Exhibit 1

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Contents of this Issue

THE ROLE OF THE SAN DIEGO RIVER IN THE DEVELOPMENT OF MISSION VALLEY

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Images from the Article

"Is today the day, Daddy? Can we pack a picnic lunch and sit on the bluff and watch the buildings go floating out to sea?" Any rainy day might bring forth that half-joking, half-hopeful question from one of our young sons. Their father, who had spent some of his childhood in San Diego, had told them what he remembered of the floods of the San Diego River in Mission Valley. And to their rather horrified delight, he had almost promised them that it would happen again someday. Since the San Diego River was almost completely invisible to them, and the great motels, office buildings and shopping centers were increasing in size and number most visibly, they were caught up in and delighted by what seemed to be a happening worthy of Walt Disney's "plausible impossible."

And so a shared family joke delights us still. But is there still a possibility of flooding in Mission Valley? Surely not! The great surge of building continues. The scarcity of water, not a surfeit of it, seems to be Southern California's problem. The actual presence of a San Diego River astounds the relative newcomer who is apt to state, "I didn't know there was one![1]

A glance at the latest San Diego City map will reveal a bright blue stream flowing through the heart of Mission Valley.[2] But a drive from Mission Bay six miles up to the head of Mission Valley where it narrows in to Mission Gorge will reveal only a couple of ponds and wet places. The river, for the entire span of its recorded history, has been a "now you see it, now you don't" vision for the inhabitants of the area. "It's upside down now!" chuckled one old-timer.[3] At present it does flow underground through the valley,' but where do its ghostly waters originate? A much quoted passage from Smythe's

History of San Diego describes it thusly:

> The San Diego River rises in the Volcan Mountains 60 miles from the city. It flows through the El Cajon and ex-mission ranchos, the pueblo lands of San Diego and into False Bay. At Capitan Grande, 35 miles from its mouth, it is joined by a branch rising to the southeast of the Cuyamaca Mountains. Fed by numerous springs on its course, it flows to Capitan Grande all year, then it sinks into the sands and disappears in the curious manner of California rivers.[5]

"False Bay?" "ranchos?" "pueblo lands?" —Words from the past! We will find that the will-o-the-wisp river has played a dominant role in the settling and development of both Mission Valley and San Diego city as well.

La Canada de San Diego (1602-1846)

Mission Valley was known to the Spanish as La Canada de San Diego (The Glen of San Diego.[6]) The first mention of the San Diego River was in the diary of explorer Sebastian Vizcaino. In 1602 he left San Diego Bay to investigate what he called False Bay (now Mission Bay) and he reported at that time that it was a "good port, although it had at its entrance a bar of little more than 2 fathoms depth, and there was a very large grove at an estuary which extended into the land, and many Indians."[7]

When the Spanish returned in 1769 with the intent to settle the area, the San Diego River was found to be a "river with excellent water" by Captain Vicente Vila of the ship *San Carlos*. He also noted a village of thirty-five to forty families of Indians living along the river.[8] A chart by Vila shows the changeable river entering into San Diego Bay.[9] Fr. Juan Crespi told of the first exploration (by white men) of Mission Bay in his letter of June 22, 1769:

> When we reached the port we found, about one league distant, a good river with sufficient water, but in a few days it ran dry. Yesterday, May 21, Fr. Viscaino, and I went out to examine it, accompanied by the lieutenant of the troops Don Pedro Fages, and the engineer Don Miguel Costanso and seven or eight soldiers. We followed the course of the river which runs through a canada of much level land, in places extending from a quarter to half a league. The soil seems to be good for raising corn and wheat. In some parts there seem to be marshes and humid soil. All along the river bed there are poplar, willow, and alder trees. We found it dry in many places. In some spots there were pools with water, and in others there was only a streamlet. We walked about three leagues up the river bed and the

> valley; but conditions were the same, until we reached the sierra, where the bed narrowed; (ed. note. Mission Gorge) but there was no running water. We do not know whether any irrigation could be done from it. However, if there be sufficient rains, as in other parts, good crops of cereals could be produced, as there is much land and good pasture. Building stone we have not seen anywhere.[10]

When the group that had arrived by ship was joined by the land party of Fr. Junipero Serra, they moved their camp up to a bluff overlooking the river (both for safety and to be nearer the source of water) and on July 16, 1769 founded the Mission and military post that was known as the Presidio.[11]

The first year they planted their crops near the river, and the river rose so high that it carried away all that was sown. The second year planting was done further back from the stream, but water was so scarce that most of the plants died.[12]

The padres recommended that the Mission be moved further up the Valley in hopes of having better luck with the crops. Fr. Serra in his first report of the Mission for 1774 stated, "It is determined to move the Mission within the same canada of the port toward the northeast of the presidio, at a distance of a little less than two leagues. The place is much more suitable for a population, on account of the facility of obtaining the necessary water, and on account of the vicinity of good land for cultivation. The place is called Nipoguay."[13] The move was accomplished in August of 1774 and Mission Valley had its first white inhabitants and California's first mission had its permanent home.

It is thought that in 1774 the river returned to False Bay after a period of heavy rain.[14] (The San Diego River has apparently shifted its channel back and forth between Mission (False) Bay and the San Diego Bay many times in the past. Historians conflict as to the actual years of change. It would be fascinating to do the detective work necessary to try to pin down the facts, but that would be another story.) Scarcity of water was the pressing problem of the padres, their growing mission and the surrounding Indian Villages. In 1792 Frs. Mariner and Torrent discovered fresh springs and had an irrigation ditch 1300 vares long built to bring water to the fields.[15]

The Spanish Military forces remained at the Presidio. According to British Captain George Vancouver who visited there in 1794, the military were supported by the fields and labors of the missionaries and their Indian neophytes.[16] Thus Mission Valley supported both settlements.

The marvel of the mission era was the dam and aqueduct which was

started in 1807. Using Indian labor, they dammed the San Diego River at the head of Mission Gorge where the river ran the year round. An aqueduct was run nearly six miles through a rugged canyon to the fields of the mission. The padres didn't keep many records during this time but Frs. Sanchey and Martin reported in 1813, "We are working on an aqueduct, which is to bring water to the Mission." In 1814 they reported that 3.8 miles had been completed.[17] Judge Hayes, who viewed the dam in 1867, said there was a settling basin with sand traps to clear the water before it entered the flume, and a four-inch penstock through which water was forced to turn a grist mill.[18] With the advent of the water Mission agriculture flourished. Vineyards, orchards and crops were quite successful, as were herds of cattle. When the Mission was secularized in 1833, the inventories show that it was a thriving enter prise.[18a]

Don Blas Aquilar, an old time resident of San Diego, recalled that by 1821 there were 15 rancherias and two vineyards in Mission Valley. He said that all the crops were washed away and homes were damaged by a great flood that year, and the river changed its course back into False Bay.[19]

A tiny town slowly grew up at the foot of Presidio hill. The years of the 1820s must have been wet ones. Early citizens like Bandini and Pio Pico reported floods and each remembered a different year that the river changed course again. There is some evidence that the channel moved southward in 1821 and completed the change in the flood of 1825 back into San Diego Bay.[20]

All California came under the jurisdiction of the Republic of Mexico in 1824, and the town of San Diego was officially established as a municipality or pueblo in 1834. The townspeople planted their gardens in nearby Mission Valley, and obtained their water from the river or from under its sands.

In 1842, M. Duflot de Mofra, an attache of the French legation to Mexico, visited the area and spoke of the port:

> Certain areas are shallow, and some parts are so covered with sand banks that ships can easily run aground on the silt that the tiny San Diego River brings down from the mountains in the rainy season. Within the last few years the river, through the negligence of the inhabitants, has returned to its former channel and now empties into the waters of San Diego Harbor.[21]

The wandering river was now threatening to choke up San Diego Bay as it had already done to False Bay, once a good deep port as reported by Viscaino in 1602.

The Mexican government sold the lands which formerly belonged to the Mission. Maria Estudillo received the El Cajon Rancho lying along the eastern San Diego River in 1845. In 1846, as the Americans were about to take over, Pio Pico gave a deed of sale to Don Santiago Arguello for "the remaining lands unsold" of the Mission San Diego.[22] A new era was about to begin. The Spanish had discovered the San Diego River and Mission Valley and though peopled sparsely, the valley was used for agriculture and cattle raising. After the first few years of adequate rainfall, the valley suffered under a long dry spell until the 1820s and 30s brought more rain and several floods. The Mission, once the center of culture in the valley, was falling into ruins.

Early American Days (1846-1900)

After three hundred years of Spanish rule, and twenty-four years under the Mexican flag, the Pueblo of San Diego and all of California was ceded to the United States for $15,000,000, in 1848. Captain S. F. du Pont, U.S.N., of the *U.S.S. Cyane* took the port of San Diego and his officer, Lt. Rowan, raised the American flag over the plaza of Old Town on July 29, 1846.[23] Du Pont later viewed the dilapidated mission and the remains of its gardens and vineyards, remarking that, "A more miserable and naked sight I never saw."[24] The first map by an American was made in 1846 by Henry D. Fitch. It shows two channels for the San Diego River. The one to the east enters San Diego Bay, the other stops short of False Bay.[25]

In 1849, Major A. R. S. Canby followed the San Diego River up to the ruined mission. He wished that the library could be cared for, and found the dam and aqueduct in good repair. With that water he felt that the valley could support a population of three or four hundred inhabitants.[26] Troops were stationed at the mission and were keeping it in good repair when John Russell Bartlett visited in May, 1852. They were withdrawn in 1858.[27] The mission was returned to the California Church in 1862 by President Abraham Lincoln,[28] but remained the haunt "of wild bees and owls"[29] for many years. In 1891 Father Ubach of San Diego began the first efforts to arouse interest in having it restored.[30]

In 1850, New Town was laid out by William Heath Davis closer to the port. But water for the ships and for the new community still had to be hauled from the river.[31] The population, according to the first census of 1850, was six hundred and fifty.[32] The diary of the artist Powell who came to San Diego during the gold rush days of 1850 states of the phantom river: "bed of river dry when we came in; today the water came rolling down a foot deep-strange sight."

The first government action to imply that the San Diego river stood in need of curbing was the U. S. Coast Survey whose report of 1851 by A. D. Bache warned that the bay may be destroyed by the silting action of the river. "The only remedy for this evil is to turn the river

into False Bay again. This is an excellent harbor and its loss would be severely felt."[33] Thus, Lt. George Horatio Derby, of the U. S. Army Corps of Engineers, was sent to San Diego in 1853 to build what was to become known as Derby's Dike. On his survey map he noted that "during freshets of the rainy season, the marsh south of town is entirely' inundated as well as part of the valley and plain bordering on the river."[34] Derby wanted to create a straight channel and levees for the river but he was ordered to deepen the old channel and build a levee from a point at the foot of the Presidio hill to the foot of Point Loma (1190 yards). The old *San Diego Herald*, Sept. 24, 1853; noted that "sixty laborers with carts, wheelbarrows, etc., are to be put on the work at once and by carrying it on energetically it is hoped that it may be entirely completed before the commencement of the rainy season." Derby complained that the plan was not sound, and funds were insufficient, and sure enough, the first "freshet" took out part of the dike, and in the heavy rains of 1855 the river went back into San Diego Bay.[35]

Derby became known nationally as a humorist and his own comment on this work at San Diego is typical:

> Here I saw . . . Derby . . . an elderly gentleman of emaciated appearance and serious cast of features. Constant study and unremitting attention to his laborious duties have reduced him almost to a skeleton. . . . He was sent from Washington some months since 'to dam the San Diego River' and he informed with a deep sigh and mournful smile that he had done it (mentally) several times since his arrival.[36]

A painting shows Derby's Dike in 1853 and in Mission Valley beyond, there are a few farms outlined in trees, and a large undeveloped area.[37] Two years of heavy rainfall preceded 1855 when 12.7 inches of rain added up to the flood that washed out Derby's Dike and scoured out the old burial ground at the foot of Presidio Hill as it returned the river to its San Diego Bay channel.[38]

The great[39] flood of 1862 is said to have been the largest in volume.[40] (Precipitation was 15.75 inches that year.[41]) The vast flat between Old Town and False Bay was covered. Houses were swept out to sea; gardens, olive orchards, and a grove of trees thirty feet high were washed away. Capt. Sherman lost his horses trying to cross the stream and a Capt. Johnson was unable to get across to his home for two days. Although apparently the volume of water was vast, there was no terrible loss of property.[42] San Diego was only a town of about seven hundred and fifty people, and Mission Valley was still sparsely settled.

Although a few wells were in use in the town, Mission Valley was still the principal source of water. It was known to old-timer Stephen Peters as Aqua de la Communidad and was for general use

as were the community grazing lands.[43] The water was obtained in dry season by sinking boxes or barrels into the sandy river bed.[44] Water was carted up to the Hotel in town and cost twenty-five cents a bucket.[45]

In the 1860s, a road crossed the river at Old Town and went up the north side of the river to the mission. One early resident of San Diego remembers that there were several houses on the north side of the river. One man had his house and garden in the river bed and people tried to tell him he would be washed away. He would not believe them, but woke up one morning in the flood of 1867 and found that he and his house were floating down to the bay.[46] Two years of heavy rains preceded the medium flood of '67. This one, together with the flood of '64, had washed away a twenty-four foot section of the Mission Dam although much of it remained in good repair.[47]

The 1870s and 80s were "boom and bust" years for San Diego. The population rose from 2300 in 1870 to 16,000 in 1890. Mission Valley (it received that name in 1870)[48] was the scene of truck gardening as far up as the mission. Sheep herding and bee-keeping were practiced and the marshes and fields were used for duck and dove shooting.[49] An advertisement in the *Union* of Jan. 6, 1893, offers 400 acres of level land in Mission Valley, five miles from town, for $60.00 per acre. A road crossed the river at the foot of Sandrock Grade and a store called C. W. Sandrock's Tienda was located there. The farmers brought in straw during the summertime in order to pack down the damp sand to provide a firm crossing. Fording the river was impossible if the river was flowing to any extent.[50]

The San Diego Water Company was founded in 1872 to meet the needs of the growing town. While they had several wells in town, the people continued to rely on wells in the San Diego River bottom. The *Union* of June 15, 1877, described the large excavation in the river bed about seven miles from its mouth. There was a pumping station run by steam engines which pumped the water up to a reservoir on the table land rising to the north of the city. The system served the city until 1912.[51] The same newspaper article noted that two or three times during the last thirty years, the river had flowed all year, and several times it had flowed until September.

During the winter of 1873-74, the river overflowed its banks four times, in December, January, February, and March.[52] For two months the stages were unable to cross the river and the mail was ferried back and forth in a row boat. In 1875, Congress appropriated $80,000 for a government dike to turn the river once more into Mission Bay. Work was done under the supervision of Lt. Weeden and the dike was completed in 1876.[53]

In 1881, the California Southern railroad was built across the San Diego River on pilings driven by steam power.[54]

The next great flood was in 1884. A record of 25.97 inches of rain fell that year with a long wet season continuing until June.[55] The warm and wet spring produced several phenomena. In a diary kept by Mr. Crouch of Oceanside, he remembered that the grass "outgrew itself" and contained no nutriment, causing the cattle to suffer and the lambs and yearlings to starve to death on the feed.[56] That spring also produced a flood of butterflies followed by swarms of cutworms and caterpillars, creating a disastrous year for farmers.[57] Damages to crops and cattle were severe, and although the pumping station was able to withstand the flood, it was moved to the south side of the river in 1805.[58] The railroad to the north was out for nearly nine months and the river flowed all year.[59] A flood occurred again in 1895, with its accompanying damage to crops. Bridges and railway trestles were washed out again.[60]

In 1887, Mission Valley had its land "boom and bust" fling in the Grantville residential project at the upper end of the valley near Mission Gorge. It was so named in hopes of attracting Civil War Veterans but it was never a success and the land "gradually became farming land as nature had intended it to be." (Opinion of Mission Valley Improvement Association, Union, 3-11-46, 7:2.) Allen's Dairy was developed on an old Mexican grant that was bought for taxes. Bernard started a large nursery in the valley with thousands of rose cuttings he brought from France.[61]

Thus Mission Valley retained its rural nature as the turn of the century approached. Floods periodically washed out the truck gardens and farms but actual property damage was slight as real property improvements were few and the population was small. The disruption of mail and rail routes through Mission Valley was a severe handicap for the citizens of the whole area during flood periods.

Dairies and Bridle Paths (1900-1950)

At the turn of the century, San Diego was a growing city of 17,700 whose interests were elsewhere than in Mission Valley. "It's only Mission Valley," quoted one oldtimer who complained of the marshes and mosquitos.[62] An earlier visitor from Los Angeles had spoken of Mission Bay as having "No commercial value" and that the river could fill it up "with impunity."[63] To view the rural scene from above was, however, a favorite pastime of San Diegans who visited Mission Cliff Gardens at the foot of the trolley line on Park Avenue. The beautifully kept grounds opened onto a vista below of the river meandering through small groves and farms. A gazebo was perched on the rim of the cliff. This was also a favorite spot to watch the rampaging river during flood years.[64]

Some concern was felt for the problem of flooding. A few people condemned the practice of burning off the brush cover along the waterway to improve the grazing areas, but many would not believe that it would affect rain run-off. The recent floods had served to further denude the valley hillsides.[65]

In 1901, the city sold its first water bonds and bought the San Diego Water Company. The main source of water was the reservoirs made by damming sources in the surrounding watershed areas, although an expanded well-field in Mission Valley was used until 1927. The city attorneys, in 1914, filed "An Opinion on the Rights of the City of San Diego to the Waters of the San Diego River" which was the beginning of a lengthy legal battle to prove the city's prior and paramount rights to the waters of the entire river system.[66]

The first large flood of the twentieth century was in the winter of 1905-06 after a very wet year in 1905.[67] The embankment at the end of Old Town bridge washed out, the channel shifted to the north, and the river ran until late in the summer.[68]

The largest, most destructive, and most famous flood of recent times occurred in 1916, again following a very wet year.[69] (See also Journal Winter 70.) The rainfall of the previous years was so distributed that there was little run off and the water in the city's reservoirs was very low. In December of 1915, Charles Hatfield appeared before the City Council. As a "rainmaker," he said he could fill the Morena reservoir for $10,000. The city officials voted to accept his proposition and told the city attorney to draw up a contract. Hatfield did not wait, but built a platform and began shooting off chemical explosions.[70] The rain began on January 16, 1916, and lasted four days. The newspapers welcomed the rain as the reservoirs began to slowly fill and noted that some people were beginning to take Hatfield seriously.[71] Mission Valley flooded, quickly wiping out the vegetable gardens and homes of the Chinese and Japanese farmers, and ten of the twelve wells used by the city. The police and Navy Militia used flat bottom boats to rescue families. The city's Isolation Hospital in Mission Valley had to move their patients up to the second floor as the water rose.[72] Hundreds of people flocked to Mission Cliff Gardens to watch the spectacle below,[73] and an editor in the *Union* (1-18-1916) stated that he felt the water in the reservoirs offset one-hundredfold the damage to property, private and municipal. He said suffering may grow, "but the run-off into reservoirs will also continue giving the city and county a wealth of water for future use and bringing with it the happiness and prosperity that is only possible through such a beautiful water supply."

The sun came out for a few days, and then a second storm began to batter the city. The San Diego River rose six feet higher. Bridges along the river were washed out, although the railroad bridge was partially saved by parking train cars loaded with rocks on it, and

opening up a spillway through the earth to one side.[74] There are many tales of heroism as more people were rescued from their homes in Mission Valley. *Union* headlines of the 27th stated: "Dams holding against Great Flood as Wires go; City Water Supply All Right." The Otay Dam went out at 6:14 that night, scouring out its valley to the bay and taking the lives of twenty-three people.[75] The peak flow of the San Diego River was established at 75,000 cubic feet per second, with total physical damage at $565,000.[76] All important highway and railroad bridges were destroyed or severely damaged, many miles of roadbeds and tracks were washed out, and telephones and telegraph lines were down. For a month all supplies were brought in by ship, and only the wireless remained as a means of communication.[77]

The city was soon deluged by law suits, one of which was Hatfield's, asking for his $10,000. The city attorney told Hatfield's attorney that if Hatfield would sign a statement assuming all responsibility for the flood and absolving the city, the city attorney would recommend that the Council pay the full claim. "Go to hell," said Hatfield's attorney and that was the end of that.[78]

1920 brought a new development to Mission Valley. The Mission Valley Oil Enterprise Company sank a well near the foot of Texas Street. Although they found a showing of oil, it could not be brought up in productive quantities.[79] A medium flood occurred in 1921 and the City Isolation Hospital was again isolated. Although damage was not great, it was estimated that four billion gallons of water rushed through Mission Gorge and the *Union* urged that a dam be built there.[80]

Next to the flood of 1916, the flood of 1927 was the most damaging. The storm filled the county reservoirs and "a 10 year period of prosperity was assured for the city," said the *Union* of 2-17-27. The curious were again attracted to the bluffs above the river, and one witness recalls watching a rooster ride out to sea on a box.[81] This was the flood which the writer's husband remembers as a little boy of five. He recalls that it rained a long time, and everything was very wet and he was hospitalized for ten days with typhoid fever. It would seem to the author that the water supply must not have been too safe.

After long years of litigation, the State Supreme Court ruled in 1930 that San Diego did have prior and paramount right to the entirety of San Diego River water.[82] The story of this clash between public and private interests is a stormy one, but is an interesting chapter in San Diego history. The settlement led the way to the building of the El Capitan Dam and Reservoir (completed in 1935) and the San Vicente Dam and Reservoir (completed in 1943), both of which store water from the water shed along the upper reaches of the San Diego River.

The Government Dike had been raised once in 1917 and was raised again in 1933.[83] The dirt road through Mission Valley, often muddy and impassable during rainy season, was replaced in the early thirties by a two-lane paved road by the San Diego County Highway Development Association.[84] There was a flood of medium size in 1937 and again in 1938. The latter was more serious in the North County. The railway was blocked; one witness on the way home from Los Angeles was on a train that was stalled near Escondido for seven hours. Finally the train backed all the way to Los Angeles and it was four days before it could get back as far as La Jolla. Roads and bridges were still closed and her husband had to drive around the east end of the valley to meet her in La Jolla.[85]

By 1940, San Diego was a city of 203,341, and Mission Valley had developed twenty dairies. This was now the primary activity, although vegetable farming remained a close second, and sand and gravel businesses had existed there for many years. Early in 1940, a Mission Valley Improvement Association was organized in hopes of protecting the area from too much exploitation. They proposed to make bridle paths "wide enough for buggies and safe enough for bicycling and walking" throughout the valley.[86] Horse farms were numerous and a polo club attracted much attention in the news.[87]

The war years brought a huge jump in population and the city, with help from the U. S. Navy, brought in water via canal from the Colorado River. The first Colorado River water reached the San Vicente Reservoir in November of 1947 just three months before the local supply was exhausted, a very close call with disasters[88]

The Federal Government in 1945 authorized a report on a flood control channel of 3.3 miles in length at the downstream end of the San Diego River. A hydrology report was made in 1947 by the Army Engineers and San Diego began the second half of the century with some of her flood control problems in mind.[89]

Commercial Explosion (1950-68)

Work on the flood channel and new channel entrance to Mission Bay began in 1950 and was completed in 1953. It consisted of 3.3 miles of rock-revetted levees twenty-five feet high forming a channel of from 200 to 250 feet in width.[90]

San Diego Magazine of August 1950 pointed out that Mission Valley was a horse's paradise, another Rancho Santa Fe, containing twenty miles of bridle trails. It told how the Mission Valley Improvement Association had fought against roadside stands, an airport, and a cocktail lounge for State College students. It contained a plea to the San Diego Planning Commission not to let the valley become a non-stop superhighway for the big trucking companies.

But such was not to be. Charles Brown was the "pioneer" of the commercial building boom although the Mission Valley Golf Club had been operating since 1947. (The Golf Club was private but dues were low, $10 a family, and it was felt to benefit most of the community.[91]) In the early 50s, Brown made an evaluation of the land and found that the "only alleged disadvantage seemed to be fear of flood."[92] He bought a 221h-acre site for $79,000 and built the Town and Country Hotel. He estimated shortly before his death in 1966 that the land was now worth $125,000 per frontage acre on Hotel Circle and his Town and Country Hotel was worth 2.25 million dollars.[93]

So began the rush to build the brightly lighted Mission Valley we see today. But not everyone was happy. "Corruption was the word applied to the City Council in November of 1957 by an article in *San Diego Magazine* when writing of the May Company's buying of land in Mission Valley for a proposed shopping center. It made a plea for encouraging the City Planning Commission's idea for a green belt policy, and felt that the Commission should tell May Co. where to go: they suggested an area near Rosecrans. The article predicted (correctly) that full-flood commercialism would surely follow.

F. F. Friend, consulting hydraulic engineer, was engaged by the City Council to report on flood control in Mission Valley. He pointed out the need for flood zones, urged a 250 foot wide unlined channel, and hoped that the valley would develop into an area complementing Mission Bay with accommodations, entertainment, a motor boat canal, scenic roadways, bridle paths, etc. Although the editor of *San Diego Magazine*, who commented on this, thought it was a great non-political and non-commercial (not anti-commercial) scheme, he feared it would be "buffeted by commercial pressure groups."[94]

Congressman Bob Wilson said that in 1959 the heart of Metropolitan San Diego had moved northward to Mission Valley.[95] An illustrated feature in the *Union* (6-211959) was titled "A Giant Awakes" and noted the motels and new building activity plus a picture of the rural scene in 1953. Millions were spent in the Valley. In 1961, assessed valuation on vacant parcels had increased 17 percent in three years, and as much as 1,500 percent in six years. Freeway 80 cost 15 million for the stretch between Taylor Street and Fairmount Avenue. The $25 million May Company Mission Valley Shopping Center was opened in February of 1961.[96] The First Methodist Church cost $1.6 million; $2 million were needed to renovate the Bowlero into the Masonic Temple,[97] and unknown millions were spent in building the Mission Square office building, Cinerama 21, Center Theater, Mission Valley West, Mission Valley South, luxurious automobile agencies and restaurants, enough new motels to fill Hotel Circle and a $27 million stadium to seat 55,000 people.

Real property worth millions of dollars exists in the Valley, the scene of so many floods. A long series of dry years has certainly favored the building projects. In 1965 rain flooded the lower parts of Mission Valley. One motel had a foot of water over the floor; the bridge over the river at Zion Road washed out but no serious flooding or damage occurred.[98]

May Company hired engineers to study the flood problem and consequently built with the problem in mind. They' built a riprap around the shopping center and designed the Center so that the parking area is underneath and the shops are on the second level. Pumps are needed constantly to keep the normal drainage of water pumped out and into the nearby drainage ditch. In case of a major flood they predict that the parking area would be five feet under water. City engineer Ed Gabrielson estimates that most of the motels on the north side of Highway 80 would be inundated.[99]

The city is aware of the flood problem. Each permit must show on the map the area of flooding clearly marked as such, and space must be left for the proposed flood control project.

In 1959 Congress authorized, and the Army Corps of Engineers completed, a report on flood control in Mission Bay.[100] The proposal suggested a concrete lined, rectangular flood control channel about 5.2 miles in length reaching from Zion Avenue in Grantville to the existing channel at the Morena bridge. It would range from 200 to 250 feet wide with tributary channels extending from several canyons. At the upper end there would be two inlet levees.

Property owners in Mission Valley asked the City Council to support the narrow concrete-lined channel as they felt the wide unlined channel (850 foot swale) suggested by F. F. Friend would harm their property value.[101] The Civil Defense office announced that the proposed channel would not be used as an emergency escape route during an atomic disaster.[102]

After being approved by the Chief of Engineers and by the Secretary of the Army, the proposed flood control project (estimated cost-$22,300,000) was approved by the various congressional committees and houses and was signed by President Johnson in October, 1965.[103] Funds were refused in 1966 and thought to be a casualty of the Vietnam War.[104] In 1968 the Army engineers and the State Department requested that $300,000 be budgeted for advanced engineering and design of the Mission Valley Flood Control Project. No action has as yet been taken but Mr. Lockhead of the Engineering Department of the City of San Diego said the allotment had a very good chance of being passed. If the money is appropriated, the engineering and design would begin and actual construction would be two or possibly three years away and, of course, would only follow the approval of the actual

construction funds.

The Plausible Possible?

"Yes, Virginia, there *is* a San Diego River." Its presence was one of the main reasons for locating the first Alta California Mission on San Diego Bay. It. was the main source of water for the slowly growing community for over one hundred years and remained a secondary source of water until the nineteen forties. The Mission of San Diego de Alcala was moved to its present location in the upper end of Mission Valley so that the water of the inconstant river might be better utilized for agriculture. The small community of Indians and priests finally began to prosper when the river was dammed and the aqueduct assured an adequate water supply. The secularization of the Mission brought an end to this settlement, but the river continued to be the focal point for the ranchos and rancherias which developed along its banks. The land remained largely agricultural throughout the nineteenth century. During that century, the San Diego River overflowed its banks and flooded Mission Valley many times, destroying crops, pastureland and homes. But the farmers returned to plant their crops and to rebuild, for, in the dry years in between, proximity to the precious water outweighed the dangers of flooding.

The main town, however, grew up on the higher mesa lands that flattened out as they approached the harbor of San Diego Bay. Floods were not a problem here and water could be found in wells or hauled up from the river. The main commerce developed near the port facilities.

During the first half of the twentieth century, Mission Valley developed as a dairy and horse raising center. Truck farming continued as a close second in importance. Railroads, highway, and telephone and telegraph lines crossed Mission Valley as the valley lay across the City's access to the more populous north. Floods became more disastrous as development occurred in the valley, but to the main body of San Diegans, the destruction of communication routes was the primary inconvenience caused by the flooding.

As the city doubled and trebled in size, the use of the undeveloped land of Mission Valley close to the heart of the city began to be re-evaluated. As tourism flourished and Mission Bay was developed into an aquatic park, the need for resort-type accommodations grew and the large hotels and motels were the first to see Mission Valley as a superbly located spot for their uses. The crossing of two major highways made a highly desirable location for a giant shopping center. Easy access contributed to the development of two huge sports edifices, the Sports Arena at one end of the valley and the San Diego Stadium at the upper end near the restored Mission.

Have these builders forgotten the flood problem? No, the city

zoning ordinances insure that each permit for use of the land is clearly marked as to the area subject to flooding. The city of San Diego added two zones to its zoning ordinance in 1966. The FC Zone (Flood Control) directly regulates the uses of land within the natural channel of a stream; uses permitted are restricted to agriculture, recreation, and other open space uses that would not obstruct the natural flow of the stream. The FP zone (Flood Plain) regulates the intensity of development in areas of inundation.[105]

There are two methods of flood control: protective and preventive. The protective approach proposes engineering techniques that encourage or depend upon urbanization. The preventive approach proposes to preserve the natural condition of the land and limit its urban uses. The protective approach seeks to keep the flood water away from the encroaching people; the preventive approach seeks to keep people out of the way of the flood waters. Protective measures are usually necessary after the fact of commercial and/or urban building, and the Federal Government agrees to improve rivers for flood control purposes if the benefits are in excess of the costs.[106] This is what has happened in San Diego. The earlier Planning Commission's dreams of a wide green belt in the valley and the voices of some of the citizens were too little and too late. According to Mr. Lockhead of the City Engineering Department, fifteen years ago something might have been done. But the city asked the Federal Government for protective measures in 1965 and the land owners of Mission Valley wanted them. That was the last time the citizens could have protested.[107] The protective flood control channel is still several years from the start of construction. A conservative estimate for its completion is five years, probably longer.

What are the dangers of flooding in the interim? In 1965, D. E. Lake of the County Civil Defense office said that San Diego County is long overdue for a major flood. He said that major floods have hit on the average of every 17 years for the last 125 years and that dams in the county are primarily designed for water storage, not flood control.[108] City Engineer Ed Gabrielson said that if a flood were to hit in 1966, there would be $24,835,000 damage to property in Mission Valley. He said the flood threat had worried engineers and geologists for years.[109] A projected' estimate of future flood damages from a standard project flood was made for the Corps of Engineers' report. Old-timer Don Stewart predicted in his book *Frontier Port* that the cycle of wet years will return. "If we have 2 or 3 wet years in succession, our dams will be overflowing again. I hesitate to even think of what is going to happen to Mission Valley."[110] Shelley Higgins, another long-time resident, said that the miles of pavement and terraces, fills, etc. will add to the rain run-off. To him the next flood is a certainty, and the only question is *when*.[111]

The San Diego River, it seems, now plays a lesser role in the

development of Mission Valley. The forces of nature controlled men's actions until the press of population and economic factors put man's need for space above nature's probability of disaster. Economic determinism forced the development of real property of great value along the river bed of a river that still offers the threat of flooding. And the threat will stand until the flood control channel is completed. Meanwhile the property owners in Mission Valley are playing a kind of Russian Roulette with the river. Do the many dry years favor their odds, or shorten them? The Federal Government, too, must play the odds in allocation of its monies. Present needs must be met before projected possibilities.

The mills of government grind slowly and the threat of floods remains.

"Is today the day, Daddy?"

FOOTNOTES

1. Remark of student in Historiography class, San Diego State College, April 25, 1968.

2. Street map of San Diego. Automobile Club of Southern California, March 1968.

3. Mrs. Robert Sams, personal interview with the author at San Diego, May 15, 1968.

4. Doris Christman and Dorothy Self "Ambitious Valley," *San Diego Magazine*, (August, 1950) p. 16.

5. William E. Smythe, *History of San Diego, 1542-1907* (San Diego: The History Company, 1907) p. 693.

6. *The San Diego Union*, 11 Mar. 1940, 7:2.

7. Richard F. Pourade, *The Explorers* (San Diego: Union-Tribune Publishing Co., 1960) p 184. Translation of diary of Vizcaino.

8. Fr. Zephyrin Engelhardt, *San Diego Mission* (San Francisco: James H. Barrey Company, 1920) p. 11, 12. Record of Captain Vila.

9. Pourade, *Explorers*, p. 102. Chart of Capt. Vila.

10. Engelhardt, op. cit., p 15, 16. Letter of Fr. Crespi.

11. Ibid. p 49. Letter of Fr. Palau. 12. Ibid. p 50, 51. Letter of Fr. Palau.

13. Ibid. p 56. Letter of Fr. Serra.

14. Edward J. P. Davis, *Historical San Diego*. (San Diego: Pioneer Printers, 1953) p 20.

15. Engelhardt, op. cit., p 147, 149. Report of Mission operations.

16. Ibid. p 173. Letter from Vancouver.

17. Richard F. Pourade, *Time of the Bells* (San Diego: Union-Tribune Publishing Co., 1961) p 20. Records of the Mission.

18. Ibid. p 121. Letter of Judge Hayes.

18a. Richard F. Pourade, *Silver Dons* (San Diego: Union-Tribune Publishing Co., 1962) p 4.

19. Smythe, op. cit. p 99.

20. Ibid. p 693 Pourade, Explorers p. 45. Report of Derby State of California, Department of Water Resources, Bulletin No. 112, San Diego County Flood Hazard Investigation (Sacramento, 1964) p 11.

21. Pourade, *Bells*, p 230. Letter of de Mofra.

22. Smythe, op. cit. p 73.

23. Pourade, *Silver Dons*, p 81. Log of USS Cyane.

24. Pourade, *Silver Dons*, p. 82. Letter of du Pont.

25. Davis, op. cit., p 27. Map of harbor.

26. Smythe, op. cit, p 263, Letter of Canby.

27. Engelhardt, op. cit., p 303. Letter of Bartlette.

28. Ibid., p 344. Proclamation of President Lincoln.

29. Ibid., p 305. Letter of Ford.

30. Ibid. p 309.

31. Don M. Stewart, *Frontier Port* (Los Angeles: Ward Ritchie Press, 1965) p 80. Testimony of oldtime resident.

32. James Mills, San Diego, *Where California Began* (San Diego: Historical Society, 1960) p 37. U. S. Census Report -- all further census figures refer to this report.

33. Smythe, op. cit., p 185. Report of Bache. 34. Pourade, *Silver Dons*, p 199. Map of Darby. 35. Ibid, p 201.

36. M. M. Sugg, Ed; *Stories of Old San Diego* (San Diego: Committee for the Annual Trek to Serra Cross, 1966) p 41. Writings of Darby.

37. Pourade, *Silver Dons*, p 200. Painting.

38. Smythe, op. cit., p 683. Report of Weather Bureau.

39. U. S. Secretary of the Army, Chief of Engineers, Department of the Army, *San Diego River (Mission Valley) California* (Washington: Government Printing Office, 1965). Terms, great, large and medium floods are those used by this Government report.

40. State of California, Department of Water Resources, Bulletin No. 112, *San Diego County Flood Hazard Investigation* (Sacramento: 1964) p 11.

41. Smythe, op. cit., p 683. Weather Bureau Report.

42. *The San Diego Union*, 5-23-1873, 7:2.

43. Shelley J. Higgins, This Fantastic City San Diego, (San Diego: City of San Diego, 1966) p 60. Report of old-timer.

44. Ibid., p 31. Report of old-timer.

45. Ibid., p 64. Report of old-timer.

46. Smythe, op. cit., p. 46. Report of old-timer.

47. Pourade, *Bells*, p. 121. Letter of Judge Hayes.

48. Union, 3-11-1942, 7:2.

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50. Ibid., p 59.

51. City of San Diego, Utility Department, History of the Development of the San Diego Water Supply, James I. Perry (San Diego: 1965) p 1.

52. Herbert Crouch "Reminiscences of Herbert Crouch, 1869-1915" Diary, p 92.

53. Union, 6-15-1877, 1:4.

54. Pourade, *Glory Years*, p. 160.

55. Smythe, op. cit., p. 683, Weather Report.

56. Crouch, op. cit., p 68.

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59. Crouch, op. cit., p 69.

60. *Union*, 1-28-1916.

61. *Union*, 3-11-1940, 7:2.

62. Christman, op. cit., p 14.

63. Richard F. Pourade, *The Glory Years* (San Diego: Union Tribune Publishing Co., 1964) p 144. Reporter from Los Angeles.

64. Christman, op. cit., p 16, 17.

65. Stewart, op. cit., p 83, 84.

66. Higgins, op cit., p 3.

67. Smythe, op. cit., p 683. Weather Bureau. Stewart, op. cit., p 85.

68. Smythe, op. cit., p 696.

69. Ibid., p 683, Weather Bureau. Stewart, op. cit., p 85.

70. Higgins, op. cit., p 176.

71. *Union*, 1-17-1916, 1:1. 1-18-1916, 1:1.

72. *Union*, 1-18-1916, 1:3. 1-19-1916, 1:7.

73. Stewart, op. cit., p 85.

74. Higgins, op. it., p 177.

75. Ibid., p 179.

76. U. S., Op. cit., p 3.

77. State of Calif. Flood Hazards, p 11.

78. Higgins, op. cit., p 183.

79. *Union*, 3-11-1940, 7:2.

80. *Union*, 12-27-1921, 1:1.

81. Mrs. James Minor, personal interview with author at San Diego, IS May 1968.

82. Higgins, op. cit., p 119.

83. Ibid., p. 31. State Bulletin.

84. *Union*, 10-22-1966.

85. Mrs. Theodore Burns, personal interview with Author at San Diego, May 18, 1968.

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87. *Union*, 9016-34.

88. City of San Diego, Perry, op. cit., p 2.

89. U. S. op. cit., p IX.

90. Ibid., p 4, p 26.

91. Christman, op. cit., p 14-17.

92. *Union*, 10-22-1966, B1 :2-6.

93. Ibid.

94. Editorial, *San Diego and Point Magazine* (May 1958) p 49.

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97. *Union*, 10-22-1966.

98. *Union*, 12-12-1965.

99. *Union*, 7-18-1965.

100. U. S., op. cit., P I11.

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102. *Union*, 4-2-1964.

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104. *Union*, 1-25-1966.

105. City of San Diego, City Planning Depart ment, *Guidelines for site Use of San Diego's Floodplains*. (San Diego: City, 1967, p 23.)

106. Ibid., p 27.

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111. Higgins, op. cit., p 183.

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—— *The Glory Years*, San Diego: Union Tribune Publishing Co., c. 1964, 274 pp. Illus. maps, chrono., biblio., Index. This series of books about San Diego History were commissioned by J. S. Copley, Chairman of the Board of Copley Press. They are beautifully illustrated and printed. The first volume is rich in primary source materials with translations from the Spanish. It is noted that some of his writing follows very closely that of Smythe's earlier work. It has been suggested that he mentioned sources, or showed them in pictures without using them to carefully document his facts (Cordtz). It would seem that Mr. Copley was satisfied to have a beautiful format without too much accuracy from Mr. Pourade. This writer has not the experience to judge for herself and chose to use the books largely for their primary source material.

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D. NEWSPAPERS

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E. DIARIES

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F. ORAL INTERVIEWS

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Minor, Mrs. James, personal interview, San Diego. 15 May 1968 with the author. A resident for 46 years.

Papageorge, Andrew J., personal interview, San Diego, 30 March 1968, with the author. Spent part of his childhood in San Diego.

Sams, Mrs. Robert, personal interview, San Diego. 15 May 1968, with the author, a resident for 38 years.

Nan Taylor Papageorge, a native of Virginia, has lived in San Diego for twelve years. She received her A.B. at San Diego State College and her Masters at United States International University. She is presently teaching Adult Basic Education in the San Diego Adult Schools. (Ed. note: Mrs. Papageorge's article covers the development of Mission Valley through. 1968.)

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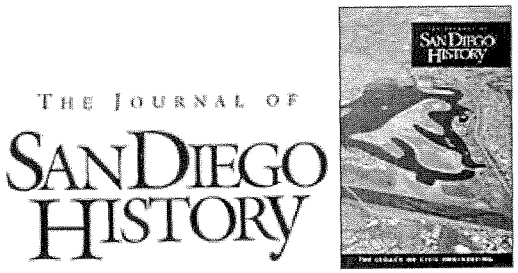

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Contents of This Issue

Dry Rivers, Dammed Rivers and Floods: An Early History of the Struggle Between Droughts and Floods in San Diego

By Joseph Hill

Images from this article

The early history of San Diego County revolved around water. The dry summers and years of low rainfall severely restricted the amount of water available for drinking, agriculture and other important activities. As a result, dams were constructed across major rivers to collect winter runoff from the seasonal rains for use during the dry summers. This proved to be a viable plan for the typical yearly water cycle. However, extreme flood years caused devastation in the rivers and creeks, even destroying parts of the early Old Town in the process. Water supply dams are closely related to flooding and flood control; they are two sides of a coin. The history of floods, flood control facilities, and flood management programs in early San Diego is presented in this article.

San Diego County covers about 4,200 square miles. About 60 miles from south to north and about 70 miles across, it is larger than some eastern states. The terrain, from the coast in the west, rises eastward through the foothills, over the mountains, then descends into the desert. Most of the storm systems that affect the coastal slope come from the Pacific Ocean and head eastward over the mountains. The rising ground level pushes the moisture-laden air up, causing increasing amounts of precipitation as the ground elevation increases. By the time the storms pass the mountain divide, most of the moisture has been removed, and the expanding air mass that passes over the desert provides little precipitation. Average annual precipitation is 10 inches for the coast, 15 inches for the foothills, 30 inches for the mountains, and 5 inches for the desert. The small amount and the wide variation of rain present a problem for the County. The 10 inches of rain along the coast creates a near desert-like climate. Most of the rain falls in winter, with no precipitation in the summer months. The rivers and creeks become dry, and there is very little water to sustain life in the summer and much of the fall. The logical response in this environment was to construct dams in the foothills to collect winter runoff from the higher elevations of the coastal slope and to prevent the water from infiltrating into the groundwater basins, then seeping into the ocean.

In a semi-arid environment, dams serve two purposes. Water for such needs

as drinking, cooking, and agriculture are essential and require the dedication of resources and the creation of infrastructure to allow an adequate annual supply. Additionally, dams provide flood control in an area prone to unpredictable rainfall. A basic relationship exits between the amount of water available and the number of people in an area. At the time the missionaries operated the Mission in San Diego, the native population consisted of several groups that lived in the area of San Diego County. To some extent, these people migrated toward the coast during periods of ample rain and retreated toward the mountains when the weather was dry for an extended time. Estimates place the native population in the County just prior to 1850 at 2,000 to 5,000 people. This provides an indication of the population that could be sustained without manmade water resource facilities.

The following table relates calendar years to census data and reservoir capacity in acre feet and provides a yardstick for considering the need for storage and water transportation facilities developed in San Diego County. The ratio of acre feet per Capita provides a comparison between reservoir storage and population. Of course, the reservoirs had to be filled by runoff from seasonal rains and evaporation during hot summers reduced the amount of available water. A series of dry years could deplete the water stored in the reservoirs.

SAN DIEGO COUNTY POPULATION and RESERVOIR CAPACITY

SAN DIEGO CITY				SAN DIEGO COUNTY		
Year	**Population**	**Res. AF**	**AF/Cap.**	**Population**	**Res. AF**	**AF/Cap.**
1850	650[c]	100	.15	798	100	.12
1860	731	100	.12	4,324	100	.02
1870	2,300	100	.02	4,951	100	.02
1880	2,637	100	.02	8,618	100	.01
1890	16,159	34,000	1.90	34,987	34,000	.97
1900	17,700	123,000	6.95	35,090	130,000	3.07
1910	39,578	123,000	3.11	61,665	130,000	2.11
1920	74,683	159,000	2.13	112,248	166,000	1.48
1930	147,995	159,000	1.07	209,659	369,600	1.76
1940	203,341	275,900	1.36	289,348	520,100	1.80
1950	334,387	393,800	1.18*	556,808	628,700	1.13*
1957	491,895[a]	393,800	.80*	900,400[b]	667,000	.74*

a Actual figure from special census by U. S. Bureau of the Census, taken in March, 1957
b Estimate
c Including La Playa

**Water supply was supplemented by importing water from the Colorado River*

The San Diego Mission and the Presidio were established in 1769, near the present site of Old Town. The Mission was moved up the river about three miles to its current location in 1774, in part to be near a reliable water source. The first complete and accurate map became available after the survey by Juan Pantoja y Arriaga in 1782. This map indicated the location of the Mission on the river, whose outlet was just south of the Presidio and Mission Bay (then called False Bay). Because of the scarcity of water, the missionaries found it necessary to construct a dam at Mission Gorge. Completed in 1816, it was 12 feet high and carried water to the Mission by way of a flume. In 1821, Mexico took control of the missions from Spain, and the missions were subsequently secularized and no longer supported.

The 1853 map by U. S. Army Lieutenant George H. Derby shows the San Diego River next to Old San Diego, now Old Town. A delta is identified downstream of Old Town and next to San Diego Bay. An 1856 sketch is consistent with the 1853 map. A dry riverbed can be seen next to Old Town, and the patterns of previous river flows identify the delta shown on the map. Note that the riverbed disappears under an area that is fenced on the right side of the picture. In 1862, the dry riverbed disappeared, at least for a few months. Torrential rains and floods washed away the east wing of Casa Bandini, though much of the structure survived.

Derby is known for more than his map. The city fathers had been concerned about the river flooding Old Town and filling the harbor in San Diego Bay with silt. Derby, an engineer, was assigned the task of designing and constructing protective measures for the city. He designed a dike from the hill north of Old Town, in a westerly direction, to the higher ground north of Point Loma. However, the structure was not adequately protected from the high velocity of floodwater, and the dike broke in the flood of 1862. By 1864, drought conditions prevailed again. In 1875, Congress appropriated $80,000 to rebuild Derby's dike. This time it was properly designed and constructed to resist the flooding of the river. It withstood the floods of 1884 and 1916.

In 1889, the Cuyamaca Dam was constructed on Boulder Creek in the Cuyamaca Mountains, along with a 45-mile long flume. The flume went through eight tunnels and over 315 trestles. The earth fill dam has a rock face and is 41.5 feet high, including 6.5 feet above the spillway level. The total crest length is 665 feet. While this was a major accomplishment, it was far from sufficient. By the turn of the century, six reservoirs were in use and diversion structures and canals were providing water for San Diego County.

Several types of dams were used to create the reservoirs/lakes in an area that had no permanent fresh water lakes or ponds. The technology for design and construction of these dams, pipelines, and canals was relatively new, and there were no long-term records of rain, river flow, and infiltration to use as a basis for design. One type of dam construction used was the gravity arch. This was a new development in concrete dam construction in the late nineteenth century. It relies on the weight of the concrete to hold it in place and the arch effect directs the water force into the rock abutment on each side of the dam. Sweetwater Dam was the highest structure of this type when it was completed in 1888. A hydraulic fill dam was also an innovative method at that time. It was difficult to transport fill long distances to place it at the core of an earthfill dam. The problem was overcome by pumping water and silt to the dam site and creating a pond, then allowing the water to seep into the ground, leaving the silt in a compacted core for the dam. La Mesa Dam was constructed in this way. A third type of dam is rock with steel core. Several dams of this type were constructed in San Diego County. The method consisted of digging and/or blasting a trench at the center of the dam from the top of one abutment, through the bottom of the streambed, and up to the top of the other abutment. The trench is filled with concrete and the bottom of a steel core is cast into the concrete. The steel

core is raised like a curtain to the elevation of the dam crest. Each side of the core is filled with rock to provide strength for resistance of the water force. The steel core limits seepage through the dam. Details of specific dams are discussed below.

Sweetwater Dam started as a 60-foot high structure. However, it was designed so that it could be expanded in height. During construction, additional analysis of the reservoir area showed that raising the dam to 90 feet would store five times more water in the reservoir. So, as the 60-foot high structure was nearing completion in January 1887, the decision was made to continue work for another 16 months to raise the dam to 90 feet. It was finally completed in April 1888, and it provided a valuable water supply for the area. Then in 1895, a rain of six inches in a 24-hour period created a flood greater than the designers had anticipated. There was no precedent for expecting that much rain and runoff in a short period. The result was that Sweetwater Dam was overtopped for a period of 40 hours, with the highest reservoir level 22 inches over the elevation of the parapet. Sweetwater Dam remained stable during this event. The cascading water caused erosion downstream of the structure and washed away some of the pipeline and other facilities, but did not adversely affect the dam. Following this flood, the parapet was repaired and raised two feet, but with 200 feet in the middle left as an overflow weir or spillway. An additional spillway was added on one side of the dam, to convey flood flow through the dam, rather than have it pass over the dam. An apron was added below the spillway to convey floodwater safely past the structure. The walls of the canyon below the dam were protected with concrete and steel beams. A 15-foot high wall was also constructed 50 feet downstream from the dam as a water cushion basin for flow going through the 200 foot overflow spillway. This basin would absorb the impact of water falling from a height of about 90 feet over the dam..

Escondido Lake, Dam and Canal were constructed to provide water to the Escondido area, which needed irrigation for crops in the valley. The relatively small watershed (8 square miles) is not large enough to provide sufficient runoff, so a canal 15.6 miles long connects the reservoir to a diversion structure on the San Luis Rey River. The conduit includes 67,287 feet of excavated channel, 14,142 feet of flume (wood channel supported by posts on the slopes of a rugged canyon) and 806 feet of tunnel.

This type of rock fill dam had given satisfactory service for many years in the mining regions of northern California. The upstream face of the dam consisted of two layers of wood planks. The joints were calked and smeared with a hot asphalt substance. Although the dam leaked (100,000 gallons per day) it was considered stable and the leakage could be used for irrigation during dry periods.

The United States Geological Society took note of the construction of the La Mesa Reservoir and Dam in a 1898 publication:

> A novel and exceedingly interesting type of dam is that constructed in the spring of 1895 by the San Diego Flume Company for the purpose of storing the flood water of San Diego River in winter, as well as to provide a means of catching … the water at the lower end of the Flume.

This shows the interest the people of that time had in this structure. While the reservoir was not directly on the San Diego River, a canal brought water to the reservoir from the river. Since the Cuyamaca transported water to the San Diego River, any excess water not used for drinking, irrigation, or other needs was stored by the dam's reservoir. During construction, hydraulic fill was conveyed into the area through a pipe, carrying a mixture of very fine soil and water. The water kept the soil in suspension. The pipe discharged the water containing the soil into a pond in the middle of the dam. Since this was a relatively new method of construction, people were also interested in this project for that reason.

Morena Lake and Dam, a rock fill dam structure on Cottonwood Creek, has a watershed that is in the higher elevations of San Diego County (the reservoir site is about 3,100 feet above sea level) and therefore has a relatively high annual precipitation. It was estimated that the reservoir would fill every year. Water could be discharged at a controlled rate into the creek and picked up by the Barrett Diversion Dam, a dam and canal system, built to direct water from Cottonwood Creek through a canal, 12 miles in length, to Lower Otay Lake.

Lower Otay Lake and Dam is a rock fill structure with a massive masonry pour as a base for the steel plates. The steel plates, riveted together, acted as a diaphragm to control seepage and can be seen at the middle of the dam. A pyramid formed by the steel members during construction was used as a crane to move rock, steel and concrete to their proper location in the structure. Explosives were used to break rock into smaller units for use in the dam. As an example of the effect of blasting, records show that 100,000 pounds of powder loosened 150,000 tons of rock.

The following table lists major facilites that supplied water in the late 19th century.

Major water supply projects of 1880 to 1899

SAN DIEGO RESERVOIRS (19th Century)

Name	Date Complete	Watershed Area Sq. Miles	Height Feet	Capacity Acre Feet	Type of Dam	Comments
Sweetwater	1888	280*	108	22,500	Gravity Arch	
Cuyamaca	1889	11	35	11,400	Earth/rock	Storage for Canal
Escondido	1887-94	8	75	3,500	Rock Fill	Lake Wohlford
La Mesa	1895	5	65	1,400	Hydraulic Fill	
Morena	1895	135	150	50,200	Rock Fill	
Barrett Div.	1896+/-	250	60	590	Rock Fill	Small structure, diverted flow to Canal
Lower Otay	1897	99	125	38,300	Rock Fill	

** Total area before Loveland Dam*

At the turn of the twentieth century, a population of about 18,000 people were being supplied with water from a system that captured a major part of the runoff from rain in the area. However, San Diego was still dependent on local rain to supply the reservoirs with water, and drought conditions prevailed in the first 15 years of the century. City fathers offered a local rainmaker named Charles Hatfield $10,000 if he could cause enough rain

to fill Morena Reservoir. The first day of January 1916, the dry weather continued. Hatfield had built towers near Morena Reservoir and was releasing strange and secret vapors into the atmosphere. The need for water was becoming more desperate each day. On January 14, 1916, a massive storm rolled in from the Pacific, and for the next six days, most of Southern California was deluged. Old Town received more than four inches of rain, and Cuyamaca received 18 inches, amounts that equaled nearly one half of their usual annual rainfall. Every river and creek was choked with floodwater, and Lake Morena was full. No doubt Hatfield was ecstatic, probably celebrating his success that had saved San Diego. The rain ceased on January 19th, and the area began to dry out. Then, just a few days later, the skies clouded again, the wind blew from the southeast, and a second deluge began, which pounded down sheets of rain, day after day. The storm added another three inches of rain at Old Town and more than 14 inches at Cuyamaca. The already saturated watershed retained little of the rain, and raging torrents of water raced down the rivers and creeks, destroying nearly every object in its path. One thing that remained structurally sound was Derby's dike. It prevented the onrushing river from devastating Old Town and filling San Diego Bay with tons of sediment. Morena Reservoir has a large watershed, and the dam survived the large flood runoff without major damage. At Sweetwater Dam, the spillway was not large enough, and the floodwater overtopped the dam and then washed out a large section of the south abutment. The dam had been constructed with enough structural stability, so that it did not wash out. When the dam was later repaired, a second spillway was incorporated in the south abutment.

Otay Dam, however, was a total loss. The spillway did not have sufficient capacity for the flood flows and the dam was overtopped. Water filled the observation shafts on the downstream side of the steel core, and the pressure blew out the rock that provided the structural stability. The steel core swung out like a gate, releasing the full depth of water, which created a flood wave in the canyon of gigantic proportions. The dam was about 130 feet high, and the depth of the wave in the canyon a short distance below the dam site was about 100 feet high. The force of the water was so great that it stripped every bit of vegetation from the canyon walls, leaving a clear trace of the wave crest. The lower canyon is much wider, and the wave height decreased to approximately 20 feet, which was still devastating to the people living in the valley below. Every structure was destroyed and many people lost their lives. At the end of the flood, San Diegans found that every bridge over every river or creek was impassible, and the only way to travel to Los Angeles was by boat.

After the flood, Hatfield was nowhere to be found. Some time later, he appeared at the City Council to claim his $10,000. However, the city attorney determined that either Hatfield was responsible for the rain, or he was not. If he collected the $10,000 for filling Morena Reservoir, he was also responsible for the flood damage. Hatfield did not collect the money, and he disappeared from the area.

RESERVOIR DEVELOPMENT FOR WATER SUPPLY *(20th Century)*

NAME	COST (Millions)	DATE CONSTR-UCTED	TYPE	HT ABOVE STREAM BED	CREST LENGTH	RESERV. AREA (ACRES)	WTRSHED AREA SQ. MILES	RES. CAP ELEVATION (ACRE FEET)	COMMENTS
Murray	$1.21	1917-18	Hollow gravity multi-arch	107	864		3.7	5,900	Constructed downstream of La Mesa Dam
Lower Otay	$7.33	1917-19	Gravity/arch	149	700	1132	98	56,300	Replaced original dam
Barrett	$1.59	1919-22	Gravity 400' radius	179	773		250	36,300	Replaced Diversion Dam
Henshaw	$1.2	1914-22 Raised 1927	Semi-hyd. fill Reinforced concrete face	127	650	6020	206	203,600 53,400*	*Lowered spillway, earthquake safety
El Capitan	$5.8	1932-35	Semi-hyd. fill rock fill	217	1170	1580	190	116,900	
Hodges	$.78	1917-18 1936	Hollow gravity multi-arch	130	552	1317	300*	33,600	
San Vincente	$2.77	1941-43	Gravity mass conc. Straight	199	980	1069	75	90,200	
Loveland	$2.15	1945	Variable arch	198	730	475	98	25,400	
Sutherland		1954	Multiple arch	162	1,025	550	53	29,000	

Subsequent to the 1916 flood, damage or destroyed structures were repaired and additional reservoirs were needed. The table above lists construction projects at reservoir sites throughout the county.

Major floods occurred again in 1927, 1937, 1978 and in 1980. None were of the magnitude of the 1916 event, and the additional reservoirs reduced the flood flows through the coastal areas. Records show the flows during the 1980 flood at three reservoirs, El Capitan and San Vicente in the San Diego River watershed and at Hodges on the San Dieguito River, indicating the degree to which the dams prevented flood damage. El Capitan Dam reduced the peak flow from (at least) 40,000 cubic feet per second (cfs) to 0. All the floodwater was stored in the reservoir and did not spill until several day later, when the sun was shinning. San Vicente Dam reduced the peak flow from 11,500 cfs to 6,000, almost a 50% reduction. The recorded flow downstream at Mission Gorge was 9,400 cfs, and the flow at Mission Valley was probably slightly higher. If the two reservoirs had not reduced the flows, the flow through Mission Valley would have been of the order of 50,000 cfs instead of about 10,000cfs.

The San Dieguito reservoir reduced the flow from 28,000 to 22,000 cfs. Sutherland dam and reservoir also reduced the peak flow, so the 28,000 cfs would have been higher without that dam. Hodges Dam spilled in 1980, and the Race Track at the lower end of the San Dieguito River flooded. The 1916 flood at this location had a flow of 72,100 cfs.

What about Sweetwater Dam in 1980? The spillway on the north bank that had washed out in 1916 functioned perfectly in 1980. All of the dams in San Diego County have had a dramatic impact on both water supply and flood control for the people of San Diego.

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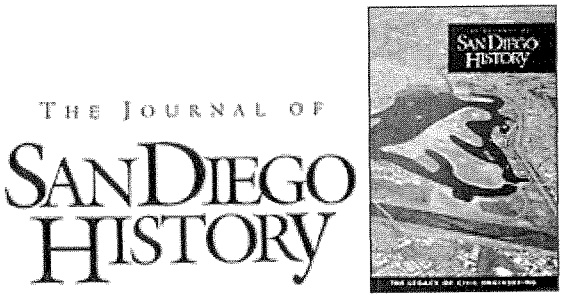
Exhibit 3



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Contents of This Issue

Water Supply Development in San Diego and a Review of Related Outstanding Projects

by Mike Sholders

Images from this article

People create cities near water to maximize opportunities for commerce, recreation, and most importantly to ensure drinking water for the population. In San Diego County, natural streams and lakes are very small, compared to other large cities, and most are in the coastal range many miles from the metropolitan area.

San Diego is classified as a semiarid section of the United States and has so little annual rainfall that the agricultural area is continuously dependant upon irrigation. The average annual rainfall on the County's coastal plain over the last 150 years is about 10 inches. Mountain streams provide only a limited and extremely variable water supply. Many reservoirs have been constructed to store water for use in dry years and to provide regulation of water flow. Only a few watersheds have reliable groundwater, and their wells provide only a small percentage of the water needed for the County's large agricultural producers.

Fortunately, the early pioneers and community leaders planned for and constructed water supply facilities that were necessary to sustain the County's population. They also had the vision to recognize the need for imported water from the Colorado River and other sources. The planning and construction of water supply facilities for sufficient imported water has been a serious issue that still remains today.

This article addresses the history of the planning and construction of the major water supply facilities that make San Diego one of the finest and most desirable cities in the world. Also, it will emphasize the role and importance of civil engineering to the water supply

development in San Diego County.

The history of water utilization in San Diego County may be broken down into four periods: the Mission Period (1769-1834), the Early California Period (1835-1885), the Boom Period (1886-1895), and the Present Day Period or Planned Development (1869 to the present).

The Mission Period, from 1769 to 1834, was characterized by the efforts of the Franciscan missionaries to obtain water for the Mission San Diego de Alcala and for the Presidio. There were many attempts to obtain a good source of water supply. The first was water from the dug wells in the gravels of the San Diego River. Later efforts to obtain a good supply included ditches with sand and brush diversion dams and storage of water in small reservoirs and cisterns. These efforts culminated in the construction of the Padre Dam (Old Mission Dam) in 1816, a brick and mortar storage and diversion dam near the head of Mission Gorge and an aqueduct to carry the waters to the Mission and the Mission lands. The Padre Dam itself is still in existence. However, since its completion, some portions of the dam have been destroyed by floods.

The Early California Period, from 1835 to 1885, is best characterized by the lack of any coordinated or planned development of a water supply. From 1834 to 1872, almost all water was obtained from dug and drilled wells, both in the San Diego River and the New Town (downtown San Diego) area. In 1873, the first planned development of water was started, with the incorporation of the San Diego Water Company. During the early years of the company, water was still pumped from wells and distributed to consumers in both San Diego and Old Towns.

Barrett 1927

The Boom Period of 1886-88 saw San Diego's population grow at tremendous rate, and the entire population seemed to think that San Diego and the County area were going to continue growing rapidly. Developers, investors, and speculators planned immense water conservation projects and, within a period of fourteen years, formed many water-related companies. These ventures included: the San Diego Land and Town Company in 1881, the Otay Water Company in 1886, Linda Vista Irrigation District also probably in 1886, the San Diego Flume Company in 1886, the Mount Tecarte Land and Water Company in 1897, the Pamo Water Company in 1888, and the Southern California Mountain Water Company in 1895.

There were numerous other plans that never had a name or reached the incorporation stage. Engineering achievements during this period include the building of the Sweetwater Dam and distribution system and the Cuyamaca Dam and flume. After the completion of Cuyamaca Dam and flume, water was purchased from the San Diego Flume Company and distributed to the populace.

A more planned period of development began after the boom was over. Only three of the companies listed above survived the drought of 1895-1904; the Otay Company, the Flume Company, and the Mountain Water Company. However, the plans of those that failed pointed the way to later developments. In fact, all the major reservoirs that are being considered for development at the present time, or that have been built, were a part of the plan of at least one of those original companies.

At the turn of the last century, the City of San Diego began purchasing some of the properties of the existing water companies to ensure a reliable water supply for its population. In 1901, the City purchased the facilities of the San Diego Water Company that lay within the City limits for $600,000. In February, 1913, it purchased the Barrett-Otay System from the Southern California Mountain Water Company for $2,500,000. In 1920, the City began purchasing water from the San Dieguito Mutual Water Company. Five years later, it purchased the San Dieguito system from the San Diego County Water Company for $3,750,000.

The City of San Diego also began building water projects itself. In 1913, the City built the Mission Valley pumping station. The following year the Bonita pipeline, eight miles of 28-inch riveted steel pipe, was installed. During the 1916 flood, the Otay reservoir dam, built of rock fill with a steel plate core, was overtopped and destroyed. In 1917 and 1918, the Otay reservoir dam was replaced with a gravity section concrete arch dam 145 feet high. Then, over the period of 1921 to 1923, Barrett Dam, a gravity section concrete arch dam 171 feet high, was constructed. Lakeside-University Heights pipe line, 17 miles of 36-inch lock joint riveted steel pipe, was installed in 1927. In that same year, the Lakeside and Riverview pumping plants were installed. Work was undertaken in 1927 through 1931 to improve the spillway at Hodges Dam. In 1928, a water filtering plant was built in University Heights, with sixteen gravity filter units. The lower Otay-San Diego second main pipeline was installed in 1929, with 8.1 miles of 40-inch electric welded steel pipe, another 8.1 miles of 36-inch pipe. The El Capitan Dam, a fill-rock embankment, 217 ft. high, was completed in 1935 at a cost of $3,000,000. These are just a few of the projects that provided a reliable water supply to San Diego County.

Early in the last century, planners began looking for sources of water beyond the local watersheds. Civil Engineers began working on the development of the Colorado River as early as 1902, when Congress enacted the Reclamation Act. A special appropriation was awarded to the Bureau of Reclamation in 1914, for intensive studies of the river basin. Civil Engineers in the U.S. Geological Service provided the basic data needed from stream gauging stations that was used to predict the amount of water available for conservation and development purposes. These studies were completed and a report compiled by the Bureau of Reclamation Project Engineer,

John T. Whistler, in March, 1919.

More funds were made available for further studies in May, 1920 and the Chief Engineer for the Bureau of Reclamation, Frank E. Weymouth, directed further investigations. This resulted in a famous report known as the Fall- Davis Report that was submitted to the Senate in 1922. This report recommended the construction of the All- American Canal to serve Imperial Valley and the construction of Boulder Dam, later known as the Hoover Dam. This report was the substance of the Swing- Johnson bill authored by Senator Hiram E. Johnson and Congressman Phil Swing of California. Wemouth prepared a report in February,1924, that fixed the site of the Boulder Dam at Black Canyon. This report caught the attention of Engineers and political leaders in southern California and resulted in the formation of the Metropolitan Water District in 1928. Mr. Weymouth became the first Chief Engineer and General Manager of the Metropolitan Water District.

The Colorado River Compact was developed in 1922 by another engineer, Herbert Hoover, who was then the Secretary of Commerce. This Compact apportioned the use of the Colorado River water between its upper and lower basins, with the point of division at Lees Ferry. The upper basin states are Wyoming, Colorado, Utah and New Mexico. The lower basin states are Nevada, Arizona and California. The apportionment to each of the states was to be 7,500,000 Acre Feet per year for beneficial consumption, with a further grant to the lower basin states to increase their use by 1,000,000 acre feet per year. Arizona refused to ratify the Compact, so it applied just to the other six states. A provision in the final version limited the use of California to 4,400,000 acre feet per year, plus not more than one half of the surplus water not apportioned. The six states ratified the Compact by 1929, and the Boulder Dam Project was adopted by Congress, with the provision that applied, at the time, only to the six states. Herbert Hoover, now president, issued the final proclamation on Mar 6, 1929. Arizona finally ratified the Compact in February, 1944.

The San Diego City Council first discussed the necessity for drawing water from the Colorado River on July 25th, 1921. Dr Elwood Mead, the Director of the Bureau of Reclamation was very supportive of the idea and defined the many benefits that the City could derive by filing for a permit to obtain Colorado River water. On May 18, 1923, the Boulder Dam Association supported this concept. This group consisted of many influential citizens in southern California, and John L. Bacon, Mayor of San Diego was its first president. Following a systematic and effective campaign of public education, the demand for action was culminated on April 18, 1926, when Bacon signed an application to the State Division of Water Resources for the right to deliver 112,000 acre feet per year from the Colorado River. This application was later broadened to

include the County of San Diego.

Two contracts assured the benefits of the Hoover Dam and Lake Mead to the City and County of San Diego. The first, the result of much effort by San Diego's Civil Engineer H.H. Savage, was executed on February 15, 1933 and provided 250,000 acre feet of capacity in Lake Mead and for the delivery of 112,000 acre per year to San Diego at a point in the river immediately above Imperial Dam. The second achievement by Mr. Savage, in co-operation with Congressman Phil D. Swing, dated October 2, 1934, provided for the construction a diversion dam, main canal and appurtenant structure for the all American Canal to satisfy the 153 cubic feet per second (cfs) allotment of lake-river water for San Diego.

Construction of an aqueduct to bring Colorado River water to the Los Angeles area began as soon as work on Boulder Dam was under way. As financed and constructed by the Metropolitan Water District of Southern California, the Colorado River Aqueduct is designed, with some ultimate enlargement, to deliver 1500 cfs to the District's present fourteen constituent areas and to other areas that may become annexed to the District. The Aqueduct was completed and placed under operation in 1941, at a cost of $190,000,000.

However, this did not get the water to San Diego. World War II caused a great increase in water consumption in San Diego, and it became imperative to bring Colorado River as soon as possible. The Bureau of Reclamation completed studies in 1943, comparing the costs of two possible connections for linking with the Los Angeles area aqueduct. An office was opened in Escondido and field surveys were completed.

In early 1945, military establishments, war industries, and war housing projects were using over 50 per cent of the water being delivered to consumers from the San Diego water system, and a threatened shortage in the City water supply had become a problem of national importance. An interdepartmental committee was appointed by the President of the United States to study the water supply of the city and to recommend a plan for securing a supplemental supply. The report of the Committee was published as Senate Document No. 249, 78th Congress, 2d Session. It recommended the immediate construction by the Federal Government of an aqueduct connecting with the Colorado River Aqueduct near San Jacinto, with the War Department, the Navy Department and the Federal Works Agency bearing the cost (estimated at $17,500,000). The recommended emergency aqueduct was to have a design capacity of 85 cfs. Tunnels and other permanent structures were to be constructed with a design capacity of 165 cfs, provided the bids to be received for such portions of the project indicated an increase of cost no greater than would warrant this action. The report further recommended "that the San Diego

County Water Authority or the City of San Diego continue and press negotiations with the Metropolitan Water District of Southern California to the end that an equitable arrangement be worked out, which would make possible permanent service by way of route 1 (the emergency aqueduct connection) in order that the value and permanent utility of the emergency work may be realized, and to protect against the possibility of an interruption in the supplemental water supply on the termination of the war emergency." The committee's report and recommendations, dated October 21, 1944, were accepted by the President of the United States. Directives were issued to the departments concerned to proceed with construction. After welcoming some opposition from other Federal Agencies, construction began in the fall of 1945.

The San Vincente Aqueduct was designed as a gravity conduit, tapping the Colorado River Aqueduct of the Metropolitan Water District at the westerly portal of San Jacinto tunnel, and extending in a southerly direction to discharge into San Vincente reservoir. The total length is 71.1 miles, of which 30.4 miles are in Riverside County and 40.7 miles are in San Diego County. From the regulating reservoirs near the San Jacinto tunnel to San Vincente reservoir consists of pipelines and tunnels are of sufficient size to carry the full capacity of 185 cubic feet per second. The San Diego Aqueduct was completed and place in operation in December 1947, providing for about one half of the ultimate capacity needed. Construction of a second barrel was completed by the County Water Authority in 1954 and a second aqueduct was completed in 1958.

One unique feature of the San Diego Aqueduct is that the elevation at the Lake Mathews Metropolitan Water District connection is so high that all of the deliveries to the member agencies are by gravity so that pumping is never required. The quality of water from the Colorado River depreciates each year with regard to total dissolved solids, affecting water hardness, and is approaching unacceptable limits. Therefore, further river water from the California Aqueduct is needed to improve quality. Other sources of water such as seawater distillation and wastewater reclamation are constantly being evaluated. So far, these supplies are either too expensive or not acceptable as portable water.

The San Diego County Water Authority, consisting of five cities, three irrigation districts and one public utility district, was organized June 9, 1944, under an enabling act of the California State Legislature known as the County Water Authority Act. The primary purpose was to import Colorado River water to San Diego County. The Water Authority staff consists of 34 Board Members and a staff of Engineers that occupy a $16,000,000 facility in San Diego and a smaller field office in Escondido. These engineers and staff are busy planning new projects that will improve the reliability of the system to accommodate the predicted population to the year

2050.

The California Aqueduct became a second major aqueduct system to bring water to Southern California. It captures water from the Feather River, funnel its south through the Sacramento/San Joaquin Bay-Delta, feeds it into the California Aqueduct, pumps it over the Tehachapi Mountains, and delivers it to reservoirs near the Antelope Valley north of Los Angeles. This aqueduct, also called the State Water Project launched a bitter north-south controversy. Northern Californians asked, "Why should the southerners be allowed to steal our water?" Southern Californians countered, "It's not their water; it's California's water and we're all Californians. Eventually, under the leadership of Governor Pat Brown, the State Water Project was built, and it started delivering water to Southern California. With that new resource, both the County Water Authority and the Metropolitan Water District could make good on their commitments to provide water to new areas - for a while. One controversial component of the original plan, a "Peripheral Canal" around the environmentally sensitive Delta, was never built. As a result, the State Water Project has never delivered as much water as originally intended. The effort to find an alternative method to deliver the full contracted amount continues to this day. Concern over environmental and ecological degradation in and around the Delta complicates the problems. During the 1990's, Governor Pete Wilson and President Bill Clinton initiated an unprecedented collaboration of state and federal agencies, as well as urban, agricultural, and environmental groups, to develop a long-term solution that restores the Bay-Delta as both a reliable water supply and a healthy habitat for fish and wildlife. This collaborative body became known as the CalFed Bay-Delta Program. San Diego County hopes to benefit from that solution with a more reliable water supply and higher-quality drinking water.

Since the State Water Project supplemented water supplies from the Colorado River, San Diego County now relies on imported water for 75 to 95 percent of its total supply. In 2002, almost three million people living and working in San Diego County depend upon the County Water Authority to make the investments necessary to secure and deliver a reliable water supply. The Authority and its member agencies finance and maintain the water supply and delivery system necessary to support the near 90 billion a year economy and quality of life enjoyed in San Diego County. Significant milestones in planning for the future include a water conservation and transfer agreement between County Water Authority and the Imperial Irrigation District that will provide up to 200,000 acre feet per year until the year 2073. This agreement represents that largest long-term water transfer in the U.S. history. Also part of future planning is the Emergency Water Storage Project, a system of reservoirs, pipelines and other facilities to increase emergency storage and pumping capabilities critical to the reliability of water supply. This action will ensure the region has

enough water and flexibility to deliver the water during potential disruptions due to draught, earthquakes of other disasters.

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Exhibit 4

San Diego
Historical Society

HISTORY OF SAN DIEGO

1542-1908

BY

WILLIAM E. SMYTHE

Previous Chapter | Table of Contents | Next Chapter

Part Four: Chapter IV

WATER DEVELOPMENT

The question of an adequate supply of water for San Diego always has been one of the most vital problems in the life of the place. During the short life of "Davis's Folly," or "Graytown," and for some time after Horton came the inhabitants depended upon water hauled from the San Diego River. The early settlers still remember paying Tasker & Hoke twenty-five cents a pail for this water. After that, they were for some time dependent upon a few wells. An effort to find an artesian supply began in 1871. A well was sunk by Calloway & Co. in which some water was found at a depth of 250 feet. They asked for city aid to enable them to continue boring, but the proposition to issue $10,000 city bonds to carry on the work was defeated at an election held in July, 1872. The well in the court house yard furnished a good supply, which was used to some extent for irrigation. In 1873 a well was completed at the Horton House, which gave great satisfaction and was thought to demonstrate that "an inexhaustible supply of good water exists at but a comparatively trifling depth, which can be reached with little expense." The well which Captain Sherman sank in the western part of his new addition, was also an important factor.

The town soon outgrew the possibility of dependence upon wells, early in its first boom, and in 1872 San Diego's first water company was organized. This was the San Diego Water Company, incorporated January 20, 1873. The principal stockholders were: H. M. Covert and Jacob Gruendike; the incorporators were these two and D. W. Briant, D.O. McCarthy, Wm. K. Gardner, B. F. Nudd, and Return Roberts. The capital stock was $90,000, divided into 900 shares of $100 each. The term of the incorporation was fifty years from February 1, 1873. H. M. Covert was the first president.

The first works of this company were artesian wells and reservoirs. They bored a well in Pound Canyon, near the southeast corner of the Park, and found water, but at a depth of 300 feet the drill entered a large cavern and work had to be abandoned. The water rose to within 60 feet of the surface and remained stationary. They then sank a well 12 feet in diameter around the first pipe, to a depth of 170 feet, and from the bottom of this second boring put down a pipe to tap the subterranean stream. The large well was then bricked up and cemented. It had a capacity of 54,000 gallons per hour. Two small reservoirs were also constructed, one at 117 feet above tide water, with a capacity of 70,000 gallons, and the other more than 200 feet above the tide, with a capacity of 100,000 gallons. The water was pumped from the 12-foot well into these two reservoirs. Such were San Diego's first waterworks. In March, 1874, the *Union* said with pride:

> About 18,000 feet of pipe will be put down for the present. Pipe now extends from the smaller reservoir down Eleventh and D, along D to Fifth, down Fifth to K, along K to Eleventh, and will also run through Ninth from D to K and from Fifth along J to Second. The supply from this well will be sufficient for 30,000 population and is seemingly inexhaustible.

But notwithstanding this confidence, in a few years the water supply in Pound Canyon was found to be inadequate, and it was determined to bring water from the river. In the summer of 1875 the company increased its capital stock to $250,000 for the purpose of making this improvement. A reservoir was built at the head of the Sandrock Grade, on University Heights. The water had to be lifted several hundred feet from the river to the reservoir, and this pumping was expensive. In order to avoid this expense and improve the service, the company drove a tunnel through the hills, beginning at a point in Mission Valley below the new County Hospital and coming out on University Avenue near George P. Hall's place. The water was piped through this tunnel, which is still in a fair state of preservation. A new reservoir was built at the southwest corner of Fifth and Hawthorne Streets; and these works constituted the San Diego water system until the pumping plant and reservoir at Old Town were constructed. This old reservoir gave sufficient pressure for the time being, and it was not then believed the high mesa lands would ever be built upon.

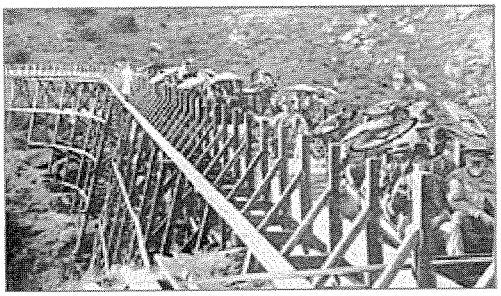
In the fall of 1879 the papers note that the water mains had been extended down K Street as far as the flour mill and thence up Twelfth to the Bay View Hotel. Early in 1886 the long delayed work on the river system, near Old Town, was resumed. From numerous wells in the river bed, the water was pumped into the large reservoir on the hill. At this time the company also made many extensions and laid new pipes for almost the entire system. The pumps installed had a capacity of 6,600,000 gallons per twenty-four hours. There are four covered reservoirs with a total capacity of 4,206,000 gallons. A standpipe was placed on Spreckels Heights, 136 feet high and 36 inches in diameter. The top of this standpipe was 401 feet above tide, and it regulated the pressure all over the city. According to the engineer's statement, about 30,000,000 gallons were pumped during each month of the year 1888. The pipe lines in January, 1890, exceeded 60 miles and had cost $800,000. There were 185 fire hydrants connected, for which the company received $100 each per annum.

The next large undertaking in the way of water development was that of the San Diego Flume Company. This project originated with Theodore S. Van Dyke and W. E. Robinson, who worked upon it for some time before they succeeded in interesting anyone else. Then General S. H. Marlette became interested and these three associates secured the water rights needed for the development. In 1885, they planned to form a corporation, to be called the San Diego Irrigating Company, but for some reason the plan failed. The promoters continued to work indefatigably, however, and finally succeeded in enlisting the interest of George D. Copeland, A. W. Hawley, and a few others, and soon were in a position to incorporate. The articles of incorporation were filed in May, 1886. Besides those mentioned, the following were incorporators: Milton Santee, R. H. Stretch, George W. Marston, General T. T. Crittenden, Robert Allison, J. M. Luco, and E. W. Morse.

Sufficient money was paid in to start the work. Copeland became President, Robinson Vice-President, and Stretch Engineer. Captain Stretch served about six months and did some of the preliminary work. He was succeeded by Lew B. Harris, who served about a year, and then J. H. Graham became the engineer and remained until the work was completed. The capital stock was $1,000,000, divided into 10,000 shares of $100 each.

The difficulties encountered were many. There was an inefficient contractor whose men the company was compelled to pay. It was asserted that the flume encroached upon an Indian reservation, and there was frequently a lack of funds. Their means becoming exhausted, some of the original incorporators were obliged to step out. Copeland became manager in place of Robinson, and Morse president in place of Copeland. Later, Bryant Howard became president and W. H. Ferry superintendent, and these two men saw the work completed.

This great pioneer undertaking was organized and carried out by far-seeing, courageous men, for the purpose of irrigating the rich lands of El Cajon Valley and also of bringing a supply of water to San Diego. Incidentally, but quite as important, they were aware that they were making a demonstration of the agricultural possibilities of San Diego's derided back country. There were a few citizens who understood the importance of the undertaking and watched the course of events with almost breathless interest. But the majority were too busy with real estate speculations to be much concerned—at least, this was true of the floating population of newcomers. Van Dyke writes pointedly: "The writer and his associates who were struggling to get the San Diego River water out of the mountains to give the city an abundant supply, and reclaim the beautiful tablelands about it, were mere fools 'monkeying' with an impracticable scheme, and of no consequence anyhow."



Dedication of the San Diego Flume

The man at the extreme right is Governor Waterman. The man in the second row wearing a straw hat is W. E. Robinson, one of the originators of the enterprise

On February 22, 1889, the completion of the flume was celebrated in San Diego, most impressively. There was a street parade over a mile long, and a display of the new water. A stream from a 1¾ inch nozzle was thrown 125 feet into the air, at the corner of Fifth and Beech Streets, and at the corner of Fifth and Ivy, another one 150 feet high, to the admiration of the citizens. There were 19 honorary presidents of the day on the grand stand. Bryant Howard, M. A. Luce, George Puterbaugh, Hon. John Brennan of Sioux City, Iowa, D. C. Reed, and Colonel W. G. Dickinson spoke, and letters and telegrams from absent notables were read.

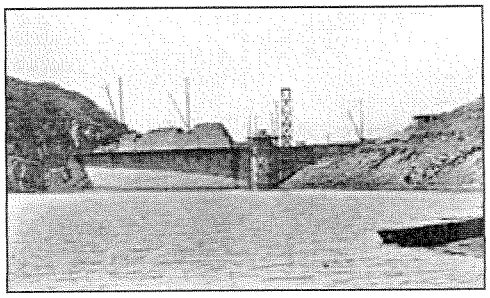
It is really a pity to have to spoil the story of the celebration of such an achievement, with a joke, but—the truth is, the water in the pipes at the time was not the Flume Company's water, at all. The Flume Company had placed no valves in their pipes, and, consequently, when they turned the water on, it was airbound and the water advanced very slowly. When the day for the celebration came, the water being still several miles away, the officers of the San Diego Water Company quietly turned their own water into the pipes, and had a good laugh in their sleeves while listening to the praises the people lavished on the fine qualities of the "new water." The Flume Company's water arrived three weeks later.

The flume emerges from the San Diego River a short distance below the mouth of Boulder Creek, and proceeds thence down the Capitan Grande Valley to El Cajon Valley, about 250

feet from the Monte. From this point the flume curves to the east and south of El Cajon, at a considerable elevation. From El Cajon, the flume is brought to the city by the general route of the Mesa road. The total length of the flume proper is 35.6 miles. The reservoir is an artificial lake on the side of Cuyamaca Mountain, about fifty miles from San Diego, at an elevation of about 5,000 feet. Its capacity is nearly 4,000,000,000 gallons. It is formed by a breastwork of clay and cement, built across the mouth of a valley, forming a natural basin.

The construction of this flume exerted a very important influence in bringing on and sustaining the great boom, although it was not completed until after the close of that episode. The officers at the time of its completion. were: Bryant Howard, president; W. H. Ferry, vice-president and manager; L. F. Doolittle, secretary; Bryant Howard, W. H. Ferry, M. A. Luce, E. W. Morse, and A. W. Hawley, directors. These men are entitled to the credit of being the first to carry to a successful conclusion a scheme of development of the water resources of San Diego County, upon a large scale.

The construction of the Sweetwater Dam was begun November, 1886, and completed March, 1888, under the well-known engineer, James D. Schuyler. The Dam alone cost $225,000 and the lands used for reservoir site I7. .9,000 more. The original investment in the system of distribution exceeded half a million dollars. The reservoir stores 7,000,000,000 gallons and supplies National City Chula Vista, and a small area of land in Sweetwater Valley.



Sweetwater Dam in Course of Construction, 1887

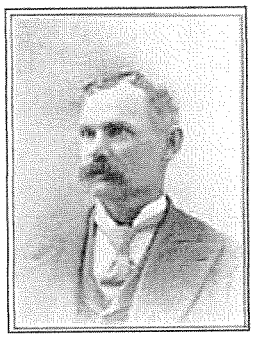
The Otay Water Company filed its articles of incorporation March 15, 1886, its declared object being to irrigate the Otay Valley lands and the adjacent mesa, and E. S. Babcock being the principal owner. In 1895 he sold a half interest to the Spreckels Brothers and the name of the corporation was changed to the Southern California Mountain Water Company. Later, the Spreckelses became sole owners. This company has an important contract under which it now supplies the city with its entire water supply. Its storage dam is at Moreno and its pipe line was extended to the city reservoir and the delivery of water commenced in the summer of 1906.

E. S. Babcock

Who came to San Diego in 1884 to hunt quail and remained to influence events more powerfully than anyone since Horton. A man of big conceptions and restless enterprise, he founded Coronado, engaged assiduously in water development, and was identified with numerous public utility corporations. Moreover, he it was who interested John D. Spreckels in local enterprises and thereby started as series of developments whisch is still unfolding to the immense advantage of the city and region

The San Diego Water Company was incorporated in 1889, and in 1894 the Consolidated Water Company was formed for the purpose of uniting the San Diego Water Company and

the San Diego Flume Company under one ownership. The Consolidated acquired by exchange of securities all the stock and bonds of both the water and the flume company. On July 21, 1901, the system of distribution within the city limits became the property of the municipality, a bond issue of $600,000 having been voted for its acquisition. The city obtained its supply from the pumping plant in Mission Valley until August, 1906, when its contract with the Southern California Mountain Water Company went into operation. Under the terms of this contract, the city obtains an abundant supply of water from mountain reservoirs at a price of four cents per thousand gallons, the water being delivered to its mains on University Heights.



C.S. Alverson

To whom the public and the government is largely indebted for the exact knowledge concerning the water rewources of the western slope of San Deigo County, which he has studied for twenty years

The water question has been from the beginning a prolific source of controversy between the people and various corporations, and every important stage of its evolution, from the day of the earliest wells to the time when the great Spreckels system was sufficiently developed to meet the present demands, was marked by acrimonious discussion and sharp divisions in the community. The Spreckels contract was not approved by public opinion until an unsuccessful effort had been made to increase the city's own supply by the purchase of water-bearing lands in El Cajon Valley and the establishment of a great pumping plant at that point. The municipal election of 1905 turned largely upon this issue. It resulted in the election of a mayor favorable to the El Cajon project, with a council opposed to it. A referendum on the subject revealed a curious state of the public mind. A majority favored the purchase of the lands, but opposed their development. The majority in favor of buying lands fell short of the necessary two-thirds, however, and the city government then turned to the Southern California Mountain Water Company as the only feasible means of creating a water supply to meet the needs of a rapidly growing city.

The mayor vetoed the contract with the Spreckels company when it first came to him from the council, urging that it be revised in such a way as to put its legality beyond all possible question (the contract was for a period of ten years, while the city attorney advised that it could legally be made for only one year at a time), and also to reserve the city's right to operate its pumping plant in Mission Valley sufficiently to keep it in condition to meet an emergency. The council promptly passed the contract over the mayor's veto, whereupon it was signed by the executive. The act was followed by the rapid completion of the pipe line to the city and the construction of an aerating plant on University Heights.

The consummation of this contract ended the long struggle for water and marked the beginning of a new epoch in the city's life. This fortunate result was not due to the fact that the contract was made with any particular company, nor to the fact that it brought water from any particular source. It was due to the fact that the people of San Diego had obtained a

cheap and reliable water supply adequate to the needs of a city three or four times its present size. Water from El Cajon or from San Luis Rey would have served the same purpose and exerted the same happy influence on the growth of population and stability of values. Since the city had failed to adopt a project of its own, it was very fortunate to possess a capitalist able and willing to meet its needs upon reasonable terms at a crucial moment in its history.

[from William Ellsworth Smythe's *History of San Diego*, 1908, pp. 443-452]

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SDHS

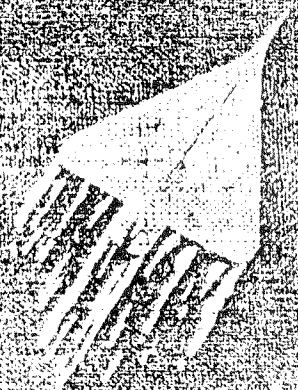
Exhibit 5

THIS
FANTASTIC
CITY
San Diego
HIGGINS
MANSFIELD

979.498

This Fantastic City—
SAN DIEGO

By Shelley J. Higgins
and Richard Mansfield



When this picture was taken, a month before his death, the Judge said to his collaborator: "Well, Dick, the story is told. Now I'm going home. I think I need a little rest." Did he know he would not return? Of him, Mayor Charles C. Dail said: "Shelley Higgins' counsel was sought by many and refused to none. His humor, his knowledge and his belief in San Diego shine through this book. His undaunted spirit is still with us."

THIS FANTASTIC CITY SAN DIEGO

By

SHELLEY J. HIGGINS

As told to

RICHARD MANSFIELD

SAN DIEGO PUBLIC LIBRARY
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BUILDING THE FLUME . . .

A DESCRIPTION of the method followed in building the flume was given by H. Culbertson, one of the witnesses called by the defense. Culbertson said he came to San Diego in February, 1886, when he was in his early thirties. Crouch questioned him for direct testimony.

Question: Do you recall the San Diego Flume Company project?

Answer: Yes, sir.

Question: Do you know how it was financed?

Answer: Really in several ways. One, of course, was the stock itself, the stockholders paying in the money. Another was the sale of a lot of lots out in the La Mesa country; bought land and divided it up and sold it to the people, practically about a hundred dollars an acre, a thousand dollars for a 10-acre lot; that was depending on position, of course. And then I know that they borrowed money frequently. I know there were quite a number of assessments on the stockholders made.

Question: Was there any development at La Mesa before this flume was constructed?

Answer: No, sir; not that I know of.

Question: Then that town was started because of the building of this flume, was it not?

Answer: Yes, sir.

Question: How about—were there orchards planted and farms made, because of the building of this flume?

Answer: As a matter of fact, there was very little improvement made until the water came from the flume system.

The witness said that in El Cajon the situation was somewhat different, that there were settlers there, already on the land, and these "bought water rights from the system and paid for them—a portion of the money that went into the building of the system came from that source."

Crouch wanted to know what the country "looked like" before

the flume brought water.

Answer: Between A Street in this city and the west side of La Mesa, or really this side of Cajon, was all sagebrush; even A Street at that time was in brush.

The court asked: How about the country in between there and where the flume crosses the present highway out beyond El Cajon, beyond Bostonia?

Answer: Well, El Cajon, of course, the planting began. Before that it was simply grain, grain and hay.

Crouch asked:

Question: Describe to the court the use that was made of the water from this flume. Did they commence taking it earlier at some places than at others?

Answer: Yes, sir. The method followed beginning at the diverting dam, whenever the builders got a section of three or four hundred feet completed they put in a bulkhead and turned the water in, kept that portion of the flume filled with water. They got a few hundred more feet done, they put in another bulkhead and filled that with water. And so on from one—from beginning to end. Of course, in the Indian Reservation,* where it begins, a very short distance from the diverting dam they began irrigating that a few weeks after they began building the flume—that was really early in '89. In El Cajon—no, to get into El Cajon they had to go through a tunnel 1800 feet long. And I remember very distinctly that the ditch carrying the water down to the Pepper Drive section received the first water that came through that tunnel; and I think—just whether it was May or June, of 1888, I am not able to say just now, but they began using the water at that point, and then it was advanced farther down around the valley, a distance of seven or eight miles at least from there to the end of the flume, they used the water as the flume advanced, drawing it from this flume that was full of water all the time, using it in that way until they got clear to the end of the flume line.

Question: Where was the end of the flume line?

Answer: Well, just this side of El Cajon, beyond La Me at the present*1—the same place it is now; a little reservoir bu there, a kind of a place to hold water for the people to draw fr at that point.

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*El Capitan Grande Indian Reservation. *1—1926.

HATFIELD'S FLOOD . . .

IN THE MID-DECADE of 1910-20, this region experienced a sequence of years when there seemed to be adequate annual rainfall*, but distributed in such sparse manner there was no appreciable runoff. Our water supply dwindled alarmingly. This low stage became acute in 1915.

In that year there manifested itself a figure of such astounding proportions in the City's annals that ever since its shadow has lingered. To such an extent, indeed, that more than once it has been suggested that the City should set up on the shores of Morena Lake a monument in commemoration of the incredible but true tale of Hatfield the Rainmaker.

San Diego characteristically can be counted on to put up a good show, no matter what the play. But in January, 1916, we outdid ourselves.

So ingrained is our penchant for the venturesome, however, that despite the devastating events which attended the appearance on our local stage of Charles M. Hatfield of Glendale, and the bitterness of our experience, and although we let a long number of years intervene during which we refrained from touching his type of trick-magic trappings with any kind of pole, he proved to be but the precursor of other similar actors (but these always with harmlessly mild performances) who have prevailed upon our officials to pick up the old habiliments of magic and pursue a policy of prodding Jupiter Pluvius, seeking to amplify our rainfall while hoping that never again will our playing with the elements have such dire consequences as fell on our unwitting heads that fateful first month of the unforgetable year 1916.

The City's water chain embraced the Morena-Otay system. Morena was uncomfortably low, and Otay shallow as a pane of glass.

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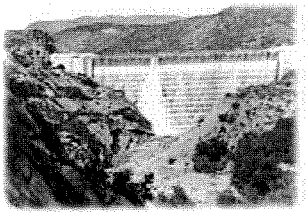
*Otay Reservoir rainfall record: Year 1910, 8.46 inches; 1911, 9.56; 1912, 14.08; 1913, 6.93; 1914, 11.27; and 1915, 14.14 inches.

Exhibit 6

General Information

City of San Diego Water History

1850 -- California becomes a state and the City of San Diego is incorporated.



Barrett Dam - 1927

1852 -- City declared insolvent. Management oversight by the state instituted.

1873 -- San Diego Water Company formed to provide an organized water supply to serve a population of approximately 2,000. Water is $.25 per bucket. An army private soldier makes $13.00 per month.

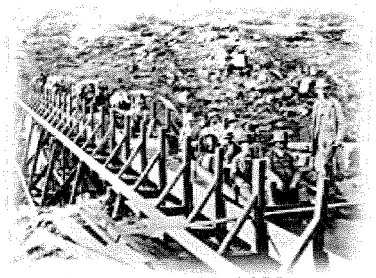
1885 -- Sewer service begins along the lower portion of 5th and 6th Avenues with the raw effluent discharged directly into San Diego Bay.

1887 -- Old Town Reservoir built to store water from 12 wells located in the San Diego River bed adjacent to the old Presidio.

1889 -- The San Diego Flume Company completes a 35.6 mile wooden flume to carry water from Boulder Creek to La Mesa Reservoir (the duck pond at Grossmont Summit).

1897 -- Lower Otay Dam completed by what becomes the Southern California Mountain Water Company. Construction of Morena Dam begun. Work is soon suspended.

1901 -- Following a vote of the people, the City of San Diego enters into the municipal water supply business by purchasing the facilities of the San Diego Water Company.



February 22, 1889
Dignitaries go for a ride on the just-completed San Diego Flume

1906 -- The Lower Otay water supply is connected to the City's distribution system by the Bonita Pipeline to a filtration plant located at Chollas Heights Reservoir.

1912 -- The City purchases the Otay River-Cottonwood Creek system from the Southern California Mountain Water Company. Morena Dam completed. The City of East San Diego incorporated.

1914 -- The City purchases Morena Dam.

1916 -- A series of very heavy rain storms, in conjunction with the alleged rainmaking activities of Charles Hatfield, hit the county. The San Diego River

floods Mission Valley from cliff to cliff cutting all highways to the north. Lower Otay Dam, built without a spillway, tops out and bursts, flooding the Otay Valley.

1918 -- Lower Otay Dam, now renamed Savage Dam, reconstruction completed. Lake Hodges Dam and San Dieguito Dam completed by the Santa Fe Land & Improvement Co. Both were later purchased by the City.

1922 -- City forces complete Barrett Dam and the Dulzura Conduit built to link Morena Reservoir and the Cottonwood Creek/Pine Creek watersheds with the City's water supply system at Lower Otay.

1923 -- City of East San Diego consolidates into the City of San Diego.

1928 -- Construction of what is now Sutherland Dam is halted after only one year of construction. The Metropolitan Water District of Southern California (MWD) is formed to bring Colorado River Water to Southern California. San Diego was not a member.

1930 -- The U.S. Supreme Court determines the City of San Diego has prior and paramount rights to the water of the San Diego River.

1931 -- Current San Diego City Charter adopted formalizing the Council-Manager form of government.

1935 -- With water rights secured, the City completes construction of El Capitan Dam and the El Capitan Pipeline connecting it to the City's water supply system. University Heights Filtration Plant enlarged.

1936 -- The City decommissions water well fields operated in Mission Valley.

1943 -- San Vicente Dam and pipeline are dedicated following two years of construction. This provides another source of water for San Diego's booming wartime population. The U.S. Navy completes the City's first sewerage treatment plant to reduce the health risks to sailors on ships in San Diego Bay.

1944 -- The San Diego County Water Authority (CWA) is formed, with the City joining, and became a member agency of MWD. CWA's first task is to complete a pipeline connecting the county with MWD's water supply system.

1947 -- The first MWD water from the Colorado River flows into San Vicente Reservoir. This ends San Diego's total dependence on local sources for water.

1950 -- The City of San Diego takes over operation of Murray Reservoir and commissions the Alvarado Filtration Plant. The water treatment plants at University Heights and Chollas Heights are decommissioned.

1954 -- Sutherland Dam, dormant since 1928, completed and connected by pipeline and natural streambeds to San Vicente Reservoir.

1956 -- South San Diego, Nestor, San Ysidro, and part of Otay Mesa annexed to the City. Service charges for sewer service instituted for the first time.

1958 -- The sewerage function transferred to the newly renamed Water Utilities Department.

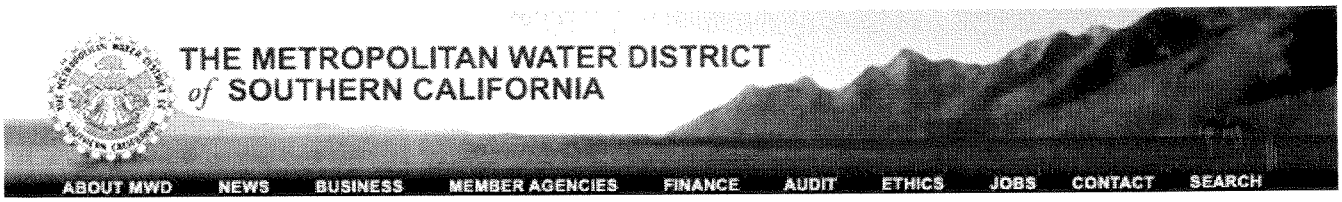
1960 -- Miramar Dam completed and Miramar Filtration Plant put into commission. Lake Murray purchased from Helix Irrigation District.

1962 -- What is now Tierrasanta annexed.

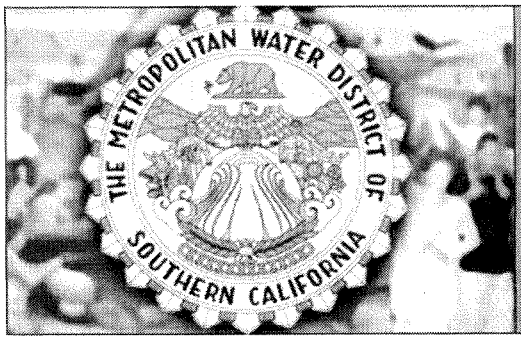
1963 -- The Point Loma Wastewater Treatment Plant and the Metropolitan Sewerage System, now the Metropolitan Wastewater System, are put into service ending regular direct discharge of raw wastewater into the San Diego Bay and the Pacific Ocean. What is now Rancho Bernardo, Rancho Penasquitos and the San Pasqual Valley annexed to the City.

1996 and 1997 -- The wastewater collection and treatment functions are separated from the Water Utilities Department forming the Metropolitan Wastewater Department. The Water Utilities Department becomes the Water Department.

Exhibit 7



About MWD



The Metropolitan Water District of Southern California is a consortium of 26 cities and water districts that provides drinking water to nearly 18 million people in parts of Los Angeles, Orange, San Diego, Riverside, San Bernardino and Ventura counties.

The mission of the Metropolitan Water District of Southern California is to provide its service area with adequate and reliable supplies of high-quality water to meet present and future needs in an environmentally and economically responsible way.

Metropolitan currently delivers an average of 1.7 billion gallons of water per day to a 5,200-square-mile service area.

Organization

Board of Directors
Profiles of member agencies and bios on MWD's Board of Directors

Executive Management
Executive Managers

Organization Chart

Ethics Office

Legal Department

Audit Department

Finance
Click here for information on our current water rates.

Career Opportunities
Information on current job announcements as well as information on hiring policies, exams and benefits.

Administrative Code (3,070kb pdf)*
MWD's administrative code adopted on Jan. 11, 1977.

MWD ACT (619kb pdf)*
The Metropolitan Water District of

General Info

Press Releases
Click here for up-to-date press releases as well as interesting at a glance facts.

Publications for Member Agencies
Click here to view our available publications. Due to limited quantities, these brochures are available only to our member agencies.

Fact Sheets and Brochures
Click here for a variety of MWD printer-friendly at a glance information.

Water Glossary
A glossary of common water terms.

About the MWD Seal
A detailed, historical account of the Metropolitan Water District seal.

MWD History:

A brief summary about the history of MWD. Click here.

Contact Info

Metropolitan Water District Headquarters:

700 N. Alameda Street
Los Angeles, CA 90012-2944
(213) 217-6000

Click here to download a printable map to MWD headquarters.

Click here to obtain driving directions to MWD Headquarters.

Mailing Address:
P.O. Box 54153
Los Angeles, CA 90054-0153

Public Transportation:
Click here for information about the Metro Rail System.

Click here for information about other MTA transportation.

Contact MWD

Aqueduct Construction Begins

Construction of the aqueduct across 150 miles of scorching desert and through 92 miles of mountains began in January 1933 and continued until June 1941. One tunnel - the infamous 13-mile-long San Jacinto Tunnel - took six years to complete. The American Society of Civil Engineers has named the aqueduct one of the engineering marvels of the modern world and a National Historic Engineering Landmark.

Colorado River water first reached Metropolitan's member cities in 1941. The post-war years saw Metropolitan's boundaries expand as the region's development and population mushroomed. The San Diego County Water joined the district in 1946 and many municipal water districts - groups of cities - signed on through the '50s and into the '60s.

Exhibit 8

San Diego County Water Authority

THE BAY-DELTA

A PLAN FOR CALIFORNIA'S PREMIER ESTUARY

FACT SHEET

The Water Authority is a public agency serving the San Diego region as a wholesale supplier of water. The Water Authority works through its 24 member agencies to provide a safe, reliable water supply to support the region's $150 billion economy and the quality of life of 3 million residents.

A Crucial Water Resource

Because of its distinctive position within the state, the estuary formed where San Francisco Bay meets the delta of the Sacramento and San Joaquin rivers has far-reaching impacts on California.

More than 22 million Californians, including San Diego County residents, get at least a portion of their drinking water from the Bay-Delta region.

Bay-Delta water irrigates 6 million acres and 200 types of crops in the Central Valley, producing almost half the nation's fruits and vegetables. The Bay-Delta is also the largest estuary on the West Coast of North America. It is home to more than 750 plant and animal species and is an essential rest stop for birds on the Pacific Flyway.

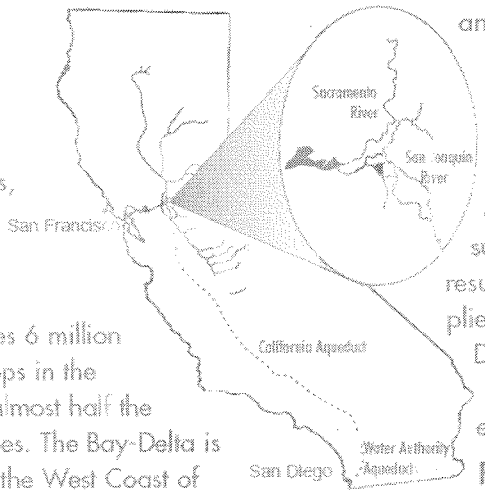
Major Source of Imported Water

The Bay-Delta is one of San Diego County's two imported water sources, the other being the Colorado River. The San Diego region imported 85 percent of its water in 2005. While San Diego's water providers are diversifying the region's water resources to reduce our dependence on any one supply, they project that the region will import about half of its water in 2020.

About two-thirds of the water imported into Southern California by the Metropolitan Water District of Southern California via the State Water Project comes from the Bay-Delta. MWD expects to continue this reliance on the Bay-Delta through at least 2030.

The Bay-Delta Needs Repair

For 150 years, the Bay-Delta has suffered from the actions of agricultural, urban, and rural interests that were often in competition for its water. The Bay-Delta estuary no longer functions adequately as either a water supply or a healthy habitat for fish and other wildlife. The problems that affect the Bay-Delta are complex and difficult to solve.



The deteriorating ecosystem and the vulnerability of an aging levee system that is supposed to control flooding diminish the reliability and quality of the water supply from the Bay-Delta. As a result of these conditions, water supplies available for diversion from the Delta to urban and agricultural water-users in central and southern California are unreliable.

Fixing the Bay-Delta

The Water Authority has been actively involved in efforts to "fix" the Bay-Delta for more than 15 years. The Water Authority helped to form the CALFED Bay-Delta Program in 1994 and supports it as the most promising way to develop and carry out a comprehensive, long-term, balanced solution to the Bay-Delta's long-standing troubles.

CALFED is a joint state-federal program working to restore the Bay-Delta's ecological health and improve water management for beneficial uses. CALFED focuses on four over-arching areas: water supply reliability, water quality, ecosystem restoration and watersheds, and levee system integrity. Its plan to restore the Bay-Delta calls for improving the way water flows through the Delta to the pumps and canals that convey water to cities and farms.

CALFED's achievements

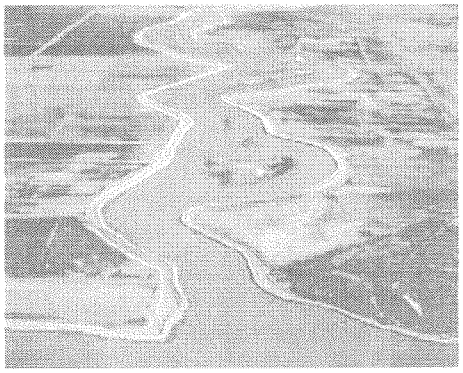
While far from "fixed," the Bay-Delta has seen improvements recently, such as the Sacramento

River salmon runs — they are the highest since the 1950s.

Today, more than 500,000 acre-feet of "new" water, primarily through development of groundwater storage capacity, now is available for businesses from Sacramento to San Diego.

CALFED has developed the Environmental Water Account. This aims to make the state's water delivery system more flexible by providing water at critical times to meet environmental needs without water supply impacts on cities, farms, and businesses.

CALFED provides a forum in which stakeholders and agencies can debate and make decisions in public, without going to court to solve problems.



The environmentally sensitive Bay-Delta

Remaining issues

Several CALFED problems remain to be solved in the Bay-Delta, including:

- The precipitous decline of several fish species, including the Delta smelt. Scientists are working to determine the cause of the decline.
- Inadequate, unreliable funding, primarily from voter-approved bond measures.
- Schedule delays that are often prolonged.
- Lack of progress in some areas, particularly water quality improvement and levee improvement/flood control.
- Complex decision-making processes, without a single point of authority and accountability.

What's next

CALFED and its participating agencies and stakeholders are developing a habitat conservation plan designed to protect Bay-Delta species and habitat while providing regulatory and funding assurances for those who depend on the Delta for water.

In addition, CALFED is part of an effort by the state to develop a long-term vision for the Delta. The goal of this initiative is to develop both short- and long-term strategies for sustainable management of the Sacramento-San Joaquin Delta.

In December 2007, CALFED will complete the first seven years of its existence. It is mandated to evaluate several issues at the end of Stage 1, including:

- Is the existing way of moving water through the Delta to the state and federal pumps working or should alternatives be considered?
- Should surface storage facilities be constructed?
- What additional actions are needed to improve drinking water quality?
- Is a new approach needed to reduce Delta levee risks?

San Diego County and the Bay-Delta

The Water Authority provides a voice for San Diego County in the CALFED Bay-Delta solution. The Water Authority seeks a reliable, affordable supply of high-quality water from the Bay-Delta, sufficient support for conservation, recycling, and desalination programs that reduce demand for Bay-Delta water and a reasonable price tag for CALFED.

The Water Authority's goals include a CALFED Finance Plan that allocates costs equitably to all beneficiaries of the Bay-Delta Program (not just water-users), so that financial support for the program reflects the benefits that are received.

Furthermore, the Water Authority seeks a fair share of funding from CALFED, its implementing agencies, and voter-approved water bond measures for the San Diego region.

Additional information about the Bay-Delta estuary is available at the California Bay-Delta Authority Web site, www.calwater.ca.gov.

San Diego County Water Authority

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San Diego, CA
92123-1233
(858) 522-6700
www.sdcwa.org

Exhibit 9

Water Department
July 25, 2008

Future City Council Action Items

Note: Dates are shown as "/00/" when a specific Council/Committee date within the month is not known.
Items shaded in yellow are anticipated items for NR&C.

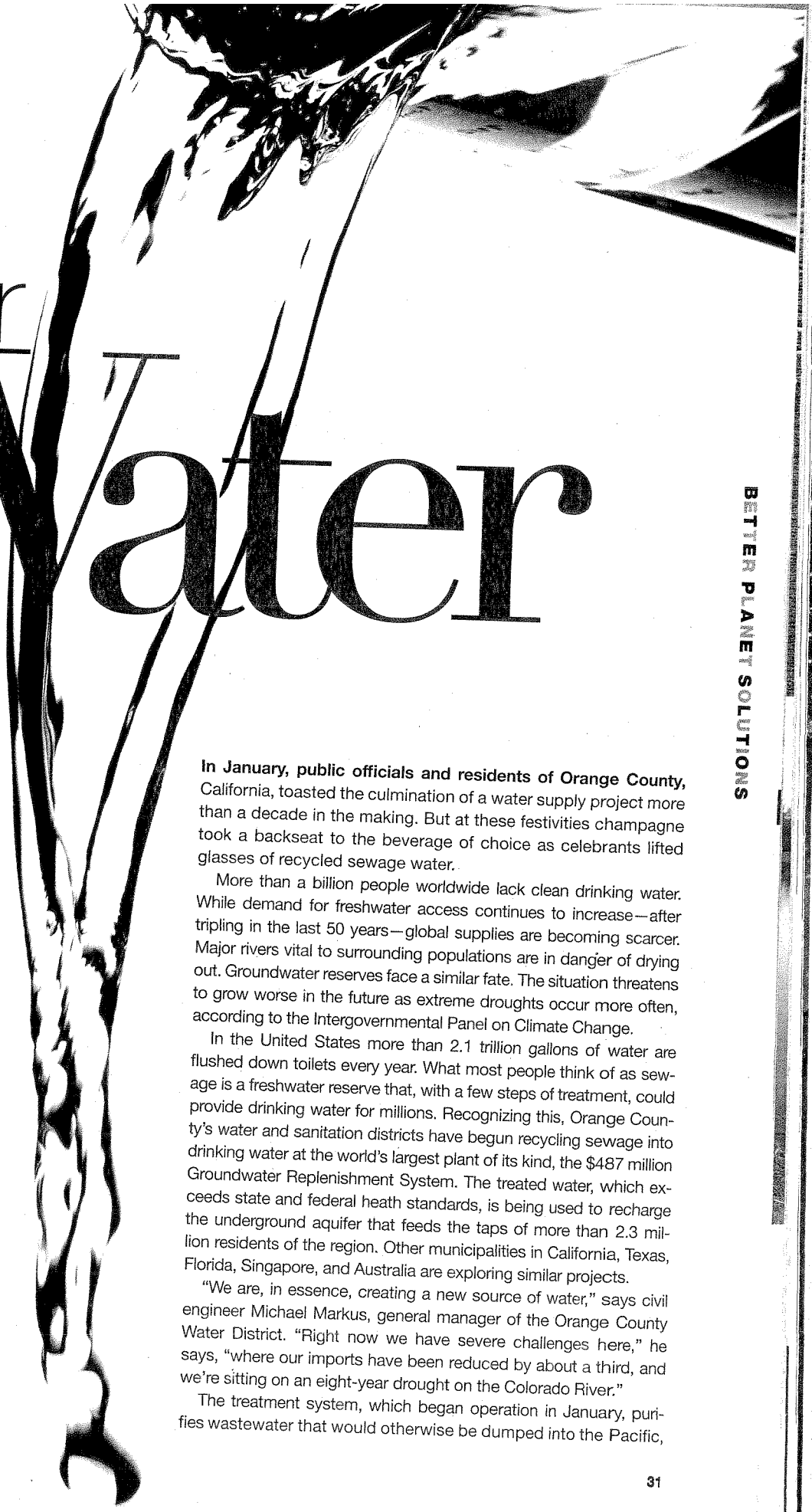
Subject (Staff Contact)	Description of Requested Action (Include $ Amounts for Major Projects)	Anticipated Council/ Committee Date
218 Notice for Pass Thru Rate Increase Rod Greek x35407	Authorize 218 notice process for rate adjustments required by increased cost of purchased water	07/28/08 (Council)
Declaration of Water Emergency Jim Barrett/Alex Ruiz x37555	Declaration of Water Emergency (State 1, Voluntary Compliance – Water Watch)	07/28/08 (Council)
Caltrans Utility Agreement Nos. 31767, 31788, 31789, 31799, 31824, 31846 (Total = 6 Utility Agreements) Marsi Steirer x34112 Hooman Partow x37570 Leonard Wilson x34287	Authorizing 6 different Utility Agreements with Caltrans; 3 Agreements for Carroll Canyon Road Bridge at 1-15; (UA No. 31788 $489,552; UA No. 31789 $1,175,522; UA No. 31824 $116,600) 2 Agreements for SR 52 Extension at SR 67; (UA No. 31799 $56,000; UA No. 31846 $56,000) 1 Agreements for SR 905 at Caliente Avenue/Otay Mesa Road (UA No. 31767 $344,077)	09/09/08 (Council) Heard at NR&C 07/23/08
Otay River Watershed Management Plan Marsi Steirer x34112 Jeff Pasek x37599	Approval of the Otay River Watershed Management Plan (ORWMP). The ORWMP will be approved or adopted by each of the five jurisdictions cooperating in the JPA: County of SD, Port of SD, cities of SD, Chula Vista and Imperial Beach.	09/09/08 (Council) Heard at NR&C 03/26/08
As-needed Groundwater Engineering Services Pilot Production Well Marsi Steirer x34112 Greg Cross x34235 Surraya Rashid x35306	Design, procure, install equipment & piping for pilot production wells within San Diego area ($500,000)	09/10/08 (NR&C) Heard at NR&C 07/23/08 09/23/08 (Council)
As–needed Groundwater Geotechnical Services Pilot Production Wells Marsi Steirer x34112 Greg Cross x34235 Surraya Rashid x35306	Construct and install pilot production wells within the San Diego area ($1,400,000)	09/10/08 (NR&C) Heard at NR&C 07/23/08 09/23/08 (Council)
As-needed Water Treatment Research Consultant Marsi Steirer x34112 Bill Pearce x35374	Evaluate water quality cost and energy consumption of water treatment technologies ($3 million contingent on future grants/budget)	09/10/08 (NR&C) 10/07/08 (Council)

Water Facilities Master Plan Marsi Steirer x34112 Hooman Partow x37570 Vien Hong x36603	Authorize and approve consultant agreement for the Water Facilities Master Plan ($1,250,000)	09/10/08 (NR&C) 10/07/08 (Council)
2010 Urban Water Management Plan Marsi Steirer x34112 George Adrian x 34680	Authorize and approve consultant agreement for the 2010 Urban Water Management Plan ($400,000)	09/10/08 (NR&C) 10/07/08 (Council)
Water Conservation Update Mike Bresnahan x35450 Luis Generoso x35258	2007 Water Conservation Update	TBD (NR&C)
Automated Meter Reading Mike Bresnahan x35450 Delia Dee x37487	Report on the automated meter reading program.	TBD (NR&C)
Reservoir Recreation BPR Jim Barrett x37555 Stacey LoMedico x66643	Approval of the Reservoir Recreation BPR recommendations ($77,151)	TBD
San Dieguito Watershed Management Plan Marsi Steirer x34112 Jeff Pasek x37599	Approval/adoption of San Dieguito Watershed Management Plan	TBD
Source Water Protection Guidelines for New Development Marsi Steirer x34112 Jeff Pasek x37599	Approval/adoption of the Source Water Protection Guidelines for New Development [SDWD, 2004] as an advisory component in the City's Land Development Code.	TBD
Water and Wastewater Rate Models Rod Greek x35407	Agreement to develop new Water and Wastewater rate models	TBD
Reclaimed Water Rates Rod Greek x35407	Authorize and approve the Water Department's reclaimed water rates to support operation, maintenance and capital improvements.	TBD
As-Needed Environmental Consulting Services Dennis Brown x73938	Authorize and approve Jones & Stokes to provide professional environmental services on as as-needed basis to support repair and maintenance efforts on projects in environmentally sensitive areas ($125,000 per FY for 2 years)	TBD

FUTURE ACTIONS ***BY OTHER DEPARTMENTS RELATED TO WATER:***		
Sewer & Water Group 689 ***(E&CP)*** Rania Amen x35492	Advertise and Award of Sewer & Water Group 689 ($7,494,551)	09/02/08 (Council) Heard at NR&C 07/23/08

Sewer & Water Group 747 ***(E&CP)*** Wendy Gamboa x51971	Advertise and Award of Sewer & Water Group 747 ($6,092,366)	09/10/08 (NR&C) 10/07/08 (Council)
Water Group 785 ***(E&CP)*** Wendy Gamboa x51971	Advertise and Award of Water Group 785 ($4,128,334)	09/10/08 (NR&C) 10/07/08 (Council)

Exhibit 10



better Water

In January, public officials and residents of Orange County, California, toasted the culmination of a water supply project more than a decade in the making. But at these festivities champagne took a backseat to the beverage of choice as celebrants lifted glasses of recycled sewage water.

More than a billion people worldwide lack clean drinking water. While demand for freshwater access continues to increase—after tripling in the last 50 years—global supplies are becoming scarcer. Major rivers vital to surrounding populations are in danger of drying out. Groundwater reserves face a similar fate. The situation threatens to grow worse in the future as extreme droughts occur more often, according to the Intergovernmental Panel on Climate Change.

In the United States more than 2.1 trillion gallons of water are flushed down toilets every year. What most people think of as sewage is a freshwater reserve that, with a few steps of treatment, could provide drinking water for millions. Recognizing this, Orange County's water and sanitation districts have begun recycling sewage into drinking water at the world's largest plant of its kind, the $487 million Groundwater Replenishment System. The treated water, which exceeds state and federal heath standards, is being used to recharge the underground aquifer that feeds the taps of more than 2.3 million residents of the region. Other municipalities in California, Texas, Florida, Singapore, and Australia are exploring similar projects.

"We are, in essence, creating a new source of water," says civil engineer Michael Markus, general manager of the Orange County Water District. "Right now we have severe challenges here," he says, "where our imports have been reduced by about a third, and we're sitting on an eight-year drought on the Colorado River."

The treatment system, which began operation in January, purifies wastewater that would otherwise be dumped into the Pacific,

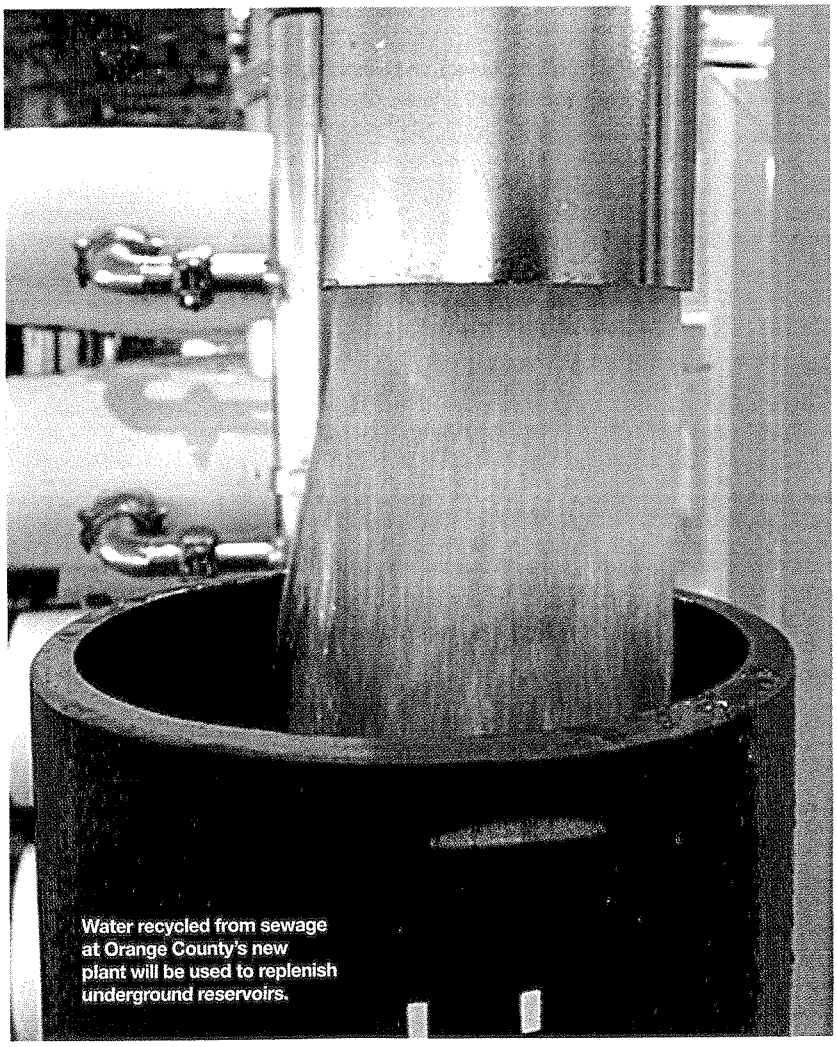
creating 70 million gallons a day of clean water. "It's a way to utilize an available resource instead of discarding it into the ocean, where it's instantly no longer of use as freshwater," says environmental health scientist Kellogg Schwab, who directs the Center for Water and Health at Johns Hopkins University.

Recycling starts with sewage treatment by the Orange County Sanitation District, which removes solid waste and uses microorganisms to break down organic materials. The water then heads to the recycling facility for purification. It passes at low pressure through an ultrafine filter that strains out particulate matter, bacteria, and the single-celled organisms known as protozoans (amoebas and their kin). Next comes reverse osmosis, in which the water is forced through a plastic membrane at high pressure to remove even tinier pollutants including viruses, salts, and pesticides. Treatment with hydrogen peroxide and ultraviolet light completes the process.

Half of the near-distilled-quality reclaimed water is injected into a saltwater barrier—an underground supply of freshwater that prevents brine from creeping inland from the sea and contaminating fresh reserves. The rest is pumped 13 miles north to a recharge basin in Anaheim, where it slowly percolates down into the ground to supplement the aquifer that provides drinking water to the community. Though all indications suggest that the water is safe the minute it emerges from filtration, direct recycling is not yet publicly accepted in the United States, according to the Environmental Protection Agency (EPA). A 2004 report from the agency found that people view recycled water that has passed through an aquifer or reservoir as being cleaner, though in some cases the recycled water is actually of higher quality than the natural sources it joins. Only one plant in the world, in Namibia, supplies recycled water directly to users without first mixing it with water from natural sources.

The biggest challenge in any water reuse program is not the technology. Rather, it is gaining public acceptance and overcoming what recycling experts have aptly named the "yuck factor." In past years, proposals that met all technical requirements have been killed by opponents who were simply repulsed by the idea, despite abundant evidence that reclaimed water is safe and clean. For example, in 1999 citizens of San Diego rejected a recycling program for drinking water. While most agreed that such water would be fine for landscaping and irrigation, 63 percent opposed using it for drinking. Opponents said they did not trust the recycling process, had health concerns, or did not have enough information about recycled water. The option is under exploration once again in the face of continuing shortages.

To get the word out about the process and the high quality of the filtered water, the Orange County Groundwater Replenishment System's developers made more than 2,000 community presentations. They also took the proposal and the results of water quality tests to local and state officials, members of the medical and public-health communities, environmental advocacy groups, and scientists, earning endorsements across a broad base. "They are to be commended for bringing a lot of people to the table to get involved in this," Schwab says. Visitors were invited to tour the plant and sample filtered water. (Water district officials note that first-timers were often pleasantly surprised by the pure, clean taste.)



Water recycled from sewage at Orange County's new plant will be used to replenish underground reservoirs.

Robert Bastian, a senior environmental scientist with the EPA who has followed the project throughout its development, calls it "very well designed" and notes that "you're getting even better tracking of the quality of the recharge water than you would if it were coming from more 'natural' sources. You know more about the water that's recharging the area now because you have control of it all the way." Environmental scientist Michael Aitken of the University of North Carolina at Chapel Hill School of Public Health predicts that recycling will become increasingly important as a supplement to water supplies around the country. Orange County's treatment process is "the gold standard for how to do it right," he says.

According to Orange County Water District officials, recycling trumps many other options for supplementing the local water supply. They estimate that reusing water consumes 50 percent less energy than importing it—that is, bringing it in from outside Southern California. Annual operating costs for the recycling facility are estimated at about $27 million, currently comparable to the cost of importing it, but import prices are predicted to rise because of growing populations throughout the Southwest. Moreover, unlike recycled water, imports are not always available during a drought. Desalinating seawater, another option that had been under consideration, would be considerably more expensive than recycling—from 50 percent to 400 percent more so. Schwab and Bastian hope that the Groundwater Replenishment System will serve as a model for other places struggling to meet their water supply needs, helping to boost prosperity and even save lives around the world.

Jennifer Barone