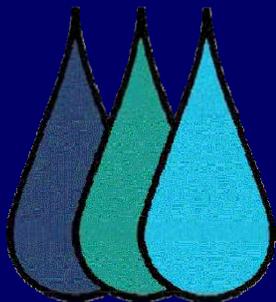


Reclaimed Water System Status Report - 2007



TUCSON WATER DEPARTMENT, TUCSON, ARIZONA





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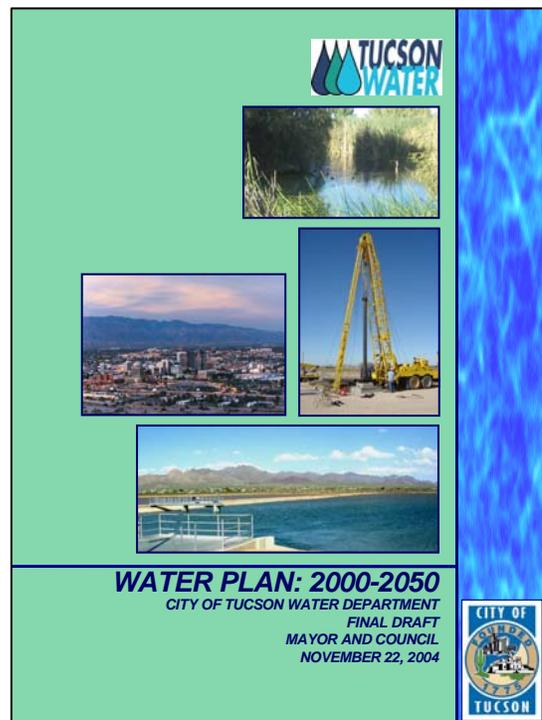


1.0 INTRODUCTION

The Tucson community historically developed by relying on groundwater to meet its water supply needs. With continued groundwater use, the regional aquifer system transitioned over time from one in approximate equilibrium, where a close balance existed between groundwater withdrawals and natural recharge, to one of accelerating depletion as the population grew. Despite the implementation of demand management programs and the strong environmental ethic of Tucson residents, rapidly declining water levels in the metropolitan area as well as in surrounding areas resulted in measurable land subsidence, increased pumping costs, and the gradual loss of natural habitat along local riparian corridors.

In order to address these issues, Tucson Water stated in *Water Plan: 2000-2050* that renewable water supplies such as Colorado River water and municipal effluent would need to be increasingly utilized in order to satisfy projected water demand. To achieve long-term sustainability, the use of available water sources must be prioritized so that utilization of renewable supplies is maximized and the use of groundwater is limited to sustainable amounts. To help accomplish this goal, Tucson Water has continued to develop the Reclaimed Water System to make direct use of municipal effluent as a renewable water resource.

The purpose of this status report is to provide the Mayor and Council with an overview of the City's Reclaimed Water System and effluent reuse issues. The report includes information on reclaimed water customers and system demand, effluent and reclaimed water supply, and issues that will affect the future direction of the Utility's use of effluent.



2.0 PURPOSE AND GOALS OF THE RECLAIMED WATER SYSTEM

Municipal effluent is a renewable water supply that grows along with the service area's population. This source water is locally-generated and is treated to meet established water quality standards. This treated supply is further enhanced and is then distributed as reclaimed water. Since the early 1980s, reclaimed water has been used by Tucson Water customers for turf irrigation and certain industrial applications. The use of reclaimed water offsets a portion of the community's demand that would otherwise be met by mining additional groundwater or by redirecting Colorado River water for non-potable uses. The use of reclaimed water provides the Tucson Water service area with greater drought tolerance and augments the community's water supply portfolio.



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The City's Reclaimed Water System provides water of a quality appropriate for turf and ornamental landscaping and some industrial uses. Currently, the primary use of reclaimed water in Tucson is for irrigation which is characterized by high seasonal demands. With the needs of large irrigation customers being met with reclaimed water, seasonal peaks in potable water demand are significantly reduced. In addition, certain capital improvements to the potable system can be delayed as a result of lower total and seasonal potable water demands.

In addition to serving customers in the Tucson Water service area, the City's Reclaimed Water System provides a regional service by treating and wheeling effluent supplies owned by other regional entities. For instance, reclaimed water is wheeled through the City's Reclaimed Water System to Pima County facilities and to the Town of Oro Valley for distribution and use. Additional wheeling agreements may be developed with other jurisdictions and water providers in the region as they shift toward the use of renewable resources.

3.0 INSTITUTIONAL FRAMEWORK

The functions of the Reclaimed Water System are governed by an institutional framework of effluent entitlement, regulatory requirements, and policy direction provided by the City of Tucson Mayor and Council.

3.1 Legal Entitlement to Effluent

Effluent ownership in the Tucson region is governed by a series of inter-governmental agreements (IGA). The basic framework was established in the 1979 IGA between the City of Tucson and Pima County whereby all wastewater assets previously owned by the City were transferred to the County. As part of this IGA, the County quit claimed all of the effluent produced from wastewater treatment plants in the Tucson metropolitan area to the City. The IGA in turn allowed 10% of the effluent to be made available to the County for specific uses.

Subsequent to the 1979 IGA, additional agreements have been executed that further distribute effluent entitlements in the Tucson area. Under the Southern Arizona Water Rights Settlement Act (SAWRSA), a pool of 28,200 AF/YR of local effluent is assigned to the Secretary of the Interior to help meet federal obligations under the settlement. In addition, a Conservation Effluent Pool (CEP) was established in 2000 to set aside up to 10,000 AF/YR of local effluent for approved habitat projects. To date, none of the CEP has been utilized. More recently, the City of Tucson has enacted IGAs with Metropolitan Domestic Water Improvement District (Metro Water) and the Town of Oro Valley to provide effluent entitlements to those entities.

These agreements have distributed effluent entitlement among five entities in the Tucson Metropolitan area: the City of Tucson, Pima County, the Bureau of Reclamation, Metro Water, and the Town of Oro Valley. Assuming an annual effluent production level of 68,200 AF/YR (which approximates production in CY 2004), the effluent would be distributed as shown on **Figure 1**. The City of Tucson currently has access to about 30,700 AF/YR of effluent. As discussed previously, a significant volume of effluent is reserved for the CEP. If the CEP were fully utilized, the City of Tucson's entitlement to effluent would be reduced to about 23,000 AF/YR under current conditions.

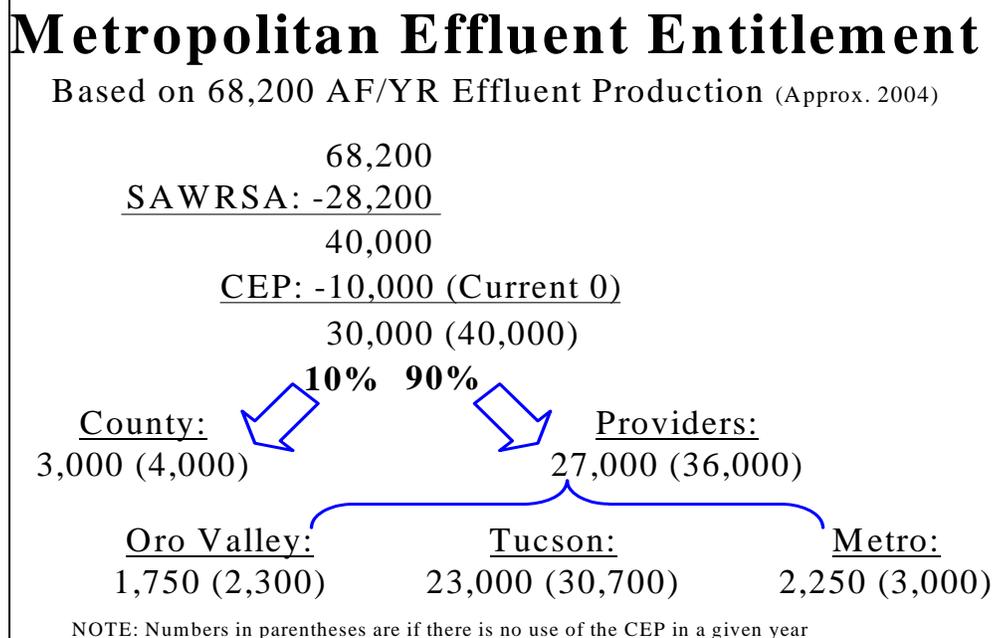


Figure 1. Effluent Entitlement in the Tucson Metropolitan Area.

About 12,000 AF/YR of the City’s effluent is reused as reclaimed water that is derived from two County wastewater treatment facilities: the Roger Road Wastewater Treatment Plant (with additional treatment by Tucson Water) and the Randolph Park Water Reclamation Facility. The remainder is discharged to the Santa Cruz River where a portion accrues long-term storage credits for 50 percent of the amount that recharges the local aquifer. The City currently has entitlement to about one-third of the effluent flowing in the Santa Cruz River.

The total volume of effluent produced in the Tucson Metropolitan area will increase as the population grows. With the exception of fixed allocations associated with SAWRSA and the CEP, the other entitlements will increase over time. By the year 2030, the total projected volume of effluent that will be produced by the Tucson Metropolitan area is 118,900 AF/YR; the City of Tucson’s effluent entitlement is projected to grow to about 62,000 AF/YR.

Over time, the IGAs that govern effluent entitlement in the region will continue to evolve. For instance, effluent agreements may be formalized with the Town of Marana, the Flowing Wells Irrigation District, and possibly other water providers in the future. In addition, the future plans of the Town of Oro Valley and Metro Water may lead to additional demands for reclaimed water service. Finally, the institutional framework governing the use of the CEP is still under development.

3.2 Permitting Authority to Operate the Reclaimed Water System

The use of reclaimed water is regulated by the Arizona Department of Environmental Quality (ADEQ) and the Arizona Department of Water Resources (ADWR) through a series of permits. The Reclaimed Water System also operates under a Consent Order with the State of Arizona resulting from an unauthorized discharge of reclaimed water to the Pantano Wash in 2003.



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The Reclaimed Water System is operated under a “Type III General Permit: Reclaimed Water Agent” held by Tucson Water. This permit classifies the reclaimed water as “Class A” which indicates that the water can be used for a number of listed purposes including turf and landscape irrigation, operation of cooling towers, and construction and dust control. ADEQ Reuse Regulations also require that lakes and other impoundments that are filled with Class A reclaimed water be lined or meet minimum leakage standards. Because Tucson Water holds an “Agent” permit, reclaimed customers do not need to obtain their own permits or submit routine regulatory reports to ADEQ.

Class A water is distinguished from Class A+ water by the total nitrogen concentration. Class A+ water must have a total nitrogen concentration of 10 mg/l or less (the drinking water standard). Therefore, it has fewer restrictions on its use than Class A water. Currently, Tucson Water’s reclaimed water quality matches Class A+ standards during parts of the year. The Utility’s long-term goal is to provide Class A+ reclaimed water throughout the year.

The reclaimed water delivered to Tucson Water customers is a blend of water produced at the City’s Reclaimed Water Treatment Plant, the Sweetwater Recharge Facilities (SRF), the Santa Cruz River Managed Underground Storage Facility (SCRMUSF), and Pima County’s Randolph Park Water Reclamation Facility (WRF). In addition, there are currently two sources of back-up supply: effluent storage credits accrued via managed in-channel recharge at the Lower Santa Cruz River Managed Recharge Project (LSCRMRP) and Tucson Water’s potable distribution system. A comprehensive listing of the regulatory permits that govern operation of the Reclaimed Water System is included in **Table 1**.

Facility	Agency	Permit Type	Description
Reclaimed Water Treatment Plant and Reclaimed System	ADEQ	Aquifer Protection Permit	P-100147. Permit covers operation of Reclaimed Water Treatment Plant and the Reclaimed distribution system.
	ADEQ	Type III General Permit: Reclaimed Water Agent	Permit covers reuse of treated wastewater at permanent reuse locations.
Sweetwater Recharge Facilities (SRF)	ADEQ	Aquifer Protection Permit	P-103370. Permit covers operation of Sweetwater recharge basins and constructed wetlands.
	ADWR	Underground Storage Facility Permit	71-520083. Permit allows recharge of 6,500 AF/YR of secondary quality effluent in eight constructed recharge basins.
	ADWR	Water Storage Permit	73-520083. Permit allows storage of 6,500 AF/YR of secondary quality effluent.
	ADWR	Recovery Well Permits	74-552006. Extraction Wells EW-001A through EW-006A have recovery permits allowing up to 32,500 AF/YR of recovery
Santa Cruz River Managed Underground Storage Facility (SCRMUSF)	ADWR	Underground Storage Facility Permit	71-545944. Permit allows recharge of 9,307 AF/YR of secondary effluent in 5.1 mile reach of the Santa Cruz River
	ADWR	Water Storage Permit	73-545943. Permit allows recharge of 9,307 AF/YR of secondary effluent in 5.1 mile reach of the Santa Cruz River
	ADWR	Recovery Well Permits	74-582678. Extraction Well EW-007A is permitted up to 3,226 AF/YR of recovery
	ADEQ	Aquifer Protection Permit	Permit held by Pima County
	ADEQ	Arizona Pollutant Discharge Elimination System	Permit held by Pima County
Randolph Park Water Reclamation Facility	ADEQ	Aquifer Protection Permit	Permit held by Pima County
Lower Santa Cruz River Managed Recharge Project (LSCRMRP) - Back-up Supply	ADWR	Underground Storage Facility Permit	71-591928. Permit allows recharge of 43,000 AF/YR of secondary effluent in 18 mile reach of the Santa Cruz River
	ADWR	Water Storage Permit	73-591928. Permit allows recharge of 43,000 AF/YR of secondary effluent in 18 mile reach of the Santa Cruz River
	ADWR	Recovery Well Permits	No project-specific recovery permit; recovery conducted via regional recovery wells
	ADEQ	Aquifer Protection Permit	Permit held by Pima County
	ADEQ	Arizona Pollutant Discharge Elimination System	Permit held by Pima County

Table 1. Regulatory Permits Governing the Reclaimed System and Related Facilities.



3.3 Overview of Mayor and Council Water Policies

The City's Reclaimed Water System has been developed and operated pursuant to established water policies of the Mayor and Council. The Mayor and Council Water Policies specific to effluent and reclaimed water ("non-potable water") are included in **Appendix A**. The main policies relating to the use of reclaimed water are briefly summarized below:

- Priority shall be given to the development of treatment capacity and delivery systems for non-potable water.
- Whenever possible, the use of non-potable water in place of potable water shall be required for landscape irrigation and industrial uses.
- Tucson Water shall work actively with new and existing large users, including golf courses, parks, schools, cemeteries, industrial, and multi-family complexes so that the Reclaimed Water System can provide practical and economic service.
- New turf facilities and golf course development shall use effluent or reclaimed water for irrigation purposes.
- The substitution of effluent and reclaimed water for potable source waters is an important element in achieving safe yield in the Tucson basin. Rate setting for effluent shall be in accordance with the following precepts:
 1. Charges for effluent and reclaimed water shall be based on the cost of service whenever possible
 2. To the extent that charges for effluent and reclaimed water that are based on cost of service do not provide an adequate price incentive, the price of reclaimed water shall be based on a market value which encourages its use.

4.0 RECLAIMED SOURCE AVAILABILITY AND SYSTEM INFRASTRUCTURE

Several treatment facilities that utilize recharge or filtration technologies are operated to produce Class A reclaimed water. This renewable resource is then delivered to customers through a series of pump stations, pipelines, and reservoirs.

4.1 Reclaimed Supply

The municipal effluent generated by the local community must be treated to tertiary standards established by ADEQ in order to be distributed through the Reclaimed Water System. The City's reclaimed water currently meets Class A reclaimed water standards. This ensures that the reclaimed water provided by Tucson Water is acceptable for open-access use (access to reclaimed water by the general public is uncontrolled).



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The Reclaimed Water System currently has four primary and two back-up sources of supply. As shown on **Table 2 and Appendix B**, the primary sources are the Reclaimed Water Treatment Plant (6,000 AF/YR), the SRF (6,500 AF/YR), the SCRMUSF (750 AF/YR), and the Randolph Park Water Reclamation Facility (2,500 AF/YR). These primary sources are currently capable of providing up to 15,750 AF/YR of reclaimed water for distribution.

Available Reclaimed Water Supplies					
Actual for 2000-2006 ; Projected for 2007-2015					
Year	Reclaimed Plant	SRF EW-001A-006A	SCRMUSF EW-007A	Randolph Plant	TOTAL SUPPLY
2000	4,553	5,582	0	0	10,135
2001	3,945	6,764	0	0	10,709
2002	3,010	6,631	2,285	0	11,926
2003	2,774	6,606	3,208	0	12,588
2004	6,234	5,685	36	98	12,053
2005	6,236	4,654	1	1,464	12,355
2006	5,212	5,097	893	2,558	13,760
2007	6,000	6,500	750	2,500	15,750
2008	6,000	8,250	750	2,500	17,500
2009	6,000	10,000	750	2,500	19,250
2010	6,000	10,000	750	2,500	19,250
2011	6,000	10,000	750	2,500	19,250
2012	6,000	10,000	750	2,500	19,250
2013	6,000	13,000	750	2,500	22,250
2014	6,000	13,000	750	2,500	22,250
2015	6,000	13,000	750	2,500	22,250

Table 2. Actual and Projected Reclaimed Water Supplies from 2000 through 2015.

The two sources of back-up supply are both based on the ability to add water from the potable distribution system into reclaimed water reservoirs at strategic locations. The accounting of such potable additions can either be classified as the recovery of effluent storage credits (accrued via managed in-channel recharge at the LSCMRP) or simply as potable water. The ability to provide back-up supply helps to ensure continuous service to reclaimed customers during emergency conditions, during interruptions of reclaimed supply due to construction projects, and to compensate for periods of time when one or more reclaimed supply sources are not available. While the primary goal is to minimize use of back-up supply sources, these options provide redundancy and reliability to the Reclaimed Water System.

Current reclaimed demands can usually be accommodated by existing supply sources. Under emergency conditions, Tucson Water can interrupt service to certain customers based on the terms of their Reclaimed Water Agreement. Over time, the demand for reclaimed water in the Tucson region is growing and additional supply sources are currently being developed. In the short-term, operational and equipment changes are in progress to increase the volume of



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reclaimed water that can be produced at the SRF. It is projected that this facility will be capable of recharging and recovering up to 10,000 AF/YR within the existing SRF footprint. This will increase the total available reclaimed water supply available for use to 19,250 AF/YR by 2009. In addition, an expansion of the SRF infrastructure is under design. Once constructed, the expansion will add three new recharge basins and two new recovery wells to bring the total SRF productive capacity up to 13,000 AF/YR and a total system supply capacity of 22,250 AF/YR by about 2013 (**Table 2**).



After 2015, additional reclaimed supply may again be required. Currently, Pima County Wastewater Management is in the planning process to implement a series of treatment upgrades at both the Roger Road and Ina Road plants. A key consideration is that these plants will likely produce de-nitrified effluent. This will improve the quality of the effluent that Tucson Water receives to a minimum Class B+ or potentially Class A+. Depending on the outcome, which at this time is uncertain, these treatment changes may reduce the amount of additional treatment that Tucson Water must provide while at the same time expanding the types of uses to which the reclaimed water can be applied. Tucson Water may also need to utilize effluent derived from the Ina Road Plant (with or without additional treatment). If this were to occur, this would increase the volume of effluent potentially available to the City's Reclaimed Water System. Finally, other locations adjacent to the Reclaimed Water System will be evaluated to assess the potential of developing new recharge facilities to provide additional storage opportunities.

4.2 Reclaimed Distribution System

In 2006, the Reclaimed Water System had almost 160 miles of pipeline, about 33 MGD of production capacity from the four primary supply sources (Reclaimed Water Treatment Plant, SRF, SCRMUSF, and the Randolph Park WTF), and 15 MG of total storage capacity.



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The Reclaimed Water System's operational characteristics are different from the potable system. The Reclaimed Water System experiences a wide range of daily demands from essentially 0 MGD on rainy winter days to almost 30 MGD in summer (**Figure 2**). The annual average demand is currently about 12 MGD although very few days actually equal this rate of usage. Demand variations occur due to seasonal conditions, variations in day and night usage, weekday versus weekend turf irrigation schedules, and the timing and frequency of when golf courses fill their lakes (typically only on weekdays).

During summer evenings when demands are high, all pumps in the Reclaimed Water System are usually running, leaving little to no excess delivery capacity in the system. Once the monsoon rains arrive (typically early July), the demand for reclaimed water drops suddenly. This relatively low-demand period is typically followed by an increase in demand when the area golf courses perform over-seeding for winter turf (**Figure 2**). As noted above, there are also times when there is essentially no demand in the Reclaimed Water System. This can create operational concerns about where to store excess reclaimed water produced by the Randolph Park Water Reclamation Facility. The Utility is currently making piping modifications and re-permitting the SRF to accept a limited volume of excess reclaimed water for recharge when there is very low or no reclaimed water demand.

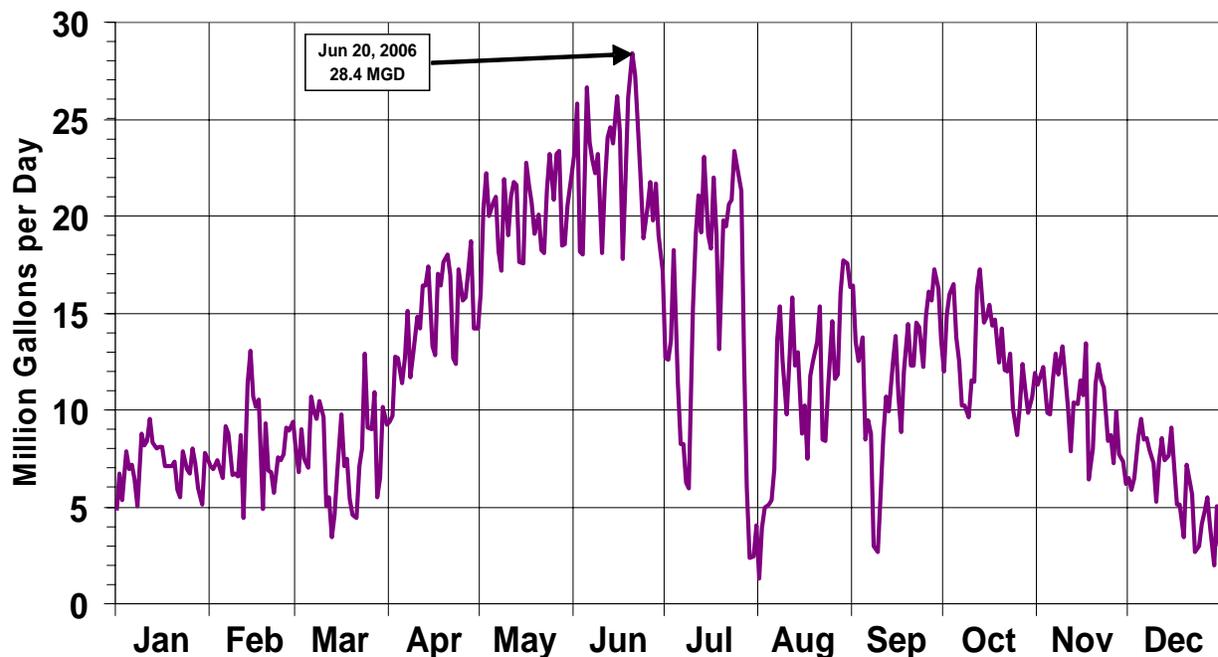


Figure 2. 2006 Daily Reclaimed Water Production.

4.3 Reclaimed System Projects in the Capital Improvement Plan (CIP)

There are a number of Reclaimed Water System projects in progress during Fiscal Year (FY) 2007 and/or planned for the next five-year (FY08 through FY12) Capital Improvements Plan (CIP). The FY07 CIP includes \$4.3 million in ongoing reclaimed system projects. The next five-Year CIP (FY08 through FY12) identifies reclaimed projects totaling \$10.2 million



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including source development \$5.5 million, storage \$1.86 million, transmission \$0.25 million, distribution \$1.13 million, new services \$0.25 million, treatment \$0.58 million, and system metering/equipment control systems \$0.62 million. This projected five-year level of spending on the Reclaimed Water System is lower than average due to the current focus on completing key elements of the Clearwater Program to increase the use of Colorado River water. Once the bulk of the projects under the Clearwater Program are completed, CIP expenditures for the Reclaimed Water System are expected to increase significantly. Specifically, the development of a reclaimed water supply at the Ina Road Water Pollution Control Facility will begin around 2012. The projects included in the five-Year CIP are spatially indicated in **Appendix C**.

Source development projects include \$5.0 million for the construction of the SRF expansion which will meet an increased projected demand of about 3 MGD. Budgeted funds also include \$1.6 million for the design and construction of a 6 MGD booster station expansion at the Reclaimed Water Treatment Plant to distribute additional supply from the SRF. Distribution system projects include \$1.13 million for system enhancements, review and inspection of developer financed projects, and design and construction of pipeline extensions to new reclaimed water customers. As indicated above, the remaining funding is for transmission mains, new services, treatment upgrades, and metering/control upgrades.

5.0 RECLAIMED WATER CUSTOMERS AND DEMAND

A resort golf course provided the impetus to develop Tucson's Reclaimed Water System. While golf courses remain the principal user of reclaimed water, a number of additional customer types have evolved over the years.

5.1 Customer Profile

Since the initiation of the Reclaimed Water System in the mid 1980s, the planning priority has been to deliver reclaimed water to sites with the highest water use. The alignment of transmission pipelines in the system has been determined by the existing or planned locations of customer "anchors." These anchors have often been golf courses (**Appendix C**).



In FY06, 14 golf courses were directly served by Tucson Water and constituted 58 percent of Reclaimed Water System's total demand. Another eight percent (a portion of the Town of Oro Valley's effluent entitlement) was wheeled through the City's Reclaimed Water System and was delivered to the Town of Oro Valley's reclaimed distribution system from which it was conveyed to golf courses within the Town of Oro Valley service area. Combining reclaimed water deliveries within the Tucson Water and the Town of Oro Valley service areas, 66 percent of the reclaimed water generated at City facilities was used to irrigate golf courses. Use by parks, including several operated by Pima County (a portion of Pima County's effluent



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entitlements), represented 18 percent of demand and schools accounted for another eight percent. The remaining eight percent of the deliveries (shown as “Other” on **Table 3**) were to agricultural, cemetery, commercial, street landscape, construction water, and residential sites. The types and numbers of reclaimed water users supported by the City’s Reclaimed Water System are summarized on **Table 3**.

TYPE OF SITE	NUMBER OF SITES	PERCENT OF ANNUAL DELIVERIES
Golf Courses (Non-Oro Valley)	14	58%
Parks (Includes Pima County)	35	18%
Schools	46	8%
Oro Valley ¹	1	8%
Other	701	8%
TOTAL	797	100%

¹Reclaimed water is delivered to Oro Valley at one site; Oro Valley then delivers to multiple golf courses within its service area.

Table 3. Percentage of Annual Reclaimed Deliveries by Use in FY 2006.

5.2 Reclaimed System Demand

The City’s Reclaimed Water System has steadily grown since it first began deliveries to the La Paloma Golf Course in 1984. **Figure 3** shows the deliveries by calendar year, including reclaimed water wheeled to Pima County and Oro Valley, from 1984 through 2006.

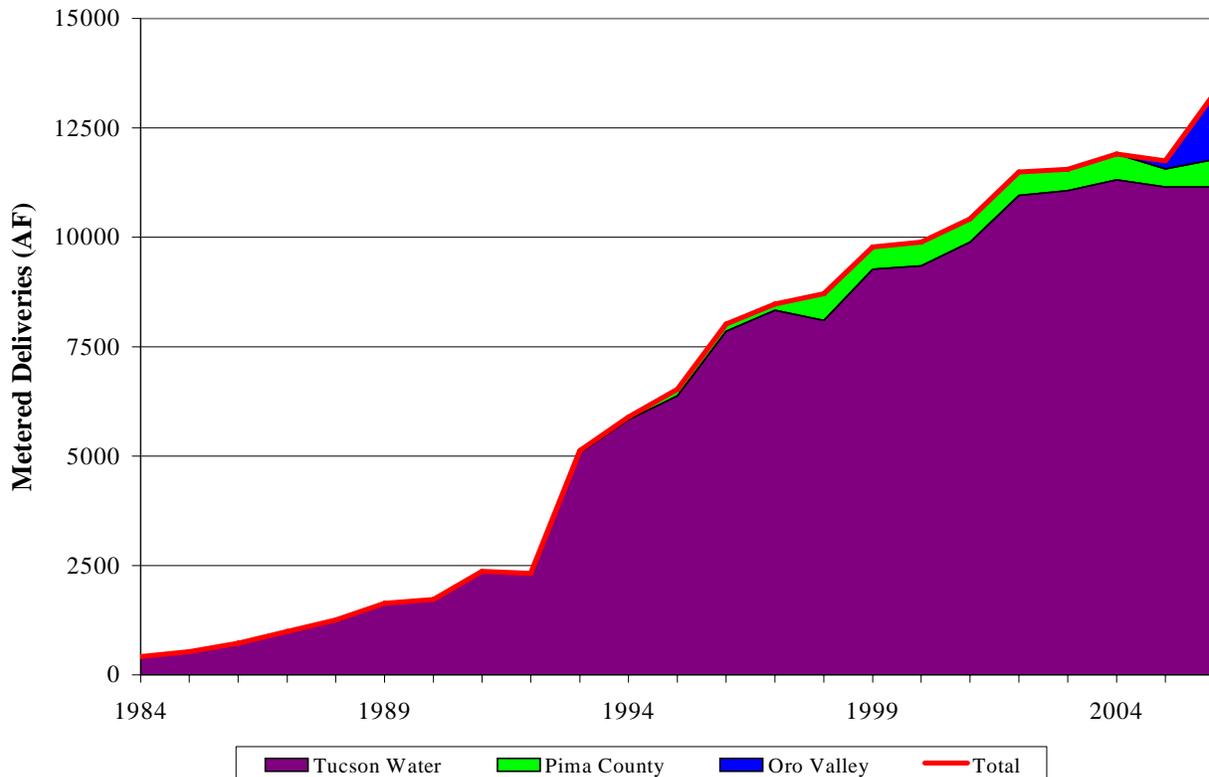


Figure 3. Reclaimed Water Deliveries for 1984 through 2006.



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5.3 Near-Term System Growth: FY 2007 through FY 2012

Most of the new growth in the Reclaimed Water System is projected to come primarily from the conversion of large volume customers that are located in the vicinity of new reclaimed pipelines. **Table 4** shows the planned connections to the Reclaimed Water System for FY 2007 through 2012.

SITE	CIP PROJECT	AC-FT/YR	FY IN-SERVICE
Safford Middle School	18 th St./10 th Ave	25	07-In service
49ers Golf Course	49er's main	474	07-In service
B&B Cactus Farm	49er's main	5	07
Single Family Residences	49er's main	7	07
Henry Elementary	49er's lateral	15	07
Van Horne Elementary	49er's lateral	15	07
Bloom Elementary	49er's lateral	15	07
Wrightstown Elementary	49er's lateral	15	08
Sahuaro High School	49er's lateral	70	08
Magee Middle School	49er's lateral	45	08
Sunnyside Park	Campbell/Drexel	105	07-In service
Mission Manor Park	Campbell/Drexel	112	07-In service
Rudy Garcia/Rodeo Park	Campbell/Drexel	88	07-In service
Dietz Elementary	Campbell/Drexel	15	07-In service
Hollinger Elementary	Campbell/Drexel	15	07
Wakefield Middle School	Campbell/Drexel	25	07
Drexel Elementary	Campbell/Drexel	15	07
Liberty Elementary	Campbell/Drexel	15	07
Los Amigos Elementary	Campbell/Drexel	15	07
Mission Manor Elementary	Campbell/Drexel	15	07
Ocotillo Elementary	Campbell/Drexel	15	07
Apollo Middle School	Campbell/Drexel	25	07
Sierra Middle School	Campbell/Drexel	25	07
Sunnyside High School	Campbell/Drexel	40	07
Alternative Education Center	Campbell/Drexel	15	07
Pueblo Gardens Elementary	TUSD lateral	40	07-In service
Ochoa Elementary	TUSD lateral	15	07-In service
Rose Elementary	TUSD lateral	22	08
Pueblo High School	TUSD Lateral	40	08
Crooked Tree Golf Course (Pima County)	Existing main	735	07-In service
Ritz Carlton Golf Course	Existing main	663	07
Fifth Dove Mountain Golf Course (9-holes)	Existing main	332	08
University of Arizona Golf Course	Proposed main	663	10
CIVANO & Tucson CC Single Family Residences	Existing mains	12	07 through 12
TOTAL		3,748	

Table 4. Planned Reclaimed System Connections for FY 2007 through 2011.



Two major uncertainties in the near term are whether the Town of Oro Valley will make arrangements to bring additional reclaimed water customers online and whether Metro Water will enter into an agreement with Tucson Water to wheel their effluent. The Town of Marana may also enter into an agreement to obtain an effluent entitlement. In addition, there are additional facilities at various stages of development in the community that will likely look to the Reclaimed Water System for supply. For example, the Pima County and City of Tucson Parks departments have presented a conceptual plan for a regional sports park (up to 1,000 AF/YR) to be located near the future Roger Road wastewater plant. Such potential customers are not included in the near-term projected demand for reclaimed water, but they could come to fruition and require supply over the next few years. Funding to expand reclaimed water production facilities beyond those discussed in this report has not yet been identified.

5.4 Long-Term System Growth

As the Tucson community grows, it is anticipated that additional parks, schools, and other turf areas will be developed. Additional golf courses may also be constructed subject to the ability to utilize renewable water supplies such as reclaimed water. Finally, it is possible that new industrial customers might be identified. The Reclaimed Water System is expected to expand to meet new demands for reclaimed water.

There are several large water-using sites located near the existing reclaimed distribution system such as Tucson Electric Power's Irvington Road Generating Facility, Rolling Hills Golf Course, Dorado Golf Course, Holy Hope Cemetery, and South Lawn Cemetery. These entities currently rely on groundwater pumped from their own wells for supply, but they may convert to renewable supplies such as reclaimed water in the future. While there have been discussions with each of these entities over the last five years, they continue to pump groundwater from their wells since it is about one-third of the cost of purchasing reclaimed water.

Within a one-half mile corridor of the existing reclaimed water distribution pipelines, there are more than 1,000 potential smaller volume reclaimed water customers who currently rely on Tucson Water's potable system. There are two customer costs involved in converting from potable water to reclaimed water:

- 1) The cost of extending the reclaimed main to the individual meter, and
- 2) The customer's on-site costs (irrigation system, backflow prevention, thermal expansion control, site drainage, and reclaimed water meter)

The current City policy is that both of these costs are the responsibility of the customer. However, for most small volume customers, reclaimed main extensions to their sites are too costly. Even in cases where main extensions are not required, the additional cost of the meter, the backflow prevention assembly, and the on-site work may not be offset in a timeframe acceptable to the customer despite the water rate savings associated with using reclaimed water. In addition, the Utility itself incurs the costs of producing the additional required reclaimed water.



Because of these costs, it is likely that the Reclaimed Water System will continue to grow with large turf areas as the primary driver. Tucson Water anticipates that the volume of reclaimed water delivered will continue to increase and as indicated in *Water Plan: 2000-2050*, is projected to be about eight percent of the Utility's total demand in future years.

6.0 CURRENT AND LONG-TERM ISSUES

There are a number of factors that will affect the evolution of the Reclaimed Water System over time. Some of these issues are discussed in the following section.

6.1 Future Reclaimed Water Quality and Quantity

The effluent that Tucson Water enhances for use in the Reclaimed Water System comes from the local wastewater treatment works owned and operated by Pima County. Pima County is presently engaged in their Regional Optimization Master Plan (ROMP). This plan will define the effluent quality and quantities that will be produced at their two major treatment facilities, the Roger Road Wastewater Treatment Plant and the Ina Road Water Pollution Control Facility. At the present time, the Recommended Plan includes replacing the Roger Road Plant with a smaller treatment plant (32 MGD down from 41 MGD), transferring excess flows to the Ina Road Plant, and increasing the treatment capacity of the latter from 37.5 MGD to 50 MGD. These changes would significantly enhance the effluent water quality produced at each facility from a current Class B to Class B+ or Class A+.

The outcome of the ROMP is critical to the future direction of the City's Reclaimed Water System since at the present time most of the reclaimed supply is derived from the County's Roger Road Plant. Any changes in the quantities treated as well as the water quality produced at the various County wastewater facilities will have a significant impact to Tucson Water and its customers. Some of the impacts of the County's Recommended Plan to the City's Reclaimed Water System include:

- 1) Reduced water availability at the Roger Road Plant may necessitate installation of a reservoir and booster pumping facility at the Ina Road Plant sooner than previously anticipated. Booster pumping at the Ina Road Plant will be required to transfer reclaimed water back to Tucson Water production and distribution facilities located adjacent to the Roger Road Plant (with increased pumping costs) as well as to customers in the northern portion of the Reclaimed Water System's service area.
- 2) If Class A+ water is produced at both the Roger Road Plant and the Ina Road Plant (on a reliable basis and with ADEQ approval), then Tucson Water will no longer need to filter the effluent to meet the applicable reclaimed water quality standards.
- 3) Significant piping and pumping modifications will be required adjacent to the existing Reclaimed Water Treatment Plant and/or distribution facilities to accommodate installation of the new Roger Road Plant.



The ROMP is in its early stages and is likely to be subject to significant changes before it is finalized. These changes may result in significant additional CIP needs for Tucson Water. One possible change is that Class A+ water may not be produced at the Pima County plants. Pima County is currently pursuing a variance to regulatory requirements related to disinfection with ADEQ. If ADEQ allows the variance, then the effluent produced and discharged from both the Roger Road Plant and Ina Road Plant may be reduced to Class B+ water quality. While this would be an improvement over existing conditions, it would not alleviate Tucson Water's need to provide additional treatment before using the effluent as reclaimed water. The impacts of this decision to Tucson Water will be significant. This decision will mean that not only will Tucson Water be required to install reservoir and booster facilities adjacent to the Ina Road Plant sooner than originally expected, but the Utility will also be required to install filtration facilities at this location to bring the water quality up to reuse permit requirements.

6.2 Future of the Effluent Resource

Tucson Water created the Reclaimed Water System to utilize a renewable water resource to offset a portion of customer demand and reduce groundwater mining. This move toward more environmentally sound operational practices continues. The needs of the environment are becoming an even more central part of Tucson Water's service to the community. The environment can be viewed not only as a stakeholder but also as a customer of the Utility, and effluent is being considered for a variety of environmental uses including riparian habitat restoration. How to strike an equitable balance between the needs of a growing community and the needs of its natural environment will require continued community-wide discussion and collaboration.

Over time, Tucson's effluent resource will continue to grow in importance. It is likely that effluent reuse will expand beyond traditional reclaimed water uses. As the population grows and other available water supplies become fully utilized, the need for reusing highly-treated effluent to augment the groundwater system will also grow. The Utility is taking prudent steps to prepare for future effluent reuse opportunities. Tucson Water considers effluent to be a vital renewable water resource that will be needed to ensure supply sustainability and drought resistance in the long term.

7. CONCLUSIONS

Since the mid-1980s, Tucson's Reclaimed Water System has been an effective means of utilizing a renewable resource to offset a portion of the community's demand for water. There are several defining characteristics and potential future challenges as outlined below:

- Reclaimed water is a highly reliable resource that provides enhanced drought tolerance and augments the community's water supply portfolio.
- The use of reclaimed water is governed by an institutional framework of effluent entitlement, environmental regulation, and policy direction provided by the City of Tucson Mayor and Council.



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- Tucson Water's Reclaimed Water System produces and delivers Class A reclaimed water to its customers and other water users in the region.
- The majority of the community's reclaimed water use is for turf irrigation at golf courses, parks, and schools; many other non-turf uses exist that may expand in the future.
- Reclaimed water demand has grown substantially since the system was initiated in the mid-1980s and is projected to continue to grow into the future.
- As the Reclaimed Water System grows, Tucson Water's Capital Improvement Program (CIP) will need to include additional treatment, storage, pumping, and distribution infrastructure.
- The Utility's current CIP is based on the projected future customers and demands outlined in this report. One major uncertainty is that other significant demands for reclaimed water service could develop in the near-term that are beyond the system's supply and/or delivery capacity. Examples include the Regional Sports Park under consideration by Pima County and the City of Tucson and the potential for increased reclaimed water demand by other local water providers that could result from ongoing IGA discussions.
- Other critical uncertainties relate to the final outcomes of Pima County's ROMP study and issues related to the location, quantity, and quality of effluent that will become available for reclaimed water use in the future.

Tucson Water will continue to operate the Reclaimed Water System in a manner consistent with the ongoing policy direction provided by the Mayor and Council. In doing so, the Utility will be able to move ever closer to its goal of utilizing renewable water resources to meet the community's water needs.



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APPENDIX A

EXCERPTS FROM:

CITY OF TUCSON

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MAYOR AND COUNCIL

WATER
POLICIES

ADOPTED

JANUARY 26, 1998

RESOLUTION NO. 17929

II. ASSUMPTIONS

- A. All financing shall be done in accordance with all city, state and federal requirements.
- B. To the extent that conservation programs succeed in reducing demand, capital improvement programs may be deferred and rate increases adjusted accordingly.

III. POLICIES

A. Finance

1. Enterprise Basis

- a. The Utility shall be a self-supporting enterprise with all costs associated with the Utility to be funded from revenues derived from the sale of water and other water-related income sources.
- b. An annual average debt service coverage of 1.75 shall be maintained.
- c. Revenues collected in excess of operating needs of the Utility shall be carried forward for future capital bond funding requirements and shall not be transferred to the City's General Fund.
- d. The Utility shall maintain cash reserves adequate for known future obligations plus an allowance for unbudgeted contingencies set at five percent (5%) of revenues from water sales.
- e. Low-income water users living within the City may be supplied a minimum amount of water at reduced rates or other form of subsidized water service at the discretion of Mayor and Council. The cost of this subsidy will be funded from the general fund of the City and not from water rates.

2. Water Rates and Charges

- a. cost-of-service basis
 - (1) Insofar as possible charges for water utility service shall be made on a cost-of-service basis.
 - (2) Marginal cost aspects of the water utility will be continually studied by staff and considered as a factor in the making of rates.

(3) The substitution of effluent and reclaimed water for potable water is an important element in achieving safe yield in the Tucson Basin. Rate setting for effluent shall be in accordance with the following precepts:

(a) charges for effluent and reclaimed water shall be based on the cost of service whenever possible;

(b) to the extent that charges for effluent and reclaimed water based on cost of service do not provide an adequate price incentive, the price of reclaimed water shall be based on a market value which encourages its use;

(c) CWAC shall review and make recommendations and the Mayor and Council shall hold a duly advertised public hearing prior to entering into any agreement to sell reclaimed water to any customer at a rate other than that rate established by ordinance and contained in the Tucson Code.

(4) In the event that Tucson Water enters into contract with other water providers for treatment and delivery of CAP allocations, the City shall recover its total cost of providing this service.

b. water rate design elements

(1) Commodity charges shall reflect the costs of service across customer classes and seasons, using rate structure features such as: seasonal rates; isolated areas service charge and reserve fund surcharge.

(2) Customers shall be charged for fixed and recurring costs of service such as:

(a) new connections

(b) re-connections

(c) meter reading

(d) billing

(3) Rate structures shall be designed so as to encourage water conservation and to control peak demand.

(4) Water rates and charges shall be reviewed annually and changes in the rate structure shall be implemented so as to avoid sudden and large-scale shifts in water rates.

- h. The City shall continue to seek Tucson AMA wide groundwater management through cooperation between water users and agencies of government, including ADWR.
- i. In considering funding projects which are sponsored by entities other than the Tucson Water Department, CWAC shall review the rate impacts and policy implications of participation in the project.
- j. The City of Tucson shall strive to become the sole retail water provider within its corporate boundaries, as they may exist, now or in the future.
- k. The City shall offer to negotiate intergovernmental agreements with other cities and towns governing the provision of new retail water service within the boundaries of those jurisdictions in order to clarify the relationship among the City, the other cities and towns and the affected retail customers.
- l. Where legally and physically feasible, ownership and control of existing Tucson Water retail service facilities within the boundaries of other cities and towns shall be negotiated with those entities. The City shall work in cooperation with those entities to determine fair market value of the facilities.

4. Non-Potable Water

Priority shall be given to the development of treatment capacity and delivery systems for non-potable water. Wherever possible, the use of non-potable water in place of potable water shall be required for landscape irrigation and industrial uses.

- a. The following shall be considered for potential uses of non-potable water:
 - (1) Landscape irrigation and industrial uses
 - (2) Direct recharge
 - (3) Agricultural irrigation and livestock watering
- b. The following priorities, from highest to lowest, are established for utilization of non-potable water:
 - (1) Direct use to replace an existing use of potable water
 - (2) Storage and recovery within the area of hydrologic impact to replace an existing use of potable water
 - (3) Direct use to replace a new use of potable water

- (4) Storage and recovery within the area of hydrologic impact to serve a new use that otherwise would use potable water
 - (5) Storage and recovery outside the area of hydrologic impact to replace either an existing or a new use of potable water
- c. Since contractual rights to the use of effluent may result in added value to a user's property, contracts shall recognize that possibility and require waiver by the owner of any such added value in the event of purchase or condemnation of the property by the City through negotiation.
 - d. The City shall monitor effluent sales and deliveries by the Pima County Wastewater Management Department to ensure compliance with the sewer system transfer IGA and shall take steps to correct any failure to so conform when necessary.
 - e. The potential for using reclaimed water shall be evaluated and included in all new and existing water and land use plans.
 - f. Tucson Water shall actively work with new and existing large water users, including golf courses, parks, schools, cemeteries, industrial and multi-family complexes, to provide practical and economic service by the reclaimed water system.
 - g. New turf facilities and golf course development shall use effluent or reclaimed water for irrigation purposes.
 - h. Any conditions of interim use of potable water shall be made a part of water service agreements and other appropriate contracts to assure prompt action converting to the maximum use of effluent or reclaimed water for irrigation purposes. These conditions shall include, but not be limited to:
 - (1) the date by which the City is required to have its portion of the system in place;
 - (2) requirements for financial participation by the developer in the construction of the project;
 - (3) penalties for non-compliance; and
 - (4) a surcharge equaling 50% of the potable water rate in addition to the regular rates and charges. This surcharge shall not apply when the continued use of potable water is required solely due to deficiencies in the City's system or delays in City construction.

i. When private development requires reclaimed water service in advance of the City's construction schedule, developers shall work with Tucson Water to formulate a plan of service to be implemented at the sole expense of the developer with facilities to be dedicated to Tucson Water upon completion.

j. When funding is available, the City will finance or participate in the construction of reclaimed water pipelines in the Tucson Water service area to serve customers whose estimated reclaimed water usage is sufficient to justify pipeline construction on the basis of economic feasibility.

k. effluent control (IGA)

(1) Effluent use shall be controlled as follows:

(a) The use of all effluent derived from water developed by the City, including the City's allocation of CAP water, shall be directly controlled by the City.

(b) Effluent from any County treatment plant derived from water developed by entities other than the City may be controlled by the City on a case-by-case basis through contracts between the City and others subject to applicable conditions to include:

i) conditions requested by Pima County in the development of their waste water systems that are consistent with the water management plans and goals of the Tucson AMA.

ii) that the use of effluent shall reduce the amount of groundwater which the other party could otherwise lawfully have pumped.

iii) that the terms of the contract shall be sufficient to amortize the cost of system improvements.

(2) The City may only enter a contract with the County under the terms of which the County would control the effluent under conditions mutually agreed upon, with no payment by the County to the City, except for sharing net profits as provided in the Sewer Transfer IGA, when the City:

(a) is not using the effluent;

(b) has no plans to use the effluent;

(c) has no contract with another party for use of effluent;

(d) has no plans for entering into a contract with another for the use of the effluent;

(e) has no existing or proposed projects which could be negatively impacted.

5. Recharge

- a. Groundwater recharge shall be used as a strategy for augmenting the groundwater and for providing long-term operational flexibility to Tucson Water's supply system.
- b. Tucson Water shall develop demonstration projects as required to assess the feasibility of recharging various water sources for operational and long-term storage.
- c. Tucson Water shall fully participate with other agencies to develop programs for water supply augmentation within the Tucson AMA.
- d. The City may provide recharge water only to entities which have the legal authority to store water.

6. Wholesale Water Service

- a. Tucson Water shall offer to provide wholesale water service to other retail water providers in the region.
- b. Tucson Water shall offer both interruptible and non-interruptible water service to wholesale customers.
- c. Tucson Water shall be responsible for delivering a specified flow rate at a specified pressure range to the point of delivery to wholesale customers.
- d. Each wholesale customer shall be responsible for all necessary storage and transmission facilities beyond the point of wholesale delivery, unless otherwise provided for in separately negotiated agreements.
- e. Tucson Water shall be responsible for delivering wholesale water in accordance with the primary water quality standards established pursuant to the Federal Safe Drinking Water Act (42 United States Code Sections 300F et seq.) at the point of delivery to the retail water service provider.
- f. Each wholesale customer shall be solely responsible for maintaining water quality within its own retail water distribution system.
- g. Tucson Water shall deliver to a wholesale customer only water which is not debited against a City of Tucson groundwater account established by the Arizona Department of Water Resources.
- h. Central Arizona Project water held under subcontract by any wholesale water customer may be treated and directly delivered or may be stored underground by Tucson Water on behalf of the wholesale customer.
- i. Agreements to treat and deliver or to recharge wholesale customers' CAP water shall be separately negotiated.

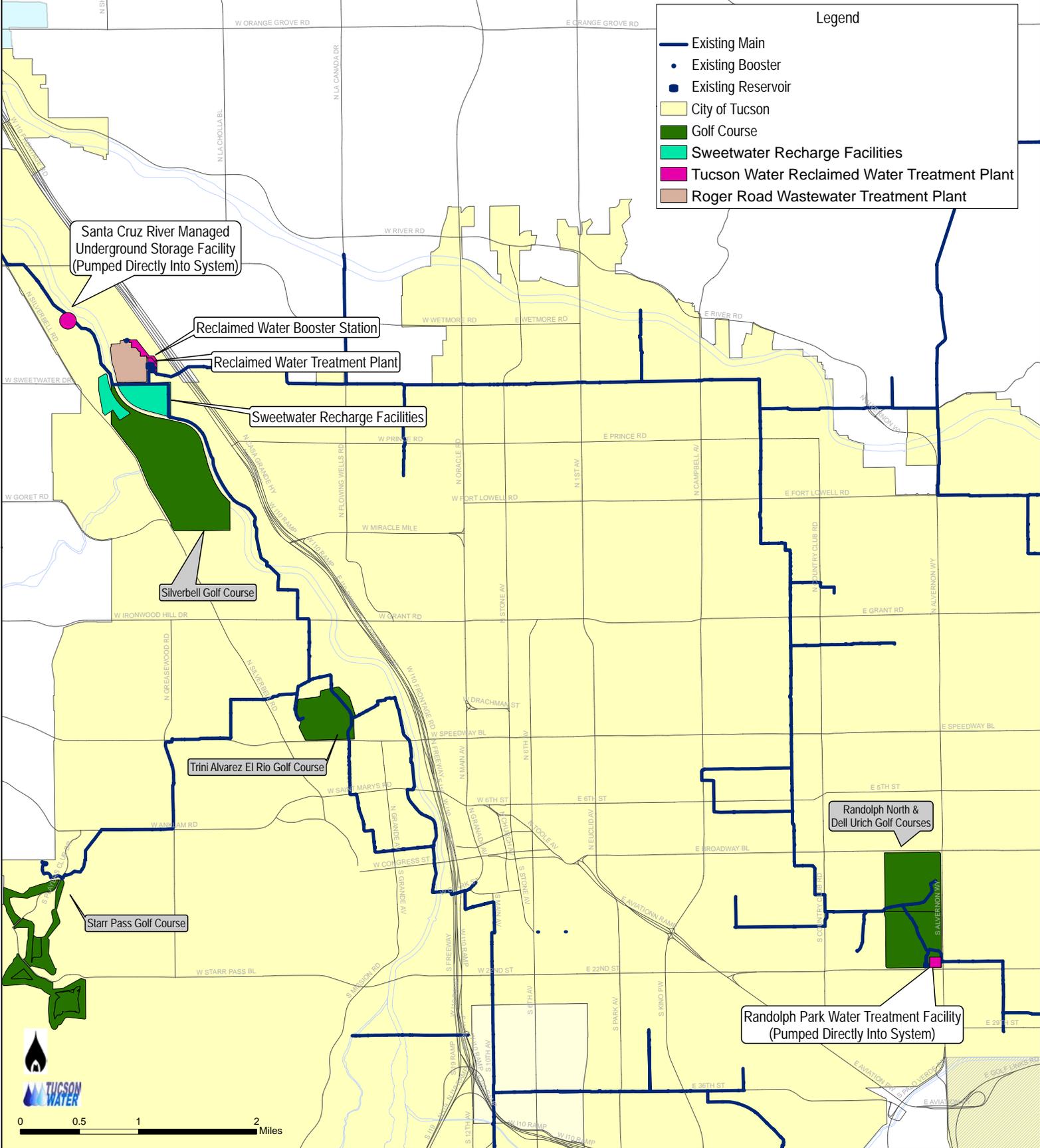


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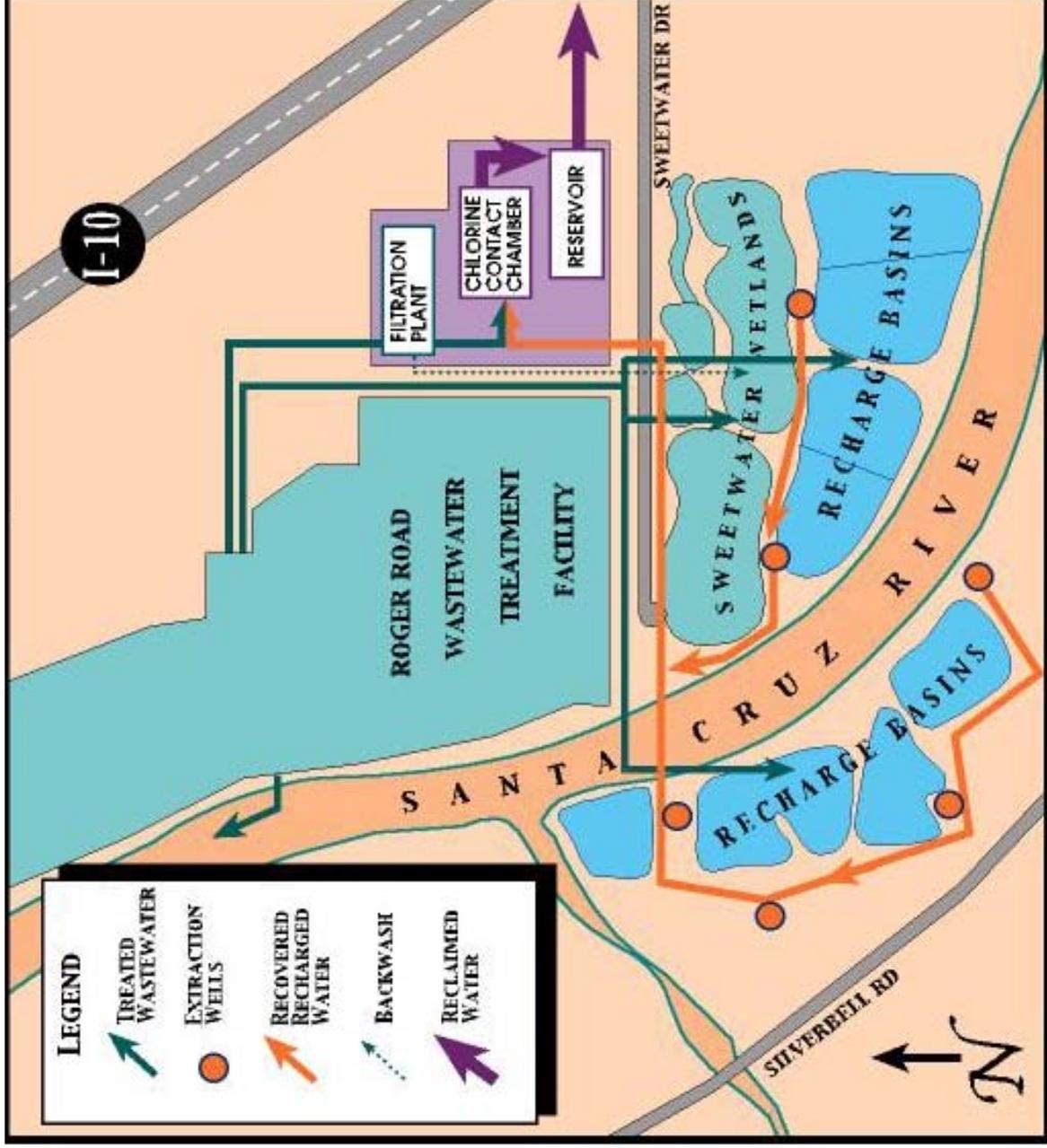


APPENDIX B

City of Tucson - Reclaimed Water System - Reclaimed Water Sources



Reclaimed Water Production Facilities located at Roger Road:
Reclaimed Water Treatment Plant (“Filtration Plant”)
Sweetwater Recharge Facilities (“Wetlands and Recharge Basins”)





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APPENDIX C

City of Tucson - Reclaimed Water System - Golf Courses - CIP Projects - FY 2007-2012

Explanation

- Existing Main
- 5YR CIP Main
- Existing OV Main
- Existing Booster
- 5YR CIP Booster
- Existing OV Booster
- Existing Reservoir
- Existing OV Reservoir
- Existing Golf Course
- Proposed Golf Course
- Sweetwater 5YR Expansion
- City of Tucson



RECLAIMED - GOLF COURSES - APRIL 2007

