

3.0 Development and Supply Availability of Recycled Water

Water Reuse Study 2005

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This section provides an overview of the history of water reuse in San Diego that began almost 25 years ago. In addition, this section provides a discussion on how much recycled water is available to San Diego and issues associated with optimizing its use.

3.1 History of Water Reuse in San Diego

Because the City has long recognized the importance of developing its local water resources, the City has been a pioneer in the field of water recycling. In 1981, the 25,000-gallon per day Aqua I Pilot Aquaculture plant began operation in Mission Valley, with the water produced used to irrigate a sod farm adjacent to Jack Murphy Stadium (now Qualcomm Stadium). In 1984, the Aqua II Water Reclamation Facility, a second, larger pilot research installation, began treating 180,000 gallons per day of wastewater. This water was sold to the California Department of Transportation (Caltrans) for use in freeway landscape irrigation beginning in 1987.

In 1991, the Aqua III Water Reclamation Facility and Aqua 2000 Research Center were constructed in the San Pasqual Valley, north of Rancho Bernardo, where the Aqua III plant continued to use aquaculture treatment to reclaim wastewater. This facility had the capacity to treat 1 MGD for agricultural use and irrigation. The Research Center continued to study advanced water treatment using a variety of methods until 2001 when the project was discontinued.

The City has been delivering recycled water to customers for non-potable irrigation and industrial use on a larger scale since the completion of the North City Water Reclamation Plant (NCWRP) in 1997. The North City Plant was a major investment that highlighted the City's commitment to delivering a safe and reliable new water supply to large areas of San Diego. In 2002, the South Bay Water Reclamation Plant (SBWRP) was completed to provide the same benefits to the southern portion of the City. Both these facilities provide a locally controlled, drought-proof supply of recycled water for San Diego.

Chronology of Events influencing the City's Reclamation Program

The incentive to develop water reuse projects is also driven by wastewater management issues. Since 1963, the City has treated its wastewater at the Point Loma Wastewater Treatment Plant, which provides treatment at the "advanced primary" level before disposal in an ocean outfall. In 1972, the Federal Clean Water Act was adopted, requiring that wastewater plants provide a more advanced form of wastewater treatment known as secondary treatment, but allowing certain ocean dischargers, such as the City, to apply for waivers. Over the course of the 33 years since the passage of the Clean



Water Act, the City has applied for a waiver, withdrawn the waiver, been sued by the U.S. Environmental Protection Agency (EPA) and environmental organizations, reapplied for and been approved for a waiver, and settled the lawsuit. These events are summarized below.

1963: City begins treating wastewater at the new Point Loma Wastewater Treatment Plant.

1972: Congress passes the Federal Clean Water Act (CWA), requiring wastewater treatment plants to provide higher treatment levels known as secondary treatment, but allowing certain ocean dischargers, such as the City, to apply for waivers.

1987: Following the City's withdrawal of its waiver application, the EPA and environmental groups sue the City for non-compliance with the CWA.

1994: Congress passes the Ocean Pollution Reduction Act (OPRA), allowing the City to reapply for a waiver. City reapplies and waiver is granted. City settles lawsuit, and begins process to achieve 45 MGD in water reclamation capacity by 2010, as required by OPRA.

1995: EPA funding grant for construction of the City's North City Water Reclamation Plant requires the City to attempt to meet a goal of reusing 25 percent of treated flows by 2003 and 50 percent of the plant's treated flow by 2010. Based on anticipated wastewater flows to the NCWRP, the City established reuse goals consistent with the above commitments of 6 MGD by the end of 2003, and 12 MGD by the end of 2010.

2002: The City fulfills the 45 MGD treatment capacity requirement with the completion of the 30 MGD NCWRP in 1997, and the 15 MGD SBWRP in 2002. After allowances for treatment process losses and other on-site uses, these two reclamation plants have recycled water production capacities of approximately 24 MGD and 13.5 MGD, respectively.

2004: City enters into Settlement agreement with environmental groups, committing among other things to conduct a comprehensive study of opportunities to make beneficial reuse of the City's recycled water. The Settlement Agreement commits the City to: (a) evaluate improved ocean monitoring; (b) pilot test biological aerated filters as a form of technology to increase solids removal; and (c) study increased water reuse. This Water Reuse Study is intended to fulfill part (c) of the City's commitment.

The City has fulfilled its treatment capacity commitment with the completion of the 30 MGD North City Water Reclamation Plant in 1997, and the 15 MGD South Bay Water Reclamation Plant in 2002.

The 2005 Water Reuse Study is intended to fulfill part (c) of the Settlement Agreement with environmental stakeholders to study increased water reuse.



The history of the City's Water Repurification Project is important to any forward-looking evaluation of water reuse opportunities.

Water Repurification Project

Beginning in 1993, the City, in cooperation with the San Diego County Water Authority, proposed an indirect potable reuse project called the Water Repurification Project. The indirect potable reuse project proceeded through various phases of planning, regulatory review, and preliminary design prior to being cancelled by the City Council in 1999. The history of the project is important to any forward-looking evaluation of water reuse opportunities.

The Water Repurification Project proposed to take NCWRP recycled water and deliver it to a new, nearby facility for further treatment. The additional treatment steps would include the use of several advanced treatment technologies including membrane filtration, reverse osmosis, ion exchange, advanced oxidation using ozone, and disinfection. The product of this sophisticated treatment regime was termed “repurified water”. About 20,000 acre-feet per year (AFY) (18 MGD) of this repurified water was planned to be pumped approximately 20 miles to the 90,000 acre-foot San Vicente Reservoir, one of the City’s potable water sources, where it would be discharged into the reservoir and blended with imported and local water. The repurified water would have been stored in the reservoir for approximately two years, during which time further natural treatment would occur. San Vicente Reservoir water, augmented by repurified water, would then be treated along with other water sources at the City’s Alvarado Water Treatment Plant before being distributed to customers.

The California Department of Health Services (DHS) first granted conditional approval to the project in 1994, and many groups voiced support for the project including the EPA, the Sierra Club, the San Diego Medical Society, the U.S. Bureau of Reclamation, a citizen’s advisory panel, and a variety of business and community interests.

Despite this support for the repurification project, public opposition to the project began to emerge. During the 1998 political campaigns, the water repurification project became an issue in several closely contested races. Some members of the public and media began to raise concerns about potable use of recycled water, and project opponents began to characterize the project with slogans eliciting a negative reaction from the public. Another important element was the concern in some stakeholder groups that socioeconomic groups were being unfairly targeted to use the repurified water. These factors placed a challenging burden on City policy makers, and subsequently, the City Council voted to halt the Water Repurification project.

2000 Water Reclamation Master Plan

Because the City remained committed to beneficially using its recycled water per the goals established as a condition of the EPA grant, an alternate means to proceed was developed. The Water Department initiated the Beneficial Reuse Project that produced the *2000 Updated Water Reclamation Master Plan* (PBS&J, 2000) and the numerous planned and implemented system improvements to maximize non-potable use of recycled water.



3.2 North City Water Reclamation Plant Recycled Water Use and Availability

The NCWRP, operated by the City’s Metropolitan Wastewater Department, currently treats the available wastewater inflow of 22.5 MGD, which is 75 percent of its capacity. Of this amount, approximately 6 MGD of tertiary-treated recycled water is produced and beneficially reused on average each year. The remaining flow is treated to a secondary level and conveyed to Point Loma for disposal through the ocean outfall.

The existing distribution facilities in place to serve the northern service area (the recycled water distribution area served by NCWRP) include a 9 million gallon storage tank, two pump stations, and about 66 miles of pipeline, including a large backbone pipeline in Miramar Road. These facilities extend from the coast to the City of Poway.

As of April 2005, the City provides recycled water to 348 metered customers, including a single connection with the City of Poway by which Poway subsequently serves an additional 191 customers. Most of these customers use recycled water for irrigation while a few customers use recycled water for industrial purposes. Large City customers include the NCWRP, the City’s Metropolitan Biosolids Center, Caltrans, City Parks and Recreation Department, General Atomics, Miramar Landfill, Miramar Nursery, Mitchell International, Motorola, Nissan Design, Pacific Retail Trust, San Diego California Temple, Superior Readymix, Timberland II, University of California, San Diego, and the Torrey Pines and Miramar Marine Corps Air Station golf courses. Infill opportunities exist for perhaps 150 to 200 additional irrigation customers connecting to the existing northern service area system, including public parks, freeway medians, and private customers using 0.5 to 20 AFY (see Section 5).

North City Water Reclamation Plant Summary Information	
• Inflow Design Capacity:	30 MGD
• Maximum Recycled Water Production Capacity (with demineralization system expansion and full inflows):	24 MGD
• Existing Beneficial Reuse:	6 MGD
• Total Planned Reuse by 2010 with completion of ongoing reuse projects (distribution system expansion Phases I & II):	9 MGD

Planned NCWRP Distribution System Expansions

The City is continuing to expand the recycled water distribution system and connect additional customers. The expansion is based on the City’s Recycled Water Master Plan completed in 2000. The expansion is divided into three phases, known as Phase I, Phase II, and Phase III. The major facilities are shown in **Figure 3-1**. The City is currently completing construction of Phase I and Phase II is in design. The Phase III expansion has not been funded. Because Phase III has not been funded, there is an opportunity to re-assess the Phase III expansion along with other non-potable opportunities (see Section 5).

The City has previously identified three phases of NCWRP distribution system expansion. Phases I and II are ongoing. Phase III remains a future option and is presented for consideration in Section 5 of this report.

Phase I of the recycled water system is being completed concurrent with this report. New customers will include two Black Mountain Ranch golf courses, parks, landscape irrigation, and the Olivenhain Municipal Water District.



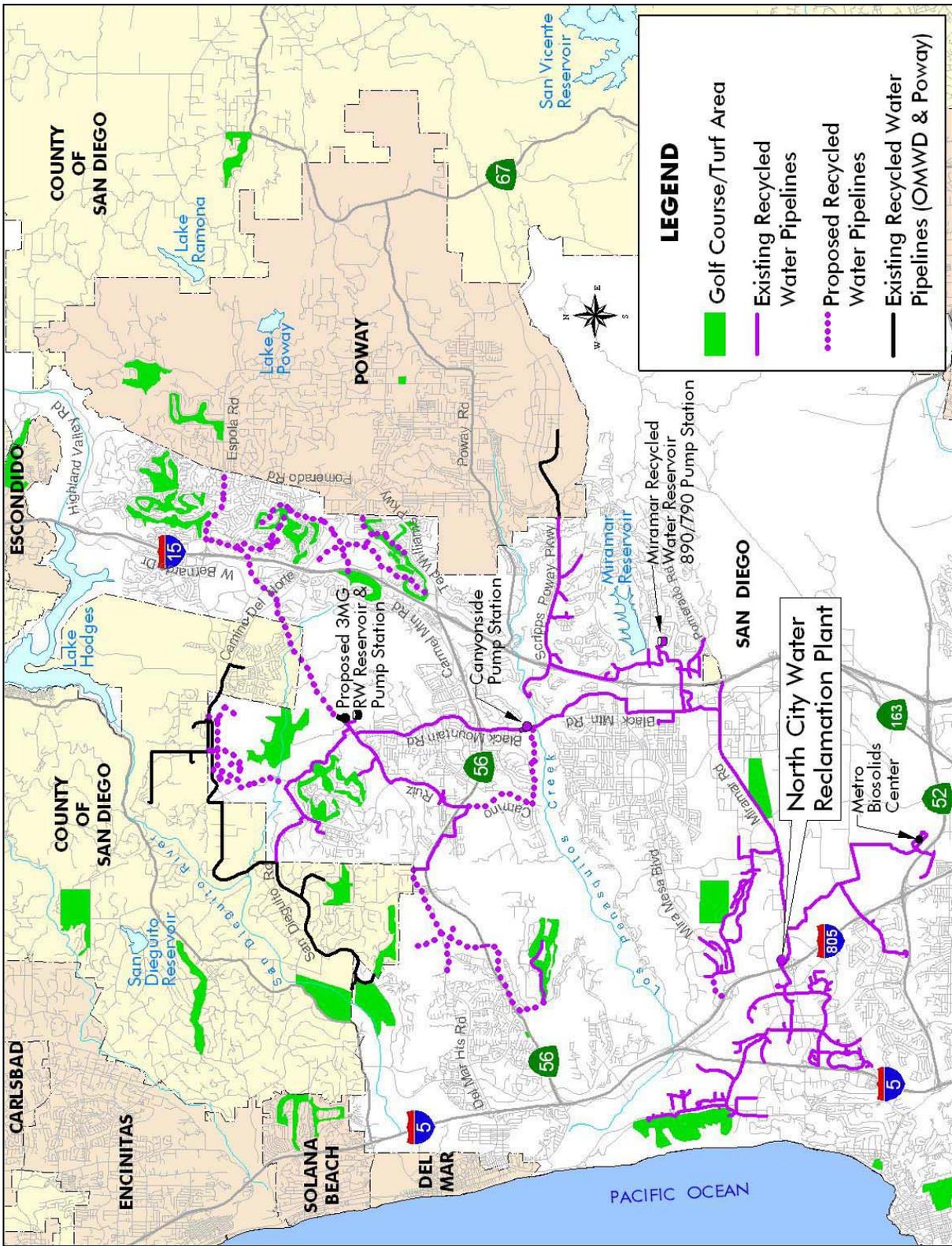


Figure 3-1 – North City Recycled Water Distribution System



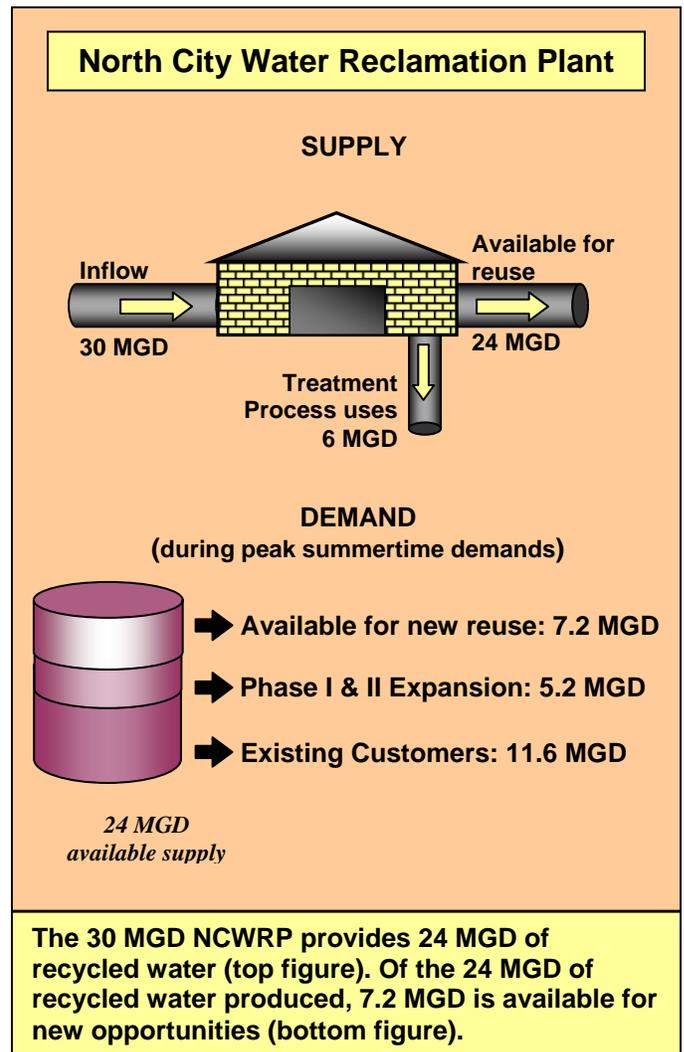
Thirteen miles of pipeline have been installed through the Rancho Peñasquitos community to the Black Mountain Ranch area, and a pump station has been constructed. In addition, to further serve the area, the 3 million gallon Black Mountain Reservoir will be in service by Fall 2005. Phase I customers are anticipated to generate a recycled water demand of approximately 1.7 MGD by 2007.

Phase II of the distribution system expansion will provide recycled water service to Carmel Valley and the State Route 56 corridor. The 16 miles of pipeline needed to implement this phase are under various stages of design or construction. Major customers to be served by the Phase II expansion include the Del Mar National Golf Club (formerly Meadows Del Mar), Caltrans, Pacific Highlands Ranch parks, and the Palacio Del Mar Golf Course. Recycled water use along this corridor is anticipated to generate a recycled water demand of approximately 0.9 MGD when the entire length of pipeline is completed in 2010.

Recycled Water Availability at the NCWRP

The NCWRP is referred to as a 30 MGD facility, based on its ability to treat 30 MGD of incoming wastewater flows. The actual amount of recycled water produced is less than the plant’s rated capacity due to internal treatment process uses such as filter backwashing and brine disposal. Accounting for these uses, the ultimate recycled water production capacity of the NCWRP is approximately 24 MGD of Title 22 non-potable recycled water.

Of the 24 MGD NCWRP available supply, 7.2 MGD is available for new opportunities in the summer months. Of the available supply, 16.8 MGD is needed to meet existing demands and the Phase I and Phase II expansions. The 16.8 MGD total is approximately twice the average annual uses summarized above, as non-potable uses peak during the warm summer months. Demands during warm months are commonly twice the average annual use. Additional recycled water produced during off-peak months could be utilized if seasonal storage was provided, or as part of an indirect potable reuse project. These considerations were taken into account in developing the reuse implementation strategies available to maximize recycled water use from NCWRP.



3.3 South Bay Water Reclamation Plant Recycled Water Use and Availability

The 15 MGD SBWRP became operational in the summer of 2002. It currently produces 5 to 6 MGD of secondary treated wastewater that is disposed of via the South Bay Ocean Outfall. Certification of the tertiary treatment facilities by the Regional Water Quality Control Board (RWQCB) was granted in 2004.

South Bay Water Reclamation Plant Summary Information

- Inflow Design Capacity: 15 MGD
- Maximum Recycled Water Production Capacity (with full inflows): 13.5 MGD
- Existing Beneficial Reuse: 1.25 MGD
- Total Planned Reuse with completion of ongoing reuse projects (distribution system expansion to Otay Water District): 7.25 MGD

The distribution system consists of a pipeline in Dairy Mart Road that will eventually connect to facilities being constructed by Otay Water District. Construction of facilities was recently completed to deliver 0.7 MGD of recycled water to the adjacent International Boundary and Water Commission (IBWC) Wastewater Treatment Plant.

Planned SBWRP Distribution System Expansions

On October 16, 2003, the San Diego City Council approved an agreement to sell 6 MGD of recycled water to the Otay Water District. Otay Water District will have infrastructure in place to take this water by January 1, 2007. In addition, Caltrans has

expressed interest in using recycled water for freeway landscape irrigation at the southern ends of Interstates 5 and 805, and the 905 interchange. The facilities that comprise the distribution system for the South Bay area are illustrated in **Figure 3-2**. Additional potential recycled water customers have been identified and are presented in Section 5 of this report.



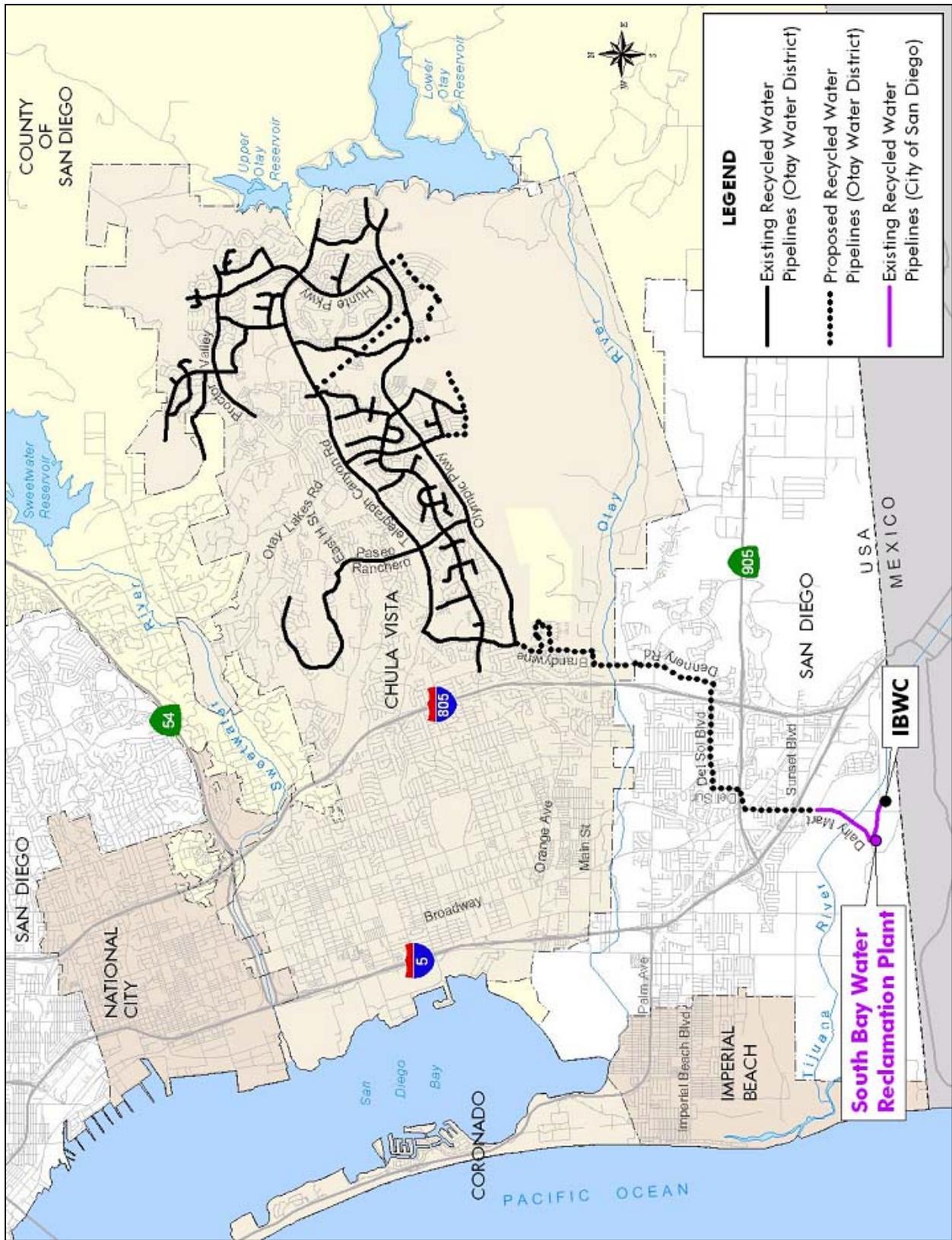
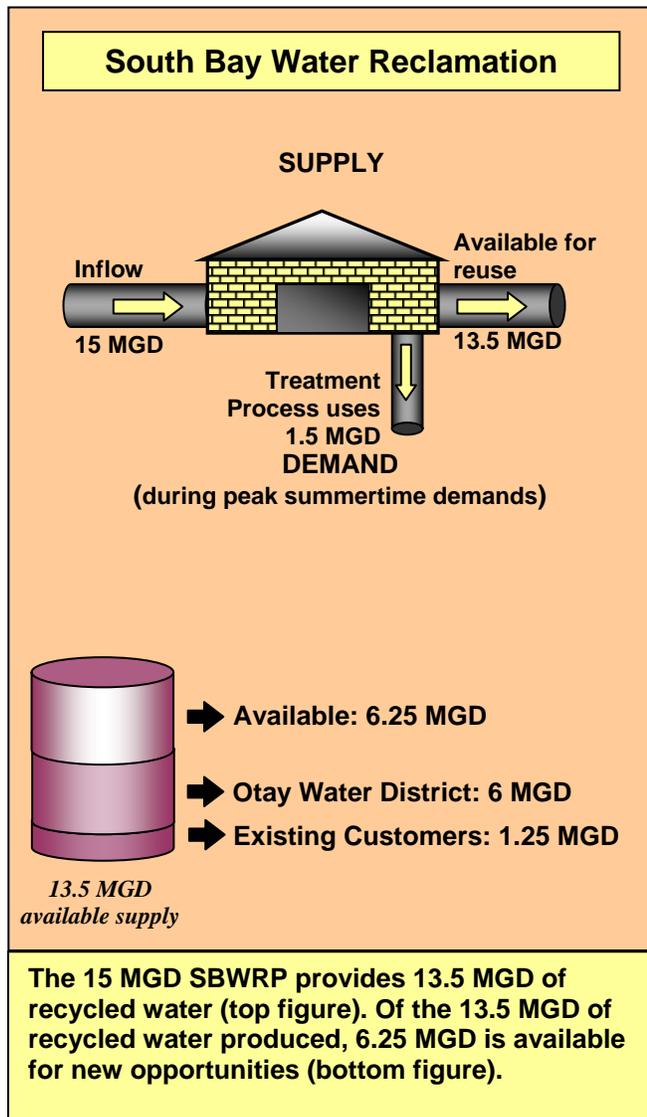


Figure 3-2 – South Bay Recycled Water Distribution System





Recycled Water Availability at the SBWRP

The SBWRP is referred to as a 15 MGD facility, based on its ability to treat 15 MGD of incoming flows. The actual amount of recycled water available is less than this due to internal treatment process uses such as filter backwashing. Accounting for these uses, the ultimate recycled water production capacity of the SBWRP is approximately 13.5 MGD. Water loss due to process uses at SBWRP is less than at NCWRP because the SBWRP does not require an additional treatment step to reduce the salt content of the recycled water.

Of the 13.5 MGD SBWRP available supply, 6.25 MGD is available for new opportunities in the summer months. A portion of the SBWRP recycled water supply is committed to existing customers – the SBWRP on-site uses and the International Boundary and Water Commission treatment plant. These non-potable uses are constant throughout the year. The City has an agreement to supply Otay Water District with 6 MGD. Once again, recycled water produced during off peak months could be utilized if seasonal storage was provided, or if it were part of an indirect potable reuse project. These considerations were taken into account in developing the reuse implementation strategies available to maximize recycled water use from the SBWRP.

3.4 New Recycled Water Supply Sources

Because new water reclamation treatment plants are a major investment, it is prudent for the City to maximize existing treatment facilities before considering the construction of new facilities. If the City were to consider siting a new treatment facility in an area that is in need of wastewater treatment facilities or in an area with significant potential demand for recycled water, a satellite reclamation plant could be considered.

Satellite treatment plants must be in close proximity to large supplies of wastewater to treat, and have access to disposal facilities. A location near or adjacent to a large trunk sewer is ideal. For this study, it was assumed that a satellite treatment plant could be constructed in the Mission Valley area. The new plant is conceptualized as a 5 MGD facility that would use membrane bioreactor treatment. Membrane Bioreactors are systems that integrate

Mission Valley Plant
A new 5 MGD Mission Valley Plant could be constructed to serve the Central Service Area.



biological degradation of waste with membrane filtration. MBRs require less space and are more automated than conventional treatment facilities, ideal for decentralized treatment. This concept is discussed further in Section 5. The San Diego County Water Authority is currently conducting a regional study on membrane bioreactor recycled water satellite treatment plants. Additional emphasis on these facilities is planned during future recycled water master plan updates.

3.5 Seasonal Storage

Seasonal storage is used to increase the amount of recycled water available for non-potable uses during the hotter, higher demand months by storing surplus recycled water in colder, lower demand months. Because recycled water supply availability is consistent year round (due to steady year-round wastewater inflows) the plants are maximized in the summer due to increased demands due to warm weather, while having excess capacity in the winter due to cooler temperatures and rainfall, as shown in **Figure 3-3**. Seasonal storage allows storage of excess off-peak supplies for later use during peak demands – effectively increasing the total amount of non-potable water reuse possible. This situation is relatively common for non-potable recycled water systems. An alternative to seasonal storage is supplementing the recycled water distribution system with raw water or potable water to meet peak demands.

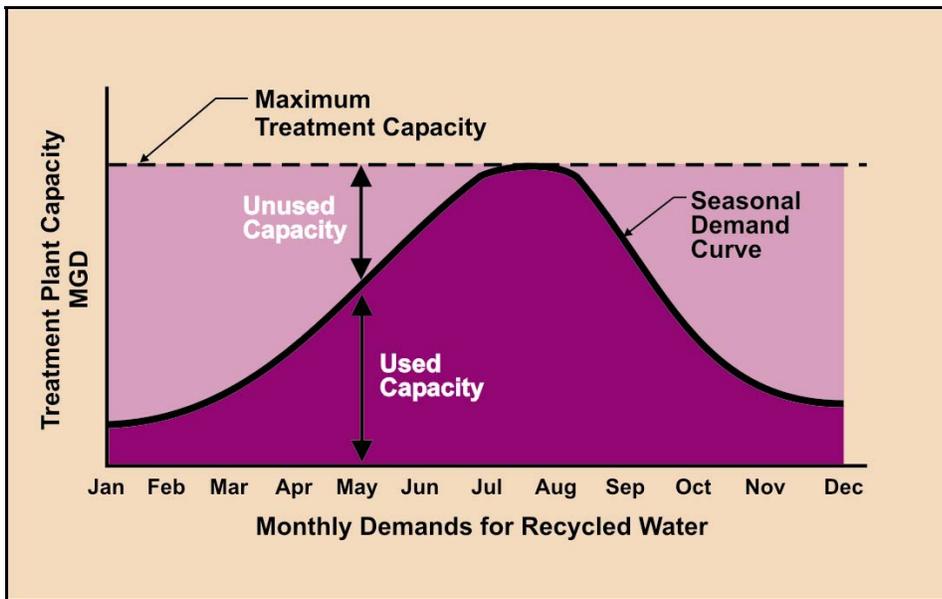


Figure 3-3 – Seasonal Storage of Recycled Water

Seasonal storage is not a use in itself, and the volume of seasonal storage required is dependent on the additional demands put on the system. For seasonal storage to be effective, significant volumes of water must be stored. Because land availability is a critical element of most seasonal storage projects, the addition of a seasonal storage facility is a relatively expensive



addition. For this study, potential sites for the construction of earthen basins were estimated to be:

- 40 acres in size for storage of approximately 1,000 acre-feet of recycled water, located on relatively level terrain.
- In relative proximity to the existing or planned recycled water distribution systems.

Groundwater storage of recycled water was also investigated, however the groundwater basins in San Diego are all designated for potable uses by the RWQCB. An amendment to the region's Basin Plan would be required before storage of non-potable recycled water was permitted to occur in a groundwater basin. According to State regulators, no groundwater basins in California have been permitted for the seasonal storage of non-potable recycled water. Therefore, only earthen basins were considered in this study.



