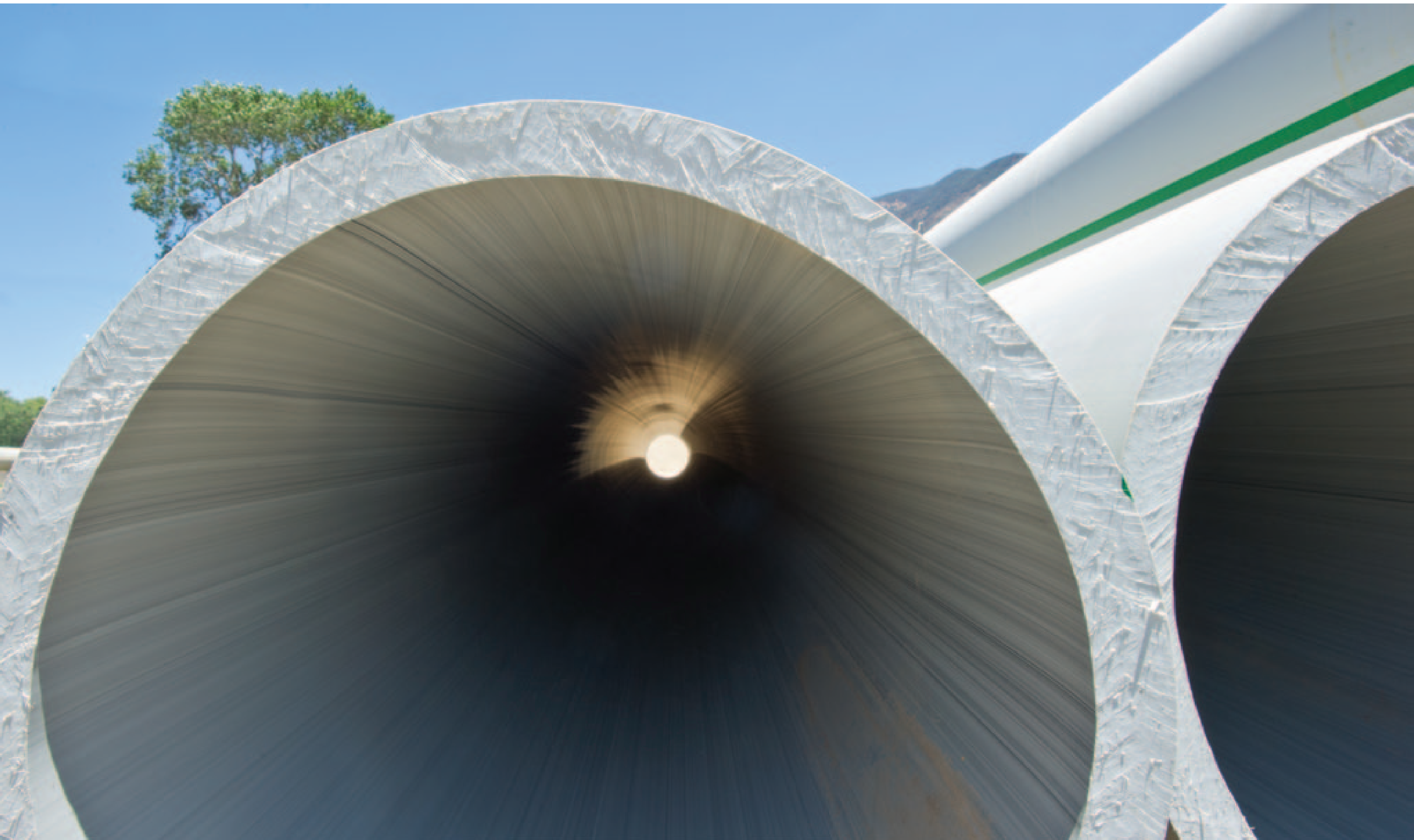
Two years later, the Fontana Feeder was built to carry water to the Fontana Union Water Company. The buried pipeline featured pipe, which had a diameter that ranged from 20- to 24 inches, depending on location. Next came the Chino Feeder, which was constructed to supply potable water to the Southern California Water Company, Pomona Valley Water Company, Park Water Company and the city of Chino.

Hall recalled the formative years of the District: "My fondest memory was basically working with all the cities within the Chino Basin at that time to meet what they felt their needs would be for imported water. And seeing that each one had a big guarantee of that source of water," he said.

In 1957, the District added 16.5 square miles of thirsty land to its southern boundaries, bringing its service population to approximately 147,000 people. Then, the dramatic increase in the District's size and number of people served seemed remarkable. It was only the beginning, however.

State Water Project on the Drawing Board

In addition to its Colorado River supplies, Metropolitan also was eyeing another source of water in the making, a long aqueduct and pumping facilities that would convey water from wetter Northern California to drier Southern California.



In 1945, the State Legislature authorized an investigation of statewide water resources to pursue an idea for a massive conveyance system to move water from Northern California to farmers in the Central Valley and the new cities in Southern California. In the 1950s, plans were on the drawing board for a 444-mile California Aqueduct of the State Water Project (SWP).

The project was not without its controversies. A project of this scale had never been built – was it even feasible from an engineering standpoint? Also, its costs were questioned. Some stakeholders in Southern California also questioned whether the designated dollar amount would cover the entire cost of the project. They wanted specific details on every facility, and they wanted to know exactly what they would be paying for.

In the north, water agencies claimed they owned the water and did not want it flowing south. Their counterparts in the south would not support the project until they gained assurances that the northern agencies could not block deliveries. San Francisco Bay stakeholders demanded guarantees the Delta channels would be protected in light that their region would be used as a transfer point, from which water would be conveyed. With the surface of the land of many Delta islands feet below the water level, they also wanted their levees rehabilitated to protect them from flooding.

The state project had its proponents, too, especially San Joaquin Valley farmers who wanted to tap surface water resources and relieve groundwater overdraft that was requiring them to drill deeper and deeper for water, raising costs and causing severe land subsidence in affected areas. Other voices raised in favor were the teamsters, steelworkers, construction workers, and engineers who would gain from public works projects.

In 1959, the state Legislature authorized $1.75 billion for the construction of the State Water Project through the Burns-Porter Act, named after Senator Hugh Burns of Fresno and Assemblyman Carley Porter of Compton, the two key legislative leaders on water policy.

To reassure all parties that the project was achievable, two independent consulting firms were hired to study the engineering and economic feasibility of the project: Charles T. Main, Inc. covered the engineering aspects and Dillon, Read & Co. studied the financing. In the financial assessment, concerns were raised about future inflation and the state's ability to complete the project. Cost-cutting measures were suggested, and engineers began reviewing the plans and scaling back proposed project facilities.

On the November 1960 ballot, the Burns-Porter Act was formally known as the California Water Resources Development Bond Act, or Proposition 1. Continuous negotiations and fierce debate occurred right up to the vote. Metropolitan withheld its endorsement until just days before the election.

On November 8, the people of California got the final say. The Burns-Porter Act, including an unprecedented $1.75 billion bond act to pay for the project, was narrowly approved by a slim margin of 173,944 votes from about 5.8 million ballots counted.

With the final votes tallied, work began on what became the nation's largest state-built water and power development and distribution system. It was a system that would eventually prove to be a lifeline for the District and other regions throughout Southern California.

Chapter 3
Expansion and Courtroom Battles

As the communities of the Chino Basin continued to grow in the 1960s, the fledgling District needed to quickly and significantly expand its services. Most pressing was providing wastewater treatment for residential and industrial customers.

Fresh water supply sent to homes and businesses and the wastewater generated inside of them from showers, washing machines and toilets are connected, yet often times the two are managed by different districts or municipal departments. While the Chino Basin Municipal Water District (District) did not set out to be a pioneer in interconnected services, it did embrace its role as serving first as a regional supplier of water and expanding to sewage treatment.

Since the beginning, as a member of Metropolitan and as a regional wholesaler, the District provided supplemental water to area water districts, which, in turn, sold the water to their customers. Delving into the sewage treatment business, the District began providing those services to agencies and municipal departments.

At the Ontario airport in 1961.

"One of the fundamental parts of the Agency is we officially took over wastewater for the whole region. We went from being a relatively small agency – maybe 10 employees – to buying the facilities and taking over the operations from all the cities," said Chris Berch, executive manager of engineering and assistant general manager.

In 1964, the District expanded its sewer service by forming an "improvement district" southwest of Chino to serve that rapidly growing residential neighborhood. It constructed the Southwest Chino Trunk Sewer to transport collected wastewater to treatment plants, then still owned by the city.

Orange County Sues

The District's successful growth was temporarily interrupted in the early 1960s when it became involved in a lawsuit filed by the Orange County Water District (OCWD) that still is referred to years later. On October 18, 1963, OCWD filed a lawsuit against virtually all Santa Ana River Basin water users upstream of Prado Dam, including the District, to establish water rights along the Santa Ana River. Orange County complained that the upper districts were using all the water and not sending it down the river for use by Orange County.

Rather than suing the water districts, OCWD chose to sue the cities of Riverside, Colton, Redlands and San Bernardino. Nevertheless it was the District that defended the rights of those cities, as well as member agencies.

"Beginning in 1963 and through 1969, lawsuits were fired off in both directions – there were some 4,500 parties up and down the river and all throughout the watershed. Some say the Santa Ana River was the most litigated, or at least had the largest number of parties involved, on the West Coast," said John Rossi, Chino Basin Watermaster from 2001 to 2004 and current general manager of Western Municipal Water District.

There was merit to OCWD's complaint. For example, at Ontario's Regional Plant 1 (RP-1), which was built in 1948 by the city of Ontario, once the wastewater was treated the effluent was used to irrigate a nearby farmers' property, on land adjacent to the plant or, later, to a golf course next door. In addition, the facility used ponds so the treated effluent would percolate back in the ground. This decreased the amount of water flowing in the river.

"Essentially they got to the point where they didn't discharge a single drop back into the Santa Ana River," Berch said. "That's what was happening between the 1940s and 1970s. In the 1960s, that's when it came to a head regarding the supply to Orange County. That triggered that whole judgment."

The courts ruled in Orange County's favor and required the District and other upstream water agencies and cities to guarantee that a certain amount of water would flow down the river.

Four and a half years later, in February 1968, upper basin interests filed a cross complaint against Orange County water users, and on April 17, 1969, the suit was settled by a "physical solution."

The upper river water users were to provide a fixed average flow below Prado Dam for downstream use, while the Chino Basin Water Users Association and the Chino Basin Municipal Water District began developing a groundwater management plan.

Delivering what would become known as the Santa Ana River Judgment, the Orange

County Superior Court entered a Stipulated Judgment in Case No. 117628 – *Orange County Water District vs. City of Chino et al.* and declared rights of the lower Santa Ana River entities versus those in the upper Santa Ana River area – Chino Basin Municipal Water District, Metropolitan, Cucamonga Valley Water District, Monte Vista Water District and the city of Upland, San Bernardino Valley Municipal Water District and Western Municipal Water District in Riverside.

The ruling provided a basis for division of water in the upper and lower portions of the Santa Ana River based upon specified flows at Prado Dam and Riverside Narrows. It stated if parties downstream of Prado Dam receive the water to which they are entitled and other provisions of the judgment are complied with, then water users and other entities upstream of Prado Dam are free to engage in "unlimited water conservation activities, including spreading, impounding, and other methods." A part of the Judgment also guaranteed flows were to be calculated over stated periods of time and were subject to adjustment for water quality.

The Judgment ultimately held three agencies responsible to meet future "base flow" requirements of 42,000 acre-feet that would flow down to Orange County: Chino Basin Municipal Water District, San Bernardino Valley Municipal Water District and Western Municipal Water District.

The District was required to supply Orange County with 17,000 acre-feet of water each year, and it was planned it would meet that obligation by sending treated sewage water from RP-1 through tertiary treatment and into the river.

Besides establishing the minimum flow standard for the Santa Ana River, the court also determined the water quality needed to improve.

"We needed to be thinking about water quality, because the salt levels in that water were getting into the river and starting to get very high, making it hard for them to reuse it downstream," Berch said.

Santa Ana River Facts

The Santa Ana River is the heart and soul of a watershed that is Southern California's largest. Covering 3,000 square miles of mountains, foothills and valleys, the watershed area includes portions of Los Angeles, Riverside, San Bernardino and Orange counties, which all together have a population of 4.8 million. The flow of the Santa Ana River begins in the San Bernardino Mountains and ultimately discharges into the ocean at Huntington Beach. Of its 50 tributaries, the ones in the Chino Valley include Lytle, Deer, Day, Cucamonga, San Antonio and Chino creeks. In the south of the valley, Prado Dam captures the runoff from the river and tributaries, before releasing it to Orange County. The water use and subsequent discharge into the river by upstream users, such as in the Chino Valley, impact downstream users in Orange County.

As Industry Grows, So Does its Wastewater Needs

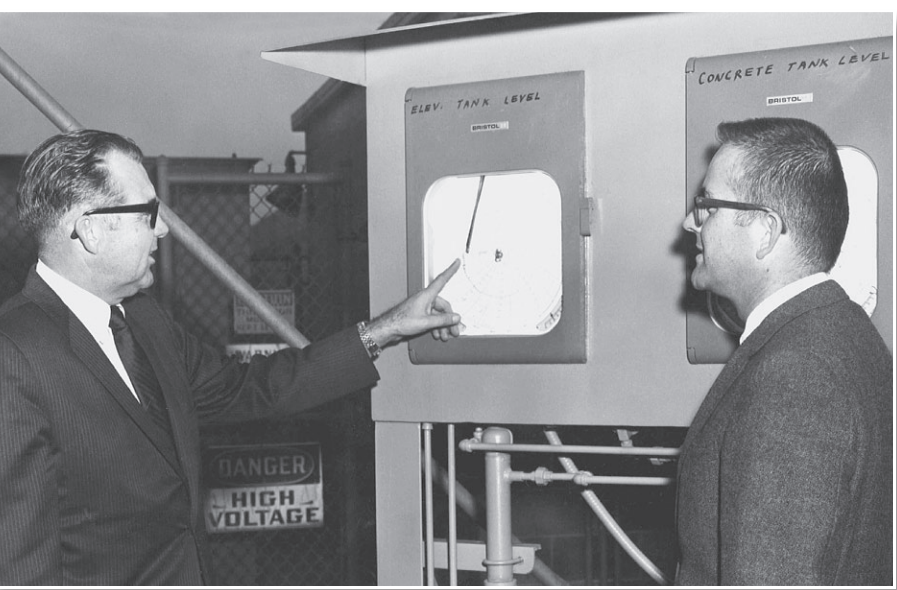
While the District began to provide residential wastewater treatment at the same time it began preparing to treat industrial wastewater – water that can't be handled with conventional sewage treatment because it is too high in salts. In the mid-1960s the District ramped up in preparation to develop a different system – the Non-Reclaimable Wastewater System (NRWS). This system would be able to provide treatment and disposal of industrial waste by transporting non-reclaimable, salt-laden, industrial strength wastewater out of the District's service area to plants in Los Angeles and Orange counties for treatment and eventual discharge into the Pacific Ocean.

Voter approval of a $16 million bond in 1966 helped finance this venture. The measure authorized the sale of general obligation bonds to finance additional discharge capabilities into treatment facilities owned by the Los Angeles County Sanitation District (LACSD). The bonds also financed construction of more than 20 miles of pipelines, a sewer system to serve the Chino area and additional non-reclaimable wastewater facilities.

In the build-up to the election, the *San Bernardino County Sun* ran the article with the headline: "Outfall Bond Election Looms Tuesday" on October 1, 1966:

> The fate of Fontana's industrial future and that of four other cities will be placed in the hands of voters Tuesday at a special election to determine whether the entire West End will surge ahead with big business or remain in an economic backwash.
>
> Turn of the tide hinges on whether or not voters will approve a bond issue to provide an outlet for waste products of "big industry" which would provide thousands of new job opportunities, new payrolls and heavy tax contributions to communities from giant firms ready to move into the area.

The west end of San Bernardino County was assured of further industrial development when the District's new industrial waste disposal line began servicing its first customer Kaiser Steel. John D. Saussaman (left), vice president of operations at Kaiser Steel, explains a gauge that records waste flow to Richard A. Bueermann, executive officer of the Santa Ana River Regional Water Quality Control Board.



Later in the article, Richard Hall, the District's general manager was quoted as saying: "If we don't act now, the possibility of providing this service and attracting large industries to the area is dead. It may be years in the future before another plan for disposal is available and any other method would be much more expensive to develop."

The bond passed, and in December 1966, work began on the $14.5 million, 25-mile trunk line, including a main line and two pumping stations, which would collect non-reclaimable wastes and convey the material to an outfall line west of Pomona, then to eventual discharge into the Pacific Ocean.

"Since the passage (of the bond issue), we have had numerous queries from prospective industries interested in locating in the West End …. A half dozen or so of these 'sniffs' from industrial developers have been directed to the county's Economic Development Commission," Hall was quoted in another article published that December in the *San Bernardino County Sun*.

Joe Grindstaff, IEUA's current general manager, applauded Hall's leadership: "Dick Hall deserves so much credit for deciding to build a brine pipeline system all the way over from Kaiser Steel to Los Angeles County, as well as negotiating a 50-year agreement that would allow them to continue to operate and allow other industry to locate here."

The trunk line was completed in two years. The first customers for the Non-Reclaimable Wastewater System were Southern California Edison (SCE) and Kaiser Steel. The District purchased a pipeline from SCE to connect an Edison generating station to the Los Angeles County Sanitation District's treatment plant in Pomona. The wastewater that was disposed through the pipeline was too polluted to be adequately treated and discharged into the Santa Ana River watershed.

Ultimately, the wastewater system was divided into a Northern and Southern System. The Northern System consists of three trunk lines: north, central and south trunk lines, which discharge the industrial wastewater into the County Sanitation Districts of Los Angeles County (CSDLAC) System.

The wastewater generated from the southern portion of the NRWS is diverted to Orange County Sanitation District (CSDOC) via the Inland Empire Brine Line – originally built as the Santa Ana Regional Interceptor, or SARI – owned and operated by the Santa Ana Watershed Project Authority (SAWPA). SAWPA was formed in 1968 as a planning agency and reformed in 1972 with a mission to plan and build facilities to protect the water quality of the Santa Ana River Watershed. The California State Water Resources Control Board and the U.S. Environmental Protection Agency funded SARI from the County Sanitation District of Orange County Treatment Plant No. 1 through Prado Dam, and later the upstream extensions in the Chino Basin. The waste is transported to the ocean.

Andrew Schlange, who served as general manager from 1970 to 1975, recalled the rationale for the NRWS: "We felt that if we could put good high quality water to use as it came off the mountains, we could recycle that water back into the system at least one more time before we had to dispose of it and let it go downstream to the Santa Ana River. That's the same concept that SAWPA was created to do. In the Santa Ana River Watershed, the water is used about three times. It starts as good quality water in the north end and comes down through the system where it is used two or three more times without having to replace it."

June 2013 construction of the Inland Empire Brine Line – formerly known as the Santa Ana Regional Interceptor (SARI) – helped expand the region's ability to reclaim groundwater by removing salts that degrade water quality in the Santa Ana River watershed.

Once the north and south lines were completed in 1969, the District saw immediate results. The NRWS helped to stop groundwater pollution by providing a viable alternative to industries. And, as Hall and Schlange predicted, it served as an enticement for new industrial development to come into the area.

"We stand on the shoulders of some really positive thinkers, real giants, in the early 1960s," said Harlan Delzer, contracts and programs administrator at IEUA. "They came up with a plan. And that plan was to take industrial waste from our service area and process it through the LA County industrial waste system and the Orange County waste system. That meant our cities could transition from being orange groves to dairies and all the agricultural wonderfulness. The whole concept was someday we'd have cities here; someday we'd have industry and great jobs here. And those great jobs are dependent on a 30-inch pipeline that they put in the ground in 1966 and 1967. It still functions today."

Chapter 4
Everything Changes and Depletion

In 1969, California passed its pioneering clean water act, called the Porter-Cologne Water Quality Control Act. The federal government subsequently expanded and restructured the 1948 Clean Water Act (CWA) in 1972.

Under the 1972 CWA, the U.S. Environmental Protection Agency (EPA) established a pollution control program to set wastewater standards for industry and also for all contaminants in surface waters. The CWA made it unlawful to discharge any pollutant from a point source, i.e. a wastewater treatment facility, into navigable waters, unless a permit was obtained. For that to happen, agencies needed to participate in EPA's National Pollutant Discharge Elimination System (NPDES) permit program that controlled discharges. With new rules in place due to the Orange County Judgment and the CWA, the District was facing new supply and quality challenges.

"Everything changed," said Chris Berch, IEUA's executive manager of engineering and assistant general manager. "California passed a Clean Water Act before the federal Clean Water Act. But for our region there was another thing: the Santa Ana River Judgment in the 1960s. Those two things are what drove, to a large extent, how our district stepped up – how are we going to raise our level of treatment so we can meet these water objectives on the Santa Ana River and also protect the groundwater quality in the Chino Basin, which had its own objectives. Both of those Acts drove consolidation and higher level of treatment for wastewater facilities, so a lot came together."

On July 10, 1959, Gov. Pat Brown signed the California Water Resources Development Bond Act, also known as the Burns-Porter Act, which authorized construction of the State Water Project.

Fortunately, with the added responsibility, the acts also had opportunities for funding. "As the regional water agency, we could all of the sudden get state and federal money to help make projects happen; otherwise, it never would have happened. It would be too expensive. It was like perfect timing of multiple things," Berch added.

The District began to negotiate with its five member cities – Chino, Ontario, Montclair, Upland and Fontana, as well as the Cucamonga Valley Water District – to purchase their wastewater treatment plants. In 1972 an agreement was reached to purchase three plants and pipelines serving Fontana, Montclair, Ontario, Upland and Chino areas.

"One incentive for cities to join with Chino Basin (Municipal Water District) and letting us take over the treatment plants was the fact we had a two-set tax rate that would cover most of the costs because we could include Fontana Steel, and the whole basin would be paying for the capital improvement projects that needed to be built in the future. The cities were very limited on what they could do at that time," recalled Andrew Schlange, the District's general manager from 1970 to 1975. "The financial incentives that we had, including large funding sources through grants, helped us put together these projects."

EPA Wastewater Definition

Wastewater: Besides sewage, wastewater includes the used water and solids – such as water in industrial processes – that flow to a treatment plant from homes and businesses. Stormwater, surface water, and groundwater infiltration also may be included in the wastewater that enters a treatment plant. The term sewage usually refers to household wastes, but this word is being replaced by the term, wastewater.

Source: Drinking Water Technical & Legal Terms

Area Population Growth

There was a correlation between increased water use and the number of people moving into the area:

- Ontario, founded in 1891, had a population of 722 in 1900 and 64,118 in 1970.
- Chino, founded in 1910, had a population of 1,444 in 1910 and 20,411 in 1970.
- Upland, founded in 1906, had a population of 2,384 in 1910 and 32,551 in 1970.
- Fontana, founded in 1952, had a population of 14,659 in 1960 and 20,673 in 1970.
- Montclair, founded in 1956, had a population of 13,546 in 1960 and 22,546 in 1970.

Source: California Department of Finance

The negotiations also led to the beginning of the Regional Sewage Service Contract that required the District to construct new pipelines and treatment facilities within a reasonable time. This opened the door to be able to finance the connector lines in existing residential areas and trunk lines to serve future development.

On September 27, 1973, a headline in the *Upland News* declared Chino Basin Municipal Water District Receives $550,970 Grant:

> The Chino Basin Municipal Water District received a $550,970 grant from the federal Environmental Protection Agency to complete work on a 9,000 foot pipeline known as the Cucamonga Regional Interceptor 3, it was announced. Upon completion, the pipeline will convey waste water from the open air one stage sewage treatment plants known as "The Cucamonga Ponds" to a more modern and thorough three stage treatment plant located in Ontario. The total cost of the project according to CBMWD General Manager, J. Andrew Schlange will be about $850,000. The pipeline is a first step in an expanding program of fresh water procurement and waste disposal for the area. CBMWD is the wholesaler for the local Cucamonga County Water District.
>
> When asked what effect the grant would have on the average home owner in the area, Schlange replied, "It just saved him (the homeowner) $550,970 which would

have had to come from the tax base to finance the project. CBMWD will furnish the additional $350,000 necessary to finance the construction."

Bids for the work are due to go in October with construction scheduled to begin In November and end in May, 1974.

Speeding Up Nature

Wastewater treatment is the process that removes the majority of the contaminants from wastewater or sewage. The process produces both a liquid effluent suitable for putting back into the environment and a sludge that can be transformed into compost.

"Sewage treatment does what nature does, just faster. We are speeding it up because there's so much that nature wouldn't be able to handle it," said Nel Groenveld, lab manager who has worked at IEUA for 25 years.

At the simplest level, treatment of sewage and most wastewater is carried out through separation of solids from liquids, usually by sedimentation. Other more advanced treatments include biological decomposition, chemical flocculation, filtration, disinfection and membrane technology. The "primary stage," developed in the 1920s, meant improving the noticeable aspects of the liquid sewage by simple settling and floatation, and skimming off the floating materials and removing sludge.

The remaining liquid was then released into fields, rivers or some other body of water. This situation prevailed throughout much of the country until World War II.

With growth and urbanization, sanitation became more of an issue. Effluent couldn't just be released into the environment without an effect on something or someone.

IEUA's Doug Drury (left), Chris Baker and Chris Berch survey biosolids created during the wastewater treatment process at RP-1 in 2002.

"Secondary treatment processes" were developed that produced cleaner, clear water after World War II. These advances made it safer to discharge treated wastewater into rivers or onto lands without creating harm. In Chino Basin, this water was primarily used to irrigate farmland around the plants.

In the early 1960s, improvements made it possible for operators to have better control of treatment and also made it possible for them to monitor equipment remotely. While establishing a more consistent, reliable process, it also was a convenience for the workers at a facility – they no longer had shifts around the clock to manually control the processes.

The greatest technological advancements came in the 1970s, when "tertiary treatment" standards were developed to produce high-quality water. Tertiary treatment includes removal of nutrients, such as phosphorus and nitrogen and practically all suspended and organic matter from wastewater. The water can then be released into the environment for non-potable uses, such as irrigation.

"When we took over the treatment plants in 1973, because of the Clean Water Act those plants went from being very simple to having tertiary level treatment, similar to the level that we treat today," Berch said. "I'm not joking when I say the level of treatment at some of our plants, like RP-1, our largest plant, is almost identical to what it was in the 1970s. It was such a leap and bound advancement at the time."

Laboratory testing also has evolved since the early days, Groenveld said. The treatment process is subjected to controls and public health regulations to ensure wastewater is properly treated. It's up to lab specialists to monitor water throughout the treatment process. They test for a long list of contaminants, from pesticides, volatile organic compounds, such as formaldehyde and solvents, and ammonia to metals, nitrates and nitrites and other minerals.

"When I first started, most of the tests were manual and time-consuming," she recalled. "Each sample was done individually and you were manually holding the beaker and adding the liquid."

For example when testing for metals, lab workers did one metal at a time. Today, an instrument can run 20 or more analyses with one water sample. Also, the types of tests have improved over time. Before 1997, it would take 5 days to get results on a metals test. Today a new test can analyze a sample in 15 minutes.

"The test produces a critical value, a data point for plants to use in their treatment. Now operators can get their numbers right away, so they can make decisions about treatment," she said.

Industrial Disposal Expands

A headline in *The Progress Bulletin* in Pomona announced on Oct. 21, 1971, "CBMWD OKs Firm's Request For Chino Sewer Service," giving an update about the interest in the NRWS by industry:

> Directors of the Chino Basin Municipal Water District approved Wednesday an

Clarifying processes are key to transforming wastewater into useful recycled water at the Carbon Canyon Water Recycling Facility in Chino. The plant can treat up to 11.4 million gallons per day.

Laboratory scientists Kevin Tang (left), Gary Guardiano and Ronald Chou test water to ensure it meets state and federal quality standards.

> application from the Swift Co. to provide industrial sewer service for a new plant it plans to construct in Chino. The district will begin installing a sewer line to carry out the non-reclaimable waste as soon as the firm pays a $5,000 fee, which is the initial charge to join the system, said Andrew Schlange, district manager. The Swift plant will be located at Yorba and Schaeffer avenues in Chino's industrial area. The plant may be in operation by next May, city officials report.

The NRWS program would prove successful through the years. In 2015, 55 customers were part of the program. Those included the Frito-Lay plant in Rancho Cucamonga that began snack production in 1970 and California Steel Industries, Inc., located in the former Kaiser Steel location in Fontana which carried on the legacy of the Kaiser plant. The company doesn't manufacture steel but processes steel slab purchased from suppliers around the world.

Other larger industries that discharge brine wastewater generated from their processes are: New-Indy Ontario, GenOn, Ventura Foods, Mission Uniform and Linen Services, Crothall, GE Mobil Water, Clement Pappas North, Cintas Corporation (I) and Cintas Corporation (II), Nestle (Arrowhead) Water, Unifirst, Sierra Aluminum (II), and Niagara Bottling I and II.

"Those lines are supporting the economy and, oh by the way, that pays your check," Delzer said. "Just to give you the cascade: If we don't have the industrial waste line – our NRW System – we don't have the industries. We would still have some industries, but their dirty water would go into our sewer system, which means we'd have contaminated recycled water, which means we wouldn't have the recycled water system, which means we wouldn't be drought-proofing our service area, which means that's two more missions we don't have in our dossier."

1970s Groundwater Depletion

The Chino Basin is one of the largest groundwater basins in Southern California, containing more than 5 million acre-feet of water and with an unused storage capacity of about 1 million acre-feet. That's 1.6 trillion gallons of water!

By comparison, the volume of Lake Arrowhead in the San Bernardino Mountains is 47,418 acre-feet. Lake Elsinore, about 40 miles south of Chino, has a volume of 30,000 acre-feet.

The Chino Basin spreads under about 235 square miles of the upper Santa Ana River watershed and lies within portions of San Bernardino (80 percent), Riverside (15 percent), and Los Angeles (5 percent) counties. It is bounded by Cucamonga Basin and the San Gabriel Mountains to the north, the Temescal Basin to the south, Chino Hills and Puente Hills to the southwest, San Jose Hills, Pomona and Claremont Basins on the northwest and the Rialto/Colton Basins on the east.

Although immense, the Chino groundwater basin was being overused, depleted and degraded as the area atop it developed and flourished. The situation had become so much of a problem that in 1931 farmers and concerned citizens formed a group to spread the word about the importance of water protection.

Groundwater overdraft was one problem. Groundwater overdraft occurs when more groundwater is pumped from a basin or aquifer than is recharged. In simplified terms, it's like if you keep drinking from a glass of water without refilling it; soon the water will be gone. Groundwater in a basin is a delicate balancing act. And when groundwater extraction exceeds the safe yield of a basin, problems will occur. Besides a decreased water supply, the quality of water also is affected.

The Chino Basin is not the only area in California to suffer from overdraft. The indirect consequences of groundwater overdraft could include land subsidence, which occurs when the land compacts, the surface elevation declines and the storage space for groundwater shrinks.

The first real indication of groundwater overdraft in the Chino Basin was noted in Bulletin 3, a publication printed by the California Department of Water Resources

First Employee to Reach 30-years' Service

George Diggs

George Diggs, Employee No. 18, was the first to be employed 30 years at IEUA. He was hired as a maintenance worker in 1972 when the agency was still Chino Basin Municipal Water District. One of his first duties was to tend the wastewater effluent that came into several Cucamonga Ponds, then located on the north side of the State Route 60. Wastewater would enter the first pond then, after percolating, it would be released into the second pond for more percolating, then the third pond, etc. By the time the wastewater had gone through the four or five ponds, it had been cleansed to a large extent.

It was Pond No. 1 that provided the most challenges for Diggs. "That first pond was where all the solids were trapped and you'd get a layer of grease that would build up. So we would take an aluminum fishing boat with small outboard motor and we'd ride around in that pond and run into all the floating debris to break it up and mix it," Diggs recalled. "Floating debris" included "everything that got flushed down the toilet or dumped down the drain."

He also recalled when he'd be called upon to patrol the sewer lines into the plant in the middle of the night, when the flows were at their lowest. "We'd have to come in with big equipment to clean out the sewer line that came into the plant during low flow," he said. Among the more unique items he pulled out of the line were bowling balls, a baby stroller and a file cabinet.

(DWR) in 1957. The Bulletin 3 report noted that by 1946 the overdraft of Chino Basin was about 20,000 acre feet a year – a little less than half the volume of Lake Arrowhead. The years of overuse had taken a toll on overall water supply and availability within the basin as more water was pumped out and used than was replenishing the underground aquifer.

By 1949, the group of farmers concerned about groundwater protection that formed in 1931 was re-established as the Chino Basin Water Conservation District (CBWCD). As a governmental special district, its job was to protect the underlying Chino groundwater basin and educate the public. Through the years, CBWCD began to intentionally replenish the groundwater supply through percolation basins used to catch rainfall and stormwater that ran down from the San Gabriel Mountains. That water then seeped, or percolated, down into the ground, replenishing the underground basin.

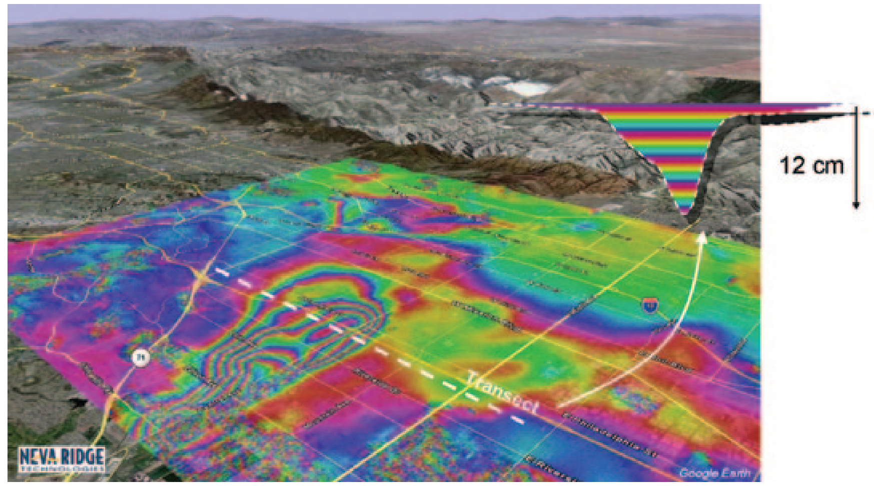
Yet more wells continued to be drilled through the years. The state of California had no groundwater regulations, so primarily anyone who owned property could drill down and tap the water below. By 2012, 1,000 wells had been drilled to tap the precious resource.

Leading into to the 1970s, the overuse situation was being compounded by drought-like conditions, which further taxed the water supplies.

The SWP Arrives in the Nick of Time

The *Montclair Tribune* emblazoned the headlines on May 4, 1972: Drought Threat Severe – Water From North Arrives 'Just' In Time:

> First distribution of water from Northern California has been started by the Metropolitan Water District of Southern California just in time to stave off some shortages in a year of extreme drought.



This image shows ground subsidence in Chino due to overdraft of the underlying groundwater basin from 1993-1995. Each color cycle represents a surface height change of about 3 cm (1 inch) to 12 cm (4.75 inches).

> Water originating from the Feather River and other streams is flowing from Castaic Reservoir, terminus of the West Branch of the $2.8 billion State Water Project, into the northwestern portion of Metropolitan's vast distribution system serving the populous coastal plain of Southern California.

In total, State Water Project (SWP) water would travel more than 600 miles to get to the Chino Basin. Metropolitan had been providing CBMWD with imported water from the Colorado River since the agency's formation in the early 1950s. That water, however, was quite salty. When the higher quality SWP water became available more than 20 years later, the District did not hesitate to switch.

On its journey from Northern California, SWP water flows down 444 miles of the California Aqueduct, which conveys water from the Sacramento-San Joaquin Delta (Delta) to Southern California.

The main stem of the Aqueduct flows through the San Joaquin Valley and then travels up and over the Tehachapi Mountains. At the bottom of the mountains, the Aqueduct splits into two branches: West Branch (serving Los Angeles, Orange and San Diego counties) and East Branch (serving Riverside and San Bernardino counties).

At the East Branch the water generates power at the Alamo Powerplant. That power is used to pump the flows uphill by Pearblossom Pumping Plant in the High Desert. The plant lifts the water 540 feet to where it eventually discharges into Lake Silverwood in the San Bernardino Mountains. When water is needed, it is discharged into Devil Canyon Powerplant and its two afterbays in San Bernardino.

SWP water is delivered to the Chino Basin through the Rialto Pipeline, which flows east to west along the northern portion of the region and carries the water west from Devil Canyon to Metropolitan's Live Oak Reservoir at La Verne. There were about a dozen connections with CBMWD pipes along the way to deliver the agency's water to its customers, the cities and districts throughout the area.

The State Water Project's East Branch delivers water to San Bernardino and Riverside counties.

Through the years other feeders were constructed. These occasionally served as secondary sources of SWP water. They include San Gabriel Valley Municipal Water District's Azusa-Devil Canyon (ADC) Pipeline, and the Etiwanda Cross Feeder Connection.

Currently, SWP water is treated at four plants located in the northern portion of the Chino Basin near the Rialto Pipeline. These facilities treat the raw water from the north to produce drinking water for storage and distribution to a multi-city service area. The Water Facilities Authority Agua de Lejos plant, located in Upland, serves the cities of Chino, Chino Hills, Ontario, Upland and the Monte Vista Water District. Cucamonga Valley Water District operates two plants, the Lloyd W. Michael Water Treatment Plant and the Royer-Nesbit Water Treatment Plant, located in the city of Rancho Cucamonga. The Fontana Water Company operates the Sandhill Water Treatment Plant.

Groundwater Depletion Tracked; News is Not Good

While Metropolitan's imported water was helping ease water woes, concern was mounting about the problems in the groundwater basin in the 1970s. Water producers had become concerned about a decreasing water supply and declining water quality in the Chino Basin. Groundwater had become the primary source of water for increasing demands by burgeoning communities, rising agricultural acreage and growing industrial enterprises.

In total, water production from the basin was 175,476 acre-feet for the fiscal year 1974-75. That was 35,000 acre-feet in excess of the 140,000 acre-feet safe yield estimate.

Groundwater being used as irrigation water for the crops, orchards and vineyards, as well as for dairies, totaled 96,206 acre-feet for fiscal year 1974-75. Water agencies and municipalites were using 69,861 acre-feet for the same time period. Industry and commercial enterprises, which typically used groundwater in processes to cool or treat production materials, as well as during manufacturing processes, used on average 9,409 acre-feet from 1965 to 1974.

Besides the great amounts of water used by agriculture, the number that jumped out was the "appropriative" use by water districts and municipalites for new growth. It was "increasing demands greater than either of the other pools (agricultural and industrial)" and had catapulted it on a level of a major user "by taking their current demand, put them into perspective with the other pools," said William Jerome Carroll, an engineer with James M. Montgomery Consulting Engineers. Carroll had been involved with the planning and design of water and wastewater systems in the region and was an expert in groundwater matters. He served as a consultant for the Chino Basin Municipal Water District, and also was appointed Watermaster after the Orange County litigation in the 1960s. Carroll made those comments during the forthcoming trial that led to the 1978 Judgment.

Stopping the Damage

Water agencies and other stakeholders pulled together and signed a "Memorandum of Agreement on the Chino Basin Plan" in 1974. The next year, state Senator Ruben S. Ayala, D-Chino, introduced Senate Bill 222 (SB 222) in the California Legislature. This bill authorized an assessment levy for $2 per acre-foot of water per year for a period of three years to raise money to fund studies and start negotiations to implement the needed water management program.

SB 222 became part of the Municipal Water District Law at Section 72140 of the California Water Code. It was approved by Gov. Ronald Reagan and filed with the Secretary of State on June 28, 1975.

Subcommittees began delving into the Chino Basin groundwater conditions and specific problem areas. For example, they analyzed aspects ranging from socio-economic effects to basin safe yield. This information would be used by stakeholders to reach an agreement regarding the allocation of water rights – who would get what amount of water.

During negotiations, three groups with major interests in the allocation of basin water emerged. Eventually, the groups formalized into pool committees and became known as the following:

- Agricultural pool, representing dairymen and farmers with property over the groundwater basin (plus the state of California was also included representing the prison)
- Non-Agricultural pool, representing industries and commercial interests with operations overlying the groundwater basin
- Appropriative pool, representing cities, water districts and water companies

Representatives of the three pool committees formed a Watermaster advisory committee. This committee made recommendations for formal action to CBMWD's Board of Directors, who had the responsibility of administering SB 222.

While work was being done, it wasn't being done fast enough. Once again, a lawsuit would be filed in 1975, which led to a major change in how water resources and water-related business in general, would be conducted.

Chapter 5
The Chino Basin Judgment

Whiskey's for drinking, water's for fightin," the famous quote attributed to Mark Twain, aptly characterizes the tumultuous history of the Chino groundwater basin.

Even as the numerous Chino Basin agencies and municipalities moved forward with supplying water and services to their various communities, they were becoming more disgruntled as demands increased and supplies decreased. On January 2, 1975, the legal battles began between neighbors instead of users across the entire Santa Ana River watershed. On that day, several Chino Basin producers overlying the Chino groundwater basin filed suit against other users in the basin in California Superior Court in San Bernardino County to determine who had water rights in the basin.

Historically, there was little state oversight of groundwater use. Similar to riparian rights, overlying landowners are entitled to pump a reasonable amount of groundwater for a beneficial use on their land. The disagreement

in the Chino Basin centered on how much groundwater could rightfully be extracted by each interested party, such as water districts or municipalities, as well as specific groups like farmers and industrial users. The court would also determine equitable distribution of groundwater, based on the amounts available each year.

Case No. 164327, *Chino Basin Municipal Water District v. City of Chino et al*, took three years to resolve. On January 27, 1978, "The Judgment," signed by Judge Howard Wiener, adjudicated the Chino Basin, confirming groundwater rights with a detailed solution to which users were to receive water, as well as determining specific allotments. The Judge also appointed a Watermaster to manage and protect the area's groundwater.

Adjudication commonly occurs when multiple parties withdraw water from the same aquifer and conflicts arise about who has the right to pump. Groundwater pumpers can ask the court to adjudicate, or hear arguments for and against, to better define the rights. The court's ruling becomes the defining course of action.

In the court proceedings, experts lined up to talk about the overuse of water from the groundwater basin and the concerns of the respective users. "… what is happening is your water levels in the basin are falling," testified William Jerome Carroll, an engineer with James M. Montgomery Consulting Engineers.

Carroll pinpointed the most severe decline from the mid-1940s to the year of the court proceedings in 1975: "The precipitation was relatively uniform through a lot of the period, yet we've had a steady decline in both of these items which is indicative of overdraft."

Importantly, Carroll also noted the space in the depleted basin could be used again. "It's usable to store other waters or to allow the basin to recover … plus the fact that you can actually store more water than just the decline. There is other dry area there, dry volume there that could be filled," he testified.

The Chino Basin Judgment

The 1978 Judgment adjudicated all rights to groundwater in the Chino Basin and its approximate 6 million acre-feet of usable storage. Water rights were broken into three pools: the agricultural (farmers and the state of California), the non-agricultural (industry and commerce) and the appropriative (water districts and municipalities).

"This is the first judgment to my knowledge ever to have a pooled concept," said attorney Scott Slater, who has served general counsel for the Chino Basin Watermaster beginning in 2000.

Judge Wiener issued rulings on several matters in the Judgment. First, he declared the safe yield of the Chino Basin was 140,000 acre-feet per year. The basin's groundwater was to be divided among the three pools of users: 82,800 acre-feet per year to the agricultural pool; 7,366 acre-feet per year to the non-agricultural pool; and 49,834 acre-feet per year to the appropriative pool.

In addition to the safe yield, the Judgment contemplated an overdraft of the basin. It was called the "controlled overdraft," 200,000 acre-feet averaged through 40 years. This added 5,000 acre-feet per year bringing the appropriative pool production right to 54,834 acre-feet.

The Judgment also noted individual groundwater rights, and the taxes to pay for replenishment water, would vary among the three pools. Individual property rights to groundwater were not specified for the agricultural pool users – instead farmers had "correlative rights" to their pool's share of the safe yield. That meant the owners of overlying land had rights to subsurface water, and each was allowed a reasonable amount for his or her own use based on the amount of land owned.

By comparison, individual rights were specified for non-agricultural pool users. Those rights could not be transferred separate from the land and meant each acre of land had a specified amount of acre-feet of water connected to it. If someone wanted to buy or sell the water, the land also would be required to be bought or sold.

Finally, the court assigned individual prescriptive rights for the appropriators, and those rights could be transferred. In addition, when the amount of water used by the other users declined below the pool's share, the appropriators could purchase rights to this "surplus water."

Replenishment water was to be purchased by the appropriators using a combination of a gross pump tax and a net pump tax. Replenishment taxes were charged to producers in each pool if, and only if, that pool's total groundwater use exceeded its share of the safe yield. When users in the agricultural pool exceeded their pool's share of the safe yield, replenishment water would be purchased by taxing all users a gross pump tax on all groundwater production. Whereas, if a non-agricultural user exceeded its pool's share of the safe yield, individuals would be taxed according to their contribution to the excess extraction (i.e. a net pump tax).

The First Watermaster

As part of the Judgment, the judge appointed a Watermaster to ensure that groundwater was allocated according to the adjudicated water rights. The goal was to create an unbiased, responsible approach to the adjudication and also discourage any litigation in the future. As part of that responsibility, the Watermaster was to develop a management plan for the groundwater basin.

"Watermaster as an entity works in two ways: No. 1, everybody knows that for something to be agreed to, you must have total consensus. You can't have disagreement because if you have disagreement, it'll go to court. So it really pushes the parties to get to a consensus, and that's where the municipalities have a great role to play. They can help bring consensus because they are all member agencies (to IEUA) and have common interests," said Peter Kavounas, who has served as general manager of Chino Basin Watermaster since 2012.

"The second way a Watermaster works is if they don't get consensus, they have quick and

During their tenure, Directors George Borba (left) and Dwight French served on the Chino Basin Municipal Water District Board and also functioned as the first Chino Basin Watermaster.

easy access to court. That's what Watermaster is – it's a placeholder. We can go to the judge with 30 days' notice; the issue can be heard; the decision is rendered, and 30 days later you are done. There's no protracted, ongoing litigation," he added. "You try your hardest to settle it, but if you don't, no worries, go to the judge, have your day in court and you're done. Win or lose, you're done."

The first Chino Basin Watermaster was the Chino Basin Municipal Water District's five-member Board of Directors. The District was chosen due to its scope – the District overlay 80 percent of the basin – and because it had supported the region's interests in the court case. The District also had the necessary powers to purchase replenishment water.

"The adjudication was a very momentous occasion," said Kathy Tiegs, former water resources analyst with IEUA and current board member at Cucamonga Valley Water District. "Chino Basin (Municipal Water District) put on two different hats, so at one meeting they were representing Chino Basin the water district and then the other time they put the other hat on and they were Chino Basin Watermaster. So that was an interesting time."

In addition to the board, members from the three pool committees and representatives from an advisory committee, who had participated in the adjudication process, had a voice. In fact, all major decisions had to be approved by a committee consisting of producers from each pool, with the relative size of each pool's representation based upon the pool's replenishment water assessments. That meant appropriators – water districts and municipalities – were to pay the lion's share of future replenishment assessments, and because the advisory committee voting was based on those assessments, appropriators had a dominant voice in basin policy-making.

The organizational meeting was held on February 15, 1978. Members and officers were: Carl B. Masingale, Chairman; Dick W. Pehl, Vice-Chairman; Ernest L. Keechler, Secretary/Treasurer; John G. Gilday, Assistant Secretary/Treasurer and George A. Borba, Member.

With the Chino Basin stakeholders sitting around the same table, the future was looking brighter.

First Attempts to Form a Groundwater Storage Program Fail

For the period 1977-78 to 1986-87, the Watermaster's engineering activities were primarily in providing direction and comment on the development of a groundwater storage program proposed by the California Department of Water Resources and Metropolitan.

"The proposed storage program," according to the Watermaster Annual Report for 1996-97, "would have put water into the groundwater basin during years with surplus State Water Project water. The 'put' would have occurred through direct recharge and through in-lieu recharge and would occur over a 10-year period. The maximum volume of groundwater storage that would be used was estimated to be about 1.5 million acre-feet. Water would be removed from storage at a rate of 300,000 acre-feet per year with some of the water exported to outside of the Chino Basin. DWR pulled out of the project due to financial reasons and the storage program was put on hold."

In 1985, Metropolitan continued to develop the storage program and in 1988, prepared a draft environmental impact report (DEIR). Studies conducted during the preparation of the DEIR indicated that the storage of 1.5 million acre-feet was not feasible from an environmental perspective. As a result, the size of the storage program was reduced by half to 750,000 acre-feet. Metropolitan suspended development of the storage program shortly after the release of the DEIR, citing environmental concerns and protests among Chino Basin producers.

The Agency attempted to develop a modified version of the storage program in the early 1990s but stopped those efforts when it appeared there would be no agreement with the Watermaster. Then the Watermaster began to conduct its own engineering studies in order to re-evaluate the safe yield of the Chino Basin, including contracting with Camp, Dresser and McKee, Inc. (CDM) and the San Bernardino County Flood Control District to conduct groundwater level measurements in order to compute the current storage in the basin and the change in storage since the Judgment was filed. That analysis would be used to form the program in the future.

During the first years, many engineering projects and studies were making progress, yet there wasn't the obvious banner progress of a "physical solution," which was dictated in the Judgment in 1978: "The administration was largely pretty tepid for the periods between 1978 and the mid-1990s," Slater said.

Eventually, on February 19, 1998, the court stepped in again to make a ruling that further gave direction that a comprehensive management plan, called the Optimum Basin Management Program (OBMP), be developed immediately.

Events Leading up to the Ruling

In 1993, the Chino Basin Municipal Water District did not reapply to retain authority as Watermaster. "There was the view there was an inherent conflict-of-interest between being the principal entity that supplied the replenishment water in the basin and the administration of the basin," Slater said, adding, "that has a poignant relevance to the world we live in today as these agencies try to grapple with who's the best and appropriate entity to be selected as the sustainable groundwater management agency."

General Manager Robb Quincey (left), Chief Financial Officer Larry Rudder and Executive Manager of Operations and Engineering Douglas Drury headed up the executive team in 1998.

It was a long process with many hearings as the parties attempted to find a plan they liked – with the court's ultimate authority serving as a reminder that working together might be the best approach. In January 1996, a motion was made and supported by a majority of the advisory committee – made up of representatives from the agricultural, industry and appropriative user pools – to actually appoint itself, the advisory committee, to serve as Watermaster, according to the Draft Phase I Report prepared for Chino Basin Watermaster by Mark Wildermuth of Wildermuth Environmental, Inc.

On June 3, 1996, the Chino Basin Municipal Water District filed a motion to appoint itself as Watermaster. At a June 18, 1996 hearing, Judge J. Michael Gunn granted the motions to appoint the Chino Basin Municipal Water District interim Watermaster. The judge also ordered the parties to meet and confer regarding the nine-member board.

The process lingered through the rest of that year and into early 1997.

On March 11, 1997, Judge Gunn heard a new motion to appoint a nine-member Watermaster board.
On April 29, 1997, he issued a ruling that:

- Appointed attorney Anne J. Schneider as special referee to make a recommendation to the court regarding the issues raised by the motions
- Ordered the Chino Basin Municipal Water District, the Advisory Committee and DWR (Department of Water Resources) to negotiate terms for DWR to serve as Interim Watermaster

Proposition 13 Slashes Tax Revenues

By 1978, the pressures of expansion and the costs associated with infrastructure and services were taking a toll: "The contract's obligations became harder to meet," noted the Chino Basin Municipal Water District's 40th Anniversary publication. "It was then that California voters approved Proposition 13, a measure that slashed the District's tax revenues by 67 percent and severely affected its ability to respond to the growing domestic sewering needs within its 242-square-mile territory. To alleviate the financial crunch, therefore, the District was forced to supplement property taxes with fees from new construction to continue servicing a burgeoning population." It's a practice still in effect today.

John Rossi, general manager of Western Municipal Water District who served as chief executive officer of the Chino Basin Watermaster from 2001 to 2004, said the idea of DWR taking over was a bit of an urban legend: "It is an urban legend of sorts. The judge said, 'I'm tired of you not getting along and being unproductive. So if you don't sit down and figure out what you're going to do as far as the Watermaster board goes, I'm going to order that the California Department of Water Resources become the Watermaster.' That galvanized the group. People love local control when it comes to groundwater management."

Schneider accepted the court's appointment to become a special referee and began the process necessary to make a recommendation to the court. After a special hearing on October 21, 1997, she delivered her written recommendation to the court, basically affirming the concept of a nine-member board and stressing the importance of an OBMP. Based on that report, Judge Gunn ruled on February 19, 1998, that:

- A nine-member Board be appointed as interim Watermaster
- The OBMP be developed
- Negotiations with DWR be resumed regarding the agency as Watermaster.

Those three decisions were all big news. First, there was the matter of the nine-member board serving as interim Watermaster.

"The nine-member board was an admittedly self-interested – that was by intention – representative board who was appointed by the court," Slater said. He described the Chino Basin form of governance as polycentric. "By having acknowledged self-interests, the parties are forced to openly represent their positions and through negotiations they find a common ground."

Aside from the legal maneuverings to establish a secure Watermaster, Slater pointed to what was happening in the basin on a daily basis: "It was acknowledged that agriculture, which had always been a significant producer in the basin, was projected to get out of the basin as urban development moved into the Inland Empire. And with that came challenges; if you were going to stop pumping groundwater in a specific area in the basin, it raised the threat that the overall yield would go down. And there was a concern about salinity levels, as the basin essentially flushed itself toward the Santa Ana River."

Already, water use in the District had shifted with 65 percent going for municipal and industrial purposes and 35 percent used for agriculture.

"That led to the acknowledgment that there was an obligation on the part of the Watermaster to adopt the OBMP," Slater said. "It had never been done and with the oversight of the court and Anne Schneider and Joe Scalmanini, who were extensions of the court as special referee and technical assistant, Watermaster was tasked with the responsibility of developing an OBMP to address the challenges in the basin."

As assistant to the special referee, Scalmanini, of Luhdorff & Scalmanini, recalled the enthusiasm and dedication of Schneider – who passed away in 2010 – in his speech when Groundwater Resources Association (GRA) honored her with its Lifetime Achievement Award in 2012.

"Simply summarized, her lifetime was definitely one of achievement … in groundwater, and in many things related to groundwater," Scalmanini said. "After she had been appointed Special Referee in the Chino Basin, she kind of giggled when she told me that she had told the court, 'All I want for Christmas is an engineer/hydrologist.' Seriously, that reflected how she was focused to understand a basin's geology and hydrology as key inputs to her work on the legal, institutional, and governance issues in any basin."

The Chino Basin Watermaster board wrote to support Schneider's nomination and, in its letter, specifically noted her role in restructuring Watermaster and getting the OBMP completed.

"In a way, this award reflects a completion of GRA's recognition of groundwater basin management in the Chino Basin, both the direction as well as the finished product," Scalmanini said at the time.

The third directive by Judge Gunn was to resume negotiations with DWR regarding the agency serving as Watermaster. That proposition served as an impetus to get moving, Slater said. "There'd been a threat from the court it might wend the responsibility to the Department of Water Resources if the Watermaster could not successfully implement an OBMP."

As a result, the process to develop the OBMP began in earnest in 1998.

By the late 1990s, agricultural water was only 35 percent of total use in the region.

Chapter 6
Making the Most of Water and Cow Manure

It can be stated simply: water is too valuable to be used just once. In its efforts to ensure the Chino Basin had a reliable water supply, Chino Basin Municipal Water District was one of the first agencies in the state to invest in and produce recycled water from wastewater. That water, highly treated to remove contaminants and meet strict health standards, was made available to be reused for non-potable (non-drinking) uses beginning in the 1970s.

Early on, as pioneers, the Agency began investing in an aggressive program to expand delivery of recycled water. The rationale was this: water customers were using drinking water for all sorts of processes, such as generating electricity, irrigating crops and fields, and maintaining landscaping and lawns. For most of these uses, recycled water could be a substitute for potable water.

Beginning in 1972, the first recycled water customers were Whispering Lakes Golf Course, which is adjacent to RP-1 in Ontario, Westwind Park in Ontario, and also El Prado Park and Golf Course in Chino.

In the treatment process, the initial steps to cleanse wastewater remove more than 90 percent of organic material. A “tertiary” step is needed to ensure the cleansed water meets the strict public health standards set by both California and the federal government. During tertiary treatment, water is passed through filtration to remove suspended organic solids, bacteria and viruses.

The district had upgraded its RP-1 sewage treatment plant to a tertiary level in the 1970s, said Chris Berch, IEUA's executive engineering and assistant general manager.

"Then we installed a pipe that went from Ontario near the 60 Freeway all the way down to the the Prado Basin. The reason was to be able to keep that high-level quality and discharge in the Santa Ana River. That transition, that pipeline, became the first recycled water backbone for our entire agency," Berch said.

At the time, the pipes that circulated recycled water weren't colored purple – what has now become the standard identifier for recycled water.

"More and more interconnections between our facilities appeared," Berch said. "It wasn't until the early 1990s that we built a facility called Carbon Canyon Water Recycling Facility. And that was the first treatment plant that was designed and constructed primarily for the purpose of generating recycled water and distributing it locally in that area of Chino Hills and Chino. It was all about helping to meet local needs."

Those connections spread as more customers signed on to using recycled water. Fast forward, and by 2015, the IEUA had more than 800 connections to its recycled water distribution system. Customers used recycled water as the supply for landscaping, farms, parks, cemeteries, construction projects, industrial cooling, recreational lakes, groundwater recharge, industrial processing and median strips.

From the initial recycled water distribution that began in 1972 with the formation of the Regional Sewage Service Contract, the enthusiasm spread. The District served as the wholesale recycled water provider to its member agencies, which in turn sold the water directly to their customers. The first member agencies to sign on were the city of

In 1989, construction of the second clarifier at Carbon Canyon Water Recycling Facility was in full swing.

Chino, city of Chino Hills, city of Ontario, Cucamonga Valley Water District, Monte Vista Water District and the city of Fontana.

The Inland Empire was not alone in its development of recycled water. Throughout Southern California, cities encouraged the use of highly treated wastewater for outdoor irrigation and reuse at manufacturing plants. The trend continues today: recycled water is an integrated part of securing local water supplies.

"It helps us retain autonomy as much as possible. Use of recycled water reduces the amount of water that we need to import from uncertain and expensive sources like the Sacramento-San Joaquin River Delta and the Colorado River. That saves all local water customers money," said Gregg Bingham, IEUA's operations supervisor.

From an operations point-of-view, the increased focus on recycled water could not be overstated.

"The biggest milestone was the change-over from treating the water in order to protect the environment to going to recycled water as a product people will buy," Bingham said. "We went from discharging into the local creeks and into Prado Lake, with an emphasis on the environment and making sure we didn't get chlorine into the water by accident, to suddenly believing that water is a resource – we are going to reclaim it all and put it in the purple pipes as a product. That was a change of thinking that the whole agency had to make."

Through the years, more than $250 million has been invested to upgrade the facilities to process wastewater into high-quality water, suitable for household, municipal and industrial use. Potable water, meanwhile, could then help the water purveyors meet demands for new urban and commercial development.

IEUA's Don Hamlett (left) and Gregg Bingham oversee RP-1 tertiary treatment in 1993.

By 2015, IEUA was receiving more than 50 million gallons of wastewater per day to its regional treatment plants. That water was treated to strict Title 22 regulations set by the California Department of Health Services. Then, the recycled water was put into the purple pipe system and delivered for agriculture, municipal irrigation, industrial uses and for groundwater replenishment.

The Steps in Treatment:

- Preliminary Treatment: Wastewater flows through bar screens and grit chambers, where the more dense materials such as sand, dirt, stones, rags, etc. are removed
- Primary Treatment: As wastewater goes through sedimentation tanks, approximately 65% of the suspended solids are removed
- Secondary Treatment: This is the biological process in which the organic solids are consumed by microorganisms. This process removes an excess of 90% of the organic material in the wastewater
- Tertiary Treatment: In the final stage, water is passed through filtration to remove suspended organic solids, bacteria and viruses

IEUA was among the first utilities to realize wastewater treatment could be taken further to create higher quality water that could be reused in the community. In the 1990s, the two new recycling plants, Carbon Canyon Water Recycling Facility in Chino and Regional Plant No. 4 (RP-4) – built in 1997 in Rancho Cucamonga – were sited specifically at higher elevations to reduce recycled water pumping costs. A distribution system was installed in Chino and Chino Hills from the Carbon Canyon Water Recycling Facility in 1997 and was initially operated by IEUA. This system was later turned over to the city of Chino and the city of Chino Hills and forms the core of the recycled water distribution network operated by these two cities. Use of recycled water for irrigation and industry increased rapidly. In addition, the Agency began using it to recharge groundwater supplies, which was, and is, key to the region's drought-proofing strategy.

How is Recycled Water Made?

In communities located along a river, recycled water is a fact of life. Community A withdraws the water, treats it and delivers it as drinking water to homes and businesses. After its use, it is returned to the wastewater treatment plant where it is once again disinfected and then put back into the river for Community B, downstream, to withdraw. The active decision to recycle water follows in the footsteps of that example. Drinking water once used is recycled to serve another need in the community – stretching the supply.

To produce recycled water, household wastewater from showers, toilets and sinks, as well as used water from offices, industrial facilities and businesses is conveyed to IEUA's water reclamation plants for treatment. Treatment features a process that duplicates nature's own cleaning processes. Solids are screened out of the wastewater in the primary phase of the treatment; then, in the secondary phase, the wastewater is subjected to an aeration process, where microbes and other bacteria are allowed to consume and dissolve the remaining organic material. Finally, in the third phase of the tertiary process, the water is filtered again and disinfected. The result is highly purified recycled water. In total, it takes about 16 to 18 hours to produce recycled water – from the time the wastewater enters the plant until the finished product is disinfected and ready for distribution.

It's not a new process for inland urban regions not located by a river. The use of recycled wastewater, initially a basic filtering process, dates back to 1929 in Southern California when the city of Pomona started using treated municipal wastewater for landscape irrigation.

The treatment process became refined through the years. Irvine Ranch Water District (IRWD) was a leading pioneer, beginning to integrate water recycling into the community design in 1963 and then developing the dual distribution system – one set of pipes for potable water and another set for recycled water – that is used throughout the industry today. It was then the "purple pipe" system was introduced. Today, California's plumbing code mandates that recycled water flow through purple pipes.

In the 1970s, the County of Los Angeles, the Orange County Sanitation District, as well as IRWD pioneered more widespread use of recycled water along with Chino Basin Municipal Water District.

While recycled water is an essential component of the region's long-term plan to achieve water security, it doesn't come cheap. Berch estimated that by the 2000s the Agency had invested about $200 million into infrastructure. Most of that was funded through state and federal grants. In recent years, necessary capital improvements, including laterals and retrofit financing, amounted to $40 million a year over three years for a total of $120 million in costs. Though most are being paid for with stimulus funds through the Environmental Protection Agency (EPA) and the Bureau of Reclamation, the Agency also received state grants and low-interest loans.

When the projects reach full capacity, the system is expected to deliver between 45,000 and 51,000 acre-feet a year, generating more than $24 million annually through wholesale recycled-water sales and rebates through Metropolitan's local projects program. With debt service expected to be $13-$15 million a year and operation and maintenance costs at $11 million a year, the operation will be entirely self-sustaining.

"It's a grand dream in the sense that these lending agencies have stepped up. You're going to build all these programs and offset all these imported water needs," Berch said. "Efficient water use is critical to sustaining water availability, and finding new ways to extend water resources is crucial. Treating and reusing water conserves limited, high-quality freshwater supplies while helping to meet the ever-growing demands for water. It's a safe, cost-effective approach to managing the region's limited water resources. The best thing is it provides high quality, non-potable water to our agencies."

RP-4 in Rancho Cucamonga began operations in 1997. The Inland Empire Regional Composting Facility was constructed in 2007.

In 1992, the Carbon Canyon Water Recycling Facility was opened with a snip of a ribbon. Dignitaries included Bill Ruh (left), Kosti Shirvanian, Jerry King, Ruben Ayala, Bill Hill, Fred Aguire, Tim Worley, Larry Walker and Bob Feenstra.

Finding Solutions to Ongoing Challenges

On December 14, 1989, the *Los Angeles Times* put it rather bluntly in a headline: Manure Project Called Dairyman's Godsend. The accompanying article detailed plans to convert cows' waste to a salable soil additive in order to solve a threat to the safety of the Inland Empire water supply.

"They stand, shoulder to shoulder, on the sloping pastures of the Chino Valley – thousands and thousands of cows. Painstakingly bred through sophisticated artificial insemination techniques, these bovines – numbering 300,000 in all – are champion milk producers, making the region home to some of the top dairies in the world," began the article.

By 2004, San Bernardino County was the largest milk producing county in the nation, according to the Milk Producers Council. The dairy industry was thriving, contributing $500 million annually to the local economy, even as the subdivisions crept closer and the freeways split traditional pastureland. Yet, as the *Los Angeles Times* article put it: "But the docile animals pump out something else as well: manure. Mountains of manure. Two tons per cow per year, to be exact."

If the sheer number wasn't startling enough, the potential impacts of that amount of waste were daunting; during an estimated three decades, salts and nitrogen in the manure had seeped into the underground aquifer, gradually fouling the water source for 1 million residents in the Inland Empire and downstream in Orange County, where another 1.8 million people relied on that water supply.

"The regional (Water Quality Control) Board and Chino Basin (Municipal Water District) were very concerned about nitrates and salt-laden waste that were being deposited on the surface and which would migrate into the water supply of the lower Chino Basin. We did a number of studies – how to handle waste product from 17,000 cows. One way was to compost, which some of the private entrepreneurs were doing. The second was to limit the salt intake the cows themselves were being given. I heard that made them want more water and thereby they'd produce more milk," said Andy Schlange, general manager of the Chino Basin Municipal Water District, from 1970 to 1975. "Composting seemed to be ideal."

Nitrates are chemicals that are ultra-soluble in water and easily pass through soil to accumulate in groundwater. Once there, they can last for decades and increase in concentration as more fertilizer is added. Health studies have shown ingestion of nitrates by infants can lower levels of oxygen in the blood, leading to the potentially fatal blue-baby syndrome. A 2010 report by the National Cancer Institute linked nitrates directly to thyroid cancer in humans. A study of more than 20,000 older women in Iowa showed that those who had consumed water that had nitrate levels of 5 milligrams per liter or above were three times as likely to develop thyroid cancer as women who consumed water low in nitrates. Five milligrams per liter is half the nitrate concentration EPA deems "safe."

Nitrates especially are prevalent in cow manure. "When contaminants from animal waste seep into underground sources of drinking water, the amount of nitrate in the ground water supply can reach unhealthy levels," the EPA notes. The federal agency set a regulation for nitrate in 1992. Known as a maximum contaminant level (MCL), this protective measure aims to establish a safe

As the years have progressed, development has encroached on historic dairyland.

health goal considering cost, benefits and the ability of public water systems to detect and remove contaminants using suitable treatment technologies. For nitrates, the MCL is 10 mg/L or 10 ppm.

Well before the health studies confirmed the danger or nitrates, the Chino Basin Municipal Water District formed a plan to address the problem. In 1989, it opened a composting plant that would convert cow manure into a salable soil additive from the 400 dairies that called the Chino Basin home.

Every day, the treatment plants were producing more than 120 tons of black, wet sludge, the residual, semi-solid material produced as a by-product during sewage treatment of industrial or municipal wastewater. The composting process would convert the sludge into a natural, useful fertilizing product to be used on crops. In addition, the Agency stood to save more than $1 million annually in costs it had been accruing to dispose of the immense volume of sludge.

"I think this is a win-win situation for everyone," County Supervisor Larry Walker said at a press briefing on the project. "We're talking about taking manure off the dairies' hands, mixing it with sludge, processing it in a natural way and shipping it as a profitable material out of the area."

For decades, leading up to the composting facility, Chino's dairies had disposed of manure by spreading it untreated on pastures or selling it to farmers. The nitrogen would supercharge crop growth, yet it produced nitrates.

At the time the composting plan evolved, residential development and urban development had begun to pave over spare pastureland. In addition, the number of acres of crops and orchards was waning, and that meant a declining market for manure used as fertilizer. Consequently, dairies were paying upward to $20 per cow per year to have the manure hauled away.

The Chino Basin Municipal Water District Changes Name

On July 1, 1998 the Chino Basin Municipal Water District changed its name to the Inland Empire Utilities Agency (IEUA) to better reflect the expanded regional responsibilities the District was undertaking. In 1950, when the District was formed, its primary mission was to obtain supplemental water from Metropolitan Water District of Southern California.

By 1998, the agency was providing regional wastewater service and imported water deliveries to eight contracting agencies. "Although the name has changed, the Agency's commitment is the same," wrote General Manager Robb D. Quincey in the 1998 annual report. "The Agency will continue to work to ensure reliable, high-quality water, wastewater, and other related-utility services are readily available when needed, and at some of the lowest rates in the State of California."

cbmwd

Inland Empire Utilities Agency

"Regulators, while understanding of the ranchers' plight, have nonetheless been quick to punish those who violate laws governing the handling of dairy waste. This year, fines of up to $40,000 have been imposed on dairymen whose waste management was deemed negligent," the *Los Angeles Times* article noted.

The contamination was prompting closure of many wells in the basin. And in other instances, water pumped from the aquifer had to be mixed with clean water before it was suitable for consumption.

The idea of a composting facility dated back to 1987. Both the Chino Basin Municipal Water District and dairymen contacted state Senator Ruben Ayala (D-Chino), who introduced a bill to run a composting facility at the nearby California Institute for Men. However, his bill to authorize the use of inmate labor was killed in the Assembly after protests from organized labor.

The revised 1989 plan featured an independent contractor to run the composting plant, located on a 100-acre parcel purchased by the Agency near the California Institute for Women, located between Chino and Corona.

Edward A. Girard, a Chino Basin Municipal Water District board member, told the *Los Angeles Times* reporter that the composting project would solve the agency's sludge disposal problem for at least 10 years. He added that solving the waste problem was "critical" to future plans to use the basin as a storage tank for water harvested in wet years and saved for use during droughts.

Chapter 7
Calming the Waters with a Grand Plan

While water recycling and other programs helped to address challenges of securing a reliable high-quality water supply in the basin, the declining amount of groundwater in the basin remained a concern.

The Optimum Basin Management Program (OBMP), ordered by the Superior Court in the 1998 ruling that also restructured the Watermaster responsibilities, was being prepared to detail steps to protect and maximize management efficiency of the basin. One of the focus areas was the recharge of the groundwater basin itself by replenishing it with stormwater, recycled water and even imported water.

Mark Wildermuth, owner of Wildermuth Environmental Inc., was contracted to serve as the engineer to lead the process to develop the OBMP, which, once implemented, would cost more than $800 million. From the onset of the planning process, water producers and other interested parties met twice a month for about a year. Special workshops also were held to develop the scope of work, and stakeholders included municipal representatives from the water agencies, the cities, industrial producers, regional water wholesalers and about 300 agricultural producers. In addition, more than 100 people in the region signed up to receive information and notifications during the process.

"There was an incredible amount of interest," said Scott Slater, who served as general counsel to the Chino Watermaster.

At first the workshops focused on what types of actions would affect positive change in the basin and, more specifically, what type of plan was needed to replenish the groundwater basin and use the water as efficiently as possible. The court approved the scope of work on November 5, 1998. From there, development of the OBMP included three parallel processes: institutional, engineering and financial.

The institutional process was the administrative arm. Its function was to set agendas and provide the organizational support and structure for later OBMP implementation. The engineering process focused on making sure the plan would work. Those involved with this portion analyzed and evaluated the technical and economic merits of the proposed management elements that were to become the meat on the bones of the OBMP. The financial process was tasked with developing alternative financing plans for the OBMP through its lifespan.

The OBMP was broken into "program elements," which were to be enacted through the years, especially as funding could be secured. For example, having a recharge master plan

(Program Element 2) with clearly defined financial and reliability benefits integrated with the OBMP, enabled IEUA to obtain $20 million in grant funding from voter-approved Proposition 13, also known as the 2000 Water Bond. The Agency also secured an additional $20 million in conventional municipal funding to construct recharge improvements. In addition, to help fund the Chino Basin

The Chino I Desalter began operation in 2001, and expanded production in 2005 from 8.4 to 14 million gallons a day.

Desalters (Program Element 3), IEUA and the Chino Basin Watermaster teamed up to obtain another $60 million in grants from Proposition 13.

As far as funding for other program elements, IEUA secured federal grants for its recycled water distribution system.

Once funding was obtained, the attention turned to realizing the actuality of the plan. Wildermuth conducted technical analyses to site new well fields for groundwater desalter systems and recharge facilities for stormwater, recycled water and imported water. And IEUA developed complex monitoring programs for water quality, surface water discharge, groundwater levels, stormwater recharge and subsidence. Amazingly, the Herculean task of developing the OBMP was finished in less than two years.

IEUA General Manager Richard Atwater testified before the water and power subcommittee of the state Legislative Committee on Resources on January 29, 2008. He touted the benefits of the regional OBMP in the Chino Valley "to meet the challenges of having less water available from the Delta and the related issues with developing a sustainable ecosystem. The Inland Empire Utilities Agency in partnership with many other agencies in Southern California and with financial assistance from the State of California and the Bureau of Reclamation is implementing a 'Drought Proofing Strategy' that is a key element of a Delta Plan.

"We have recognized the challenges for a long time of meeting the statewide water needs in an environmentally responsible manner … have committed over $500 million over the past seven years to implement projects that will develop new local supplies in Southern California and reduce our need for Delta exports," he testified.

"With the rapid growth, demand from (Metropolitan) could increase from 70,000 acre-feet per year currently to 150,000 acre-feet in 2020 if we did business as usual!" he testified. "However IEUA, Chino Basin Watermaster and in cooperation with many other agencies have developed a 'Drought Proof Plan' that will develop over 100,000 acre-feet of new local supplies to minimize the need for additional imported water from MWD, thereby reduce our need for more Delta (SWP) water supplies."

Atwater detailed specific water savings. For example, the Agency's regional water recycling project was projected to develop a new local water supply of 100,000 acre-feet per year while the desalters were expected to develop an additional 40,000 acre-feet per year. Conservation efforts would amount to a 10 percent savings, or 35,000 acre-feet of retention. About 500,000 acre-feet could be secured through new groundwater storage and conjunctive use programs, and an additional 25,000 acre-feet could be collected through stormwater capture.

The overall goal of the OBMP was for the stakeholders to take a basin-wide look at the region – ensuring that multiple demands and multiple needs were being met and that one party's solution was not another party's problem. The OBMP contained nine key elements covering a wide range of water activity in the basin:

- a comprehensive monitoring program
- a comprehensive recharge program
- a water supply plan for the impaired areas of the basin
- a land subsidence management plan for the western portion of the basin
- a regional supplemental water program
- cooperative programs with the Santa Ana Regional Water Quality Control Board and other agencies to improve basin management
- a salt management program
- groundwater storage management program
- conjunctive use programs

"The program elements drive our work, and it drives the information that we collect," said Watermaster Peter Kavounas. "Water levels dropped, and people finally came to the realization in the mid-1990s that they needed to manage this basin better. That's how OBMP came about; it was on the strength of we must have well-defined monitoring effort and management."

He emphasized the importance of comprehensive monitoring, noted in the OBMP: "The first element is 'gather data.' If you put it in historic perspective, in the 1990s, they didn't have enough data to understand the response in the basin or to understand water quality in the basin. They didn't understand land subsidence. They didn't understand surface water quality," he said. "So, the first big element is to gather data. And that took a big part of our budget, including the effort to establish the agreed upon data gathering protocol and scope in all these areas."

The focus was on the agricultural producers because they were the largest well-pumping segment and also the ones who were not being metered. Then, once metering was in place, the well-reporting numbers synched up. "In 1999-2000 you start to see a correspondence with what is being reported and what trues up with what the model knows, which are water levels," he said.

Kavounas said the lack of monitoring in the years following the Santa Ana River Judgment inhibited progress. "Back then, the Watermaster didn't proactively go out and meter wells – ag production was basically unmetered. And so, because it was unmetered, information was not reliable. And, as it turns out the numbers reported by ag were lower than what they actually produced.

Now, through modeling and refined analysis, it's possible to see how far off the reporting was in the past. For example, looking back to 1978, analysis and modeling indicates agricultural wells produced 120,000 acre-feet of water. At the time, agricultural users reported use of 90,000 acre-feet."

In the OBMP, the groundwater monitoring program requires constant efforts to collect water quality data from production and monitoring wells. This includes different types of monitoring: groundwater levels, groundwater quality, production, surface water quality and quantity, in addition to well construction, abandonment and destruction monitoring.

Cleaning Up Groundwater with Desalters

Supplying water was the primary focus for the first 50 years of IEUA's existence – water that was necessary to maintain the farming in the basin and later to support the expanding urban region. When the calendar turned the page into the 21st century, attention turned to water quality.

Over the previous decades, agricultural, industrial and residential water uses and waste disposal practices had degraded the groundwater as the resource was contaminated with nitrates, salt and Total Dissolved Solids (TDS). TDS is a measurement of the inorganic and organic substances found in water. These tiny contaminants at higher concentrations can pollute a water system, for example in streams, rivers and lakes. Although TDS isn't considered a toxic in itself, it represents the presence of a broad array of chemical contaminants. The most common chemical constituents in TDS are calcium, phosphates, nitrates, sodium, potassium and chloride.

Federal and California laws set water quality standards that must be met. For the Santa Ana watershed, these standards were established in the 1975, 1984 and 1995 Water Quality Control Plans for the Santa Ana River Basin by the Santa Ana Regional Water Quality Control Board (Santa Ana Regional Board).

A primary challenge was that the contaminated groundwater couldn't be effectively used and also potentially impacted water quality in the Santa Ana River.

A solution was found, and although it took millions of dollars, it was sound and, within a few years, was greatly celebrated. The solution was a desalter facility, which would pump contaminated, salty water from a series of wells, treat it and then transport it to customers or for disposal out of the region.

It all started with an 8- to 10-year period of negotiations to draft an amended basin plan by IEUA, the Watermaster and other stakeholders and the Santa Ana Regional Board, which ultimately agreed to the amended plan. In 1995, the Regional Board began a study with 22 water supply and wastewater agencies to develop a new TDS and nitrogen management plan for the basin and larger watershed. The study culminated in the Regional Board's adoption of a Basin Plan amendment in January 2004. This amendment included revised groundwater sub-basin boundaries, known as "management zones," revised TDS and nitrate-nitrogen objectives for groundwater and revised TDS and nitrogen wasteload allocations, among other findings.

All of these amendments were established to ensure historical groundwater quality was maintained in accordance with state objectives. IEUA and Watermaster proposed "maximum-benefit" objectives for a large portion of the Chino Basin. This maximum-benefit TDS objective was higher than the former ambient TDS concentration and allowed for recycled water reuse and recharge without mitigation.

To convince the Santa Ana Regional Board to adopt the maximum benefit objectives, IEUA and Watermaster demonstrated beneficial uses would continue to be protected. Second, they showed water quality consistent with maximum benefit to the people of the state of California would be maintained. Other factors – such as economics, the need to use recycled water, and the need to develop housing in the area – were also taken into account.

"The idea goes back to a solution that incorporates water quality with supply reliability," Kavounas said.

"How did they agree to do this? The concept is desalters. The idea was to build a series of wells – a picket fence line – and produce water, remove the TDS, meaning the salt, and then deliver it as potable water to a party who had rights to pump from the basin."

Initial construction began in September 1998 on the Chino Basin Desalination System Project. Chino I Desalter construction began in September 1998, and by August 2000 the facility was delivering water to area agencies with a capacity of 8 million gallons per day.

On September 25, 2001, the Chino Basin Desalter Authority (CDA) was formed under a joint exercise of powers agreement (JPA) by a group of seven local agencies: IEUA, Jurupa Community Services District, the Santa Ana River Water Company, the cities of Chino, Chino Hills, Norco and Ontario, as well as Western Municipal Water District in Riverside.

The Authority's job was to purify groundwater extracted from the southern portion of the Chino Basin through treatment at the desalter facility and then distribute it as drinking water to member agencies. Chino I Desalter was managed by IEUA. When the CDA was created, IEUA still operated the plant through a contract.

Expansion of Chino I Desalter to 14 million gallons per day (mgd) and the new Chino II Desalter 10 mgd was made possible in part with $48 million in funds from the Southern California Integrated Watershed Program. The total construction cost was about $80 million.

Together, the two desalters removed more than 7,100 tons of salt from the groundwater basin annually. In addition, the treated water that flowed from the facilities met the needs of more than 7,000 families in the west end of San Bernardino County. By 2012, Chino I Desalter was producing an average of 11.1 million gallons per day of drinking water and about 2 million gallons per day of brine, a byproduct of the process.

"The engineering concept is you have a picket fence line of wells that intercept water that would have otherwise flowed down and would pool and rise into the Santa Ana River, raising the TDS in the Santa Ana River going down to Orange County. So the picket fence of wells lowered the water table, does not allow water to get to the river and provides a control of the TDS that goes into the river. It is called hydraulic control," Kavounas said. "In addition, since it lowers groundwater next to the river, it actually pulls water from the river into the basin, providing more recharge into the basin."

In 2015, the CDA was producing 24,600 acre-feet per year of high-quality water that was delivered to the municipal water supply systems.

In addition to the high-quality water used by regional cities and agencies, the Brine Line is used by industries that incorporate processes that generate salty wastewater as a byproduct. This might include during manufacturing, or from cooling, boiler blowdown or other processes. That wastewater is too salty to be processed through IEUA's treatment facilities. However, it is able to be redirected from the local wastewater treatment plant to the Brine Line. Redirecting the salty wastewater reduces the salt discharged from treatment plants into the Santa Ana River, thereby protecting plants and animals dependent on lower salt water

The Peace Agreement

Management of the Chino Basin is now guided by the "Peace Agreement" of the Optimum Basin Management Program (OBMP) that was approved by the Chino Basin Watermaster and accepted by the Superior Court in 2000. The OBMP constitutes the integrated management plan for the Chino Basin. The goals of the OBMP are:

Enhance Basin Water Supplies. This goal applies not only to local groundwater, but also to all sources of water available for the enhancement of the Chino Groundwater Basin, including recharge of storm water runoff and recycled water, treatment and use of contaminated groundwater, reduction of groundwater outflow, and promotion of the direct use of recycled water

Protect and Enhance Water Quality. This goal will be accomplished by implementing activities that capture and dispose of contaminated groundwater, treat contaminated groundwater for direct high-priority beneficial uses, and encourage better management of waste discharges that impact groundwater.

Enhance Management of the Basin. This goal will be achieved by implementing activities that will lead to optimal management of the Chino Basin, including optimization of local groundwater storage, development of conjunctive use programs, and encouragement of production patterns that optimize yield and beneficial use and development of alternative water supply sources that maximize availability of groundwater and minimize land subsidence; and,

Equitably Finance the OBMP. This goal will establish an equitable financing plan that will spread the cost of OBMP implementation among the groundwater producers for each individual project required in the OBMP.

and reducing the salt that percolates into the groundwater basins.

Andy Schlange, Chino Basin Municipal Water District's fourth general manager, later became general manager of SAWPA, then called the Santa Ana Watershed Planning Authority. Celeste Cantú, current general manager of SAWPA, has referred to Schlange as the "father of SAWPA." John Rossi, former Chino Basin Watermaster from 2001 to 2004 and current general manager of Western Municipal Water District, also recalled Schlange's contribution during the time of the desalter planning.

"Andy Schlange saw the vision there and helped build the Chino I Desalter and the big brine line. Those were all done with Andy, thinking through not only what needed to be done, but – in those days there was not a lot of project management abilities – how to fund. Andy was remarkable, especially for his ability to work with the federal government. Andy was behind a lot of these things, a really smart, creative guy."

The Chino Desalter Phase 3 Expansion Project will expand existing operations in the southern portion of the Chino Valley. Once completed, expected in spring of 2017, groundwater extraction and treatment will increase from an existing 27,000 acre-feet annually to about 40,000 acre-feet annually.

The project consists of installing up to six new wells and new pipelines to deliver the raw water to the Chino Desalters I and ll. Also on the slate are new treatment facilities at the Chino ll Desalter to treat the additional raw water, up to four pump stations to transfer product water to potable water suppliers and new pipelines to deliver the treated water to water suppliers. A small amount of "reject water" will also be able to be disposed of through the Santa Ana Regional Interceptor Line for treatment in Orange County.

Peace Agreement Brings Harmony to the Region

The desalters were a key ingredient of the OBMP, and on June, 29, 2000, it seemed anyone who was interested in water assembled in Chino for a ceremony to acknowledge the signing of the Peace Agreement regarding the Chino Groundwater Basin. Nineteen parties signed the Agreement, which validated the OBMP, detailed the recharge master plan and spelled out a collaborative partnership and cooperative spirit among those in the Chino Basin.

"Before, there was a fractured relationship among members. The Peace Agreement was a key to success. It got them past the 'pointing-finger' stage," said Christina Valencia, IEUA's chief financial officer who started with the Agency in 1999.

The Peace Agreement resolution flashed back to 1978 and the Judgment which was entered to settle disputes that arose from time to time among and between water users within the Chino Basin. Although most people living and working in the valley didn't even think about where their water came from, the hidden infrastructure that permitted everyday life to continue was an intricate web of agreements, compromise and partnerships. The Peace Agreement was a culmination of 20 years of strife and a promise among stakeholders to work together for the greater good of the valley.

With court-adjudicated rights to the groundwater and storage capacity within the Chino Basin and the establishment of a Watermaster to manage the basin, "The aim was each producer should be able to produce both the quantity and quality of water to meet its water supply needs to the greatest extent possible from the water that underlies the producer's area of benefit," noted the Resolution.

There were the customary, exhaustive "whereases." Two key ones were:

> WHEREAS, the Parties wish to preserve and maintain Watermaster's role under the Judgment without compromising the Parties' collective and individual "benefits of the bargain" under this Agreement; and
> WHEREAS, the Parties intend that this Agreement shall enable the adoption and implementation of an OBMP consistent herewith, which will benefit the Basin and all Parties hereto;

The signing parties also agreed on a joint defense: "The Parties shall proceed with reasonable diligence and use Best Efforts to jointly defend any lawsuit or administrative proceeding challenging the legality, validity, or enforceability of any term of this Agreement."

They vowed no opposition to the OBMP: "No Party to this Agreement shall oppose Watermaster's adoption and implementation of the OBMP."

Signatories of the agreement were: IEUA, cities of Ontario, Pomona, Upland, Chino, Chino Hills; the State of California; Cucamonga Valley Water District, Monte Vista Water District, Fontana Union Water Company, Jurupa Community Services District, Three Valleys Municipal Water District, Western Municipal Water District, San Antonio Water Company, Chino Basin Water Conservation District; Kaiser Ventures, Inc. and representatives from the agricultural, appropriative and the non-agricultural pools.

In September 2000 the Superior Court approved the Peace Agreement and authorized the implementation of the OBMP.

Chapter 8
Bold Strides in the New Millennium

Entering the new millennium, leaders at IEUA realized they were facing a daunting future. Population in the seven-city service area had more than doubled since the 1980s and was projected to increase nearly another 50 percent the next two decades. In Ontario alone, the population of 722 in 1900 had exploded to 163,924 by 2000. The region's small cities and rural nature had been transformed; farmland, dairies and open space were increasingly being converted into subdivisions and shopping centers.

And the challenge was compounded. In addition to a growing urban population that demanded more water and sewage treatment services, the potential impacts of seasonal droughts and overall climate change pointed to fewer natural resources to quench the cities' thirst and meet their future needs.

Then-General Manager Rich Atwater welcomed the new century in the 2000 annual report, noting "by 'recycling' our water, our organic material, and generating clean, renewable energy, we will have a secure economy and protect our region's environmental values. These are exciting times. Through the vision and cooperation of the cities, local water districts, state and federal agencies, and private partners, IEUA is building a new future for the region."

That optimism was soon tested by the energy crisis of 2000-2001. Throughout California, power costs rose abruptly, creating an unprecedented impact on IEUA and its service area. For the first time in its 50-year history, the Agency experienced unreliable energy supplies. In January 2001 alone, there were 20 days of interrupted service. Amid price spikes, IEUA was forced to spend large amounts of cash reserves to install emergency backup generation so wastewater treatment operations would not experience further interruptions.

To make matters worse, Southern California was in the throes of a drought. The amount of rainfall during 2001 was dismal. Los Angeles, for example, received only 29 percent of its annual average – at the time it was the worst rainfall year in nearly a 100-year history.
In the Chino Basin, only 6 inches of rain fell, compared to the 16.9-inch annual average for the valley.

The IEUA Board of Directors took immediate action, adopting a Seven Point Energy Action Plan to get them through the crisis. The Plan also served as the definitive guide to the Agency's energy policy – ultimately shaping its renewable energy portfolio in upcoming years.

Among the seven points was a focus on being as efficient and thrifty as possible in office and plant operations and to promote conservation throughout the region. A key effort was to maximize self-sufficient operations and generate new local sources of energy for plant operations and related facilities, such as the Chino Basin Desalter, with excess generation available for sale to the grid.

During the energy crisis, IEUA evaluated its office and plant operations for conservation opportunities that could be implemented immediately. In addition, operators took advantage of the pipeline interconnections among the wastewater treatment plants to detain wastewater flows and shift operations so the use of power during critical peak periods could be minimized.

What Caused the Energy Crisis?

During the energy crisis in 2000-2001, the entire state experienced a shortage of electricity supply caused by a "perfect storm" of circumstances: suffering the impacts of a drought, a flawed state deregulation scheme, shutdowns of pipelines by the energy consortium Enron and delays in approval of new power plants. Throughout 2000 and 2001 the situation went from bad to worse, with rolling blackouts impacting many businesses dependent upon a reliable supply of electricity. During the last six months of 2000, decreased supplies of electricity caused an 800 percent increase in wholesale prices.

The state's hydroelectric plants were not able to help remedy the crisis. Drought conditions resulted in low runoff throughout the state – meaning less water was available to generate hydroelectric energy. Total hydroelectricity production in California for 2001 was 25 million net megawatts per hour (MWh), compared to 31.4 million MWh in 2002 and 36.3 million MWh in 2003.

For its efforts to reduce electrical consumption during the summer, IEUA earned Southern California Edison's "Beat the Peak Award." In all, the Agency was able to save 3.2 megawatts of electricity use during peak time periods, enough energy to power 3,000 homes, and decrease associated power costs by $450,500.

Pursuing the Concept of Homegrown Water

In the next year or so, the leadership at IEUA decided on a daring strategy to create a long-term reliable water supply and establish a viable sewage treatment system for the future. The goal was to be self-sufficient by developing local supplies of water the Agency could better control. At the time about one-quarter of the region's water was imported by Metropolitan through the State Water Project.

"We needed to figure out how to do more with less. What we came up with was a bold plan using innovative, new program elements," Atwater said.

The goal was to meet future water needs through increased local water development that included a laundry list of ways to better use – and reuse – the water available within the region. More conservation, increased use of recycled water, enhanced groundwater recharge, desalters and overall water efficiency were key components of the plan.

The first pieces of the strategy were already in place. IEUA had been recycling wastewater since the 1970s with the first major recycled water pipeline constructed in 1995 to expand the delivery. In addition, in the late 1990s, the Agency began its groundwater recharge with recycled water at Ely Basin. While these programs continued to develop, IEUA leadership looked to new endeavors to increase regional sustainability through efficiency, and eliminating waste and unreasonable use.

"As a utility that was a wastewater treatment agency, instead of disposing of waste we were looking to ourselves to solve our communities' problems," Atwater recalled. "We wanted to recycle and reuse every drop of water that we used. If we didn't use it locally it went down the Santa Ana River and Orange County took every drop."

Likewise, when it came to dairy waste, biosolids and organic materials, the idea was to clean them up and reuse them at home. Before constructing and operating a local co-composting facility in 1995, IEUA contracted with a hauler to transport the waste out of the area. As Southern California continued to urbanize, the agency would be forced to truck the solid waste farther and farther afield and at greater cost.

"We needed a strategy for managing organics locally," Martha Davis, IEUA's executive manager for policy development, told a reporter in 2007.

Davis has been a resounding voice for IEUA's progressive strategies. A July 20, 2009 *Los Angeles Times* article reported on the relationship between General Manager Rich Atwater and Davis, united in vision although from quite different backgrounds:

> "As a Metropolitan Water District official in the late 1980s, he helped kill a State Water Control Board proposal to cut water shipments from Northern California for environmental reasons, decrying the plan as a recipe for drought "forever" in the Southland.
>
> Davis grew up in Marin County and worked for Greenpeace after college.
>
> For much of the 1980s and '90s, she headed the small but tenacious Mono Lake Committee, which took on LA's mighty water brokers and won, eventually forcing the city to give up much of its water from the ecologically fragile Mono Basin on the edge of the Eastern Sierra.

RP-1 in Ontario has been in operation since 1948. The plant has undergone several expansions to increase wastewater treatment capacity to 44 million gallons per day.

When Atwater left MWD in 1990 to become general manager of two water districts in Los Angeles County, their interests converged. He was developing recycled water – a.k.a. cleansed sewage – to inject into coastal aquifers as a seawater barrier.

Davis' group, meanwhile, was exploring water recycling as a way for Los Angeles to make up for its Mono Lake losses. The two wound up working together to pursue federal funding and Atwater came out in support of the "Save Mono Lake" campaign.

When Atwater was hired to run the Inland Empire agency in 1999, he called Davis – though she had never envisioned herself as a water utility executive. 'Heavens no!' Davis exclaimed."

She did accept, and has earned a reputation as a stalwart presence in the water industry.

Christina Valencia, who joined IEUA in 1999 and became its chief financial officer, said Atwater took the Agency to new levels with the help of Davis.

"We were known as the 'wastewater agency.' He shifted our focus to recycled water plus conservation. Rich brought in Martha, and together they propelled us into a new level," Valencia said. "One of the ways was to see the massive amounts of cow manure not as waste but a potential energy source."

Managing Organics in a Better Way

IEUA commissioned an Organics Management Strategy in August 2000 to focus on the groundwater basin's water quality. The primary objective was to "seek to protect the Chino Groundwater Basin from infiltration of salts and nitrogen compounds generated on dairies so as to reduce the future cost of removing such contaminants from the groundwater." While the Agency had used some of the manure for composting, officials sought to find a new use for the enormous number of dairy cows and their excrement, which were threatening the quality of water in the basin.

IEUA partnered with the Milk Producers Council and local, state and federal agencies to create a program that would use digester technology to transform waste materials into renewable energy and fertilizer products while providing significant air and water quality benefits.

To put words to action, the Agency began to look into the acquisition of several sites for digestion facilities, which would be constructed in phases and expanded as necessary as needs increased for additional biosolids treatment.

IEUA had installed and operated anaerobic digesters for processing of biosolids, yet had only used a small amount of the methane gas for energy generation. Coming out of the energy crisis of 2001 and embracing the concepts of the Organics Management Strategy, the Agency had a clear view of its situation – it was the regional expert in operating sewage treatment plants and it had access to a steady supply of manure from 300,000 dairy cows within 10 miles of its RP-1 treatment plant in Ontario. The Board of Directors seized the chance to increase methane gas production and embarked on an aggressive program to develop additional digester capacity and to optimize the generation of methane.

Building on the concepts, the Organics Management Strategy Business Plan, released on May 31, 2001, included plans for construction of several anaerobic digesters and co-generation facilities at IEUA's wastewater treatment plants to treat collected dairy washwater, which contains high concentrations of manure. The biosolids from that washwater, as well as wastewater, would be anaerobically digested.

Generating Cow Power – Renewable Energy Efficiency Project (REEP)

In 2001, IEUA built on its Organics Management Strategy to ramp up to its "Cow Power" program to power more than just its treatment plants. After cow manure was processed, a portion of the methane would be used as supplemental energy to run two generators powering the Chino I Desalter. The remaining methane would be used to run micro-turbines, which would generate electricity – renewable energy – at the plant. The 2001 annual report noted the project was one of the largest commercial systems in the country to convert dairy cow manure into renewable energy.

The Renewable Energy Efficiency Project (REEP) was established in April 2003 at the Regional Water Recycling Plant No. 5 Solids Handling Facility (RP-5 SHF) in Chino. The facility had opened in 2001 to accept dairy manure for recycling and generating biogas. The REEP was conceived as a series of full-scale demonstration systems, designed to test and research innovative combinations of primary and secondary treatment processes that could generate energy using methane gas derived from local processing of food waste, dairy manure and other organic material.

California Secretary of Resources Mary Nichols attended the REEP dedication ceremony on June 3, 2002, along with more than 200 federal, state and local dignitaries. She was quite pleased with the program: "Chino will be a place that people from around the world will be visiting to see how you can take waste and turn it into a resource," Nichols said during her speech. Then with a flip of the switch, she powered up the two Waukesha generators to power the Chino I Desalter, which produces more than 8,000 acre-feet of drinking water annually for 20,000 families.

California Secretary of Resources Mary Nichols attended a dedication ceremony on June 3, 2002 to kick-off the onset of the Renewable Energy Efficiency Project, which promised to generate energy using methane gas derived from dairy manure and food waste.

As the project progressed, however, significant challenges emerged. There was excessive staff time required for overall facility operation; problems with manure delivery and debris, such as rocks, grit and even ear tags, which when discharged into the receiving tanks caused pump clogging; and finally, odors.

The beginning of the end came when the project was suspended due to exhaust system damage caused by detonation in the early stage of engine commissioning using digester gas. Then, changes in air emission engine regulations in 2008 hard-pressed the REEP engines, which were not designed to comply. And finally, the biogas supply was insufficient to continuously supply 90 percent of one engine's fuel requirements.

In February 2009, the Board of Directors voted to suspend REEP operations altogether after an internal review of project economics indicated that operational costs exceeded revenue. In addition, the manure supply was dwindling as dairies moved out of the region, according to the minutes for the Board of Directors meeting on February 18, 2009.

Going "Green" at Headquarters

The Agency has had several home offices since 1950. From 1950 to 1956, meetings rotated at offices in Fontana and Ontario. From 1956 to 1994, the headquarters were located at 8555 Archibald Avenue in Rancho Cucamonga. From 1994 to 2003, the offices were at 9400 Cherry Avenue in Fontana at the former Kaiser Steel executive offices. After the Agency outgrew the site, in the spring of 2000 the Board of Directors approved a plan to build a new headquarters on a 14-acre parcel that was formerly a dairy. The location would also become the site of the RP-5 wastewater treatment plant, which was under construction at the time. The complex was adjacent to a 22-acre parcel that would become Chino Creek Park, a public recreation space stocked with drought-tolerant plants and educational displays about water conservation and efficiency.

When the Agency opened the doors in 2003, the new headquarters complex and community Chino Creek Park were to be a very visible expression of the vision of promoting water recycling, composting, renewable energy and overall environmental resources management. The two buildings that housed the Agency's executive, management, administrative and engineering offices in addition to operations offices for RP-5 included a total working space of 66,000 square feet and completely energy-efficient.

The design earned IEUA the prestigious LEED Platinum certification in 2002. LEED, or Leadership in Energy & Environmental Design, is a green building certification program that recognizes the best building strategies and practices. LEED certification provides independent verification of a building's green features. To receive LEED certification building projects must meet strict prerequisites and earn points to achieve different levels of certification with the top rating being "Platinum." LEED certification signifies a healthier, more productive workplace that reduces stress on the environment by encouraging energy and resource-efficient buildings.

IEUA was the first public agency in the nation to have a building rated as LEED Platinum. Plus, built at $154 per square-foot – far below the industry standard of $180 to $294 per square foot for comparable buildings – the project was the first to achieve platinum certification at a cost below industry standards.

"We've tried to be at the leading edge on a variety of fronts. … It's a matter of integrating a green approach to our business practices. That is why the agency built a Platinum LEED 'green' building," Davis told a reporter. "We did it because we believe in conservation and knew it was a good business practice. And it is serving as a model for other public agencies throughout the nation."

IEUA focused on responsible use of water at its new headquarters. Recycled water is used to flush toilets and irrigate the landscape. Dual-flush toilets, low-flow urinals and other efficient plumbing fixtures further reduced the facility's use of potable water. Water-guzzling ceramic toilets, acquired through IEUA's community exchange program, were symbolically crushed and used as fill for the buildings' foundations. In all, the headquarters was expected to use 73 percent less potable water than it would with a conventional design.

Construction materials featured low-emitting paints, carpets, adhesives and composite wood products that reduced the off-gassing of volatile organic compounds. The design also featured good use of natural light, which entered the building through exterior and interior windows and skylights.

Electricity for the buildings is provided by both roof-mounted photovoltaic panels and methane gas generated by anaerobic digestion at RP-5. To keep energy consumption at the lowest rate possible, a reflective roof, efficient appliances, extensive daylighting and advanced lighting controls were installed.

While the headquarter complex's two 33,000 square-foot buildings were equivalent in size to 40 average-sized homes, the energy consumption equaled that of three or four average-sized homes. That would amount to a savings of more than $800,000 per year in energy costs.

General Manager Atwater viewed the headquarters building as a "catalyst of visionary and practical achievements. In setting this standard, it has helped IEUA build environmental awareness with community developers, cities and customers."

Kathy Tiegs, who worked at IEUA for more than 30 years first as a secretary for the customer service department in 1974 and later as an analyst with the water resources

IEUA Directors Gene Koopman (left) and John Anderson join Chino Mayor Dennis Yates in the breaking of high water-flush toilets during the groundbreaking ceremony for the Agency's energy-efficient headquarters in June 2002.

department, said she was proud of the environmental stewardship when they built the new headquarters and took advantage of the nearby wetlands to develop an educational park.

"The Agency was a leader in its time," she said. "The staff there has always been innovative and forward thinking and that to me is what continues to take IEUA forward."

She recalled the time before technology was available in the office and everything was done on paper.

"I remember when we were there in the Rancho Cucamonga office, there was a torrential rain. The roof was leaking, and when we came into work on a Monday morning in the front office, all our papers and everything was just soaked. So my colleague and I were innovative and found some string, and we hung it up and draped the papers over to try and dry them all out. That's a fun memory."

Chino Creek Wetlands and Educational Park

The Chino Creek Wetlands and Educational Park sets the perfect backdrop for the community to learn about natural water treatment and upland habitats. The park, located adjacent to IEUA's Headquarters in Chino, features 22 acres of native habitat and natural drainage, with 1.7 miles of trails landscaped with a wide variety of low-water use plants appropriate for the semi-arid climate of the Inland Empire and with informational signs and an interpretative center.

The park opened in 2004 and was partially funded by a state grant from the State Water Resources Control Board (SWRCB). IEUA and the Santa Ana Watershed Association (SAWA) partnered to establish the site.

Though the Water Discovery Program, IEUA offers free environmental education programs for school children taught by on-site naturalists who specialize in focusing on water conservation and watershed issues.


IEUA Headquarters

Since opening in 2004, the Chino Creek Wetlands and Educational Park has been a popular destination to enjoy nature and learn about water-use efficiency.

Elements of the Chino Creek Wetlands and Educational Park include:

- 22,000 various drought-tolerant plants
- More than 5 miles of irrigation
- 1.7 miles of trails
- 22 acres of habitat
- 6 connecting ponds
- 1 million gallons of recycled water flowing through the wetlands each day
- Wildlife monitoring stations
- Pipe garden showing how to save water

Conjunctive Use Agreement Saves Rainy-day Water for Dry Times

Another bold move in the new millennium looked downward to improve overall water supply reliability. The Agency was eager to begin a "conjunctive use" program, the practice of storing surface water in a groundwater basin during wet years when there is ample supply, and withdrawing it from the basin during dry years when there is less readily available water.

In 2003, Metropolitan partnered with IEUA, Three Valleys Municipal Water District and the Chino Basin Watermaster on a project designed to bank water underground in the Chino Basin. Increasing water storage capacity was an ongoing goal of agencies throughout the state and with the costs and controversies of building surface storage reservoirs, more and more agencies began to consider storing water underground – in depleted aquifers with available space. The subsequent Conjunctive Use Program (also referred to as the Dry Year Yield Program), developed by the three agencies was unique in that it allowed for agencies to cross county boundaries. Under terms of the agreement, the deal provided for a 100,000 acre-feet storage account. Upon a call by Metropolitan, program participants could extract up to 33,000 acre-feet a year– enough for more than 65,000 families – during dry spells, droughts or emergencies in lieu of receiving regular water deliveries at a Metropolitan service connection. The program provided funding for development of facilities needed for extraction of stored water.

"This was rather unique," said John Rossi, who was Chino Basin Watermaster from 2001 to 2004 and now is the general manager of Western Municipal Water District. At the time of the agreement, Metropolitan did not allow agencies or entities to cross county boundaries: "So here in the Chino Basin," Rossi said, "there are three Metropolitan member agencies that overlie the basin – there's the small portion in the Pomona area, which is Los Angeles County. IEUA has the bulk of the 220 square-mile basin and then Western Municipal Water District has the southern portion, and that's in Riverside County."

At the time, when the agencies signed the 25-year agreement, Ronald Gastelum, Metropolitan's president and chief executive officer, commented, "Groundwater storage projects like this illustrate how the region puts together the pieces of our water supply reliability portfolio. We look for opportunities to store water when it's available for

Garden in Every School® Program

More than 19,000 students have participated in IEUA's award-winning Garden in Every School® program since 2004. The goal of the program is to educate students and the community about water-wise usage through a garden landscape featuring drought tolerant plants and efficient irrigation.

Schools receive a grant valued at $4,500 for IEUA to assist in the installation of a 2000 square-foot or less garden. The garden is a hands-on project that is designed and created by teachers, parents, students, and program staff.

Sponsors of Garden in Every School include IEUA and the Regional Conservation Partnership, comprised of the Cities of Chino, Chino Hills, Ontario, Upland, Cucamonga Valley Water District (City of Rancho Cucamonga), Monte Vista Water District (City of Montclair), Fontana Water Company and San Antonio Water Company (City of Upland). Garden in Every School is a registered trademark of the National Garden Association.

Participating schools for 2014 included Citrus Elementary, Eagle Canyon Elementary, Truman Middle School, Cortez Elementary, Etiwanda Colony and Golden Elementary.

times when it's needed, particularly during dry years."

Atwater then called the deal "a historic agreement that has been in the works since 1984." In retrospect, in 2015, he said, "In 1986, Metropolitan proposed a groundwater storage project for 1 million acre-feet in the Chino Basin. It didn't go forward, because the dairies and the history of agricultural waste meant the basin was going to have nitrate problems. Metropolitan's thinking was, 'why would we store perfectly good water in this groundwater basin that's going to have problems?'"

"Fifteen years later, we figured it out in Southern California. Today, you can't afford not to clean up all the groundwater basins. They just are too much of a valuable resource," he added.

Later that year, in November, Metropolitan and IEUA agreed to storage terms, and Metropolitan funded $1.6 million for costs associated with California Environmental Quality Act compliance and preliminary engineering studies for the $27.5 million facilities.

Metropolitan also agreed to modify the Carbon Canyon Reclamation Local Projects Funding Agreement and to assist in the refurbishment of existing replenishment connections and the construction of one new replenishment connection.

The Chino Basin Groundwater Storage Project with Metropolitan would allow up to 100,000 acre-feet of water to be stored by Metropolitan during wet years. In times of imported water shortages, such as in drought or emergencies, the new facilities would produce 33,000 acre-feet during a 12-month period. The new facilities funded by this agreement would be owned and operated by IEUA's eight member utilities: the cities of Chino, Chino Hills, Ontario, Pomona and Upland, as well as Cucamonga Valley Water District and Monte Vista Water District and Jurupa Community Services District.

As part of the deal, Metropolitan would be able to call on the participating agencies to reduce their imported water demand through its Dry Year Yield Program. Each of these agencies agreed to a pre-approved amount as a specific shift obligation. Added together, these would provide Metropolitan with a total of 33,000 acre-feet of dry year yield. The city of Chino would provide 1,159 acre-feet, city of Chino Hills 1,448 acre-feet, Cucamonga Valley Water District 11,353 acre-feet, Jurupa Community Services District 2,000 acre-feet, Monte Vista Water District 3,963 acre-feet, city of Ontario 8,076 acre-feet, city of Pomona 2,000 acre-feet and city of Upland 3,001 acre-feet.

Efficient Use of the Resource

IEUA was dead-set on making efficient use of the water across the basin. Already the cornerstones were in place at the turn of the century: recycled water, conservation and efficient use of the valuable resource.

While the Agency strived to beef up its recycled water program to provide up to 20 percent of the region's total water need – focusing on outdoor irrigation and in industrial processes – the efficiency program was busy distributing low-flow fixtures and educating people about irrigation efficiency.

"Since potable (drinkable) water is a limited resource, it only makes sense to use as much recycled water whenever possible," Atwater told the Santa Ana Regional Water Quality Control Board in testimony.

He noted IEUA's four treatment plants were recycling more than 70,000 acre-feet of water each year. "Using recycled water will conserve potable water that is currently being used for these purposes, offering our residents a reliable alternative water supply source and at the same time helping to 'drought proof' our region," Atwater said.

Industrial customers fell in line. For example, in 2001 an agreement was reached with Reliant Energy for the use of recycled Prado Wetlands recycled water. By using recycled water, Reliant Energy Etiwanda, Inc., which was the largest industrial customer in IEUA's

When Chino Basin Municipal Water District purchased property from the Ito Family (where RP-5 is located today) there was a beautiful tree which the Ito children called the broccoli tree. The tree needed to be removed due to the widening of Kimball Avenue. Chino Basin Municipal Water District (now IEUA) retained the services of a wood miller who received a great deal of wood from the tree to make a wood carving to replicate the tree and mill benches throughout the park and wetlands. After the attack on Pearl Harbor, HI, people of Japanese descent living in the United States were sent to internment camps. Mr. Kow Ito, his brother Ken Ito and their families were sent to a camp in Arizona for seven years. The Ito's farmhands grew crops and used the money to pay taxes and maintain the land. After the war, they returned to their farm in Chino.

service area, conserved 3,000 acre-feet of potable water annually – enough for 6,000 homes, according to the 2002 annual report.

In order to meet its goal to reduce water demands by 10 percent, the Agency pursued customer conservation programs, such as the Inland Empire Landscape Alliance, in which cities and water agencies within IEUA's service area worked to promote outdoor conservation including turf reduction rebates, use of California-friendly native plants and new regional model landscape ordinances to promote water savings. Other programs included conservation rebates offered in partnership with the Metropolitan Water District of Southern California (ultra-low-flow toilets, weather-based irrigation controllers, synthetic turf, efficient sprinklers, water brooms, X-Ray recirculation units and other water-saving devices), landscape audits, and school education programs including the award-winning Garden In Every School program.

Since 1991, the Agency estimated about 12,000 water-wasteful toilets had been replaced with ultra-low flush toilets, saving more than 1.3 million gallons of potable water. Other outreach programs included sponsoring water education science programs at local high schools and landscape irrigation training programs.

IEUA, its retail agencies and Metropolitan also offered rebate programs that rewarded customers for using water efficient fixtures and appliances in and around the home as well as in business and industry.

Chapter 9
Renewing the Source

In the early 2000s, groundwater was still the Chino Valley's No. 1 source of water, and through the years it became better understood and appreciated. It also had become more and more depleted. But perhaps more importantly, it had 1 million acre-feet of space not being used. The Chino Basin Watermaster took the lead to figure out a way to enhance groundwater storage. The potential for increasing annual groundwater recharge capacity was estimated to be more than 100,000 acre-feet per year from a combination of improved stormwater capture, recycled water and imported water.

"In the 'old' days, the county wasn't maintaining recharge basins nor percolating stormwater. There was no money to replenish water, six customers for recycled water and only reused less than 1,000 acre-feet," former General Manager Rich Atwater recalled. "All that changed dramatically from 2000 to 2008."

For the most part, as dairyland transformed into urban communities, the conventional wisdom was to get excess water away from development as quickly as possible to prevent flooding. And, as urban areas grew, soils and natural surfaces that once absorbed excess water and filtered pollutants were built over with impermeable surfaces, such as buildings, roads, parking lots and sidewalks.

Chino Basin Groundwater Fast Facts

Groundwater Level Trends: Groundwater levels declined about 80 feet from historical high marks in the 1920s by 1980. By 2000, water levels had recovered about 20 feet.

Groundwater Storage: Groundwater Storage Capacity. Total storage within the Basin was 18.3 million acre-feet in 1971(DWR).

Groundwater in Storage: Water in storage in 1982 was estimated to be 8.6 million acre-feet (CDMI 1983), 5.3 million acre-feet in 1997and 5.325 million acre-feet in 2000 (Malone 2002).

Groundwater: Total groundwater production in the Chino Basin was estimated at 145,735 acre-feet during the 1997-1998 water year, 162,267 acre-feet for 1998-1999 (CBW 2000), 178,820 acre-feet for 1999-2000 and 161,475 for 2000-2001 (Malone 2002).

Thus, when it rains, the water hits these hard surfaces, it starts rushing "down" – down roofs, and gutters, and then as the runoff picks up pollutants along the way, it flows downhill to find the quickest escape route through concrete conduits, streams and rivers. This alteration of natural water flow characteristics, known as hydromodification, has severe implications. With no natural filtering, hydromodification sweeps everything from oil and pesticides to animal feces and trash downstream.

Besides water quality impacts, hydromodification has serious effects on water supply. One inch of rain falling over a paved area one acre in size produces 27,000 gallons of water. Compound that figure to cover a large urban area and the effect of the stormwater flow becomes a huge loss of water literally right down the drain. In the Chino Basin, urbanization and the construction of flood control facilities that expedited the conveyance to the Santa Ana River, the loss was calculated at an average of 40,000 acre-feet per year of the stormwater that historically had recharged the groundwater aquifer.

The Chino Basin Watermaster made capture of stormwater a top priority in the mid-2000s. The idea was to slow runoff flows and divert them into a pond or lake to turn what was viewed as waste into new supply to recharge the groundwater basin. By making improvements to flood control facilities and modifying the recharge basins, approximately 23,000 acre-feet per year could be captured.

The *Los Angeles Times* described the new project this way in a July 20, 2009 article headlined: "Utility Reverts to the Long Ago and Not-So-Far-Away." The article described the 25-foot-deep catchment south of East Riverside Drive where, after winter showers, rainwater began to seep into the sand and gravel at a rate of a quarter-foot a day, "starting a years-long, subterranean journey to the utility's well fields a few miles south."

"By the time it arrives, it will have mingled with natural drainage from the San Gabriel foothills, as well as treated wastewater, other storm runoff and some imported water the district uses to help replenish the aquifer," the article said. "At the wells, pumps suck the brew into desalting plants that strip out contaminants, including the nitrates and salts left by a century of farming. From there, the purified water goes to the bathrooms and kitchens of Chino, Norco, Ontario and Chino Hills."

Participating in a 2001 groundbreaking of Regional Plant No. 5 and new IEUA headquarters were (left to right) IEUA General Manager Richard Atwater and Board Members Gene Koopman, John Anderson, Anne Dunihue, Wyatt Troxel and Terry Catlin; John Withers of Lewis Operating Corp.; City of Chino Councilmember Eunice M. Ulloa; California State Assembly Member Gloria Negrete McLeod and San Bernardino County Supervisor Fred Aguire.

Beyond stormwater capture, the Watermaster made the second priority across the basin the use of recycled water to store in the aquifer. The Santa Ana Regional Water Quality Control Board took groundbreaking action in 2005 when it issued the state's first permit for the use of recycled water for groundwater recharge for indirect potable reuse, which received unanimous local and statewide support. By 2005, more than 60,000 acre-feet of recycled water was being produced through the recycling program each year, with about 20,000 acre-feet being used within the Chino Basin. In 2007, the permit was updated to include additional recharge sites.

Purple pipes are reserved for recycled water to help differentiate it from potable water.

When the site for the new headquarters and RP-5 was being prepared for construction, IEUA's engineering, energy and water resources department was busy trying to reinstate the Ely Basin Recycled Water Groundwater Recharge Project of 1977. Put out of commission years before, the idea was to reactivate it to store recycled water from RP-5 once it was up and running. In September 1999 the Agency began delivering recycled water from RP-1 to Ely Basin at a rate of about 2 million gallons per day. From September through December, 471 acre-feet were recharged to the aquifer. The basin soon was replenishing 500 acre-feet per year with the capability of storing up to 2,500 acre-feet per year.

"The [Chino] Basin will serve as a model for future recycled water recharge projects," noted Neil Clifton, manager of Engineering, Energy and Water Resources in the Agency's 1999 Annual Report.

From 2000 to 2010, the Agency spent more than $60 million to expand its recycled water distribution system. In 2010, about 15,000 acre-feet of water was being recycled annually. That number jumped more than three times that amount when the Board of Directors approved an accelerated plan to increase annual recycled water use to about 50,000 acre-feet in three years. They would do this by constructing a "purple" recycled water pipeline system to connect to existing large customers, such as schools, golf courses, city parks and groundwater recharge. IEUA's board approved a $140 million budget to expedite the construction of the recycled water pipeline distribution system. The fast-tracked plan was developed and approved by many stakeholders – local cities, water districts, the Chino Basin Watermaster and others. In addition, IEUA and local cities coordinated with developers to incorporate dual "purple" piping into new urban developments to maximize recycled water use for non-potable purposes.

The savings were immediate. Energy demands to produce and deliver recycled water were cheaper than importing water to the region. IEUA achieved additional energy savings by building smaller water recycling plants in the northern part of the Agency's service area to provide recycled water to communities – in Upland, Fontana and Rancho Cucamonga – without the need to pump the water to them.

About one-quarter of the recycled water began to be used for groundwater replenishment within the Chino Groundwater basin to augment the potable water supply. The plan was to blend recycled water with stormwater and imported water to ensure that all water sources were conserved in an optimal manner to eventually recharge 80,000 acre-feet per year into the basin.


At Montclair 1, part of the Agency's groundwater recharge operations, water coming from San Antonio Channel flows over two stop log structures and a Parshall Flume which are used to measure cubic feet per second.

The third priority for recharge was the use of imported water supplies. The Groundwater Recharge Master Plan identified opportunities to use these supplies during wet years when surplus water was available.

In 2002, the Chino Basin Watermaster, Chino Basin Water Conservation District, San Bernardino County Flood Control District and IEUA formed a partnership to implement the Chino Basin Groundwater Recharge Master Plan. Called the Chino Basin Facilities Improvement Project (CBFIP), this award-winning $40 million construction program within IEUA's service area resulted in the modification of 18 existing recharge sites and the construction of one additional facility. The five recharge facilities in the Basin were Deer Creek, Day Creek, East Etiwanda, San Sevaine and Victoria.

The Agency took on the extensive task of modifying the inlet and outlet structures to better channel stormwater. Improvements included earthwork to improve water percolation, as well as the construction of pump stations, conveyance facilities and turnouts from IEUA's Regional Recycled Water Distribution System and Metropolitan's Foothill Feeder.

Another chief focus was incorporating Best Management Practices (BMPs) in new developments to improve recharge opportunities through more infiltration and reducing the amount of water lost from the groundwater basin.

By participating in these practices, local communities would have an easier time implementing the Stormwater Management Program Permit issued by the Santa Ana Regional Water Quality Control Board to San Bernardino County in 2005 and with future Total Maximum Daily Load (TMDL) requirements.

In 2003, developer Randall Lewis was one of the first to incorporate BMPs into the design of one of his planned communities. At The Preserve, he installed pipes to carry reclaimed water to common areas so that median strips and parks were irrigated with recycled water. Many areas were landscaped with drought-tolerant plants instead of grass. Runoff from streets was directed into a 20-acre basin, which filters the water before it flows into creeks and percolates back into the aquifer.

Closing the Loop in Organics Recycling

By the mid-2000s, IEUA was supplying imported and recycled water, and providing wastewater treatment services to residents in seven cities in the Inland Empire. Still, the growing population was adding challenges – namely what to do with the 75,000 tons a year of biosolids being created during the wastewater treatment process at the agency's five wastewater facilities.

The challenge was nothing new. Back in the mid-1970s, the disposal of "sludge," the solid by-product of the wastewater treatment process, was a major concern. Historically, the agency composted its sludge and sold it to farmers and weekend gardeners for use as a soil amendment. The agency's 40th year anniversary publication (from 1990) noted, "However, bans on coastal communities dumping sludge into the ocean later made the supply greater than the demand, and rapid development in the Chino Basin reduced the number of agricultural markets making use of the material."

Since the 1970s, the Agency had been toying with the idea of composting. First was the plan to compost one part sludge from district facilities and seven parts manure collected at nearby dairy farms to produce a saleable soil amendment and conditioner. One hundred acres of the Chino Agricultural Preserve property near the California Institution for Women was purchased and transformed into a co-composting facility in 1995. Although this project would not be a revenue-generating venture, the costs would be much less than other alternatives. More importantly, the project would allow both IEUA officials and dairy farmers to dispose of sludge and manure in an environmentally sensitive manner.

Next came a large outdoor composting site in Chino since 1995. After being treated at the plants, the biosolids were delivered to the compost facility and piled in long rows, then turned to mix and remove moisture. The site produced about 250,000 tons of compost per year for use in fertilizer and soil conditioner, which was trucked out of the region to use on crops in the San Joaquin, Imperial and Coachella valleys, as well as to Arizona for direct land application on nonfood crops such as cotton.

However, as urbanization crept closer to the site and regulatory requirements – especially concerning air quality – became stricter, the facility had to close in 2006. Throughout its 11-year history, more than 1.3 million tons of manure and biosolids had been converted into compost.

With the Chino facility closed and encroaching development shutting off options for odorous outdoor operations, IEUA took a bold step and decided to build the nation's largest indoor composting facility. In 2003, the agency found the ideal site in Rancho Cucamonga, which turned out to be a 452,320-square foot warehouse formerly occupied by IKEA. The site was chosen for close proximity to two major interstates, the I-15 and l-10, which could easily handle commercial truck traffic, as well as consistency with neighboring land uses – the entire property is 24.4 acres, and it has a maximum security prison and a large retail warehouse facility as neighbors. The closest residence is a mile away. And most importantly, the site is next door to IEUA's Regional Wastewater Treatment Plant No. 4.

Construction to retrofit the building began in 2003, and was completed in April 2007. Total building costs were $85 million, which included engineering and purchase of the property and original structure.

Taking the composting process indoors was quite a feat. Yet, once the building was retrofitted and the process adapted to a new setting, the results were incredibly successful, said Greg Barron, compost facility superintendent.

"The composting facility is completely enclosed to control odors to meet stringent air quality regulations," Barron said. "When we moved indoors, there were new challenges. But we could control the environment; here, there is no rain or wind, and we can control the temperature. It makes it easier to produce a consistent, good-looking product."

The composting facility, called the Inland Empire Regional Composting Facility, was constructed under a Joint Powers Authority agreement between IEUA and the County Sanitation Districts of Los Angeles County (CSDLAC). Both agencies were facing the challenge of what to do with tons and tons of wastewater biosolids generated from their wastewater treatment plants. Based on studies, they determined composting was the most economically and environmentally sound method of recycling these materials. Plus, an additional market was created to collect local "green waste," recycled wood and yard trimmings needed for the composting process. Also, the partnership forged a larger budget than possible if each agency had built a comparable operation on its own.

The agencies later formed Inland Empire Regional Composting Authority to operate the composting facility. Today, it has reached its capacity and has produced more than one million tons (1.3 million cubic yards) of high-quality compost each year, an amount that would fill the Rose Bowl three times!

A chief benefit of composting is it "closes the loop," said Project Manager Jeff Ziegenbein. "We are creating quality compost from biosolid material generated in this area.

The Inland Empire Regional Composting Facility is housed in a 454,000 square-foot facility that was a former IKEA furniture warehouse.

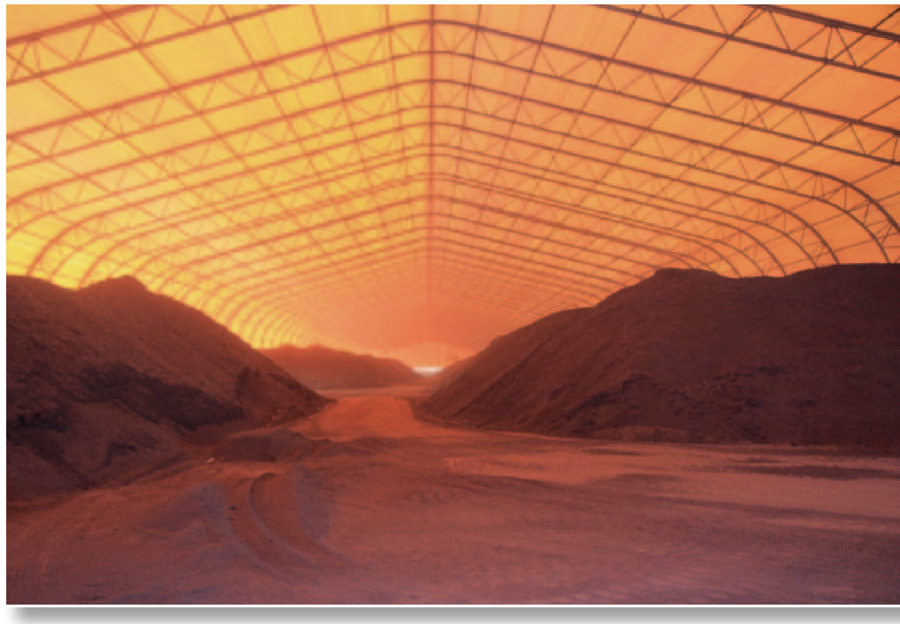
People who live here grow food; they play and recreate here. They also produce waste. Through our wastewater treatment facilities and composting facility, we transform that waste into a valuable resource through composting. In turn, our compost goes back into the community to fertilize parks and be used in gardens and landscaping. It's a complete local recycling cycle."

The Inland Empire Regional Composting Facility receives about 410 wet tons – 16 truckloads – of biosolids and recycled waste products each day from the IEUA treatment facilities and Los Angeles. That's about 150,000 wet tons every year.

To help with the composting process, about 60,000 tons a year come from wood waste; yard trimmings; bedding waste from local equestrian centers including Disneyland and Hollywood Park; and landscapers and tree trimmers. Other materials are received from local material recovery facilities that separate wood wastes and grind the material to meet precise specifications. In all, the composting facility has 20 different sources for its green waste.

Trucks deliver both biosolids and green waste to the facility every day, 365 days a year, and unload the material in an indoor enclosure to ensure odors are controlled. Green waste suppliers deliver clean, chipped material and pay a modest tip fee based on the quality and volume of the materials. The biosolids' generators pay a fee set by the Board of Directors covering the majority of the operating costs at the facility.

The green waste serves as bulking agents, which is coarse matter that breaks down slowly in a windrow (a compost pile), and is crucial for air circulation. This material is unloaded into a designated area where



The composting facility features a covered storage area that is 144,000 square feet (about 3.3 acres).

it is blended and scooped into an amendment hopper with a front-end loader. The hoppers feed the material onto belt conveyors that measure it and take it to be blended. From the trucks, the biosolids are dumped directly into hoppers to begin the process of being blended with the green waste. Once blended, the material is conveyed to an active composting area where windrows, about 12 feet tall, 175 feet long and 20 feet wide, are created using front-end loaders.

The process, known as Aerated Static Pile (ASP) Composting, is an EPA-approved method that forces air through the piles of biosolids and green waste. The composting facility uses this method by drawing air though the compost piles with fans and exhausting the foul air through a biofilter.

The total process takes about 60 days. In the first few weeks of composting, temperatures are much higher due to the high level of microbial activity within the compost piles. Microbes break down the carbonaceous material transforming it into humus-like compost. The material is then aged (cured) for about a month allowing it to cool down and stabilize before it's screened for customer use.

Marketed as SoilPro Premium, the compost is high quality and highly consistent thanks to the indoor composting process that protects the material from weather.

Marketing Compost

After the main building was retrofitted, another covered, but open-sided facility was built for compost storage. The 3-plus acre facility can hold nearly three months' production of compost (about 50,000 cubic yards), often required during winter months, when sales are typically slow.

Marketed under the brand SoilPro Premium Compost, the product is described as "a wood-based, nutrient rich compost made from recycled green waste, biosolids and horse stable bedding proven to save water and produce direct benefits to soils and crops in both horticulture (lawns and gardens) and agriculture (vegetables, fruits, nuts, and hay crops)."

The finished product has a consistent quality. Today, more than 100 customers use the compost for a variety of uses, such as to prepare soil for turf and other vegetation on both public and private properties.

Local cities that provide feedstock to the facility also use the compost in their public places. More than 15 cities – including the eight cities partnered with IEUA – representing more than 1 million residents participate in a "take back" program.

Keeping Odors at Bay

Environmental protection, being a good neighbor and keeping odors to a minimum were cornerstones of the facility's design.

The windrows of the blended material being composted are constructed over an aeration system, which draws air through the pile using an in-ground pipe and spigot system with hundreds of small air distribution grates in the floor. Each pile also has an aeration blower that exhausts to the facility's biofilter. The blowers, controlled manually by operators, regulate pile temperatures for the most efficient composting. More than 75 probes monitor temperatures in compost piles throughout the facility.

Air inside the building is completely exchanged at least six times per hour, and exhausted to the enormous outdoor biofilter, which naturally controls and treats odorous air and dust. The biofilter consists of more than 50,000 cubic yards of chipped wood piled over 3 acres.

"Our biofilter is essentially a wet pile of wood. It's a natural process and, the beauty of that is you don't have to have a full-time engineer with a bunch of fancy instruments. We have to maintain it for moisture and make sure the air is moving through it appropriately, and size the pieces of wood appropriately and things like that. But biofilters work," Ziegenbein said. "For odor control, and for compliance with air quality districts, a biofilter is a very good tool."

Recycled water is used to keep the moisture content optimal at about 55 percent. Exhaust air slowly travels through the 8-foot deep bed, providing at least a full minute of exhaust air contact time. This residence time has been shown through numerous tests to remove 94.8 percent of the volatile organic compounds (VOCs) and 100 percent of the ammonia, as well as virtually all of the odors produced at the facility.

Meeting the air quality standards and reducing pollution is important in the South Coast Air Basin, which includes all of Orange County and urban areas of Los Angeles, Riverside and San Bernardino counties. The basin has been called "the smoggiest region of the U.S." by the South Coast Air Quality Management District (SCAQMD). Sadly, it consistently registers unhealthy amounts of PM1O (particulate matter less than 10 microns) and is an "extreme ozone nonattainment area." Ammonia is a precursor of PM10 and VOCs are precursors to ozone.

To combat the pollution, the SCAQMD has adopted one of the most stringent air quality rules in the country: Rule 1 133.2, "Emission Reductions from Co-composting Facilities," requires that VOC and ammonia emissions emanating from composting operations must be reduced by a minimum of 80 percent. IEAU's composting facility has not only met, but far exceeded, the minimum standards of the rule.

Thus the American Academy of Environmental Engineers gave IEUA its Excellence in Environmental Engineering Honors Award in Operations/Management for the composting facility. In addition, in 2013, the composting facility received the Governor's Environmental and Economic Leadership Award for the design and construction of the fully enclosed composting facility.

"We are truly honored to be recognized with this award," said Gene Koopman, composting facility board vice chairman and IEUA director, at the time. "This recognition manifests the wisdom and foresight of both agencies' boards and staff and their commitment to providing a cost-effective and environmentally friendly solution for their agencies' biosolids recycling needs now and for the future."

All the air collected in the enclosed composting building is vented to a 3-acre biofilter that removes more than 80 percent of the ammonia and VOCs generated in the composting process.

Chapter 10
Stepping Up the Drought-Proofing

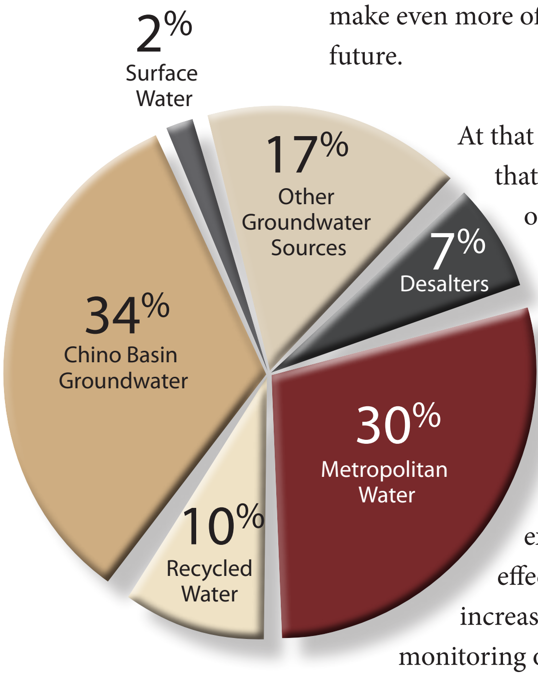
It's true, there is no such thing as "new water." The water on the planet has been around since the beginning of time. It's naturally recycled: rain falls into lakes, evaporates and goes back up into the clouds to turn into rain again, and sometimes it is saved in places such as springs, aquifers and even in polar glaciers. With every single drop accounted for, it is impossible for "new water" to form on earth.

In light of uncertainty with the amount of water imported from the Delta and the environmental restrictions on that water, IEUA extended its vision in 2010 with a plan to seemingly tap "new water" by stretching local supplies. The idea was to get more out of existing groundwater, conservation and with innovative measures to maximize use efficiency.

The strategies were detailed in the Agency's Urban Water Management Plan (UWMP), required to be updated every five years by the California Department of Water Resources (DWR). Beginning in 2010 agencies also had to forecast reliability of their water sources during a 20-year planning cycle, including a

progress report on a 20 percent reduction in per-capita urban water consumption by the year 2020.

Beyond mere pencil-pushing, IEUA's UMWP contained real strategies that were already making a difference and held the promise to make even more of a positive impact in the future.



2015 water supply sources.

At that time, IEUA determined that in order to reduce reliance on imported Metropolitan water, significant increases in the use of groundwater, recycled water and desalter water would be needed. Local supplies were key: "The expansion of use of local supplies is expected to have a positive effect on water quality and an increased focus on water quality monitoring of local supplies," the UMWP noted.

Potential water gains were calculated for several programs, including water conservation, which was estimated to save 28,500 acre-feet; groundwater storage and stormwater capture, which was estimated to collect 23,000 acre-feet per year; and maximized use of recycled water, which was projected to generate 104,000 acre-feet by 2025.

General Manager Richard Atwater told a *Los Angeles Times* reporter in 2010, "You need to be strategic, look at long-term trends, and pick your targets carefully. Options need to be carefully studied by a diverse team to confirm that there's a reasonable return on investment and limited downside risk."

He pointed to a large program costing several hundred million dollars that was underway to increase local groundwater storage and recycled water use, and recover groundwater by removing contaminants through advanced treatment at the Chino Basin Desalters and well-head ion exchange treatment.

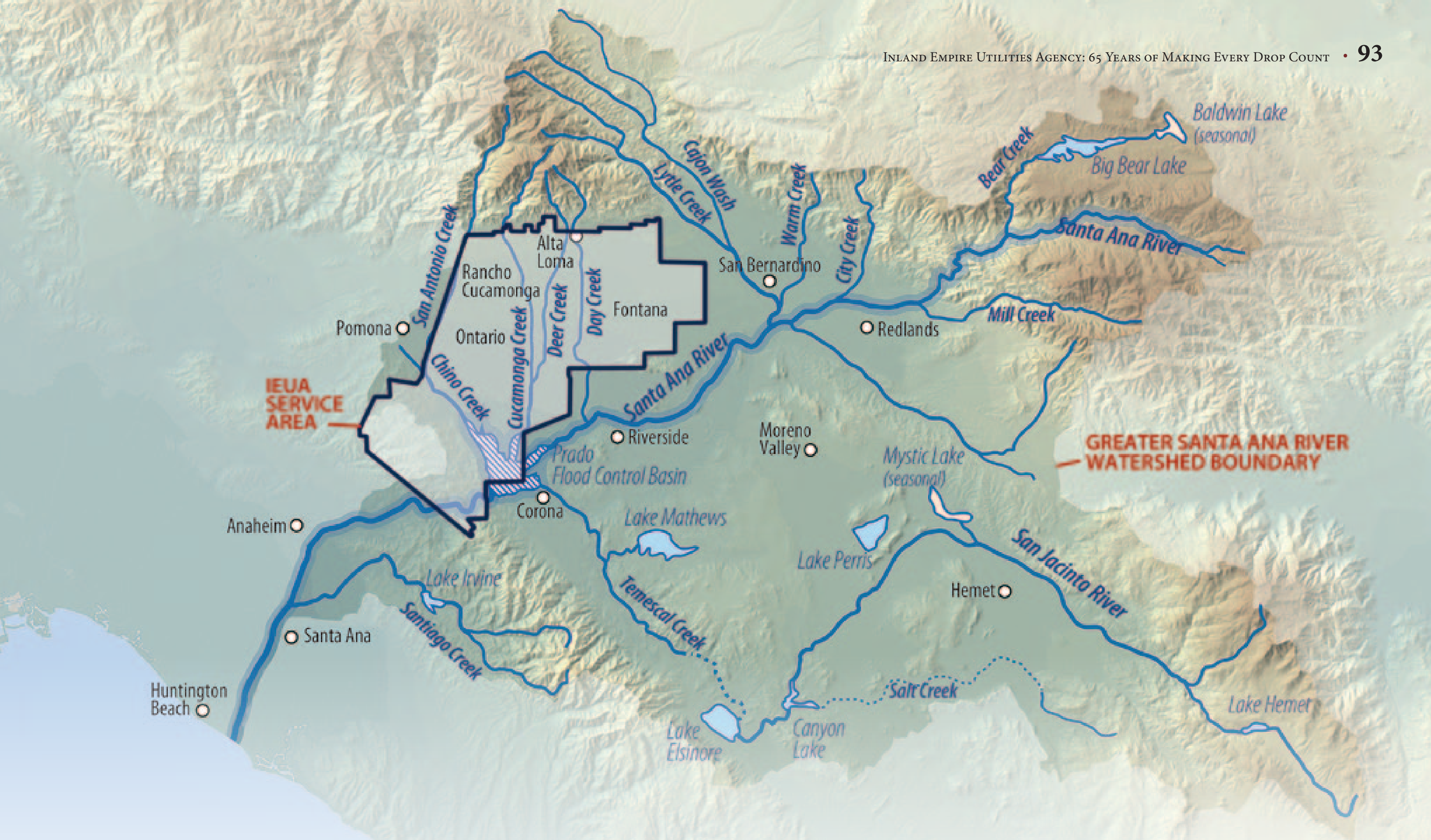
In 2010, about 23 percent of all urban water use in the region was Metropolitan water, while 31 percent of the urban water use was from the Chino groundwater basin, with an additional 8 percent of the water coming from the desalters. Also, surface water provided 12 percent, recycled water 7 percent and other basin groundwater sources 19 percent.

IEUA distributed the Metropolitan water to the Cucamonga Valley Water District and the Water Facilities Authority, which in turn sold the water to five retail water agencies: the cities of Chino, Chino Hills, Ontario, Upland and the Monte Vista Water District. In all, about 70,000 acre-feet of Chino Basin groundwater was used for urban water supply, and an additional 21,000 acre-feet of groundwater in Chino Basin was used for agricultural irrigation.

Use and Reuse

The goal of the water conservation program was to "maximize efficient water use and reuse in the service area." The Agency was accomplishing that by offering programs to residents to conserve water. These included: conversion to low-water-use dishwaters, toilets and shower heads, as well as the use of swimming pool covers to stop evaporation. The Agency also was evaluating programs, such as turf removal.

Atwater, testifying on January 28, 2008 before the state Legislative Committee on Resources, Subcommittee on Water and Power, told the panel IEUA and its retail utilities were committed to implementing the Memorandum



The boundaries of the IEUA (outlined in black) are part of the greater Santa Ana River watershed.

of Understanding (MOU) regarding Urban Water Conservation in California.

"The Agency is expanding its conservation efforts to promote both water and energy conservation programs to our customers," he testified. "IEUA's goal is to reduce water demands by 10 percent through aggressive implementation of customer conservation programs. Innovative programs initiated by IEUA include the Inland Empire Landscape Alliance, in which elected officials from cities and water agencies within IEUA's service area are working to promote outdoor conservation including turf reduction rebates, use of California-friendly native plants and new regional model landscape ordinances that will promote water savings.

Other programs include conservation rebates which are offered in partnership with the Metropolitan Water District of Southern California (ultra-low-flow toilets, weather-based irrigation controllers, synthetic turf, efficient sprinklers, water brooms, X-Ray recirculation units and other water saving devices), landscape audits, and school education programs including the award-winning Garden In Every School program."

In total, the District was aiming to achieve water savings of 28,500 acre-feet through conservation efforts.

Groundwater Recovery Program

In 2010, Chino Basin groundwater comprised from 60-70 percent of the water supplies needed to meet urban water demand. Estimates projected ultimate development of the Chino Basin Desalter Program would produce 51,800 acre-feet a year of potable water; and extract an estimated 54,000 tons of salt from the Chino Basin annually.

After the expansion of Desalter No. 1, which added an ion exchange unit, and completion of Desalter No. 2 in 2006, both desalters combined were producing about 27,000 acre-feet a year that year. By 2010, the facilities were producing 30,000 acre-feet.

John Rossi called IEUA a model for its regional approach. "They've done so much to advance regional projects, including finding grant funding of the Chino desalter expansion of $150 million. This is the only project in my career that we are well over 55 percent grant or 'other people's' money between the state and the federal government. In fact we received the single largest grant that the California Department of Public Health has ever done – $51 million."

"With regional kinds of projects, you have to show multiple benefits, multiple areas, multiple agencies. There are also other things to consider: environmental benefits, clean up of groundwater, able to shift on and off Colorado River vs State Water Project water. You must get on the groundwater basin with storage and get off imported in the dry years. IEUA set the stage and helped define this kind of regional project concept, which again is used up and down the state. Plus it's kind of the buzz phrase in Washington D.C. If you're not talking about a regional project, then you aren't going to get a lot of time. And I think IEUA is the forerunner on that concept."

Cleaning Up Plumes of Toxics

Pollutants that fall on the ground can sink through the ground and find their way into groundwater. When that happens within an aquifer, a contamination plume is created. A plume usually moves away from its source and widens, causing more of an impact. Generally, plumes can be used to track and measure water pollution within the aquifer's total body of water.

In the Chino Basin, there are five identified plumes in the groundwater that are tainted with chemicals from past industrial operations. The plumes are: the GE Flatiron Facility Plume and GE Test Cell Facility Plume; the South Ontario VOC Plume; the Kaiser Steel Corporation Plume; the Milliken Landfill Plume, and the Chino Airport Plume.

As of 2010, pumping and treating contaminated water was underway from the GE Flatiron Facility Plume and GE Test Cell Facility Plume using reverse osmosis. The treated water was discharged to a storm drain that flowed to the recharge basins known as Ely Basins 1, 2, & 3. The recharged water then was put back into the Chino Basin aquifer.

Another program targeted wells owned by water agencies and municipalities that had been contaminated to the extent the water from these wells could no longer be used for drinking. These wells were operated by the cities of Chino, Chino Hills, Ontario and Upland, and Monte Vista Water District.

Under the Dry Year Yield Conjunctive Use Program with Metropolitan, impacted wells had ion exchange (IX) wellhead treatment installed. Once treated through the IX process, the water quality levels increased, improving overall yield in the groundwater basin, especially during dry years. Brine from the wellhead IX treatment processes was transported via the non-reclaimable waste pipeline to be treated and eventually disposed of in the Pacific Ocean.

Industrial Efficiency through Pre-treated Water

"Pre-treated water" is the water that industry uses and then treats to reduce contaminants before it enters the pipeline to either an IEUA facility or to the Non-Reclaimable Wastewater System. That system has transported salt-laden, industrial-strength wastewater out of the Agency's service area to treatment plants located in Los Angeles and Orange counties and eventually to be discharged into the Pacific Ocean since the late 1960s.

In the early 1980s, after the EPA established water quality regulations, the District was still small and delegated that authority to local cities. As a result, there were seven different programs in its service area. In mid-2000, IEUA became responsible for the regional program.

"The overall goal of this program is to keep the water both surface and groundwater free of pollutants, protect the plants and workers, and to meet the EPA obligations," said Craig Proctor, the Agency's Pretreatment and Source Control Supervisor.

He described a couple of ways different industries pre-treat water at their facilities: "Food facilities treat their wastes similarly to what we do at our treatment plants. They use a biological treatment process or maybe a mechanical process to filter or separate out solid material from the water."

By comparison, a metal finisher needs to use a different approach to remove unwanted metals from its waste water.

Maximizing the Use of Recycled Water

IEUA's recycled water program was already one of the best in California. Yet, Agency officials saw opportunities to reclaim even more water. In fact, they targeted recycling at a total of 104,000 acre-feet a year by 2025. With a total construction estimate of $250 million, ultimately, the recycled water program would be self-funded through sales and Metropolitan local project rebates.

Already, the District's recycled water met all state requirements for quality, called Title 22. This permitted the water to be used for irrigation of row crops, parks and water features where human contact is likely. While full human contact was permitted; recycled water could not be used for potable uses.

The desalter treatment processes includes reverse osmosis to remove nitrate and total dissolved solids.

Expanded Groundwater Storage

As part of the OBMP adopted in 2001, Program Elements Nos. 8 and 9 were to develop and implement a groundwater storage and conjunction use program. That materialized in 2003 under the Dry Year Yield Conjunctive Use Program with Metropolitan.

Under the agreement with Metropolitan, the program had a maximum storage capacity of 100,000 acre-feet. Water can be "put" into and "taken" out of the basin at a maximum rate of 25,000 acre-feet a year and 33,000 acre-feet a year, respectively.

The original signatories – IEUA, Metropolitan, Three Valleys Municipal Water District and the Chino Basin Watermaster – were interested in expanding the existing storage account to 150,000 acre-feet.

By December 2008, the environmental study required under the California Environmental Quality Act was completed. There were three key components to the proposed expansion:

- Increase the existing 25,000 acre-feet a year storage capacity by 15,000 acre-feet a year with aquifer storage recovery wells and conveyance facilities
- Increase the existing 33,000 acre-feet a year extraction capacity by 13,000 acre-feet a year with new wells, ion exchange facilities, aquifer storage recovery wells and conveyance facilities
- Continue negotiations with Metropolitan on expanding the conjunctive use program to include a negative capacity of -100,000 acre-feet a year and a maximum capacity of +300,000 acre-feet a year

The UWMP noted planning for a total of 35,000 acre-feet a year of recycled water to replenish the aquifer, including a maximum 20 percent blend of recycled water with stormwater and imported water. "In the future, it is expected that future replenishment permits will allow a higher percentage level either because of successful operating experience at 20 percent level or through the use of additional treatment," the report noted.

Enhanced Stormwater Management

Stormwater runoff could be called a primary creation of modern-day life. As open space and dirt fields are paved over to make way for urban development, the number of impervious surfaces – paved streets, parking lots, driveways and building rooftops, for example – increase.

"It is widely recognized that the patterns of urban development, including hard surfacing (roads, roofs) and stormwater management systems (concrete channels) have resulted in a significant reduction in natural infiltration of stormwater into the groundwater within Southern California," noted the 2010 report. Earlier studies indicated the Chino Basin was losing on average about 40,000 acre-feet a year.

At IEUA, the strategy emerged in the OBMP to build up the recharge program and was reinforced in the UMWP: "A key part thereof

Empire Lakes Golf Course in Rancho Cucamonga uses recycled water.

Forecasting Wastewater Use During a Recession

Forecasting growth within IEUA's service area became trickier from 2008 on, when a recession brought a significant drop in housing prices, limited credit availability and a rise in interest rates from recent historic lows. The real estate market softened dramatically throughout Southern California. As the economy and societal trends fluctuated, the amount of wastewater generated from homes dropped, and, in turn, the amount of recycled water generated from those homes. In the face of a recessional economy, the average daily flow rates of raw sewage into the regional water recycling plants decreased by about 10 percent. The decrease was attributed to sluggish economic growth and the increase in area foreclosures. Yet, projections indicated the downward trend would continue for years after the economy rebounded, as conservation continued and increased.

In 2010, for a third straight year, water use by the IEUA's member agencies and wastewater generation significantly declined, according to the Urban Water Management Plan. Member agencies' overall water use has decreased about 32,000 acre-feet since fiscal year of 2006-07, and wastewater generation decreased by 4 million gallons per day (MGD). In fiscal year 2010-11, water use was estimated to decrease by another 5 percent and wastewater by another 3 MGD due to education efforts and subsequent reduction in water use thanks to conservation, water use efficiency, as well as economic times.

"The backbone of the regional system," the plan noted, "has been designed using the raw sewage flow rate specified in the regional sewerage service contract which is 270 gallons per day (GPD) per equivalent dwelling unit.

However, the current average flow rate for new developments is estimated to be 200 GPD per equivalent dwelling unit. Newly constructed and re-modeled homes are assumed to generate less wastewater on average due to the installation of water-efficient appliances. It is expected that the overall average Agency service area flow per equivalent dwelling unit will continue to decline, given the rising price of water, decreases in water supply availability and greater need for water conservation."

is the establishment of a well-coordinated stormwater management program to capture the maximum amount of stormwater," the UMWP noted. "In addition, there are a number of non-traditional stormwater management techniques that, if implemented, could significantly improve water management in the Chino Basin.

In 2009, IEUA and the Watermaster began Phase 2 of the groundwater program, using $11 million to add more capacity to store imported water, drill monitoring wells, heighten and reinforce conservation berms and add new automated control structures to several recharge sites.

Expanding and Improving Groundwater Recharge Facilities

The groundwater recharge program was targeted to be a flexible program, always being enhanced and ever-expanding to meet the needs of the population.

As of 2010, several groundwater recharge basins in the Chino Basin complex had been expanded and improved beyond that proposed in the Chino Basin Facilities Improvement Project (CBFIP). The UWMP noted improvements would be immediately made to the design, by adding hardened spillways to the internal berms; ridges and furrows to the flow-through basins to enhance the percolation rate; and silt setting/debris catchments basins.

Tom Dodson, president of Tom Dodson & Associates (TDA), an environmental

Summary Of Chino Basin Groundwater Recharge Operations • *February 2015*

Drainage System	Recharge Volume (AF)*			Management
Basin	SW/LR	MW	RW	Zone Subtotals
San Antonio Channel Drainage System				
College Heights	-	-	N	MZ-1
Upland	29	-	N	202
Montclair 1, 2, 3 & 4	30	-	N	AF**
Brooks	27	-	92	
West Cucamonga Channel Drainage System				
8th Street	37	-	-	
7th Street	5	-	-	
Ely 1, 2, & 3	72	-	222	
Minor Drainage				
Grove	29	N	N	
Cucamonga and Deer Creek Channel Drainage Systems				MZ-2
Turner 1 & 2	93	-	60	974
Turner 3 & 4	65	-	53	AF**
Day Creek Channel Drainage System				
Lower Day	17	-	X	
Etiwanda Channel Drainage System				
Etiwanda Debris	-	-	X	
Victoria	40	-	57	
San Sevaine Channel Drainage System				
San Sevaine 1, 2, 3, & 4	8	-	-	
San Sevaine 5	31	-	-	
West Fontana Channel System				
Hickory	47	-	180	
Banana	16	-	47	
Declez Channel Drainage System				MZ-3
RP3 Cells 1, 3, & 4	74	-	243	507
RP3 Cell 2	21	-	-	AF**
Declez	106	-	-	
Non-Replenishment Recharge**				
Brooks (MVWD) MZ-1	(7)			
Montclair (MVWD) MZ-1	(11)			
Turner (CVWD) MZ-2	-			
Month Total = 1,683 AF	**729**	**0**	**954**	February 2015
Fiscal Year to Date Total Since July 1, 2014 = 12,998 AF	**6,640**	**0**	**6,358**	Fiscal Year to Date
Calendar Year to Date Total Since Jan. 1, 2015 = 2,982 AF	**1,405**	**0**	**1,577**	Calendar Year to Date

SW : Storm Water, **LR** : Local Runoff (and GE, MVWD), **MW** : MWD Imported Water, **RW** : Recycled Water
- : No stormwater/local runoff, or basin not in use due to maintenance or testing.
X : Turnouts not available - to be installed during future projects.
N : No turnout planned for installation.
* : Data are preliminary based on the data available at the time of this report preparation.
** : Management Zone Subtotals have deducted from them any Non-Replenishment Recharge, which is recharge originating from pumped groundwater and is not new water.

consulting firm, prepared the programmatic environmental impact report (PEIR) for the Optimum Basin Management Program. The PEIR was necessary for compliance with the California Environmental Quality Act, the National Environmental Policy Act, and the state and federal Endangered Species Acts.

Dodson testified on April 12, 2007 before the State Water Board: "After working with this document and its many second-tier specific projects for the past seven years, I believe the simplest interpretation of the Optimum Basin Management Program (OBMP) is that it sets forth an overall management guide to clean the Chino Basin groundwater aquifer and to increase the yield of the Chino Basin for the water purveyors and other large groundwater producers in the Basin."

"Again, in its simplest form the program consists of a number of actions that increase the recharge of water into northern and central portions of the Basin; extract high salt and nitrate contaminated water at the south end of the Basin; and provide for conjunctive use by expanding storage in the Basin. The OBMP and its second-tier specific projects comprise a sophisticated program to cleanse a groundwater aquifer which will, over time, restore the Chino Basin groundwater resources to high quality," he added.

Facilities Needed to Make Recharge Happen

To make the groundwater recharge program happen, certain facilities needed to be built and improved upon. These included: recharge basin rehabilitation, pipelines to deliver recycled water to recharge basins and users of recycled water; turnouts and pipelines from imported water lines to recharge basins; new storage reservoirs, some for recycled water; monitoring wells and other monitoring systems; and groundwater extraction wells.

Part of IEUA's strategy for water efficiency is to promote the use of drought-tolerant plants and landscaping.

"The end result is that 20 recharge basins, almost all originally designed and installed by the San Bernardino County Flood Control District, have been prepared to receive a mix of stormwater, recycled water and imported water to increase the volume of groundwater in storage within the Chino Basin. The necessary connections (pipelines and turnouts) have been installed and additional facilities are being considered, reviewed and funded on an ongoing basis," Dodson testified.

IEUA Director Steven J. Elie noted the progressive steps the Agency has made. "Since 2000, the Chino Basin has successfully managed its water portfolio to diminish reliance on imported water," he said. "Investment in our recycled water, ground water recharge and water use efficiency programs has enabled the region to develop a resilient water supply which has prepared us for dry years and drought better than most."

Chapter 11
Water-Energy Nexus

Water and energy are permanently intertwined as mutually dependent resources; water infrastructure requires large amounts of energy, and the production of energy – for example, electricity created through hydroelectric plants – requires large volumes of water. This connection is called the water-energy nexus.

The energy needed to meet the wastewater treatment and water supply demands within IEUA's service area is significant. On the wastewater side, the Agency collects industrial and municipal wastewater through a network of regional wastewater sewer interceptors and two non-reclaimable wastewater sewer pipeline systems. Sewage treatment is provided by five regional plants. Recycled water is produced through tertiary treatment by all but one of the plants, which only processes solids. IEUA also operates the state's largest enclosed composting facility.

On the water side, IEUA distributes imported and recycled water and operates the Chino groundwater desalters. The current combined energy requirements for all of IEUA's facilities average 82,000 megawatts annually, with average peak demand of 10 megawatts.

In general, getting water and putting it to use is quite energy intensive. Once rain and snow fall to the ground and moves gravity fed down mountains or creeks, energy is needed to move the rain and snowmelt to reservoirs for storage and sometimes to pump the water uphill. In order to make water usable and drinkable, power is necessary to operate treatment facilities. Even more energy is required to distribute the water to customers, often miles and miles away from any treatment plant. It doesn't end there. After the water is used by a home, business, agricultural field or industrial plant, more energy is needed to recollect it for wastewater treatment, which removes contaminants and disposes of solid waste. Then, even more energy is needed to re-distribute recycled water for additional uses.

In total, the California Energy Commission (CEC) has determined electricity use for water-related services is 48 terawatt-hours (TWh) each year. That's millions of megawatts and at least 19 percent of the total electricity used statewide in any given year. In addition, processes related to water transfer and treatment amount to 30 percent of the state's natural gas consumption annually, and require upward of 88 billion gallons of diesel fuel each year.

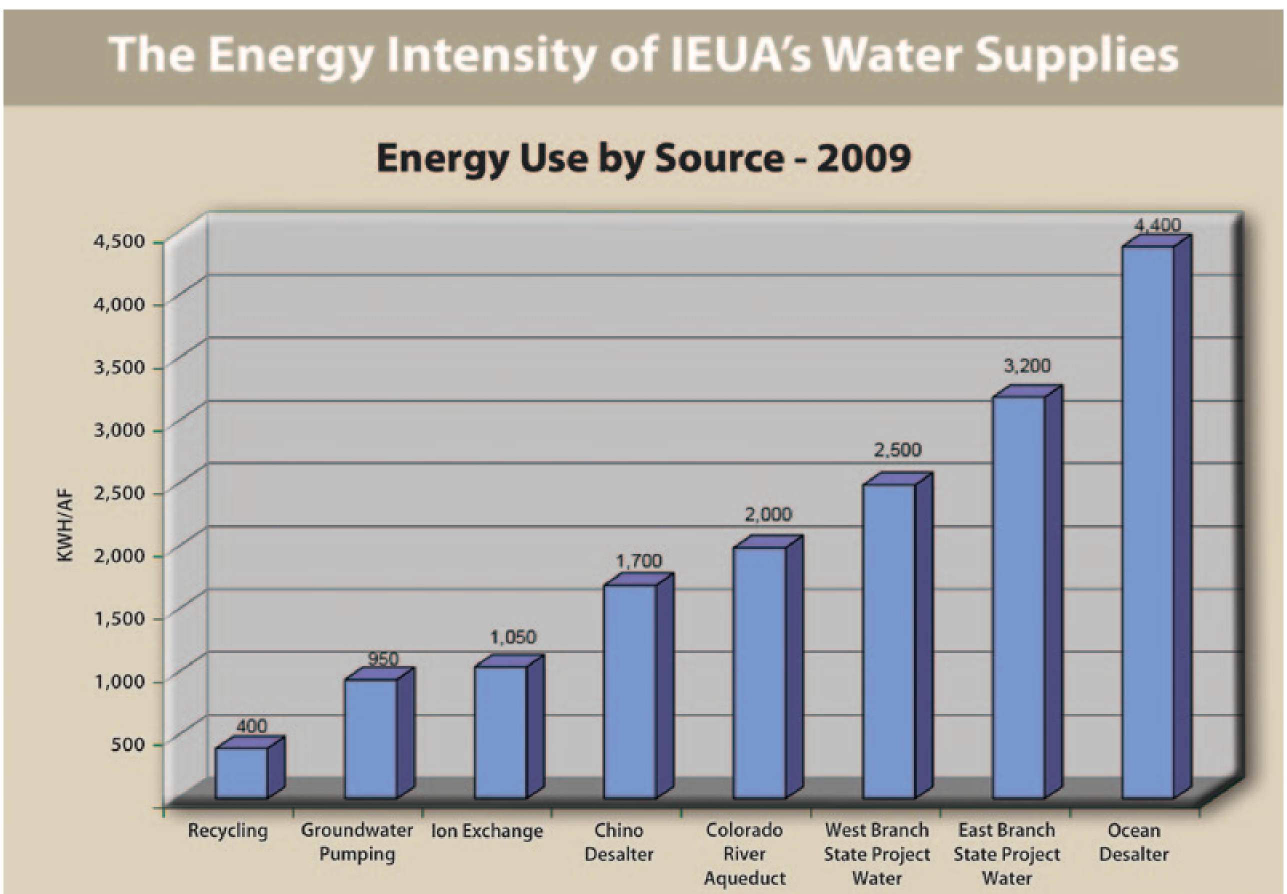
In Southern California, the water-energy nexus is compounded by the dependence on imported water from sources including the eastern Sierras, the Colorado River and the Sacramento–San Joaquin River Delta (Delta). Because the water must be conveyed hundreds of miles, the U.S. Department of Energy declared that water provisioning in Southern California is among the highest in the country. A more local source, Metropolitan, estimated the energy used to deliver water to residential customers is equivalent to about one-third of total household electricity use in the region.

IEUA Delves Deeper Into Renewable Energy

With the heavy use of energy in mind, IEUA announced plans in 2012 to adopt a "Go Gridless by 2020" initiative, with a specific goal to garner energy independence, generating all the power it used during peak electricity-usage hours. The Agency didn't literally plan to go off the grid – it still was to be hooked up to transmission lines owned by Southern California Edison (SCE) – yet the goal was to generate enough electricity on-site to avoid using purchased grid power from noon to 6 p.m. each day. Key to achieving this goal is enhancing energy efficiency of the Agency's operations and water supplies, and also to generate new renewable supplies of power.

"The direct benefits of IEUA's programs include improved access to more reliable and cost-effective sources of energy, and a reduced need for power from the State's overburdened grid. Additionally, by reducing the 'energy intensity' of its water supplies, IEUA is indirectly helping California reduce statewide energy demand, particularly during critical peak times," wrote Martha Davis, IEUA's executive manager of policy development, in her co-authored paper titled, *The Critical Role of Water and Wastewater Agencies in Energy Efficiency.*

IEUA has made significant strides in reducing its dependence on the electrical power grid by investing in renewable energy projects. In an effort to diversify and maximize renewable energy generation, the Agency installed 3.5 megawatts (MW) of solar power in 2008, a 1 MW wind turbine in 2011, a biogas fuel cell system that could generate 2.8 MW and



a food waste anaerobic digester that could produce 1.5 MW in 2012. Combined, these projects have provided more than 50 percent of peak energy demand at facilities and have reduced the net consumption at the regional water recycling plants.

Amid growing concerns about the cost of energy in the future, IEUA officials only needed to point to existing costs in 2012, such as the price tag for the power needed to treat wastewater and deliver recycled water. It cost about $200,000 a year just to run blowers that aerate water during the treatment process, and then pump the recycled water uphill to foothill communities. That price was projected to increase in subsequent years.

"This is a very significant initiative given the uncertainty of future energy costs," said IEUA Board President Terry Catlin at the time. "The Energy Management Plan will reduce the demand on an already taxed California power grid system while enhancing IEUA's energy reliability and rate stability in an environmentally prudent manner. By the end of 2012, IEUA will increase its self-generation of renewable energy from 35 percent of its energy demand to 66 percent."

Thus, the Agency set out to launch the projects – wind turbine, solar panels, fuel cell and waste-to-energy – through public/private partnerships, which made implementation possible with minimal risk and without expending capital.

IEUA Leading the Way in Renewable Energy

In the Nation:

- Constructed first Platinum LEED-rated energy efficient headquarters by a public agency

In California:

- Constructed first centralized digester using a combination of dairy manure and food waste
- Sold first renewable energy credits that were generated by "cow power"
- Sold first green-house gas credits that were generated by "cow power"
- Sponsored first legislation to authorize "net metering" program for energy generated through "cow power" and was the first public agency to use the net metering program

Powering Up Solar

In 2008, IEUA first began its investment in solar power. The Agency installed solar panels able to generate 3.5 megawatts of power at three of its water recycling facilities in Chino and Ontario as well as the Inland Empire Regional Composting Facility. In total, 185 panels were installed with the

IEUA installed 3.5 megawatts of solar power at facilities in 2008.

capacity to generate 10 percent of the total electrical power needed for IEUA's facilities.

Given rising energy costs, the panels save the agency hundreds of thousands of dollars a year on energy costs: "It's the fact that these panels produce power during the peak hours during the day when energy costs are higher that produces savings overall," Jason Marseilles, IEUA's senior operations assistant, told a reporter in 2014.

The opportunity first arose in 2007, when IEUA began analyzing the possibility of solar panels and discovered the existence of federal and state financial incentives for solar power production. Those included a 30 percent investment tax credit and an accelerated depreciation schedule, in addition to significant performance-based incentives then available through the California Solar Initiative (CSI). Yet there was a catch; IEUA needed to have a solar power system installed and operating by the end of 2008.

A feasibility study showed through a combination of high-efficiency solar technologies the Agency would be able to generate more than 10 percent of its energy from the sun while reducing costs. The Agency did not hesitate to move ahead, soliciting bids from six solar providers.

In April 2008, IEUA entered into an agreement with SunPower, a leading designer and manufacturer of silicon photovoltaic cells and solar panels. Under the public-private partnership agreement, SunPower provided IEUA with financing for the project through financier Morgan Stanley, who ultimately owns and operates the solar power system and sells the electricity to IEUA. In addition to delivering immediate savings on electricity costs, the agreement required no capital expenditure. It also acted as a hedge against rising electricity costs, locking in guaranteed savings over the long term.

In total, the solar-power system cost $25 million. In the first year, IEUA saved about $300,000 the first year, and savings increased each year for a total of about $500,000 a year.

Marseilles said the solar system was reliable and provided cost stability. "When you look at billing for grid power, there are two components. One is the actual energy production that you pay for, and you actually pay a certain charge for transmission of the energy. Then there are additional fees for using excess power. We now have price stability from having these renewables onsite. It's a fixed cost and we know what we're going to pay for."

Benefits of IEUA's Solar Program

- Offsets over 10 percent of Agency's total electricity demand
- Delivers savings of approximately $500,000 in annual electricity costs
- Provides significant hedge against future rate increases from SCE
- Reduces carbon emissions by over 230 million pounds over the next 30 years, which is equivalent to powering 18,350 homes, or removing more than 19,000 cars from our roads
- Contributes to IEUA's increasing commitment to sustainability and environmental practices

Fuel Cell System

In October 2012, IEUA announced RP-1, its oldest treatment facility, was to begin operating a 2.8 MW fuel cell system that would convert solid waste to biogas and provide ultra-clean electricity to power the Ontario facility.

Again IEUA teamed up with a private firm, this time a Canadian company Anaergia Inc., based in Burlington, Ont., to sign the largest power purchase agreement (PPA) using a fuel cell system powered by renewable biogas in North America.

As part of the 20-year PPA, Anaergia, which specialized in the generation of renewable energy from organic waste from municipal, industrial and agricultural sectors, built and financed the $17 million fuel cell system at RP-1. IEUA then purchased base-load power from the company to offset up to about 60 percent of the grid power previously used by the facility to treat wastewater.

In addition to reducing long-term energy costs and contributing to the energy self-sufficiency of the treatment plant, Anaergia's operations contributed to improving the air quality for the residents of Ontario by using one of the most environmentally sustainable options available.

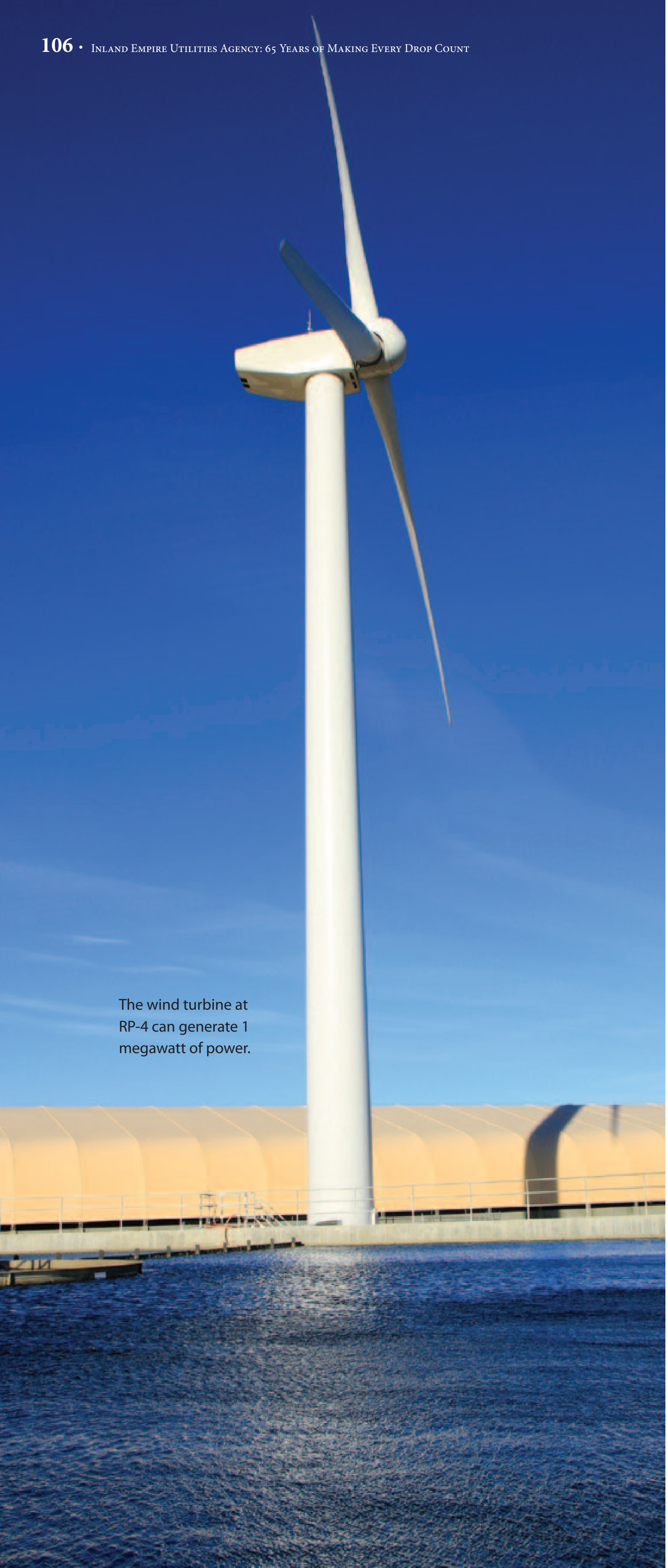
"IEUA is proud to expand its already successful renewable energy program with the addition of a biogas-powered fuel cell system," said Terry Catlin, president of the IEUA Board. "The fuel cell allows IEUA to move closer to its strategic energy plan goal to go "Gridless by 2020" with almost no capital outlay by the Agency. Our plan is to minimize IEUA's dependency on energy purchased from the grid, and to be able to operate completely off the grid during peak energy usage periods."

Steve Watzeck, then-CEO of Anaergia, also lauded the partnership. "The (RP-1) fuel cell project with the Inland Empire Utilities Agency is a world-class example of how energy self-sufficiency can be achieved by generating renewable and cost-effective electricity onsite under a power purchase agreement," he said in a press release. "This project will have a lasting and positive impact on the area by reducing greenhouse gas emissions in California's South Coast Air Quality Management District and providing long-term electricity cost savings to the district."

The biogas fuel cells can produce 2.8 megawatts at RP-1.

As part of its renewable energy program, not only did the fuel cell boost the Agency's renewable energy portfolio, it helped remove a significant risk factor regarding compliance with changes to clean air regulations. The treatment plant had long depended on digester gas to provide a fuel for cogeneration engines, which created energy for other processes within the facility. Regulatory requirements regarding power-generation emissions had become much more stringent through the years, and IEUA wanted to ensure it was in a position to meet any future tightening of the rules.

"What is provided is a stable power source separate from the Southern California Edison grid," Jason Marseille, IEUA's senior operations assistant, said at the time. "Previously,



The wind turbine at RP-4 can generate 1 megawatt of power.

the Agency was using two internal combustion engines. The system here is so much more efficient and cleaner, and when I say cleaner the emissions coming from the system don't have high levels of carbon monoxide."

Although the technology had been around for the past 20 years, RP1's fuel cells were unique because the technology had only become feasible for large-scale energy production in recent years. In California, as of late 2014, there were fuel cell installations in more than half of the counties throughout the state. In total, the systems represented more than 100 MW of installed capacity, according to the National Fuel Cell Research Center at the University of California, Irvine.

Besides IEUA's wastewater treatment plant, the fuel cells around the state were producing power for a wide range of industries, such as food processing plants, corporate data centers, grocery stores, several hotels, a casino, jails, college campuses and numerous wastewater treatment plants.

Wind Power

A 1 MW wind turbine was installed at RP-4 in Rancho Cucamonga in January 2012. With a constant wind the turbine is able to generate up to 40 percent of the electricity needed at the plant.

The wind turbine was made possible through another private-public partnership. Built by Mitsubishi Heavy Industries, the turbine is owned by Foundation Windpower LLC, which developed and financed the turbine. Some of the benefits IEUA will enjoy from the turbine over the lifetime of the 20-year PPA are no capital or maintenance expenses, energy cost savings estimated at $3 million and protection against future rate increases.

The turbine eliminates an annual emission of 1,034 tons of carbon dioxide, the equivalent of removing 203 passenger vehicles from the roads each year. It generates the equivalent energy needed to power 129 homes per year.

The project is welcome in a region where air pollution levels exceed those accepted by state and federal laws. In fact, the Inland Empire is regarded as having some of the worst air quality in the nation.

"The new wind turbine provides clean, renewable energy. It provides a hedge against potential volatility in future energy prices, as well as improved operational reliability," said IEUA Board Vice President Michael Camacho during a dedication ceremony at RP-4 on April 5, 2012.

Food Waste Anaerobic Digester

The IEUA built the first centralized anaerobic digester to be developed in the United States. The project came online in 2002 and processed cow manure from six regional farms in addition to a small percentage of other organic waste from local food industries. Unfortunately, due to a lack of biogas production, the anaerobic digester was shut down in early 2009. IEUA re-evaluated and determined the best use of the facility would be for a food waste anaerobic digester.

In 2012, the Agency formed a partnership with Environ Strategy Consultants, Inc. and Burrtec Waste Industries, the largest privately held solid waste company in California, originally started in 1955. According to Burrtec, Californians throw away more than 5 million tons of food waste each year. On average, a food establishment disposes of more than 50 tons of food waste each year. In order to divert food waste away from landfills, Burrtec started a commercial and industrial food waste collection program that put the waste through the anaerobic digestion process to produce energy. Besides creating energy, another benefit was diverting solid wastes from landfills.

Burrtec worked with Environ Strategies to form Inland Bio Energy (IBE), which leased the facility at RP-5 in Chino. RP-5's manure and food waste processing plant was able to digest the waste to produce up to 1.5 MW of biogas to fuel two engines to generate power for the facility.

How does anaerobic digestion produce power?

Anaerobic digestion is a biological process that produces a gas principally composed of methane (CH4) and carbon dioxide (CO2) otherwise known as biogas. These gases are produced from organic wastes such as livestock manure, food processing waste, etc.

The process of anaerobic digestion consists of three steps: The first step is the decomposition (hydrolysis) of plant or animal matter. This step breaks down the organic material to usable-sized molecules such as sugar. The second step is the conversion of decomposed matter to organic acids. Finally, the acids are converted to methane gas.

How are solids turned to electricity?

RP-1 receives 30 million gallons of wastewater a day from the cities of Ontario, Fontana, Rancho Cucamonga, Upland and Montclair. The anaerobic digestion of solid waste creates methane gas, which is heated with water to create a positive and negative charge as hydrogen and carbonate react inside two large fuel cell units. The electro-chemical process is similar to the process used in batteries.

At RP-1, both cells can generate about 2.8 megawatts of electricity or about 70 percent of the plant's energy use. The process also reduces particulate matter emissions by 70-90 percent compared to typical internal combustion engine systems.

Chapter 12
Setting Records Into the Future

When the doors of the Agency first opened in 1950, agriculture was king while fledgling communities were starting to build up. Residents were flocking to the iconic 1925 Granada Theatre on Euclid Avenue in Ontario to see the premier of Walt Disney's Cinderella, which a cinema poster in the front window pitched as "A Love Story with Music."

The concept of a family vacation was becoming a new American phenomenon in the 1950s, and Route 66, which cut through the Inland Empire, was the ultimate road trip. Chances were the family sedan would stop in Fontana at one of the iconic juice-and-fruit stands shaped like immense oranges that dotted all of California's Route 66. For something more substantial just up the road on Route 66 was Upland's Buffalo Inn where buffalo burgers had been served since 1929. Today, in 2015, cows can still be seen in some areas of Chino but the dairies are being swallowed up by urbanization, planned communities and residential subdivisions.

The Agency brought in supplemental water from Metropolitan in 1953, and worked with cities and water districts to ensure a regional approach to provide high-quality water in the future. In the beginning, the Agency's jurisdiction covered 92 square miles. After expansion and taking on new responsibilities, the Agency became a regional provider of wastewater treatment with domestic and industrial disposal systems, and energy production facilities serving 830,000 residents within a 242-square mile area located in San Bernardino County through its water and sewer member agencies.

IEUA Focuses on Three Key Services:

- Treating wastewater and developing recycled water, local water resources and conservation programs to reduce the region's dependence on imported water supplies and drought-proof the service area
- Converting biosolids and waste products into a high-quality compost made from recycled materials
- Generating electrical energy from renewable sources. IEUA strives to provide these services in a well-managed, cost-effective manner

These days, IEUA provides sewage utility services to seven entities: the cities of Chino, Chino Hills, Fontana, Montclair, Ontario, Upland, and Cucamonga Valley Water District in the city of Rancho Cucamonga. In addition to these contracting agencies, IEUA provides wholesale imported water to seven retailers, who, in turn, sell the water to customers: the cities of Chino, Chino Hills, Ontario, Upland, Cucamonga Valley Water District in the city of Rancho Cucamonga, Fontana Water Company in the city of

Fontana, and the Monte Vista Water District in the city of Montclair.

With a clear vision and role as a "steward of the region," IEUA's 285 employees are dedicated to continuing its integrated water resource management plan that promotes cost-effective, reliable, efficient and sustainable water supplies to support and promote economic growth. And with an average 11 years' experience each with the Agency, the workforce has the skills to accomplish their goals.

The dedication of years of experience is important given the forecast into the future. The Inland Empire population is expected to reach 1.1 million by 2025, more than doubling within a 25-year span. As a result, water resources will be hard-pressed to keep up. The demand for retail water is projected to increase more than 70 percent – from about 214,000 acre-feet per year (in the mid-2000s) to 365,000 acre-feet per year by 2025. Wastewater treatment needs are expected to nearly double from the level of 60 million gallons per day to more than 110 million gallons per day.

Topping the list of focus areas is protecting the region's vital groundwater supplies. IEUA's commitment to water quality management and environmental stewardship ensures the maximum beneficial use of recycled water, stormwater and imported water throughout the region. The more water recharged into the Chino Groundwater Basin, the more self-reliant the region becomes as it reduces dependence on imported water supplies.

In addition, IEUA has become a shining example of visionary self-sufficiency and a leader in the production of renewable energy through the use of biogas, solar and wind power. Combined, these renewable energy sources provide more than 50 percent of the Agency's peak energy demand for their treatment plants. Periodic updates to the Energy Management Plan ensure the Agency will achieve its goal to be energy independent during peak periods by 2020.

Andy Schlange, the former general manager who many say started the ball rolling back

in the early 1960s, credits the water leaders of the earlier era – a time before the explosive changes began – for having a vision and commitment to finding solutions for the basin. "It goes back to an entrepreneurial type of spirit that was inherent in the water field at that time. We didn't look at why we couldn't do things. We looked at why we could do them," he said. "The bottom line is you are a steward of a water supply that people depend on. All of that goes through your mind. But the idea was that without the development of the types of projects we were talking about, Southern California would not be what it is today. We just had wonderful people who really want to solve problems and they came up with the most amazing solutions."

Leading up to present day, that spirit continues. Terry Catlin, president of the IEUA Board of Directors, attributed success of the Agency's work to a willingness to be aggressive while being creative – especially with financing big projects – and do what's best for the region.

"I've noticed through the years how the Agency has become more progressive, more innovative, more visionary in terms of the environmental side of the picture with the energy, especially trying to become more independent from the energy grid, for example with the solar panels and the fuel cells," he said. "If you look at the accomplishments and the history of what we've been able to capture from state and the federal government, that's a good benefit. Of course our focus has been on our ratepayers, trying to keep the cost down as best as possible."

In 2015, IEUA targeted major initiatives to be accomplished by 2020: water reliability and wastewater management, environmental stewardship and fiscal responsibility.

Water Reliability

With the economy progressively showing signs of recovery following the worst economic recession in history, 2015 headlines shifted to water shortages caused by drought. The water years of 2012-14 stand as California's driest three consecutive years in terms of statewide precipitation. Year 2014 also set new climate records for statewide average temperatures.

Emergency drought proclamations by Gov. Jerry Brown led to the Department of Water Resources' (DWR) historic decision in 2014 to reduce allocations via the State Water Project (SWP) to zero – ultimately raised to 5 percent – for all 29 public agencies that supply SWP water to 25 million Californians. In May 2014, for the first time this century, the U.S. Drought Monitor declared all of California to be in a state of "extreme drought or worse." Reduced surface water availability triggered increased groundwater pumping, with groundwater levels in many parts of the state dropping 50 to 100 feet below their previous historical lows.

In the Annual Report for 2014, Grindstaff noted: "IEUA and its member agencies started ramping up their water use efficiency programs in January in response to the Governor's emergency drought declaration, which has resulted in a downward trend in per capita water use, commencing April 2014. Water use reductions are expected to continue along this favorable trend and exceed IEUA's drought resolution adopted on April 16, 2014, which calls for extraordinary conservation actions to achieve a 20 percent reduction in water use."

The Agency also set a new record in recycled water deliveries with total deliveries of 38,000 acre-feet in FY 2013-14. The extremely dry weather conditions and optimal availability of recharge basins permitted deliveries well over the budgeted 32,000 acre-feet. However, given the probability of an "El Niño" event in 2015, and the storm water impact to groundwater recharge basins, recycled water delivery estimates have been maintained at 32,000 acre-feet for the upcoming fiscal year.

Winter 2014-15 did not offer relief to California's water picture. On April 2, 2015, Gov. Jerry Brown went into the Sierra Nevada with a state team to measure the Sierra snowpack, a key source that supplies snowmelt for the state and federal water projects. Standing in a bare meadow that would typically be covered with five feet of snow and noting the water content of the snowpack was at only 5 percent of normal, Brown announced California's first-ever mandatory water reductions, aiming to cut water use by 25 percent to protect the state's health and safety from severe water shortages. Also, SWP water allocations were announced to be 20 percent in March 2015.

As a member of Metropolitan, one-third of the water distributed by IEUA is imported through the SWP from Northern California. During the last several years, these deliveries have declined from a high of 78,872 acre-feet in 2009 to 59,047 acre-feet in 2013. Recognizing the limitations of imported water supplies caused by drought conditions and environmental restrictions, IEUA has aggressively pursued a strategy to "drought-proof" the region by developing local supplies and maximizing groundwater recharge.

By using water more efficiently, eliminating waste and unreasonable use and increasing the use of recycled water, the Agency was on track to reduce water use by 5,157 acre-feet by the end of 2015. The ongoing construction of the Agency's distribution system was a major component to advance beneficial reuse of recycled water. Two projects under construction in 2015 were estimated to increase recycled water storage by 5 million gallons and increase deliveries (direct and groundwater recharge) by about 4,500 acre-feet per year. The first, the Southern Area project, would provide essential storage and additional reliability for the overall system, while the other, the Central/Wineville Area project, would complete the backbone of the distribution system and make recycled water accessible throughout the primary sectors of the service area.

In 2015, IEUA also eyed 11 projects – at a total cost of $57 million – to develop an additional 6,781 acre-feet a year of stormwater recharge and 4,936 acre-feet more a year of recycled water recharge.

The Agency focused on ensuring optimum beneficial reuse of the high-quality recycled water generated from treated wastewater, maximizing groundwater recharge and promoting water use efficiency and conservation programs to reduce reliance on imported water supplies. It also beefed up community outreach about water-use efficiency to educate the region about the importance of conservation. In 2015, Gov. Jerry Brown called on all Californians to reduce their water use by 25 percent.

In 2014, even before the governor's mandate, IEUA set the average target for water use within its service area to be less than 200 gallons per capita per day (GPCD) by 2018.

On the wastewater side, the Agency collects industrial and municipal wastewater through a network of regional wastewater sewer interceptors and two non-reclaimable wastewater sewer pipeline systems. Sewage treatment is provided by five regional plants – recycled water is produced through tertiary treatment by all but one of the plants, which only processes solids. The composting facility, which began operations in the fall of 2006, also is linked to wastewater operations.

For the first time since the 2008 economic downturn, expansion-related construction projects were back on IEUA's radar in 2015. Because new residential and commercial development once again was gaining momentum throughout the region, the demands for wastewater and water services increased and were expected to increase even more in the next decade.

Another key goal for the Agency and its member agencies is to promote environmental sustainability. Enhancement of water quality and reliability is essential in meeting

General Manager Joe Grindstaff (left) discussed water issues with Congressman Pete Aguilar (D-CA31) and IEUA Directors Steven J. Elie and Michael Camacho in April 2015.

Joe Grindstaff

Joe Grindstaff, who joined IEUA as general manager in 2013, is well-suited to lead the Agency into the future. He has had an honored and influential career in California wastewater and water resources, including the San Francisco Bay and Sacramento-San Joaquin River Delta. He served as the Executive Officer for the Delta Stewardship Council from 2010 to 2012, where he organized the Delta Stewardship Council and helped establish the Delta Conservancy. From 2005 to 2010, he served as Director of the California Bay-Delta Authority. Then-Governor Arnold Schwarzenegger appointed Grindstaff to serve as Deputy Secretary for Water Policy at the Natural Resources Agency from 2006 to 2010. As Deputy Secretary for Water Policy, he took part in the historic 2009 legislative reform package, coordinated water policy, supported Delta Vision, and helped advance the co-equal goal concept of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem through the CALFED Bay-Delta Program, a unique collaboration among 25 state and federal agencies. When he became general manager at IEUA, he was returning to familiar territory. He had been general manager of the Santa Ana Watershed Project Authority of which IEUA is a member and of Monte Vista Water District, one of IEUA's member agencies.

Congresswoman Norma Torres (D-CA35) (right) joined IEUA Directors Jasmin Hall and Michael Camacho on a facility tour in April 2015.

this goal. The Agency continues to work collaboratively with member agencies and partners at the regional, state and federal levels to further enhance the Chino Basin's water supplies and water quality.

The Agency is actively working with the Governor's office and state water agencies to address the current drought crisis and revise legislation and regulatory requirements to promote water-use efficiency and maximize groundwater recharge. Additionally, the Agency, in partnership with the Orange

"Because of the legacy of forward thinking and innovation that has become a cornerstone of this Agency. I wanted to help direct an organization that is an integral part of the community and considered to be a leader in the industry."

– IEUA Director Steven J. Elie

County Water District, San Bernardino Valley Municipal Water District, Western Municipal Water District, and Eastern Municipal Water District, formed the Santa Ana River Watershed Action Team (Team) to actively identify large-scale water supply and reliability projects that will provide benefits to the entire Santa Ana watershed.

Included in the Agency's FY 2014/15 water resources management program were drought mitigation projects consistent with the Team's initiatives. Some of these projects included turf removal from commercial and residential landscaping, water-use efficiency education, and technology-based water conservation tools such as aerial imagery of the region to support future conversion to sustainable water budget rates by retail water suppliers in the Chino Basin.

A key goal for the Team was to secure grants and necessary funding, including DWR Proposition 84 funding through the Santa Ana Watershed Project Authority's "One Water One Watershed" (OWOW) program, to defray the cost to implement necessary projects. Such collaboration enabled the Agency and partners to eventually secure federal and state grant funding that significantly advanced the capital investment in the region.

Fiscal Responsibility

A key driver in 2015 was leveraging California's resurgent economy to improve the Agency's fiscal health as it continues on its path of achieving full cost of service rates for all programs. *"Cost of service"* reflects the total amount that must be collected in rates for the utility to recover its costs and earn a reasonable return.

"We've always kept rates low and have used property taxes to subsidize services," said Chief Financial Officer Christina Valencia. "We want to get to the point where our rates match the cost of service. We see us well-positioned to meet the growth, yet we have big commitments in the future. No doubt about it, we will continue to be a key player and always act responsibly to keep rates as low as we can."

Fiscal year 2014/15 was the final year of a three-year rate increase for two of its primary programs: regional wastewater and the recycled water program. The annual report noted that while multi-year rates helped to narrow the gap between program revenues and costs, the 2014/15 rates still did not recover full cost of service.

"The Agency and its member agencies recognize that future incremental rate increases will be needed to achieve full cost of service for all Agency programs: To mitigate future rate increases, the Agency remains committed to cost containment and optimizing grant funding to support capital investments in the region," the annual Financial Report 2014 noted. "Since 2009, in response to the worst economic recession in history, the Agency has achieved cost savings of over $245 million."

The financial report also noted: "However, management recognizes that some cost containment strategies are not sustainable. Although deferral of R&R projects has helped to reduce operating and capital projects over the last several years, aging facilities and infrastructure cannot withstand continual deferral of repair and replacement (R&R) without compromising the quality and reliability of services." Included in the financial report are R&R projects identified as critical in the 2014 Regional Wastewater Projects Asset Management Plan, some which were previously deferred as part of the cost containment strategies.

Through the 65 years the IEUA has provide services in the Chino Basin, hundreds of dedicated employees have left their marks on shaping water history in the region. What started out as a simple directive to secure more water has evolved into a multi-faceted plan to safeguard water for use in the region. The result is an intricate, innovative water service system that truly is a stand-out in California and the nation.

John Rossi, general manager of Western Municipal Water District and former Chino Basin Watermaster, called IEUA a leader in the industry: "One of the things I always tell people around this neck of the woods is the level of sophistication in these agencies (IEUA, Eastern Municipal Water District and Western Municipal Water District). IEUA is one of the leaders with their energy management, dairy manure, desalter project …. Because the cost of water at Metropolitan is so high, it capitalizes a lot of projects you wouldn't do anywhere else in the country."

IEUA Director Jasmin Hall touted the Agency's key accomplishments, such as the indoor composting facility, SAWPA's Brine Line, creating drought resiliency in the region through conservation and the use of recycled water, enhancing water storage for use in dry years and expanding water use efficiency programs.

"IEUA has long been a leader in the region, working closely with our member agencies and our neighboring counties to ensure a robust and reliable water supply and provide efficient wastewater services," she said. "IEUA has accomplished these goals while accommodating strong growth in its service area, helping assist economic development and being steadfast stewards of the environment."

Joe Grindstaff, IEUA's general manager, said IEUA has built an amazing system and will continue its good work.

"In the next 10 years, the agency will be doing more water resource work. Water supply will become even more important than it is today," he said. "In Southern California, the Chino Basin's location and size make it incredibly significant. And it's not utilized to its fullest extent. It's one of the things I'd like to see happen."

IEUA General Managers

Philip B. Hasbrouck	12/7/1950	11/26/1953
H.F. Clark	12/10/1953	2/28/1961
Richard R. Hall	3/1/1961	8/26/1970
J. Andrew Schlange	8/26/1970	6/11/1975
E. Gil Ross	6/11/1975	5/4/1976
Theo T. Nowack	5/12/1976	8/4/1976 *(acting capacity)*
Ray W. Ferguson	8/11/1976	05/1979
Theo T. Nowack	5/15/1979	5/4/1988
Thomas J. Homan	5/4/1988	10/7/1992
Diana Leach	10/7/1992	12/21/1992 *(acting capacity)*
Robert G. Westdyke	1/6/1993	4/17/1996
Robb Quincey	12/6/1995	5/19/1999 *(CEO/GM - along with Robert Westdyke)*
Larry Rudder	5/19/1999	7/7/1999 *(acting capacity)*
Richard Atwater	7/21/1999	5/19/2010
Thomas A. Love	6/2/2010	1/23/2013
P. Joseph Grindstaff	2/6/2013	current

Board of Directors

A.C. Reynolds	12/7/1950	12/11/1952
Otto S. Roen	12/7/1950	9/6/1962
E.W. Soper	12/7/1950	6/22/1961
Philip B. Hasbrouck	12/7/1950	11/27/1953
R.C. Wolf	12/7/1950	1/3/1961
R.V. Ward	12/17/1952	1/3/1961
John D. Saussaman	1/7/1954	7/18/1967
Robert Walline	1/3/1961	1/15/1969
John Masingale	1/3/1961	1/14/1981
Ernest L. Keechler	8/10/1961	1/9/1979
Ray W. Ferguson	7/26/1962	8/11/1976
Howard A. Andrews	7/20/1967	2/11/1970
Alex Tobin	1/15/1969	1/10/1973
Jack Comstock	6/10/1970	1/8/1975
Dick W. Pehl	1/10/1973	4/10/1979
John G. Gilday	1/8/1975	2/20/1985
George A. Borba	9/22/1976	12/16/1998
John L. Anderson	1/9/1979	1/5/2011
Edward A. Girard	5/15/1979	6/1/1990
Dwight F. French	1/14/1981	1/6/1993
Anne W. Dunihue	4/17/1985	1/15/2003
Bill M. Hill	6/27/1990	
Wyatt L. Troxel	1/6/1993	1/7/2009
Terry Catlin	12/18/1996	--
Gene Koopman	12/16/1998	--
Angel Santiago	1/15/2003	9/11/2013
Michael Camacho	1/7/2009	--
Steven J. Elie	1/5/2011	--
Jasmin Hall	10/23/2013	--

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Page 5: (center) Chaffey College
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CHAPTER 2
Page 11: (top) Robert E. Ellingwood Model Colony History Room, Ontario City Library
Page 11: (bottom) Kaiser Permanente Heritage Resources
Page 13: Robert E. Ellingwood Model Colony History Room, Ontario City Library
Page 14: Robert E. Ellingwood Model Colony History Room, Ontario City Library
Page 16: U.S. National Archives and Records Administration
Page 19: Metropolitan Water District of Southern California
Page 20: Kaiser Permanente Heritage Resources
Page 21: Kaiser Permanente Heritage Resources

CHAPTER 3
Page 25: Robert E. Ellingwood Model Colony History Room
Page 28: IEUA
Page 29: John Chacon, California Department of Water Resources

CHAPTER 4
Page 31: California Department of Water Resources
Page 33: IEUA
Page 34: IEUA
Page 35: IEUA
Page 36: IEUA
Page 37: Neva Ridge Technologies
Page 38: East Branch

CHAPTER 5
Page 41: Douglas McCulloh
Page 43: IEUA
Page 45: IEUA
Page 47: IEUA

CHAPTER 6
Page 50: IEUA
Page 51: IEUA
Page 53: IEUA
Page 54: IEUA
Page 55: Susan Lauer

CHAPTER 7
Page 60: IEUA
Page 64: IEUA

CHAPTER 8
Page 69: IEUA
Page 72: IEUA
Page 73: IEUA
Page 74: IEUA
Page 75: Susan Lauer
Page 76: IEUA

CHAPTER 9
Page 81: IEUA
Page 82: IEUA
Page 84: IEUA
Page 85: IEUA
Page 86: IEUA
Page 87: IEUA

CHAPTER 10
Page 89 IEUA
Page 91: IEUA
Page 93: IEUA
Page 94: Susan Lauer
Page 97: IEUA

CHAPTER 11
Page 101: IEUA
Page 103: IEUA
Page 104: IEUA

CHAPTER 12
Page 108: IEUA
Page 111: IEUA
Page 112: IEUA

Inland Empire Utilities Agency is committed to meeting the needs of the region by providing essential services in a regionally planned and cost effective manner while safeguarding public health, promoting economic development, and protecting the environment. Key areas of service:

- Securing and supplying imported water.
- Collecting and treating wastewater.
- Producing high-quality renewable products such as recycled water, compost, and energy.
- Promoting sustainable use of groundwater and development of local water supplies.

Inland Empire Utilities Agency
A MUNICIPAL WATER DISTRICT