# INTERIM REPORT NO. 34

# SAN DIEGO'S WATER SHORTAGE

## Steps the City Must Take to Issue Positive Water Supply Assessments for New Development

## REPORT OF THE

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# I.
# INTRODUCTION

The City of San Diego's water supply is facing unprecedented threats. Nearly 90% of San Diego's water is imported from the Colorado River or the San Francisco Bay-Delta region of Northern California. The Colorado River basin is in the eighth year of a drought, and storage there is down to 50% of capacity. Last spring was the driest on record for Northern California, with runoff forecasted to be only 55% of normal. Pumping from the State Water Project is being reduced by order of a federal court to protect the endangered Delta Smelt, further reducing water available from the San Francisco Bay-Delta. These pumping restrictions could be in place for years. Governor Arnold Schwarzenegger declared a state-wide drought emergency on June 4, 2008. Mayor Jerry Sanders followed with a declaration of a Stage 1 Water Watch on July 28, 2008.

Despite the threat of severe water shortages, large development projects are still being proposed and approved, creating even more demand for water (artist's rendering of the proposed 1,929 room Ballpark Village Marriott, shown at left, which was recently canceled by the hotel chain). Under State law, certain large developments need a Water Supply Assessment from the City demonstrating there is a sufficient water supply to serve the development for the next 20 years. It is inconsistent for the City to issue positive Water Supply Assessments for new development, while at the same time calling for conservation because there may not be enough water to serve current residents.

The City should consider adopting guidelines for issuing Water Supply Assessments to capture large developments that appear to be designed to avoid review because they are piecemealed or mixed-use projects. This report proposes such guidelines.

The City also needs to wean itself of imported water by pursuing new locally-controlled sources of water, including desalination, indirect potable reuse, groundwater, and increased conservation. This report outlines the opportunities the City has to develop these resources. If pursued, the City will be well-positioned to issue positive Water Supply Assessments for new development that is so vital to our local economy.

## II.
## THE HISTORY OF WATER IN SAN DIEGO

As San Diego has grown, its inhabitants have always been pressed to reach further and be ever more resourceful in meeting water needs. In its early development San Diego expanded out ever more with enterprise and engineering to capture local watersheds, and in the modern era it has become ever more reliant on distant watersheds. It has been a consistent story of reaching further upstream.

The first report of the San Diego River was made by Spanish explorer Sebastian Vizcaino, who noted in his 1602 diary how the river emptied into False Bay (now Mission Bay) and supported natives living at the sandy estuary of the river mouth.[1] Spanish explorers and missionaries returned in 1769 to further investigate the port and the river. Fr. Juan Crespi, who arrived with Capitan Vicente Vila aboard the S*an Carlos*, wrote on June 22, 1769 that "[w]hen we reached the port we found, about one league distant a good river with sufficient water, but in a few days it ran dry."[2] The military party and its engineer Don Miguel Costanzo investigated the river further up to Mission Gorge and found it to run dry in places, but also having streamlets and pools in some locations.[3]

The *San Carlos* party was met by Fr. Junipero Serra who had been traveling by land. Fr. Serra decided to settle on the bluff overlooking the river to be in a safe position and to be near the water. Fr. Serra founded the military post and Mission known as the Presidio on July, 16, 1769. The land along the river was planted with crops. The first year, the river rose so high the crops were flooded. The second year was the opposite - the crops perished in drought.[4] The swings of flood and drought are endemic to San Diego and its watersheds.[5] Fr. Serra wrote of his belief that that it would be easier to get water upstream and there was more land to cultivate. The Mission San Diego de Alcala was established by Fr. Serra in Mission Valley in August 1774. Scarcity of water was the pressing problem of the padres, their growing Mission, and the surrounding Indian Villages.[6]

The founding of Mission San Diego de Alcala brought the first major water works project in San Diego history. In 1807, using Indian labor, the padres dammed the San Diego River at the head of Mission Gorge where the waters of the river ran year round. By 1814 they had completed a 3.8 mile aqueduct to bring water from Padre Dam (Old Mission Dam) down to the Mission. The aqueduct water irrigated crops down the valley and provided a measure of reliability for the growing town. The Mission Period of San Diego's water history ended after San Diego was

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[1] Papageorge, Nan Taylor, *The Role of the San Diego River in the Development of Mission Valley*, Journal of San Diego History Vol. 17 No. 2 (1971), Exhibit 1.
[2] Id., citing Fr. Zephyrin Englehart, *San Diego Mission*, (San Francisco: J.H. Barrey Co., 1920) Record of Capt. Vila, Exhibit 1.
[3] Id. citing Englehart, letter of Fr. Palau, Exhibit 1.
[4] Id. citing Englehart, letter of Fr. Serra, Exhibit 1.
[5] Hill, Joseph, *Dry Rivers, Dammed Rivers and Floods: An Early History of the Struggle between Droughts and Floods in San Diego* Journal of San Diego History Vol. 48 No. 1 (2002), Exhibit 2.
[6] Papageorge. citing Englehart, Report of Mission Operations, Exhibit 1.

ceded from Spain to Mexico in 1824 and was secularized as a Pueblo in 1833.[7] The town became American territory with the Treaty of Guadalupe Hidalgo in 1848. By this time the old Mission had fallen into disrepair, but the aqueduct was still functional.

In 1850 New Town was laid out by William Heath Davis closer to the port, which was becoming busier with the Gold Rush. Water for the port still had to be hauled from the river.[8] San Diego grew in the Early California Period from 1833 to 1885, but water supply was still dependent mostly on wells in Old and New Towns, and on the old mission system.[9] In 1868 Alonzo Horton bought and developed Horton's Addition in New Town, which signaled a burst of growth for San Diego. With that growth came the need to reach out to the backcountry to better secure a reliable water supply. This brought the Boom Period from 1886 to 1895.[10]

The Boom Period saw San Diego grow at a tremendous rate and the whole population seemed to think that the area was going to continue to grow rapidly.[11] This fueled a number of private water ventures that included the San Diego Water Co. (1873), San Diego Land and Town Co. (1881), Otay Water Company (1886) Linda Vista Irrigation District (1886), San Diego Flume Company (1886), and the Southern California Mountain Water Company (1895). The San Diego Water Co. developed the first system of mains in New Town streets and brought water from wells near Pound Canyon (near where Balboa Park) and two small reservoirs.[12] But that supply soon proved inadequate so efforts began to pipe water from the San Diego River at Old Town. In 1886 work on the river system began. Water was pumped from a number of wells in the river bed up to a reservoir on the hill; a standpipe stood on Spreckels Heights.[13]

The next expansion of this era was the San Diego Flume Company's flume project to bring water down from Volcan and Cuyamaca Mountains. The flume was completed in 1889. These are the headwaters of the San Diego River, and the works of the Flume Company included Cuyamaca Dam. The flume intake was just below Boulder Creek and proceeds to Capitan Grande (where the El Captian Dam was later completed by the City in 1935).[14] The Flume Company's rights were transferred in 1910 to majority owners of the Southern California Mountain Water Co., including Col. Ed Fletcher.[15]

The limits of the San Diego River watershed were clear even in this era, so private companies developed the Cottonwood Creek/Otay River watershed to the south and the San Dieguito River watershed to the north. The Cottonwood Creek/Otay River chain was developed by the Southern California Mountain Water Company.  Morena Lake and Dam were completed

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[7] Sholders, *Water Supply Development in San Diego and a Review of Related Outstanding Projects*, Journal of San Diego History Vol. 48 No. 1 (2002), Exhibit 3.
[8] Papageorge, citing Don M. Stewart, *Frontier Port* (Los Angeles: Ward Ritchie Press, 1965), Exhibit 1.
[9] Sholders, *Water Supply Development of San Diego*, Exhibit 3.
[10] Id.
[11] Id.
[12] William T. Smythe, *History of San Diego 1542-1908* (San Diego: The History Company 1907), Part 4 Ch 4, Exhibit 4.
[13] Id.
[14] Id.
[15] Higgins, Shelley; Mansford, Richard, *This Fantastic City San Diego* (City of San Diego 1956) p 81, Exhibit 5.

in 1895, Barrett Diversion around 1896, and Lower Otay Dam in 1897.[16] Sweetwater Reservoir was built in1888. The Flume Company built a dam in Alvarado Canyon in 1897 and superseded this with the La Mesa Dam (now Murray Dam), built in 1917. Pumping facilities were located in El Monte near Lakeside. Hodges Dam was commissioned by the Volcan Water Company and built on the San Dieguito River in 1918. All of these reservoirs are critical to today's operations.

In the early 1900s the importance of water became more pronounced. The City of San Diego began to purchase properties of the water companies in order to further develop the watersheds. In 1901 the City bought the facilities of the San Diego Water Company.[17] In 1906 the City built the Bonita Pipeline to bring water from Lower Otay to its distribution mains.[18] In 1913 it bought the Morena- Barrett-Otay system outright from the Southern California Mountain Water Company.[19] The City later acquired Lake Hodges on the San Dieguito River in 1924. In 1950 the City took over the operation of Murray Reservoir and commissioned the Alvarado Filtration plant.

When the City purchased these systems it assumed the responsibilities for the operation and maintenance. In 1916 there was such a drought and the City so slaked for water that the Council entertained an offer from Charles Hatfield, who promised to fill the lakes with rain from seeded clouds.[20] It is legend and lore that Hatfield caused a gigantic flood in January 1916. Whatever the cause, an historical flood happened that topped and destroyed Lower Otay Dam and caused massive damage in the lower San Diego River watershed.[21] Mystery persists over Hatfield's' causative role in these events, but the early missionaries and early settlers in the preceding century before Hatfield had seen similar floods, followed by dry spells.

As the population continued to grow the City planned and developed additional reservoirs. The El Capitan Dam was completed in 1935. San Vicente was completed in 1943.[22] The City had also purchased wide tracts of land in the San Pasqual Valley in anticipation of a planned "Super Hodges" dam in the 1930s. The intent was to raise the height of Hodges Dam and impound more of the San Dieguito River. The project never came to fruition because access to Colorado River water was achieved in 1944. This marked the end of the era when the planning focus was entirely on water originating in San Diego area watersheds.

During WWI and after, as San Diego expanded, other cities to the north were also growing. In 1913 the City of Los Angeles had developed the Los Angeles Aqueduct (engineered by William Mulholland), effectively appropriating for Los Angeles the watershed of the Eastern Sierra and Owens Valley. Other cities in the Los Angeles and San Bernardino regions took steps to obtain their own supplies. The Federal Reclamation Act of 1914 ultimately led to California's formation of the Metropolitan Water District of Southern California in 1927 (MWD). MWD's mission was to develop a conduit to the Colorado River. Its member agencies did not include

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[16] Hill, *Dry Rivers Dammed Rivers and Floods in San Diego*, Exhibit 2.
[17] Id.
[18] City of San Diego Water Utilities Department, Exhibit 6.
[19] Id.
[20] Higgins, Shelley; Mansford, Richard, *This Fantastic City San Diego* (City of San Diego 1956) p 175, Exhibit 5.
[21] Id.
[22] Water Utilities Department, Exhibit 6.

those from the San Diego area. The Colorado River aqueduct was begun in 1933 and completed in 1941.[23]

World War II brought another population boom to San Diego which caused the City to join associations with broader state interests. The San Diego County Water Authority (CWA) was formed by legislation in 1944 to congregate the planning interests of the San Diego regional cities. Involvement in CWA brought the City into the fold with most if not all other cities in Southern California in being participatory to MWD and its Colorado River connections. The first Colorado River water arrived in the City via a CWA pipeline to San Vicente Reservoir in 1947.[24]

By the 1960s MWD realized that even the Colorado River aqueduct would not be adequate to support Southern California's growth in the coming decades. MWD embarked to build the State Water Project, which brings water south from the Western Sierra watershed, mainly from the San Joaquin- Sacramento River delta. Both the Colorado River and State Water project supplies have become less due to drought and an ever expanding growth in development.

## III.
## PROPOSED WATER SUPPLY ASSESSMENT GUIDELINES

### A. Water Supply Assessments

Today, the San Diego City Water Department is more than a water purveyor. On a regional scale, it is actively involved in securing imported water supplies for San Diegans. On a local scale, the Water Department conducts vital programs including water conservation, water reclamation, customer service, public outreach, meter reading, and system repair and maintenance. The Water Department also prepares reports on the status of the City's water supply which are required by State law.

One of the key documents prepared by the Water Department is the Water Supply Assessment [WSA]. Pursuant to California law, the City of San Diego is required, before approving certain large developments, to verify that there will be a sufficient water supply for the next 20 years. A WSA is required by Senate Bill 610 [SB 610] to assist in water supply planning efforts and to assist the City in making decisions related to land use and water supply.

In many cases, WSAs rely on the City's most recent Urban Water Management Plan [UWMP]. The City's 2005 UWMP is three and a half years old and in need of an update in light of impacts to our water supply due to climate change, drought, and recent court decisions.[25]

[23] Metropolitan Water District of Southern California, Exhibit 7.
[24] Water Utilities Department, Exhibit 6.
[25] "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**." San Diego County Water Authority Fact Sheet, "The Bay-Delta," January 2007 (emphasis added), Exhibit 8.

Similarly, the WSAs for large development projects currently under review were prepared before the State of California or the City of San Diego declared a water shortage emergency.[26]

Due to recent information relating to the unreliability of the Water Authority's water supply to the City of San Diego, a re-evaluation of the pending WSAs, water verifications, and analysis in environmental documents must be undertaken prior to official action being taken on projects subject to the requirements of SB 610.

SB 610 requires a WSA be included in the California Environmental Quality Act [CEQA] documentation for projects involving the construction of 500 or more residential units. California Water Code §§10910 *et seq*. In addition, California law "requires affirmative written verification from the water purveyor of the public water system that sufficient water supplies are available for certain large residential subdivision of property prior to approval of a tentative map." *See* 2005 Updated Water Urban Management Plan, San Diego County Water Authority (*citing* Cal Gov Code §§ 65867.5, 66455.3, and 66473.7).

When a project requires CEQA evaluation, a UWMP analysis may be incorporated in the water supply and demand assessment required by both the Water Code and CEQA "[i]f the projected water demand associated with the proposed project was accounted for in the most recently adopted urban water management plan." Water Code § 10910(c) (2). Water Code § 10910 requires that a "project" (as defined in § 10912[27]) that is subject to CEQA must have a WSA.

Due to significant, changed circumstances, the City must re-evaluate the water supply availability in its various WSAs for those projects that required the preparation of environmental documents, such as Environmental Impact Reports [EIRs]. The additional analysis should include information as to whether particular supplies "bear a likelihood of actually proving available; speculative sources and unrealistic allocations ('paper water') are insufficient bases for decision-making under CEQA." *Vineyard Area Citizens for Responsible Growth, Inc., v. City of Rancho Cordova,* 40 Cal. 4$^{th}$ 412, 432 (2007). *See also Santa Clarita Org For Planning the*

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[26] Of significance, Governor Schwarzenegger declared a statewide drought as of June 4, 2008. On July 28, 2008, City Council voted unanimously to approve the Mayor's request to declare a Stage One Water Watch pursuant to SDMC Section 67.3806, Exhibit 9.

[27] (a) "Project" means any of the following:

(1) A proposed residential development of more than 500 dwelling units.

(2) A proposed shopping center or business establishment employing more than 1,000 persons or having more than 500,000 square feet of floor space.

(3) A proposed commercial office building employing more than 1,000 persons or having more than 250,000 square feet of floor space.

(4) A proposed hotel or motel, or both, having more than 500 rooms.

(5) A proposed industrial, manufacturing, or processing plant, or industrial park planned to house more than 1,000 persons, occupying more than 40 acres of land, or having more than 650,000 square feet of floor area.

(6) A mixed-use project that includes one or more of the projects specified in this subdivision.

(7) A project that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project.

(b) If a public water system has fewer than 5,000 service connections, then "project" means any … development that would account for an increase of 10 percent or more in the number of the public water system's existing service connections ….

*Environment v. County of Los Angeles*, 106 Cal. App. 4th 715 (2003) (when "there is a huge gap between what is promised and what can be delivered,' [it] render[s] State Water Project entitlements nothing more than 'hopes, expectations, water futures or, as the parties refer to them, 'paper water.'").

In light of such uncertainty, it is not sufficient to merely conclude that potential future measures will result in adequate water supplies. Where supplies are uncertain, an EIR needs to acknowledge the degree of uncertainty and discuss reasonably foreseeable alternatives, potential environmental impacts associated with those alternatives and feasible mitigation for each adverse impact. *Vineyard Area Citizens for Responsible Growth, Inc., v. City of Rancho Cordova,* 40 Cal. 4th 412, 432-434 (2007).

## B. Guidelines for Issuing Water Supply Assessments

For various reasons, certain large developments are scheduled for construction or otherwise designed in a manner that does not appear to meet any of the threshold definitions of a "project" under Water Code § 10912. Furthermore, a large development could partially meet several of the threshold definitions of "project" listed in § 10912 simultaneously. We note that § 10912 (a)(6) requires a WSA for "a mixed-use project that includes one or more of the projects specified in this subdivision."

Regardless of how isolated elements of a large development are defined by its proponent, § 10912 (a)(6) and (a)(7) do not permit the segmentation of a mixed-use project in order to evade the WSA requirement. If a WSA is not prepared for a segmented large development, the project could be subject to legal challenge if its CEQA documents are improperly approved.

In the context of reviewing a project subject to CEQA, the First District Court of Appeal has said: "[I]f a party merely purchases a property and plans to make no changes or alterations to the acquired property, no further "scientific" or "factual" data are necessary." *Silveira v. Las Gallinas Valley Sanitary Dist.*, 54 Cal.App.4th 980, 990 (1997). Conversely, if there ***are*** plans to change or alter the "existing" part of a large development, then the changes to the "existing" parts of the development should be analyzed in conjunction with the "new" parts of the development. This concept was also reflected in the recent case *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova,* 40 Cal.4th 412, 431 (2007), when the court noted that "an adequate environmental impact analysis for a large project, to be built and occupied over a number of years, cannot be limited to the water supply for the first stage or the first few years."

Similarly, the 500-unit threshold of § 10912 (a)(1) and the "catchall" provision at (a)(7) has prompted commentators to suggest that efforts by developers to evade SB 610 requirements by manipulating minimum units, square footage, employees, or other WSA thresholds will result in large multi-phase residential projects being "piecemealed" into separate projects of 499 units or less. These actions, which are proscribed under CEQA, would generate litigation. (27 Los Angeles Lawyer 18, 20, 21 (*citations omitted*).) As explained below, a simple numbers game will not avoid the requirement for careful analysis of water supplies.

First, the "more than 500" unit trigger applies only to large suppliers. (Water Code, § 10912 (a).) Although not relevant to the Water Department, the verification and assessment requirement could apply to projects with as few as 300 units if the supplier is small. (*Id*. at subd. (b).) Thus, 499 is not necessarily a magic number.

Second, CEQA requires analysis of a project's water supplies whenever the need for such information is relevant, regardless of the size of a proposed development. *Santa Clarita Organization for Planning the Environment v. County of Los Angeles* 106 Cal.App.4th 715, 717 (2003) (holding that "[a]n environmental impact report for a housing development must contain a thorough analysis that reasonably informs the reader of the amount of water available.") If environmental review reveals that a proposed project would cause a significant adverse environmental impact, the lead agency must adopt any feasible means of substantially lessening or avoiding such an impact, and, if the impact still remains significant must adopt a statement of overriding considerations as to the impacts. *Mountain Lion Foundation v. Fish and Game Commission* 16 Cal.4th 105, 134 (1997); Pub. Resources Code, § 21002. The proponents of development projects cannot avoid consideration of water supply issues simply by designing a 499-unit project.

Finally, CEQA does not require a city or county, each time a new land use development comes up for approval, to reinvent the water planning wheel. Every urban water supplier is already required to prepare and periodically update its UWMP, which must describe and project estimated past, present, and future water sources, and the supply and demand for at least 20 years into the future. (Water Code, §§ 10620–10631.) When an individual land use project requires CEQA evaluation, the UWMP's information and analysis may be incorporated in the WSA required by both the Water Code and CEQA (Water Code, § 10910, subd. (c)(2).) San Diego last updated its UWMP in 2005.

However, reliance on a UWMP in a project's CEQA analysis is no guarantee of adequate water supply. The Fifth District Court of Appeal ruled in *Friends of the Santa Clara River v. Castaic Lake Water Agency,* 123 Cal.App.4th 1 (2004) that a UWMP was legally inadequate four years after its adoption for deficiencies that did not exist and were not known at the time it was adopted. The Fifth District warned quite clearly:

> Without a reliable analysis of the availability of water, the UWMP is fatally flawed. The public and the various governmental entities that rely on the UWMP may be seriously misled by it and, if the wrong set of circumstances occur, the consequences to those who relied on the UWMP, as well as those who share a water supply with them, could be severe. (*Id.,* at 15.)

Given the passage of time since San Diego's last UWMP, coupled with recent legal and natural events impacting the State's water supply, there is a significant risk of project-halting CEQA litigation if a thorough and current analysis of a project's water supply is not present either in a WSA or the project's CEQA documents. The following table illustrates that the City's growth and water consumption levels have continued to increase despite the current water crisis:

/ / /

## Fiscal Year 1999 to 2008
## Water Used by City Customers

| Fiscal Years | Total Water Deliveries BGY | Total Deliveries *City Only BYG | Total Meters City Only | San Diego Population |
|---|---|---|---|---|
| **FY 1999** | 74.8 | 71.6 | 256,946 @ | 1,255,449 > |
| **FY 2000** | 80.0 | 76.7 | 259,609 @ | 1,227,784 < |
| **FY 2001** | 74.9 | 71.8 | 261,658 @ | 1,245,074 < |
| **FY 2002** | 76.0 | 72.9 | 264,746 @ | 1,253,869 < |
| **FY 2003** | 73.1 | 70.1 | 267,400 ^ | 1,263,450 < |
| **FY 2004** | 79.3 | 76.2 | 269,631 # | 1,263,379 < |
| **FY 2005** | 74.9 | 72.2 | 270,756 # | 1,257,328 < |
| **FY 2006** | 77.4 | 74.7 | 271,875 # | 1,256,951 < |
| **FY 2007** | 80.7 | 76.4 | 272,779 # | 1,316,837 > |
| **FY 2008** | 79.7 | 75.0 | TBD | 1,350,116 > |

**Units: Billions of Gallons**

* * Deliveries to South Bay via Cal-Am are included
* @ Water Dept. 2002 Financial Statement
* ^ Water Dept. Raw Data
* # Water Dept. 2008 Draft Financial Statement
* > SANDAG
* < U.S. Census Estimates

### C. Conclusion and Recommendations

A recent trial court case, while not binding authority, provides further insight as to the direction courts may take in reviewing WSAs. In *Highland Springs Conf. v. City of Banning* (January 29, 2008) (RCSC Case No. 460950), the petitioners challenged decisions of the City of Banning related to Banning's approval of CEQA documents for a large development project. The project's EIR contained a WSA that was heavily reliant on Banning's 2005 UWMP. The trial court held that Banning improperly relied on an EIR that failed to adequately analyze water supply or set forth sufficiently reliable information on the project. Banning was ordered to set aside its certification of the EIR and set aside its approval of the project.

For the foregoing reasons, current legal trends in this area support the preparation of a WSA when the "existing" elements of a large development combined with the proposed "new" elements will meet the definition of a "project" under § 10912 (a). For the same reasons, a WSA should be prepared for development proposals nearing the mandatory legal thresholds under § 10912 (a). Doing so will assist project proponents in adequately addressing water supply issues in the project's environmental documents.

Most importantly, by updating the City's 2005 UWMP and revaluating WSAs for recently proposed development projects, the City Council and the public will be better able to make informed decisions about the impact of proposed growth on the City's water supply.

## IV.
## INDIRECT POTABLE REUSE

Indirect Potable Reuse ("IPR") is a process of recycling treated sewage into drinking water. It is "indirect" because the water is released into a reservoir or injected into an underground aquifer before it is drawn out later, treated again, and distributed to customers. Detractors label the process "toilet-to-tap." It has also been called sewage-to-spigot, reservoir augmentation, and showers-to-flowers. The City's program used to be called Water Repurification, before it was abruptly canceled in 1999. The proposal was killed by opponents who were simply repulsed by the idea, despite abundant evidence that reclaimed water is safe and clean.[28]

A common misperception is that the water currently received by the City is "virgin" runoff from melting snow in the Rocky Mountains. Nothing could be further from the truth. Two hundred communities, including Las Vegas, dump their treated sewage into the Colorado River before it arrives in San Diego reservoirs.[29] For decades, city residents have been drinking treated sewage from towns upstream, so the possible adverse health effects touted by opponents are, at worst, no different than those we have been subjected to for years. The irony is that IPR is so efficient at removing contaminants, it would actually improve the water quality of the City's reservoirs.[30]

### A. IPR in Other Places

Orange County has been supplementing its drinking water supply with reclaimed water for over 30 years. Water Factory 21 started operation in 1976, injecting reclaimed water into an underground aquifer where it mixes with deep well water. Orange County decided to expand the system in 1997 at a cost of $487 million. Now called the Groundwater Replenishment System, it has the capacity to produce 70 million gallons of near-distilled quality water per day. Their aquifer supplies 2.3 million residents with potable water. According to Orange County, the biggest obstacle to the project was public perception. They implemented a comprehensive public outreach and education program to gain public approval of the project. A detailed educational website can be found at www.gwrsystem.com.


In Singapore, sewage is treated to potable water quality and marketed as NEWater. Four NEWater plants produce about 43 million gallons per day, most of which is used in manufacturing.[31] About 3 million gallons per day is used for IPR, with plans to increase it to 7.5 million gallons per day by 2011.[32]

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[28] Jennifer Barone, *Better Water*, Discover Magazine, May 2008, Exhibit 10.
[29] Elizabeth Royte, *A Tall Cool Drink of . . . Sewage?*, New York Times, August 10, 2008, Exhibit 11.
[30] Final Report, City of San Diego Advanced Water Treatment Research Studies, August 2007, at p. 25, Exhibit 12.
[31] Tifa Asrianti, *Singapore NEWater Starts Gaining Support*, The Jakarta Post, July 9, 2008, Exhibit 13.
[32] Singapore Public Utilities Board website, www.pub.gov.sg/NEWater, Exhibit 14.

NEWater is also bottled (shown at right) and distributed for consumption as part of a public education and outreach program.

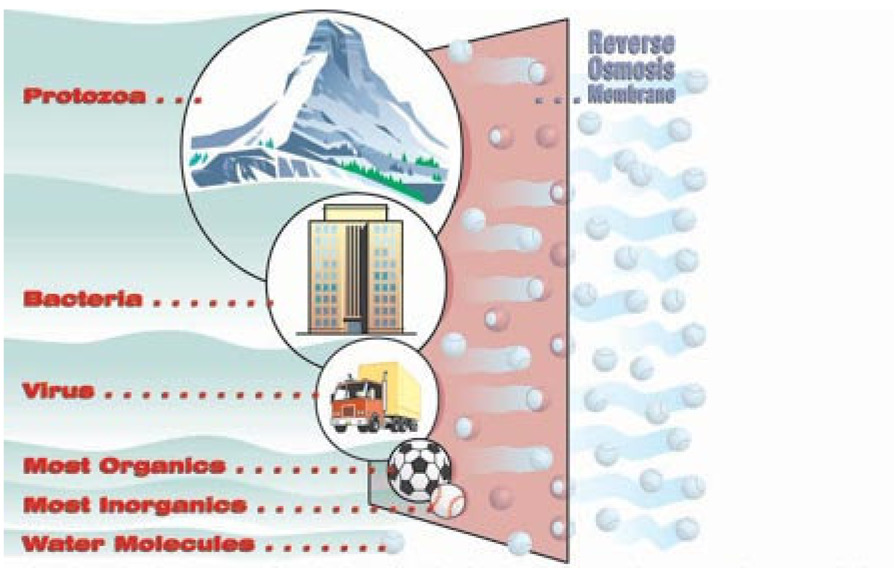
For over 20 years, the Upper Occoquan Sewage Authority has been recycling sewage into drinking water and storing it in the Occoquan Reservoir in northern Virginia. This reservoir supplies drinking water to over one million residents.

Other cities are considering IPR projects to enhance their local water supplies. Mayor Villaraigosa of Los Angeles recently announced that his city will be resurrecting its IPR plans, shelved in 2000, with a goal of providing as much as 10% of his city's potable water supplied through IPR.[33] Aurora, Colorado, is moving forward with an IPR project that will supply 20% of their potable water needs by 2010.[34] There is even a proposal pending to add 1.5 million gallons of water per day to Lake Arrowhead through IPR.[35]

## B. The Repurification Process

Starting with treated sewage, a typical purification process has three or four steps. First is microfiltration, the water passes through a membrane filter to remove suspended solids, bacteria and other material. This filtration process is common in the commercial industry to make fruit juices and soft drinks.

Next is reverse osmosis, another membrane filtration process that removes smaller particles than microfiltration. The illustration below shows how small the membrane holes are compared to some possible contaminants.




These objects show the relative sizes of particles that are filtered out by a reverse osmosis membrane, compared to a water molecule the size of a tennis ball. Water molecules are forced under high pressure through the molecular structure of the membrane. Purified water is collected on the other side of the reverse osmosis membrane while particles remain trapped on the membrane due to their large size.

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[33] Kerry Cananaugh, *Mayor rethinks recycled water*, DailyBreeze.com, May 14, 2008, Exhibit 15.
[34] Water Reuse News, January 30, 2007 (www.watereuse.org/publications/water-reuse-news/), Exhibit 16.
[35] Duane W. Gang, *Proposal to mix Lake Arrowhead with recycled wastewater resurfaces*, The Press-Enterprise, November 13, 2007, Exhibit 17.

Reverse osmosis is followed by one or more disinfection methods such as ultraviolet light, ozone, chlorination, and hydrogen peroxide. The resulting water is so pure, it is necessary to add minerals to the water to prevent it from corroding any metal pipes used to transport it.

### C. San Diego's Water Repurification Program

The City of San Diego has been studying the concept of repurifying water since the 1970's. A breakthrough came in 1992, when the Health Effects Study of the AQUA II Project (the former aquaculture facility in Mission Valley) demonstrated that the health effects associated with using repurified water was less than or equal to using the existing raw water in our reservoirs.[36] These results led to the creation of the Water Repurification Program and the development of a feasibility study in partnership with the San Diego County Water Authority.[37] The California Department of Health Services ("DHS") approved the feasibility study in August, 1994.

In December 1996, the City Council directed the City Manager to continue with planning, design, environmental work and funding of the Water Repurification Program.[38] The preferred alternative in the City's 1997 Strategic Plan for Water Supply identified repurified water as providing 13.4 million gallons per day, or about 7.5% of the City's potable water demand beginning in 2002.[39] The capital cost of the Water Repurification Program was estimated to be $125 million, resulting in an average cost for repurified water of $742 per acre-foot.[40]

To implement water repurification, the City proposed to build an Advanced Water Treatment Plant ("AWTP") adjacent to the North City Water Reclamation Plant ("NCWRP") located near the intersection of Miramar Road and I-805. The NCWRP (shown at right), completed in 1997, is capable of recycling 30 million gallons of sewage per day into irrigation-quality water. Currently, only a small portion of the plant's capacity is being used, due to lack of sufficient customers in close proximity to the City's reclaimed water distribution system. The remaining sewage is treated to just secondary levels and then returned to the sewer system for disposal through the Point Loma Wastewater Treatment Plant. Instead of returning this water to the sewer system, the

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[36] City Manager's Report No. 96-243, Exhibit 18.
[37] City Council Resolution No. R-285070, Exhibit 19.
[38] City Council Resolution No. R-288181, Exhibit 20.
[39] 1997 City of San Diego Strategic Plan for Water Supply, p. 8-2, Exhibit 21.
[40] Id. at p. 5-9.

AWTP would capture and treat it to potable standards through IPR. Malcolm Pirnie, Inc. was hired to design the AWTP.[41]

A Repurified Water Conveyance System ("RWCS") would transport the repurified water to San Vicente Reservoir. San Vicente was chosen for its large volume, which allowed for the DHS' recommendation that the repurified water be retained for at least a year before being treated again and distributed to water customers. The conveyance system would consist of a pump station and a 42-inch pipeline 23 miles long. Boyle Engineering Corporation was hired to design the RWCS.[42] Tetra Tech, Inc. was selected to analyze the environmental impacts and draft an Environmental Impact Report for the AWTP and the RWCS.[43]

The Water Repurification Program was praised as both safe and environmentally friendly. The program was approved by a Repurified Water Review Committee and an Independent Advisory Committee, both made up of experts in the medical, industrial, and environmental fields.[44] Some specific endorsements from other public agencies and organizations included:

> "Therefore, it [the Water Repurification Program] must provide the highest level of public health protection and meet the most stringent reliability criteria to ensure that the citizens of San Diego receive a continuous supply of safe drinking water. The project that is being proposed meets these standards and will serve as the model for similar projects in the future."
>
> -- California Department of Health Services.[45]

> "[Y]ou have the full support of EPA in your pursuit of this project. … As currently planned, we have full confidence that the water repurification project will provide a safe, reliable source water for potable uses."
>
> -- United States Environmental Protection Agency.[46]

> "[I]t is my pleasure to heartily endorse the study and successful operation of the water repurification process … It is my belief that this is an extraordinarily safe procedure and is worthy of this very conservative approach to instituting the repurification process."
>
> -- The San Diego County Medical Society.[47]

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[41] City Council Resolution No. R-287753, Exhibit 22.
[42] City Council Resolution No. R-288182, Exhibit 23.
[43] City Council Resolution No. R-286779, Exhibit 24.
[44] City Manager's Report No. 96-243, Exhibit 18.
[45] Letter from David P. Spath, Ph.D., Chief of the Division of Drinking Water and Environmental Management at the California Department of Health Services, to Mayor Susan Golding, dated October 25, 1996, Exhibit 25.
[46] Letter from Alexis Strauss, Acting Director of Water Management Division of Region IX of the U.S. Environmental Protection Agency, to Patsy Tennyson of the San Diego County Water Authority, dated February 6, 1995, Exhibit 26.
[47] Letter from Rosemarie M. Johnson, M.D., Immediate Past President of the San Diego County Medical Society, to Lester Snow, General Manager of the San Diego County Water Authority, dated February 1, 1995, Exhibit 27.

> "[T]his is the next logical step in managing California's precious water resources."
> -- State Water Resources Control Board.[48]

> "With water repurification, we can avoid the necessity for replumbing large sections of our city with dual pipelines, and we may not need to construct new reservoirs solely for the winter storage of non-potable, reclaimed water supplies. … Therefore, the Sierra Club strongly recommends that the County Water Authority and other policy makers move ahead to further consider this proposed water repurification plan."
> -- Sierra Club, San Diego Chapter.[49]

> "The San Diego Water Repurification Project is the most unique and innovative water recycling project in Southern California. By using state-of-the-art processes to treat recycled water to meet or exceed stringent potable water standards, the repurified water will be safely blended with imported water in order to augment water supplies. The City of San Diego and the San Diego County Water Authority are to be commended for their efforts to pioneer this technology."
> -- United States Department of the Interior.[50]

Despite these endorsements and the progress the City was making, the City Council canceled the Water Repurification Program in 1999. At the time, misleading information about the program was being spread by politicians, radio talk show hosts, and the editorial board of the Union Tribune newspaper. During a request to raise sewer rates by the Metropolitan Wastewater Department, the City Council directed staff not to spend any more money on the Water Repurification Program, effectively killing it.[51]

In attacking IPR, the Union-Tribune editorial board still cites a 1998 report from the National Research Council that called IPR a measure of "last resort."[52] What the Union-Tribune ignores is that the National Research Council has repudiated that statement. According to Jim Cook, the Chair of the National Research Council, they know a lot more now than they did when the report was issued and the industry can now treat sewage to higher levels.[53] According to Dr. Jack Skinner, an internal-medicine specialist who serves on a state committee that evaluates drinking water standards, reverse osmosis followed by ultraviolet light and hydrogen peroxide effectively removes pharmaceutical compounds and endocrine disrupters.[54]

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[48] Letter from Marc Del Piero, Board Member, State Water Resources Control Board, to Lester Snow, General Manager of the San Diego County Water Authority, dated February 6, 1995, Exhibit 28.
[49] Letter from Barry Hite, President of the San Diego Chapter of the Sierra Club, to Lester Snow, General Manager of the San Diego County Water Authority, dated February 6, 1995, Exhibit 29.
[50] Letter from Timothy J. Ulrich, Acting Area Manager for the Southern California Office of the Bureau of Reclamation, United States Department of the Interior, to Lester Snow, General Manager of the San Diego County Water Authority, dated February 6, 1995, Exhibit 30.
[51] City Council Resolution No. R-291210, Exhibit 31.
[52] *No Toilet-To-Tap, Special Water Rate Hike Unwarranted*, Union Tribune Editorial, September 8, 2008, Exhibit 32.
[53] Anjali Athavaley, *Sewer to Spigot: Recycled Water*, The Wall Street Journal Online, May 15, 2008, Exhibit 33.
[54] Id.

## D. Rebirth of Repurification

As part of a settlement of litigation over the City's waiver from secondary treatment at the Point Loma Wastewater Treatment Plant, in 2004 the City Council agreed to conduct a study of ways to increase its use of recycled water, including IPR.[55] The study was published by the City as the 2006 Water Reuse Study, currently available on the City of San Diego website.[56] The study concluded the most cost effective way to utilize the full capacity of the NCWRP is to treat the water to potable standards and transport it to a City reservoir[57] – a resurrection of the Water Repurification Program.

Litigation was immediately filed against the City, claiming that the mere study of IPR was a waste of taxpayer funds.[58] The plaintiffs alleged that IPR was unproven, unsafe, and would cost as much as $2 billion.[59] The lawsuit was backed by an inventor of a related technology, Graywater Irrigation, which recycles residential wastewater on site for use in landscape irrigation. The threat posed by IPR was that it would enhance local water supplies, which was bad for the Graywater business. The City Attorney's Office successfully defended the litigation and the case was dismissed when the plaintiff finally abandoned his lawsuit.[60]

When the 2006 Water Reuse Study was presented to the City Council on October 29, 2007, the Council directed staff to develop and implement a pilot study of IPR, as identified in Alternative NC-3 in the Water Reuse Study.[61] The Mayor vetoed Council's direction on November 14, 2007, but the Mayor's veto was overridden on December 3, 2007. The Mayor cited the high cost of IPR as his reason for the veto, which he estimated at $1,882 per acre-foot.[62]

The Mayor's estimate of $1,882 per acre-foot is much higher than the estimated cost for IPR in Los Angeles and Orange County, and higher than previous City estimates. This appears to be partially due to including the cost of tertiary (irrigation quality) treatment while failing to deduct the avoided cost of treating the sewage again at the Point Loma Wastewater Treatment Plant, which is the City's current practice.

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[55] City Council Resolution No. R-298781, Exhibit 34.
[56] http://www.sandiego.gov/water/waterreusestudy/index.shtml.
[57] 2006 City of San Diego Water Reuse Study, at p. 7-40, Exhibit 35.
[58] *Currie v. City of San Diego*, Superior Court Case No. GIC 857292, Exhibit 36.
[59] Association of Concerned Taxpayers, Press Release dated November 22, 2005, Exhibit 36.
[60] Superior Court Case No. GIC 875292, Order of Dismissal dated July 6, 2006, Exhibit 36.
[61] City Council Resolution No. R-303095, Exhibit 37.
[62] Press Release of Mayor Jerry Sanders dated November 14, 2007, Exhibit 38.

| Location | Estimated Cost of IPR per acre-foot |
|---|---|
| Los Angeles | $478 [63] |
| Orange County | $565 [64] |
| City of San Diego | $742 (from 1997 Strategic Plan for Water) |
| City of San Diego | $1,230 (from 2006 Water Reuse Study) |

A substantial factor in the cost is also the length of the pipeline needed between the NCWRP and San Vicente Reservoir of approximately 23 miles. However, IPR is still more cost effective than expanding the purple pipe system for irrigation use.[65]

In November, the City Council will be considering a rate increase pursuant to Proposition 218 to fund a pilot study of IPR. The City Attorney strongly urges the City Council to approve this rate increase. Although the estimated cost of implementing IPR is more expensive than imported water, the sources of imported water are no longer reliable. IPR offers a self-sustaining, locally controlled source of water. At the conclusion of the pilot study, the City Council will still have the opportunity to decide whether the results warrant the capital investment in a full IPR program.

## V.
## GROUNDWATER RESOURCES

As the 2005 City of San Diego Urban Water Management Plan notes, the City of San Diego is preparing a Water Resources Implementation Plan that will evaluate and recommend groundwater storage and desalinization projects for implementation from 2010 to 2020.[66] In fact, the Fiscal Year 2009 budget identifies the Groundwater Asset Development Program as a project that "provides for investigation work related to legal, technical, regulatory, and water quality issues; and for the planning, design, and construction of groundwater facilities to increase the local water supply."[67] The research, exploration, and demonstration is expected to continue through Fiscal Year 2010.[68] Almost $3 million was allocated for this project in the Fiscal Year 2009 budget, with over $11 million expected to be expended in next year's budget, when the design and construction of subprojects begins.[69]

On March 10, 2008, the City Council unanimously approved the City's General Plan, and certified the Program Environmental Impact Report [PEIR]. The PEIR examined the City's

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[63] Cottonwood Water and Sanitation District, http://www.cottonwoodwater.org/indirect_potable_reuse.htm, (quoting from Use of Recycled Water to Augment Potable Supplies: An Economic Perspective, Potable Reuse Committee, Water Reuse Association, September 1999), Exhibit 39.
[64] Id.
[65] 2006 City of San Diego Water Reuse Study, Table 7-5, Exhibit 35.
[66] 2005 Urban Water Management Plan, pg. 2-19, Exhibit 40.
[67] Fiscal Year 2009 Proposed Budget, pg. 514, Exhibit 41.
[68] Id.
[69] Id.

hydrology, including groundwater. The PEIR stated that potential groundwater supplies are estimated at 6,000-20,000 AFY, but the current costs of utilization made its use infeasible.[70]

## A. Groundwater Basins

The Long-Range Water Resources Plan, approved by the City Council on December 9, 2002, discussed the feasibility of utilizing groundwater basins. The report identified eight major groundwater basins of interest for development:

- San Pasqual Valley Basin
- San Dieguito Valley Basin
- Santa Maria Basin
- Mission Valley Basin
- Santee/El Monte Basin
- Middle Sweetwater River Basin
- Lower Sweetwater River Basin
- Tijuana River Valley Basin
- San Diego Formation Aquifer

Some of these basins are alluvial inland basins, which are "hydraulically isolated from the ocean and have limited areas where natural outflow takes place" and as such, are viable for water storage.[71] The San Pasqual Valley, Santa Maria, Santee/El Monte and Middle Sweetwater River are alluvial inland basins.

The San Dieguito Valley, Mission Valley, Lower Sweetwater River, and Tijuana Valley Basins are alluvial shoreline basins. These types of basins are "likely to have hydraulic interaction with the ocean and, therefore, management options would likely be needed to address this factor." (*Id.*) The remaining basin, the San Diego Formation Aquifer, appears to be a "confined aquifer system," and is also likely to have hydraulic interaction with the ocean. (*Id.*)

## B. Feasibility of Use

The 2002 Long-Range Water Resources Plan identifies five basins as under investigation for determination of feasibility: San Diego River System (Mission Valley Basin and Santee/El Monte Basin), San Dieguito Valley, San Pasqual Valley, Lower Tijuana River Valley, and San Diego Formation.[72] These basins could have two potential uses: 1) production, and 2) storage.

<u>Production</u>- also known as "safe yield production." These basins may be able to yield 6,000-20,000 AFY and be able to be naturally recharged (i.e., "safe yield"). Associated costs depend on factors such as a desalinization facility, brine disposal lines, groundwater production wells, and facilities necessary to move the groundwater supply. (*Id.*) Cost estimates vary from $650-$1,200 per acre-foot.[73]

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[70] Draft General Plan, Final PEIR, 3.17-1, Exhibit 42.
[71] 2002 Long-Range Water Resources Plan, pg. 3-15, Exhibit 43.
[72] 2002 Long-Range Water Resources Plan, pg. 3-17, Exhibit 43.
[73] 2002 Long-Range Water Resources Plan, pg. 3-18, Exhibit 43.

Storage- also known as "conjunctive use storage." The basins may be used for storage of a non-native water supply, if there is little or no natural replenishment occurring. The water may be treated or untreated, and may be injected or percolate through natural or man-made locations. (*Id.*) Associated costs depend on many of the same factors present in using the basins for production, plus the costs of obtaining the reclaimed or imported water prior to storage.[74] Cost estimates range from $550-$700 per acre-foot. (*Id.*)

### 1. Mission Valley Basin

With regard to the Mission Valley Basin, a deep monitoring well was drilled in 2005 as part of the effort to collect and analyze the groundwater. The approximate yield of this basin is 2,000-4,000 acre feet per year. The approximate storage capacity is 42,000 acre feet. The estimated costs to extract and desalinate this ground water through reverse osmosis, and then distribute locally is $25 million. The timeline to complete such a project is estimated to be 4-5 years. At present, any efforts to use this basin for either safe yield or storage must await cleanup of petroleum projects.[75]

### 2. San Diego Formation Basin

Regarding the San Diego Formation Basin, a monitoring well has already been drilled for this basin as well. The approximate yield of this basin is 10,000 acre feet per year. The approximate storage capacity is 200,000 acre feet. The estimated costs to extract, desalinate through reverse osmosis, and distribute locally is $45 million. The estimated timeline is 4-5 years. So far, $375,000 in grant funding has been obtained for planning.[76]

On November 20, 2007, the City Council adopted the San Pasqual Groundwater Management Plan for the San Pasqual Valley Basin. The Plan identifies the Basin Management Objectives and identifies the actions, schedule, and financing for achieving the objectives.[77] The estimated yield of the basin is 5,800 acre-feet per year. The estimated cost of extracting, desalinating through reverse osmosis, and transporting the water to the City's potable water system is $45 million over 4-5 years. Approximately $1.5 has been obtained in grant funding for the planning study.[78] The approximate cost of using the basin for storage is $39 million and the estimated timeline is also 4-5 years. Storage costs include delivery of water, transfer into the basin by percolation, and then recovery by extraction wells. So far, $750,000 in grant funding has been obtained for planning.[79]

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[74] 2002 Long-Range Water Resources Plan, pg. 3-19, Exhibit 43.
[75] Mission Valley Basin, www.sandiego.gov/water/gen-info/watersupply.shtml. Visited Aug. 25, 2008, Exhibit 44.
[76] San Diego Formation Basin, www.sandiego.gov/water/gen-info/watersupply.shtml. Visited Aug. 25, 2008, Exhibit 45.
[77] San Pasqual Groundwater Management Plan, 2007; City of San Diego website. Visited Aug. 25, 2008. http://www.sandiego.gov/water/pdf/supply/spgmpreport.pdf, Exhibit 46.
[78] San Pasqual Basin; http://www.sandiego.gov/water/pdf/supply/pasqualdesal.pdf. Visited Aug. 25, 2008, Exhibit 47.
[79] San Pasqual Basin; http://www.sandiego.gov/water/pdf/supply/pasqualstorage.pdf. Visited Aug. 25, 2008, Exhibit 47.

There are additional issues that will need to be resolved as the City moves forward:

Water Quality[80]- contamination from Methyl Tertiary Butyl Ether (MTBE) and high salinity.

MTBE- only removed from gasoline in January 2004. Very water soluble, "low affinity for soil particles," allowing chemical to move quickly in the groundwater. Treatment is difficult because MTBE is resistant to chemical and microbial degradation in water. The presence of MTBE is more likely caused by leaking underground storage tanks and poor fuel handling practices at gas stations.

Salinity- caused by over-drafting of basins near the ocean or by agricultural and urban returns that contain salts. The San Diego Regional Water Quality Control Board places restrictions on the salinity levels of water used for basin recharge or for irrigation of land over the aquifer.

Legal Rights- The basins extend beyond the City's overlying land.[81] Other land owners or public entities may claim a right to the groundwater.

Environmental Impacts- Future growth, as identified in the General Plan PEIR, has the potential to impact groundwater quality through stock depletion, contamination, and secondary problems such as land subsidence and saline intrusion. However, the PEIR notes that because groundwater is not considered a source of potable water, there are in fact no anticipated significant impacts from stock depletion, land subsidence, or new saline intrusion.[82] In light of this assumption, it must be emphasized that any future efforts to transform groundwater to potable water will need further environmental review.

## VI.
## DESALINATION

### A. History

Since time immemorial, man has sought to harness the vast supply of ocean water as a dependable source of drinking water. In fact, both Aristotle and Hippocrates developed methods for turning the ocean into a clean source of potable water.[83] By the 1800's, many military and commercial maritime vessels installed desalination stills onboard to provide potable water while the ships were out at sea. It was not until the early Twentieth Century when Aristotle's and Hippocrates' dream of turning sea water into a fresh source of drinking water became reality when major desalination plants would first be built in the Dutch Antilles and Saudi Arabia. Today, Saudi Arabia remains in the forefront of desalination, where over 60% of the world's

[80] 2005 Urban Water Management Plan, 6-5 to 6-6, Exhibit 4.
[81] Draft General Plan, PEIR, 3.17-8, Exhibit 42.
[82] Id.
[83] Michael Schriber , *Why Desalination Doesn't Work (Yet)*, Live Science June 25, 2007, Exhibit 48.

desalination plants reside thanks to that country's arid climate and rich abundance of energy resources.[84]

As California and the rest of the Western United States continue in its current drought, various public entities have looked to the Pacific Ocean to buffer against its lowered water supply. The California Department of Water Resources has recommended that water agencies add desalination as a part of their water supply "where economically and environmentally appropriate, as an element of a balanced water supply portfolio, which also includes conservation and water recycling to the maximum extent practicable."[85] California currently has several desalination plants operating within the state, as listed in the tables on the next page.[86]

**Table 1. Coastal Seawater Desalination Plants in California**

| Plant* | Purpose | Technology | Capacity** | Energy Use (kWh/AF) | Feedwater Source | Size** |
|---|---|---|---|---|---|---|
| **Existing Plants** | | | | | | |
| Chevron Gaviota Oil and Gas Processing Plant | Processing plant | Reverse osmosis (RO) | 460 AF/yr | 15,000 | Ocean | 1,170 sq. ft. |
| City of Morro Bay *** | Domestic | RO | 600,000 gpd | 8,900 | Seawater wells | 9,000 sq. ft. |
| City of Santa Barbara *** | Domestic | RO | 7,500 AF/yr | 6,600 | Ocean | 2.1 acres |
| DPR, Hearst San Simeon State Historical Monument *** | Visitor Center Uses | RO | 40,000 gpd | Data not available (n.d.) | Ocean | n.d. |
| Monterey Bay Aquarium **** | Aquarium | RO | 43,000 gpd | n.d. | Ocean | n.d. |
| SCE, Santa Catalina Island | Domestic | RO | 132,000 gpd | n.d. | Seawater wells | 2,100 sq. ft. |
| Offshore oil and gas platforms | Platform Uses | Both | 2,000 to 34,000 gpd | n.d. | Ocean | n.d. |
| PG&E Diablo Canyon Power Plant | Power plant | RO | 576,000 gpd | 9,100 | Ocean | 1 acre |
| PG&E Morro Bay Power Plant | Power plant | Distillation | 430,000 gpd | n.d. | Ocean | n.d. |
| PG&E Moss Landing Power Plant | Power plant | Distillation | 475,000 gpd | n.d. | Ocean | n.d. |
| U.S. Navy, San Nicolas Island | Domestic | RO | 24,000 gpd | n.d. | Seawater wells | 160 sq. ft. |

[84] Jeff Szytel, P.E ., *Supply from the Sea-Exploring Ocean Desalination*, Waterscapes, Volume 15, Number December 4, 2004, Exhibit 49.
[85] California Department of Water Resources: Water Desalination Finds and Recommendations (2003), Exhibit 50.
[86] California Coastal Commission: Seawater Desalination in California (1993), Exhibit 51.

**Proposed Projects**

| | | | | | | |
|---|---|---|---|---|---|---|
| Sand City, Proposed Sterling Hotel/Conference Center ***** | Private Development | RO | 20 AF/yr | n.d. | Seawater wells | n.d. |
| Cambria Community Services District | Domestic | RO | 1 MGD | n.d. | Groundwater wells or Ocean | n.d. |
| City of Buenaventura | Domestic | RO (probable) | 5 to 7 MGD | n.d. | Seawater wells or Ocean | n.d. |
| Marina Coast Water District | Domestic | RO | 1 to 3.5 MGD | n.d. | Seawater wells | n.d. |
| Metropolitan Water District of Southern California | Domestic | Distillation | 5 MGD | 6,000 | Ocean | n.d. |
| San Diego County Water Authority | Domestic | RO | 10 to 30 MGD | 7,200 | Ocean | 2 acres |
| U.S. Navy, N. Island Naval Air Stn. & 32nd St. Naval Stn., San Diego | Power plant | RO | 700,000 gpd total | n.d. | Seawater wells | n.d. |

Excerpts from Chapter 2, pp. 15-26
CRO/RB, 9/93

**Notes:**

* Shaded projects have been all or in part approved or conditionally approved by the California Coastal Commission.

** 1 acre = 43,560 sq. ft. 1 acre-foot (AF) = 325,851 gallons. In most cases, gallons per day (gpd)/millions of gallons per day (MGD) can not be converted to acre-feet per year (AF/yr) since most plants do not operate every day of the year.

*** Plant is permitted and constructed but is not operating.

**** Plant is permitted and is under construction.

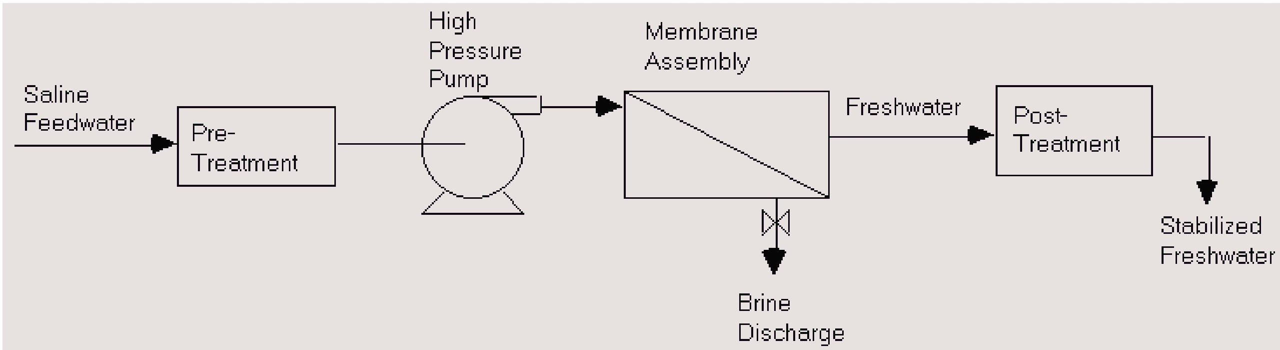
***** Plant was permitted but has not been constructed.

## B. Desalination Process

There are two different methods of desalination. The first method, the distillation process, takes place by heating seawater to evaporation which separates out the dissolved minerals. The most common methods of distillation include multistage flash (MSF), multiple effect distillation (MED), and vapor compression (VC). Distillation advantages include fewer shutdowns for maintenance and less pretreatment requirements, which in turns means less waste from the backwash of the pretreatment filters.

Reverse Osmosis (RO), the second method of desalination, turns the seawater into potable drinking water by pumping water at high pressure through permeable membranes that filter the salt from the water. The seawater is pretreated to remove suspended solids and particles which would otherwise clog the membranes. The advantages of RO include the following: thermal impacts of RO discharge are lower; its plants have less problems with corrosion; RO has lower energy requirements; it has a higher water recovery rate; RO plants take up less surface area than distillation plants for the same amount of water production; capital costs are lower; and can remove unwanted contaminants in the drinking water, such as trihalomethane-precursors, pesticides and bacteria.

**Figure 1.** Flow Diagram of a reverse osmosis system (courtesy of USAID). (Kahn, 1986.)




1. Input Water - Ocean Desalination plants collect seawater for desalination by taking through either offshore intake pipes or wells located on the beach or seafloor. The intake water must be pretreated to remove objects that would interfere with the desalination process. Biocides are required to kill algae and prevent bacteria from growing in both RO and distillation plants. Ozone can be used if RO membranes can not tolerate chlorine. However, if ozone is used it must be removed from the feedwater before reaching the membranes.

2. Water Recovery and Brine Discharge - Generally it takes 100 gallons of seawater to create 15 to 50 gallons of potable water.[87] The amount of water recovery varies due to the particulars of the plant operations and on site specific factors. However, the pure desalinated water is highly acidic and will corrode the water pipes if it is not properly treated after the desalination process. Therefore, desalinated water must be mixed with other sources of water or adjusted for pH, hardness and alkalinity so that the desalinated water does not corrode the water delivery infrastructure.

In addition to creating clean potable water, desalination produces brine water containing dissolved solids, toxic metals and chemicals used during pretreatment and cleaning of the plant's facilities. The discharge may be mixed with sewer effluent for return to the ocean, or dried out and disposed of in a landfill.

## C. Mitigation Issues

### 1. Energy Requirements

Since seawater desalination requires a large amount of energy, the economic viability of seawater desalination is dependent on the availability of low-cost power. Energy requirements depend on the salinity and temperature of the feedwater, quality of the water produced and method of desalination.

[87] California Coastal Commission: Seawater Desalination in California (1993), Exhibit 51.

The cost of desalination may be lowered by securing non-retail agreements with power generators. If a desalination plant can obtain power from a co-generator, it would not be subject to rate regulation, thus reducing the cost of electricity.[88] Other advantages for co-locating desalination plants with power plants include the following: compatible land use, use of existing feedwater intake and brine discharge, location security, use of warmed power plant water as feedwater for the desalination plant, reduction of power plant plume, and ability to buy power at lower rates.

### 2. Environmental Issues

The direct intake of ocean water may result in the incidental loss of marine life when the ocean species collide with screens at the intake pipe or when the species become entrapped in the intake pipes and eventually are destroyed at the plant during the desalination process. The use of beach wells may help reduce these impacts. However, the capacity of these wells is unknown and intrusion of saltwater in aquifers must be considered before implementing the use of beach wells.

Desalination plants also produce liquid wastes that contain high salinity concentration and chemicals used to clean the plant's facilities and pretreatment of feedwater. These wastes may be disposed with by discharging it directly into the ocean or drying it out and discarding it in a landfill. However, if a desalination plant can blend its brine discharge with an existing wastewater discharge it will reduce the salinity of the plants' brine discharge to more close match the receiving ocean waters.

Desalination may also lead to worsening greenhouse affect since desalination requires an extensive amount of energy, which is mostly produced through fossil fuels. Therefore, if a desalination plant is built, the local agency should require greenhouse mitigation measures such as buying greenhouse offsets or using renewable energy.

## D. Cost of Desalinated Water

The California Coastal Commission reported the following costs per acre foot for existing desalinated water in 1992 cost basis[89]:

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[88] Heather Cooley, Peter H. Gleick and Gary Wolff; *Desalination, With a Grain of Salt, A California Perspective*, pages 6-8, Pacific Institute (2006), Exhibit 52.
[89] California Coastal Commission: Seawater Desalination in California (1993), Exhibit 51.

**Table 2. Costs of Water from Desalination Plants & Other Sources** (1992 Cost Basis)

| | $ Cost (per AF) |
|---|---|
| **Seawater Desalination Plants** | |
| ▪ Chevron Gaviota Oil and Gas Processing Plant | 4,000 |
| ▪ City of Morro Bay | 1,750 |
| ▪ City of Santa Barbara** | 1,900 |
| ▪ Marin Municipal Water District* | 1,600 – 1,700 |
| ▪ Metropolitan Water District (MWD) of Southern California* | 700 |
| ▪ Monterey Bay Aquarium* | 1,800 |
| ▪ PG&E Diablo Canyon Power Plant | 2,000 |
| ▪ San Diego County Water Authority (South Bay Desalination Plant)* | 1,100 – 1,300 |
| ▪ SCE, Santa Catalina Island | 2,000 |
| ▪ U.S. Navy, San Nicolas Island | 6,000 |
| **Other Water Sources** | |
| ▪ City of Santa Barbara | |
| Lake Cachuma — existing source | 35 |
| Groundwater — existing | 200 |
| Groundwater wells in mountains — new source | 600 – 700 |
| Expanding reservoir — new | 950 |
| Tying into State Water Project | 1,300 |
| Temporary State Water Project deliveries via MWD | 2,300 |
| ▪ Metropolitan Water District (MWD) of Southern California | |
| Colorado River — existing | 27 |
| California Water Project — existing | 195 |
| Imperial Irrigation District — new | 130 |
| Water storage project — new (no water now) | 90 |
| ▪ San Diego County | |
| MWD — existing | 270 |
| New water projects — new | 600 –700 |

**Notes:**

* Cost estimate for a proposed plant.

** Cost amortized over 5 years.

Unless otherwise noted, cost estimates for desalination plants are costs to produce the water. Cost estimates listed under other sources are the costs to the city, county, or water district.

The following is a summary of costs for a modular 5 MGD plant in Alameda County:

| *Desalination Source Water* | *Capital Cost ($)* | *Product Cost ($/AF)* |
|---|---|---|
| Brackish groundwater | 7,000,000–10,000,000 | 440–500 |
| Municipal wastewater (excludes cost of pretreatment and distribution) | 6,400,000 | 540 |
| Seawater | 20,300,000 | 1,300 |

**E. Recommendation**

The City should conduct research into the feasibility of building a desalination plant for the City's use. This feasibility study should include proper environmental mitigation measures and locating energy at wholesale prices. It is suggested that the City monitor the progress of the proposed desalination plant in Carlsbad.

## VII.
## CONSERVATION

Increased water conservation can create a new source of water, insofar as water saved today can be used tomorrow. The City has had significant success in the past, primarily through installation of low-flow water fixtures. Now that those efforts have reached their fruition, the City needs to implement new methods to conserve more water.

To increase conservation, the City should amend its Emergency Water Regulations (Municipal Code sections §67.3801-67.3811) to allow the City to better respond to water shortages. The San Diego County Grand Jury criticized these regulations for having vague triggers for water alert stages, no permanent water use restrictions, and lacking a tiered rate structure for multi-family, commercial and industrial water user classes.[90]

The City Attorney has proposed changes to the City's Water Conservation code that would do the following:

- Require yearly reporting on water supply from the Water Department to the City Council;
- Require water restrictions when water supply decreases at set percentages;
- Require some permanent water use restrictions;
- Require water customers to make water use reductions at a set rate
- Allow water customers an appeal process in the event any water conservation measure is unduly burdensome or unfair; and
- Create stronger penalties.

[90] San Diego County Grand Jury, *Water Conservation, Sober Up San Diego, the Water Party is Over*, February 13, 2008, Exhibit 53.

Depending on the severity and the duration of the current water shortage, stricter conservation measures may be necessary to ensure enough water for everyone. The City Attorney's proposed ordinance will put those measures in place, in the event the City Council needs to resort to them. It is critical, therefore, to adopt a new ordinance before this spring, when mandatory cutbacks from the County Water Authority are likely to come.

## VIII.
## CONCLUSION

As outlined in detail herein, the City must take immediate action to diversify its ever-shrinking water supply. As to Water Supply Assessments, this office recommends that the City immediately begin issuing WSAs that take into account existing elements of a large development project as well as the project's proposed new elements. A WSA should also be prepared for development proposals nearing the mandatory legal thresholds under Water Code § 10912 (a). Further, the City must update its 2005 UWMP so the City Council and the public can make more informed decisions about the impact of large development projects under review.

In November, the City Council will have the opportunity to fund a pilot study of Indirect Potable Reuse. The City Attorney strongly urges the City Council to approve the required rate increase in order to fund the IPR demonstration project. IPR offers a self-sustaining, locally controlled source of water that, if implemented, could reduce the impact of future droughts.

The City must also take steps to identify local sources of groundwater and determine its suitability for potable or other beneficial uses. As necessary, the City must undertake the appropriate environmental review to evaluate levels of contamination and salinity in our local groundwater.

This office also joins in the recommendation of the California Department of Water Resources that water agencies, such as the City's Water Department, add desalination as a part of their water supply where economically and environmentally appropriate. California currently has several desalination plants operating within the state, and the City should conduct research into the feasibility of building a desalination plant for the City's use.

Increased water conservation will remain vital for the foreseeable future, but the City must redouble its efforts. To increase conservation, the City must amend its Emergency Water Regulations to allow the City to better respond to water shortages. This office is revising the City's Municipal Code to strengthen the current triggers for water alert stages, provide for permanent water use restrictions, and implement a tiered rate structure for multi-family, commercial and industrial water user classes.

Given the severity and the duration of the current water shortage, the aggressive water development measures described in this Interim Report are necessary to ensure enough water for everyone. With foresight, the City of San Diego can ensure the security of its future water supply.

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