

5.0 Non-Potable Reuse Opportunities

Water Reuse Study 2005

- 1.0 Introduction
- 2.0 Public Outreach and Education
- 3.0 Development and Supply Availability of Recycled Water
- 4.0 Overview of Water Reuse Opportunities and Public Health Protection
- 5.0 Non-Potable Reuse Opportunities**
 - 5.1 Northern Service Area Recycled Water Opportunities**
 - 5.2 Southern Service Area Recycled Water Opportunities**
 - 5.3 Central Service Area Recycled Water Opportunities**
 - 5.4 Regional Opportunities**
 - 5.5 Graywater Opportunities**
 - 5.6 Summary of Non-potable Opportunities that are Brought Forward for Evaluation**

In investigating potential non-potable reuse opportunities in San Diego, three service areas were identified within the City (**Figure 5-1**). In each service area the initial focus was on irrigation and industrial customers because those types of customers generally use significant amounts of water. The identification of any additional non-potable opportunities was targeted at capturing smaller potential customers located near existing infrastructure or branching out to areas currently not served by the existing systems. Wetlands creation projects were investigated for the use of recycled water during winter months to simulate storm events in canyon streams. Seasonal storage facilities were considered in each service area. Regional opportunities, including the sale of recycled water by the City to neighboring municipalities or water districts, were identified. And finally, graywater opportunities were addressed.

5.1 Northern Service Area Recycled Water Opportunities

In December 2000, the City prepared the *Updated Water Reclamation Master Plan*. The Master Plan recommended a three-phase expansion of the Northern Service Area distribution system. Phase I and Phase II included expansion of the system north on Black Mountain Road and then west into Carmel Valley. Phase III included recycled water service to the Rancho Bernardo area. Infrastructure associated with Phases I and II is currently under construction, in design phases, or completed. The City has not authorized funding for the Phase III system, and this phase remains a potential future project for consideration in this report.

In this study, expansion of the existing Northern Service Area recycled water distribution system centered on four conceptual opportunities:

- The first Northern Service Area opportunity considered was to evaluate the potential for finding new customers adjacent to or within a quarter mile of the existing Phase I and Phase II distribution pipelines. These markets were referred to as “infill” customers.
- The second opportunity considered was to extend the existing system to the northeast to serve the Rancho Bernardo area (Phase III Expansion) and the golf courses located there.
- The third opportunity considered was to extend the existing system south to Friars Road to the Central Service Area where the pipeline would branch west to Mission Bay Park and south to Balboa Park, serving additional customers along the way.



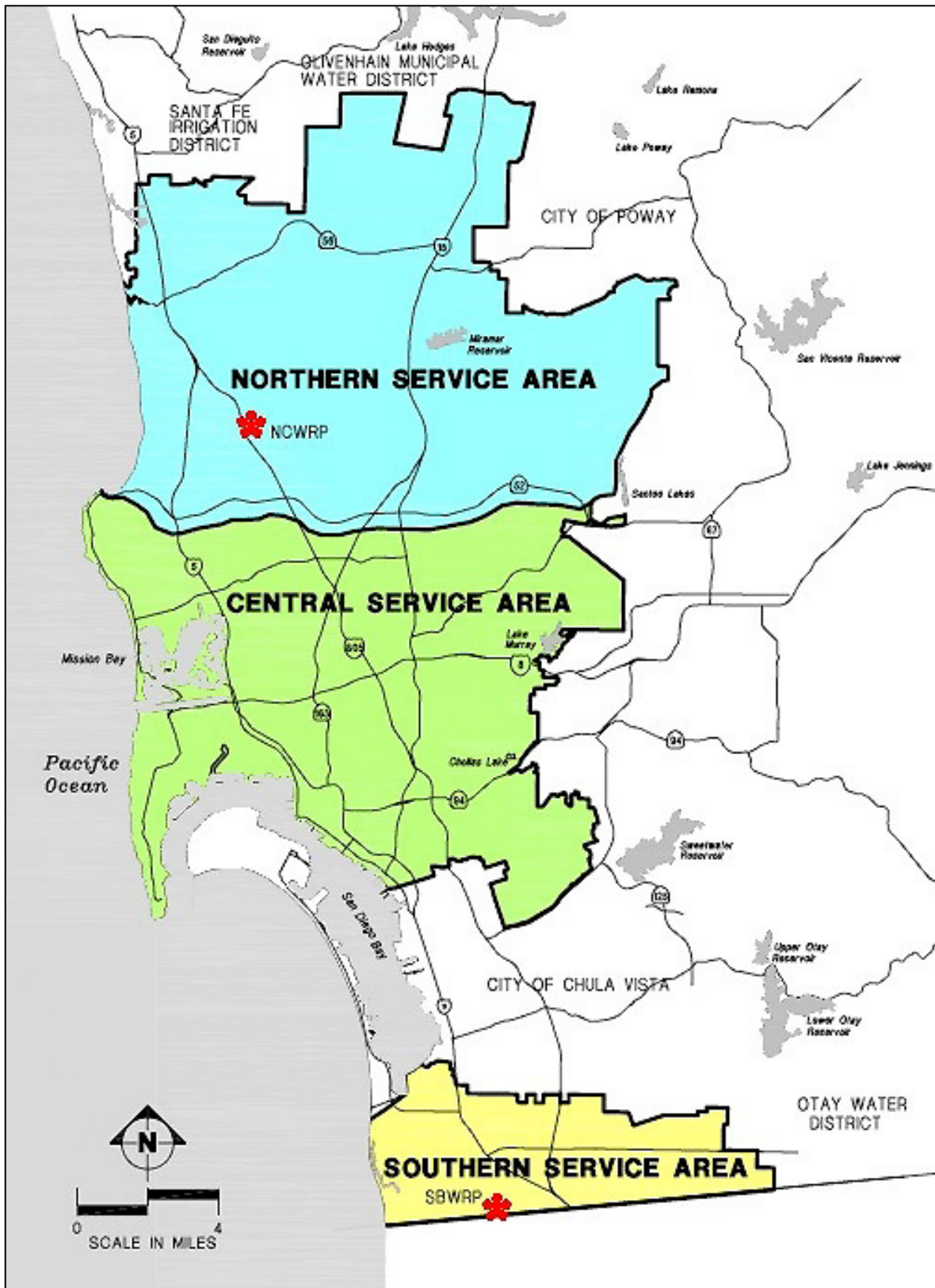


Figure 5-1 – Existing and Proposed Recycled Water Service Areas



- The fourth opportunity considered was a created wetlands project in Rose Canyon. This opportunity would allow seasonal discharge of recycled water to Rose Canyon Creek through the extension of the existing recycled water system.

These four Northern Service Area non-potable project opportunities are shown in **Figure 5-2**.

Northern Service Area – Infill Customers

When the North City recycled water system was originally planned, a market assessment was performed and recycled water customers were assessed based upon three main questions:

- Could their existing water use be met with recycled water?
- How much water did they use?
- What is their proximity to the planned infrastructure?

The City worked closely with customers who decided to connect to the recycled water system. The first step was designing on-site piping upgrades. The designs were submitted for regulatory approval. Upon approval, the customer was disconnected from the potable water system and the pipeline upgrades were constructed. Once the piping upgrades were complete, the new customer was connected to the recycled water system. This process is referred to as retrofitting.

Infill is similar to the retrofit process used to get customers connected to the original recycled water system. The infill opportunity is particularly applicable to the Northern Service Area. The City has made strategic infrastructure investments to get transmission facilities to high water demand areas in northern San Diego. Infill could occur by connecting smaller non-potable customers along these transmission facility corridors.

The 2010 beneficial reuse goal of 12 MGD can be met via infill in the Northern Service Area. Approximately 300 sites within a quarter mile of the existing Phase I and Phase II recycled water pipelines were identified in a new market assessment. Approximately 150 of these sites have an estimated average water demand, primarily for irrigation, of 3.6 MGD that will close the gap on the 12 MGD goal. Significant infill customers include Marine Corps Air Station Miramar and Qualcomm, as well as the City’s Park and Recreation Department. Potential customers are located in close proximity to existing and planned pipelines. Although off-site infrastructure requirements are minimal, the customer’s on-site retrofit requirements could be extensive depending on the size of the irrigated area.

Infill Can Meet 2010 Goal

The 2010 beneficial reuse goal of 12 MGD can be met via infill in the northern service area. There are as many as 300 potential customers within a quarter mile of existing pipelines. Infill has less off-site infrastructure requirements, but on-site retrofits must be considered.



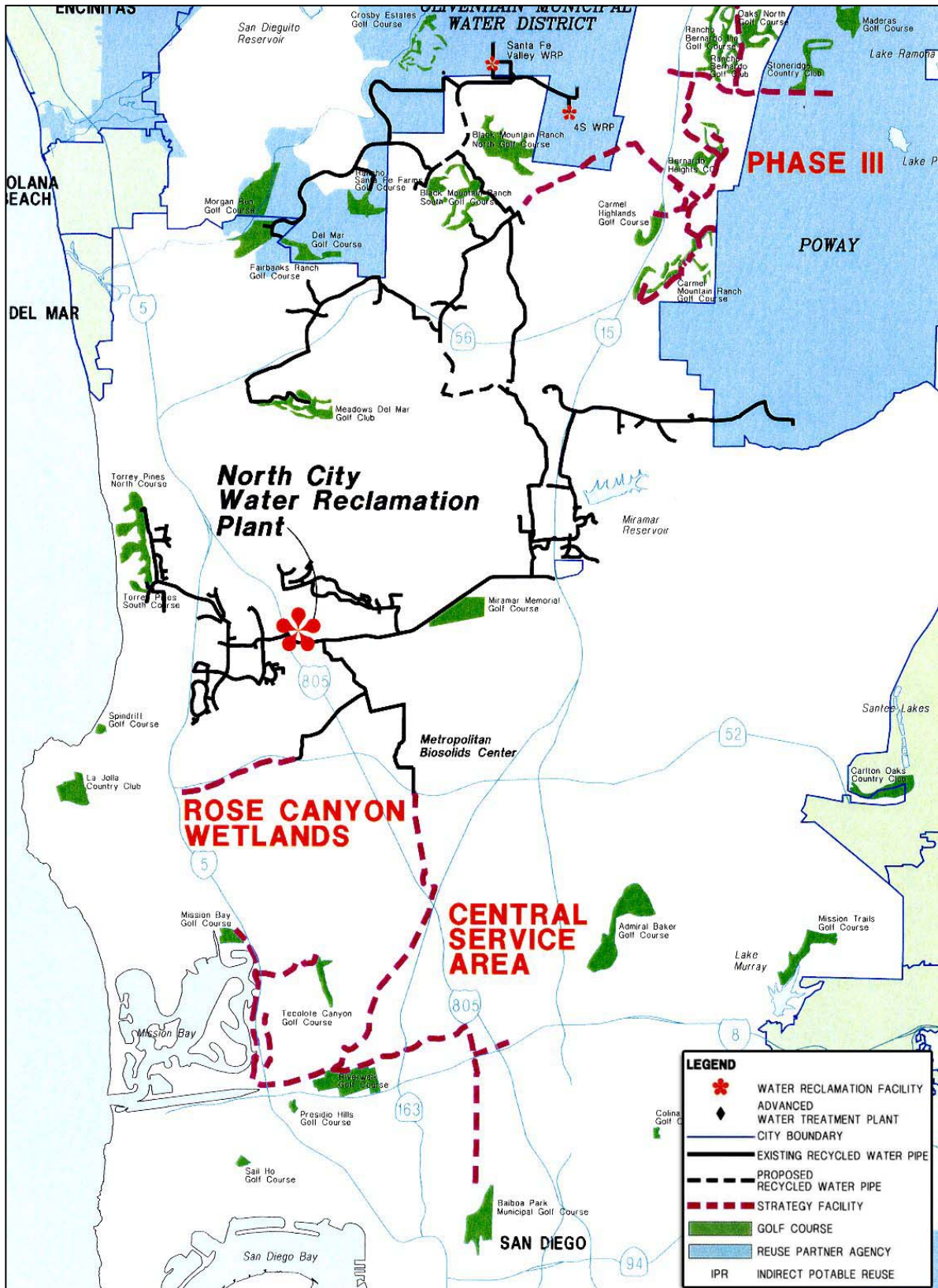


Figure 5-2 – Northern Service Area Non-Potable Reuse Opportunities



Northern Service Area – Phase III Expansion

The Phase III expansion was originally proposed in the 2000 Master Plan. The expansion of the system would extend the City's recycled water system into Rancho Bernardo. Originally, the Phase III system originated east of Interstate 15 at Sabre Springs. Subsequent technical studies altered the alignment to originate off the Phase II system along Black Mountain Road. The most recent alignment is along the new extension of Carmel Valley Road east of Black Mountain. In the Phase III service area, reservoir locations and piping alignments have also been modified from the 2000 Master Plan.

The Phase III expansion is aimed at serving six San Diego golf courses and two Poway golf courses, and nearby homeowner associations (HOAs). The expanded system would include approximately 17 miles of pipeline, two separate 2 million gallon reservoirs and a pump station. In all, 21 customers have been identified with a total average water demand of 2.5 MGD.

Northern Service Area – Interconnection to Central Service Area

Although the northern and central service areas are summarized separately in this section, there are opportunities to serve the Central Service Area via the North City Water Reclamation Plant. The Central Service Area lies south of the Northern Service Area, bounded by State Route 52 on the north and National City on the south. The largest potential recycled water users in this service area are Balboa and Mission Bay Parks. From a strategic planning approach, within the Central Service Area, these markets would be targeted for conversion to recycled water service first due to the large demands associated with these City-owned parks.

To serve the Central Service Area from the Northern Service Area, a 17-mile, 24-inch diameter pipeline extension is proposed along Convoy Street to Linda Vista Road to Friars Road, west on Friars Road to Mission Bay Park, and east on Friars Road to Qualcomm Way. The pipeline would continue south on Texas, tunneling beneath the San Diego River and Interstate 8, to Balboa Park. Additional customers include Riverwalk and Tecolote Golf Courses, the University of San Diego, and Sea World. The estimated average day demand for recycled water is 2.35 MGD.

Northern Service Area – Seasonal Storage

To maximize the use of recycled water from the NCWRP with a non-potable use strategy, seasonal storage is needed to provide a means of storing recycled water in the winter for use during peak summer months. The Study team considered several Northern Service Area seasonal storage opportunities, including groundwater storage and recovery in the San Dieguito Groundwater Basin, and several potential sites for the construction of an excavated earthen basin. Because of the difficulties associated with permitting non-potable recycled water storage in groundwater basins, described in Section 4, the San Dieguito Basin was eliminated from consideration. However, several potential earthen basin sites were identified in the Black Mountain area, adjacent to Phase I facilities.



Because the Black Mountain area is currently undergoing development, and the identified properties are not City-owned, it is anticipated that obtaining the rights to these sites would be difficult and most likely expensive. The cost effectiveness of seasonal storage must be weighed against the cost of supplementing the peak recycled water demands with potable water. The specific volume of water needed for storage is different for each alternative reuse implementation strategy, and is described in Section 7. Section 7 also evaluates the cost effectiveness of seasonal storage as part of the overall strategy proposed.

Northern Service Area – Wetlands

Wetlands serve as habitat for diverse and endangered species, provide areas for migratory waterfowl along the Pacific Flyway, improve water quality by filtering pollutants, and help reduce flooding. Recycled water has been used in California to create wetlands. Potential sites for an independent created wetlands project that could be served by the NCWRP include Rose Canyon, Los Penasquitos, San Dieguito River, and De Anza Point (Mission Bay). These sites were investigated and it was determined that the Los Penasquitos, San Dieguito River and De Anza Point sites and their receiving waters could be negatively impacted by freshwater flows.



Rose Canyon was the most attractive opportunity to study further, based on fewer environmental constraints associated with freshwater flows and proximity to existing recycled water facilities. A Rose Canyon recycled water wetland project had also been studied previously.

Rose Canyon is an “L” shaped canyon located in the City of San Diego. The canyon originates at the Miramar Marine Corps Air Station and eventually drains to Mission Bay. The focus of this discussion is on a 1.5-mile stretch of the canyon within the Rose Canyon Open Space Park, running east to west between Genesee Avenue and Interstate 5. This section of the canyon is narrow and relatively undeveloped. Rose Creek meanders through the bottom of this portion of the canyon, which contains many natural upland and wetland habitats and is rich in cultural history. Recycled water would enter the canyon from the base of Erlanger Street, off of Governor Drive, east of Genesee Avenue, where an 8-inch existing recycled water pipeline from the NCWRP ends.

Two potential concepts for environmental reuse projects at Rose Canyon were identified based on a review of available photos, maps, and data. One concept would consist of developing year-round wetlands along the bottom of the canyon. The development of these wetlands would impact existing wetland and upland habitat that would make the project difficult to permit and approve. The project would also need to overcome other environmental concerns associated with the alteration of any seasonal drainage to year-round



flow, loss of some unique and sensitive wetland and upland habitats, disturbance to cultural resources, and conflicts with recreational and educational opportunities.

The second concept would consist of seasonal and/or periodic discharges to Rose Creek. Under this concept, recycled water would be discharged during storms and the wet-season in quantities that do not adversely impact habitats and channel integrity. These wet-season flows avoid potential impacts associated with year-round flows and also may provide some benefits to the stream ecology. The concept project would use up to 800 AFY of recycled water during the wet-weather months (approximately 1.5 MGD from November to April), when recycled water supplies are generally available.

A factor to consider in evaluating this option, in either its year-round or seasonal form, is the likelihood that once a wetlands project is established, the City would be required by permitting agencies to maintain the flow of water to that project in perpetuity.

5.2 Southern Service Area Recycled Water Opportunities

Upon California DHS approval, the 15 MGD SBWRP will provide recycled water for its own on-site uses and for those of the neighboring International Boundary and Water Commission (IBWC) Wastewater Treatment Plant. In 2003, Otay Water District entered into a 20-year agreement with the City to purchase up to 6 MGD of recycled water from the SBWRP by 2007. This recycled water will be used to supplement Otay's existing recycled water supply to serve demands within the Eastern Chula Vista area. Otay Water District is constructing a 30-inch pipeline connection to the City's Southern Service Area distribution system at Dairy Mart Road, shown as an existing pipeline in **Figure 5-3**.

Southern Service Area – Sweetwater Expansion

Expansion of the City's recycled water distribution system in the South Bay area to serve customers in the Sweetwater Authority (a neighboring water district) is also being considered (**Figure 5-3**). Sweetwater Authority provides water service to National City and the western portions of Chula Vista. The largest potential customer in this area is a proposed power plant. Typically, power plants are good recycled water customers as they use large quantities of water consistently throughout the year. The result is fewer customers to coordinate with and more capacity in the overall supply system. Sweetwater Authority's average annual demand is estimated to be 5.25 MGD.



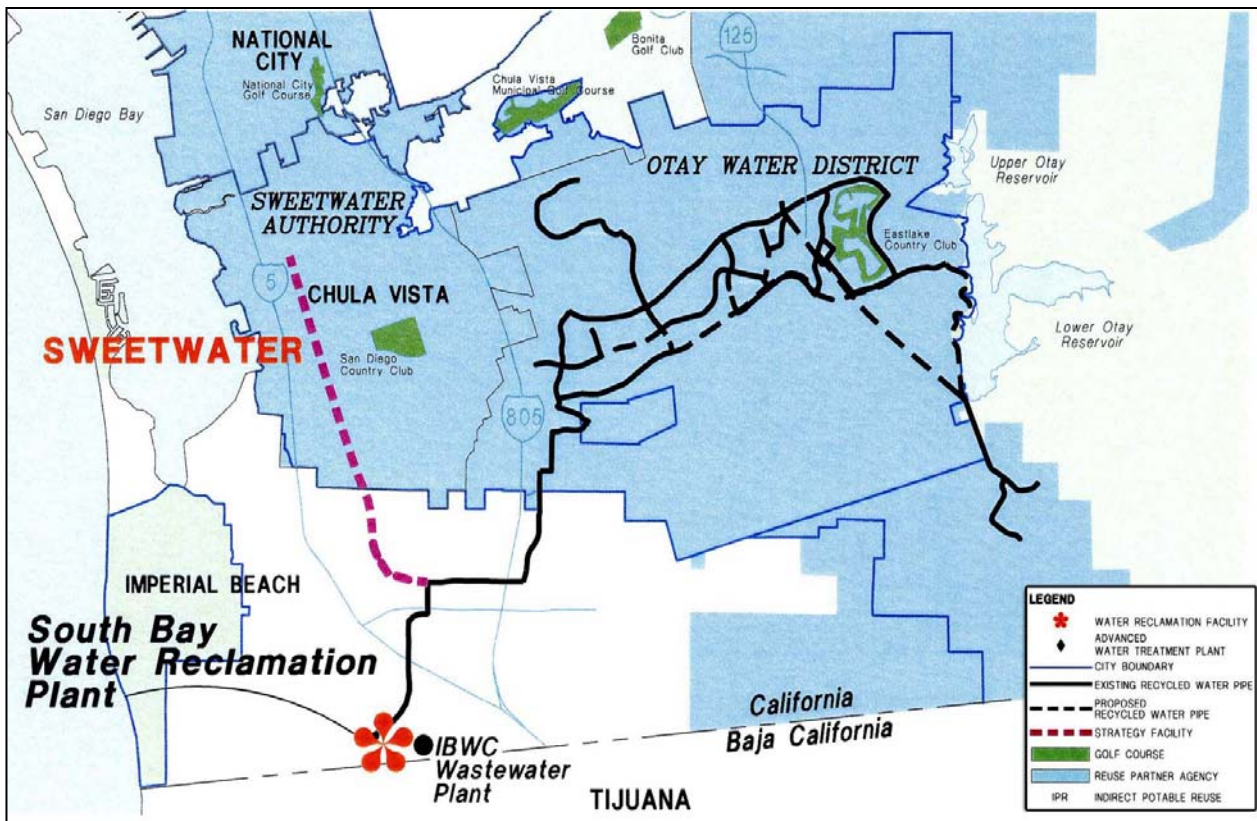


Figure 5-3 – Southern Service Area Non-Potable Opportunities

Southern Service Area – Wetlands

Potential sites for a created wetlands project in the Southern Service Area included Dairy Mart Road Pond Enhancement, Tijuana River Valley locations, and the South Bay Salt Flats. The South Bay Salt Flats was eliminated from consideration due to its distance from the SBWRP and because the property is privately held. It was determined that the Dairy Mart Road site has been studied by San Diego County and enhancement is not considered necessary or desirable there. Tijuana River Valley sites would likely require the conversion of agricultural lands and freshwater flows from a wetlands project there may impact the Tijuana Estuary. Based on this initial survey, no potential sites were identified as likely locations for a wetlands project in the Southern Service Area.

Southern Service Area – Seasonal Storage

To maximize the use of recycled water from the SBWRP, seasonal storage would provide a means of storing recycled water in the winter for use during peak summer months. Southern Service Area seasonal storage opportunities evaluated include the Tijuana Groundwater Basin, or potential sites for the construction of an earthen basin. Because of the difficulties associated with permitting non-potable recycled water storage in groundwater basins, described in Section 4, the Tijuana Basin was eliminated from consideration. However, numerous potential sites for an earthen basin were identified in the Otay Mesa area, adjacent to Otay Water District’s distribution facilities.



Because these areas are currently undergoing development, and the identified properties are not City-owned, it is anticipated that obtaining the rights to these sites would be difficult and most likely expensive. The cost effectiveness of seasonal storage must be weighed against the cost of supplementing the peak recycled water demands with potable water. The specific volume of water needed for storage is different for each alternative implementation strategy, described in Section 7, and the cost effectiveness of seasonal storage was evaluated as part of the overall strategy proposed.

5.3 Central Service Area Recycled Water Opportunities

In the 1990's, the Central Service Area was envisioned to receive recycled water service from a new water reclamation plant in Mission Valley. This proposed conventional recycled water treatment plant and related distribution system was never built. Since then, renewed interest in having a Central Service Area system has emerged due to a number of reasons including:

- Large, high profile customers such as Balboa Park, Mission Bay Park, and the Riverwalk Golf Course, and
- Treatment technology advances, which has reduced the size and costs of treatment components

Locating a new recycled water treatment facility in the vicinity of potential Central Service Area customers was evaluated in this study. The City's Metropolitan Wastewater Department (MWWD) provided their projects and future plans, which conceptualized a 15 MGD wastewater plant located in Mission Valley by 2030. This plant could be constructed in conjunction with a reclamation facility to provide recycled water. The recycled water treatment system could take advantage of technological advances in treatment processes and utilize membrane bioreactors (MBR), as described in Section 3.

*Central Service Area
A 5 MGD reclamation
plant could be located in
Mission Valley to supply
customers such as
Balboa Park, Mission
Bay Park, and the
Riverwalk Golf Course.*

A new treatment plant could be sited on a City-owned parcel in Mission Valley on Camino del Rio North. This site is close to a large volume of wastewater via the North Mission Valley Trunk Sewer. The site also appears to allow phased construction of the plant, to save initial costs. To serve the Central Service Area markets, a Mission Valley reclamation facility would have a capacity of 5 MGD to serve identified irrigation customers in the Central Service Area. Excess recycled water in winter months could be returned to the North Mission Valley Trunk Sewer or to the adjacent San Diego River as part of a live stream discharge / wetlands creation project.

Because the need for a new wastewater treatment facility in this Central Service Area is not imminent and the City is concentrating on how to maximize the recycled water it currently produces, this opportunity was not considered viable at this time.



5.4 Regional Opportunities

For recycled water customers beyond the City limits, the City works closely with the San Diego County Water Authority and local water purveyors to provide service. The City supports the San Diego County Water Authority's efforts to investigate countywide recycled water systems, and the City has also investigated regional opportunities with individual water purveyors. To date, the City has secured agreements with the City of Poway, Olivenhain Municipal Water District and Otay Water District for the sale of recycled water. These agreements and additional opportunities, are discussed below.

Countywide Opportunity – San Diego County Water Authority

In March 2002, the San Diego County Water Authority published the *Regional Recycled Water System Study* that identified recycled water system strategies that potentially utilized San Diego County Water Authority and/or local agency facilities. The concepts would provide a balance between recycled water demand and supply in San Diego County. As a result of this analysis, nine project strategies were developed. Two of the proposed strategies involved the City of San Diego.

The Escondido/Padre Dam/Helix/San Diego/Sweetwater Strategy included the utilization of the San Diego County Water Authority First Aqueduct to send recycled water flows south from Escondido's Hale Avenue Resource Recovery Facility to Helix Water District, serving Padre Dam and the City of San Diego demands by converting the East Mission Gorge Interceptor to recycled water use. Service to the Tijuana Valley/Mexico area with 2.32 MGD of recycled water from either Padre Dam or Escondido was also considered. (It was assumed that Otay Water District would be using all of the available supply from the SBWRP, thus none would be available to Tijuana Valley or Mexico.) Neither of these strategies has been or is expected to be pursued by the San Diego County Water Authority.

The San Diego County Water Authority is currently completing a feasibility study that will evaluate locations throughout San Diego County to potentially site satellite membrane bioreactor plants for recycled water production and distribution.

Northern Service Area Regional Opportunity – City of Poway

Since 1998, the City of San Diego has had an agreement with the City of Poway to provide recycled water via a connection at Scripps Poway Parkway. Based on that agreement, the City of San Diego would initially provide up to 0.67 MGD (750 AFY) of recycled water to the City of Poway. Upon Poway's request, the City of San Diego would be obligated to expand its pumping capacity to provide an additional 0.40 MGD (450 AFY), for a total of 1.07 MGD (1,200 AFY). To date, Poway has not requested additional supply. Poway typically purchases approximately 0.45 MGD (500 AFY) of recycled water from the City of San Diego to provide irrigation within the South Poway Business Park. To increase supply to high use customers, such as the

City of Poway

The City has an agreement to provide the City of Poway up to 1.07 MGD. Current use averages 0.45 MGD. The Phase III Rancho Bernardo expansion would be required to reach golf courses in northern Poway.





The Stone Ridge Golf Course in Poway is a potential regional customer.

Stone Ridge and Maderas Golf Courses in northern Poway, would require construction of the City's Phase III recycled water system expansion into Rancho Bernardo.

Northern Service Area Regional Opportunity – Olivenhain Municipal Water District and Santa Fe Irrigation District

In December 2004, the City approved an agreement with the Olivenhain Municipal Water District to provide recycled water via a metered connection at San Dieguito Road. This connection was part of the City's Phase I recycled water system expansion to the Black Mountain Ranch development. The agreement allows Olivenhain Municipal Water District to reserve 0.36 MGD (400 AFY) of capacity in the City's

Northern Service Area distribution system for a period of 20 years. Future expansion of Olivenhain's recycled water system or a new service to Santa Fe Irrigation District could increase the demand for recycled water.

Southern Service Area Regional Opportunity – Otay Water District

Otay Water District provides water and wastewater service in south San Diego, including the eastern part of the City of Chula Vista, portions of the City of San Diego and unincorporated areas within San Diego County. Otay does have its own water reclamation treatment plant, the 1.3 MGD Ralph W. Chapman Water Recycling Facility. This facility cannot meet all the demands in the Otay recycled water system. Therefore, in 2003, Otay Water District agreed to purchase up to 6 MGD of recycled water from the City of San Diego's SBWRP by 2007 (also described in the section on the southern service area). The City's recycled water will supplement Otay Water District's existing recycled water supply to serve demands within their service area. Otay Water District will construct portions of their master-planned recycled water system as new subdivision projects are developed, as well as a pipeline connection to the City's southern service area distribution system at Dairy Mart Road. Future expansion in the Otay Water District system may increase the need for City supply beyond the current 6 MGD commitment.

*Otay Water District
Otay Water District has
agreed to purchase
6 MGD of recycled
water from the City. This
needs to occur prior to
considering additional
regional expansion in
their service area.*

Southern Service Area Regional Opportunity – Sweetwater Authority

As discussed in the Southern Service Area System expansion section above, the Sweetwater Authority provides water service to National City and the western portions of Chula Vista. Currently, Sweetwater Authority does not have reclamation facilities, but has expressed interest in purchasing recycled water from the City of San Diego. Sweetwater Authority has recently completed a recycled water master plan. Recycled water could be used as a source of process and cooling water at a proposed local power plant facility. In addition, Sweetwater Authority is also investigating the use of recycled water for irrigation and industrial uses. As the Sweetwater Authority recycled water system master plan progresses, further opportunities for increasing regional usage may emerge.



5.5 Graywater Opportunities

Graywater use is a form of water recycling. It does have distinct differences from the other recycled water opportunities described throughout this study. In general, graywater systems serve one individual site or home - versus municipal recycled water systems that serve communities, businesses and industry. Graywater is generally domestic wash water, typically from sinks, showers and clothes washing machines located in the home or building. The graywater is diverted to a holding tank, and then pumped into the site's irrigation system. Water from toilets, kitchen sinks with garbage disposals and other sources containing high concentrations of organic waste is termed "blackwater" and is diverted to the sewerage system.

In California, graywater may be used for irrigation on a wide-range of sites, ranging from single-family to industrial. Typically, graywater systems require a separate plumbing system, surge tank, transfer pump and subsurface irrigation system. Graywater is subject to little or no treatment, though there are commercially available systems that include sand filters and settling tanks. The California Graywater Standards were originally developed and adopted in response to Assembly Bill 3518, the Graywater Systems for Single Family Residences Act of 1992. These standards have since been incorporated into the California Plumbing Code (California Code of Regulations, Title 24, Part 5, Appendix G: Graywater Systems). The standards apply to the construction, installation, alteration and repair of graywater systems for subsurface landscape irrigation. Within San Diego city limits, permits are required from both the City of San Diego and the San Diego County Department of Environmental Health to construct and operate a graywater system.

In 1995, the California Department of Water Resources developed a Graywater Guide for using graywater in home landscape irrigation. The guide provides prospective users of a graywater system with guidance on design, installation, and maintenance. The guide also provides education on permitting, health safety, and some benefits of graywater use. California graywater regulations estimate that the potential exists to capture 40 gallons of graywater per person per day from a local single-family residence for irrigation use. For a family of four, this would amount to 58,400 gallons per year (78 Hundred Cubic Feet (HCF)). The present day cost of water per HCF in San Diego is approximately \$2, so use of graywater could amount to a yearly savings of approximately \$156 to that family's water bill.

For residents and business owners, whether a graywater system will be advantageous depends on site-specific conditions. Typically, it is easier to install graywater systems in new structures as wastewater piping can be designed correctly from the start. Retrofitting existing structures typically increases installation costs. Clay soil conditions often require homeowners to

Gray Water Components

The local permitting authority makes the final determination of what is required for a graywater system. The common components of a system are:

- a separate plumbing system to bring the graywater out of the house,
- a surge tank to temporarily hold large flows from washing machines or bathtubs,
- a pump to transfer the water from the tank to the irrigation field, and
- a subsurface irrigation system to distribute the water to the landscaped area.

As a water supply option, graywater use will be reexamined periodically to identify any changes that increase its viability in San Diego.



replace or amend their soil prior to using graywater. These constraints may greatly limit the impact graywater use can have on decreasing potable water use for landscape irrigation purposes in San Diego. However, graywater use will be examined periodically to identify any technical or economic changes that increase its viability in San Diego.

5.6 Summary of Non-potable Opportunities that are Brought Forward for Evaluation

All of the non-potable reuse opportunities, types of customers served, quantity of recycled water used, and the facilities required to bring the recycled water to the customer in each of the three service areas have been described in previous sections. Although many opportunities were investigated, not all were brought forward for evaluation as components of larger implementation strategies.

A summary by service area of the viable opportunities and the facilities required to deliver the recycled water for non-potable uses is presented in **Table 5-1**.

**Table 5-1
Summary of Non-potable Reuse Opportunities**

Service Area	Opportunity	Estimated Average Day Demand (MGD)	Estimated Annual Use (AFY)	Customers Served	Facilities Required
Northern	Infill	3.6	4,000	148 low demand irrigation and industrial customers adjacent to existing recycled water pipelines	7 miles of pipeline
Northern	Rancho Bernardo - Phase III	2.5	2,800	21 irrigation and industrial customers including 8 golf courses	2- 2 MG reservoirs pump station 17 miles pipeline
Northern	Interconnection to Central Service Area	2.35	2,640	10 irrigation and industrial customers including Balboa Park and Mission Bay Park	1 MG reservoir 2 MG reservoir 17 miles pipeline
Northern	Rose Canyon Wetlands	1.5 (November to April only)	800	None	480 acres of created wetlands and conveyance pipeline
Southern	Expansion to neighboring water districts	6 5.25	5,760* 5,880	Otay Water District Sweetwater Authority	Pipelines constructed by other agencies

* San Diego-Otay Recycled Water Sales Agreement allows maximum of 6 MGD but limits ultimate annual use to 5,760 AFY.



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