

Tempe

City of Tempe



**Water Service Area -
Water Resources Plan**

**Tempe Water Utilities Department
December 2006**

Table of Contents

Table of Contents	2
Executive Summary	3
History of the Tempe Water Utilities Department	4
Tempe Water Resources and Water Utilities Department Facilities	5
Figure 1: Tempe Water Resources Infrastructure.....	7
Tempe Water Supplies	9
Figure 2: SRP Water Rights Status for Lands in Tempe.....	10
Assured Water Supply Designation	17
Figure 3: City of Tempe 2005 Municipal System Water Use.....	17
Figure 4: City of Tempe 2005 Non-Potable Water Use.....	18
Figure 5: Tempe 6-year Municipal Water Use Trend.....	19
Figure 6: Tempe AWS Committed Water Sources (1997).....	20
Figure 7: Tempe AWS Committed Water Sources (2005).....	22
Future Water Demand Projections	23
Figure 8: Tempe Water Master Plan (2000) Water Use Projections.....	23
Table 1: Water Demand Projections from 2000 Water Master Plan.....	25
Figure 9: Projected Land Use: Tempe General Plan 2030.....	26
Table 2: Water Demand Projections from 2006 Water Resources Plan...	27
Figure 10: Tempe Water Demand Projections through 2030.....	28
Tempe Water Utilities Department—Water Resources Planning Initiatives	29
Figure 11: Tempe Surface Water Supply Map.....	29
Tempe Water Conservation Programs	40
Table 3: Tempe Tiered Water Rate Schedule.....	46
Tempe Drought Plan Summary	47
Figure 12: Current U.S. Drought Monitor Map.....	52
Figure 13: U.S. Seasonal Drought Outlook Map.....	52
Figure 14: Three Month Precipitation Probability Outlook Map.....	53
Figure 15: Current Pacific Ocean El Nino Status Map.....	53

City of Tempe Water Utilities Department Water Resources Plan Update December 2006



Executive Summary

The Tempe Water Resources Plan Update provides background information on the Tempe Water Utilities Department and describes current water supplies and water demand for the Tempe Water Service Area, projected future water demands based on growth and redevelopment, and planning efforts for future water supply requirements.

Key elements of the water resources plan include these goals:

- Rely on renewable and sustainable water supplies and protect our access to those supplies
- Provide drinking water that meets or exceeds all federal and state water quality standards
- Provide the highest level of water and wastewater services at the lowest possible cost for customers in the Tempe water service area
- Develop and acquire new renewable water supplies
- Maintain safe yield levels of groundwater use
- Maximize the direct reuse of reclaimed water for non-potable water uses
- Utilize groundwater recharge programs to store Central Arizona Project (CAP) water and reclaimed water for future recovery and use
- Increase recovery well production capacity as a backup water supply and for protection against prolonged drought cycles
- Maintain an effective water conservation program and implement new water conservation measures
- Establish planning guidelines that consider the water rights status of lands slated for development and redevelopment projects

History of the Tempe Water Utilities Department

The City of Tempe's municipal water system dates back over a century, established in 1902. In 1901, the Tempe Town Council voted to issue \$30,000 in water works bonds to construct Tempe's first municipal water system. The bond issue was approved by the voters of Tempe by a margin of 102 to 17 in October, 1901. By the summer of 1902 construction on the town's water system was underway, and by December, 1902, residents were first able to tap into the new water system.

Tempe's first water system consisted of three 12" diameter wells, each about 150 feet deep. These wells were located east of Tempe's downtown area, at 7th Street and Willow Avenue (now College Avenue). The three wells were powered by a 30 HP electric motor that pumped water 249 feet up to a cement reservoir constructed atop the Tempe Butte. Water from the Tempe Butte reservoir was delivered by gravity flow through water mains to homes and businesses in town.

Tempe's first municipal well site (ca. 1902)



Several years ago, the City of Tempe Historical Museum and the Tempe Water Utilities Department commissioned a research project examining the history of water use in Tempe. The research examined the central importance of water throughout Tempe's history, with a new focus on the beginnings of Tempe's first municipal water and wastewater services, and the evolution of the City's water utilities over the past 100 years. Two publications resulted from this research:

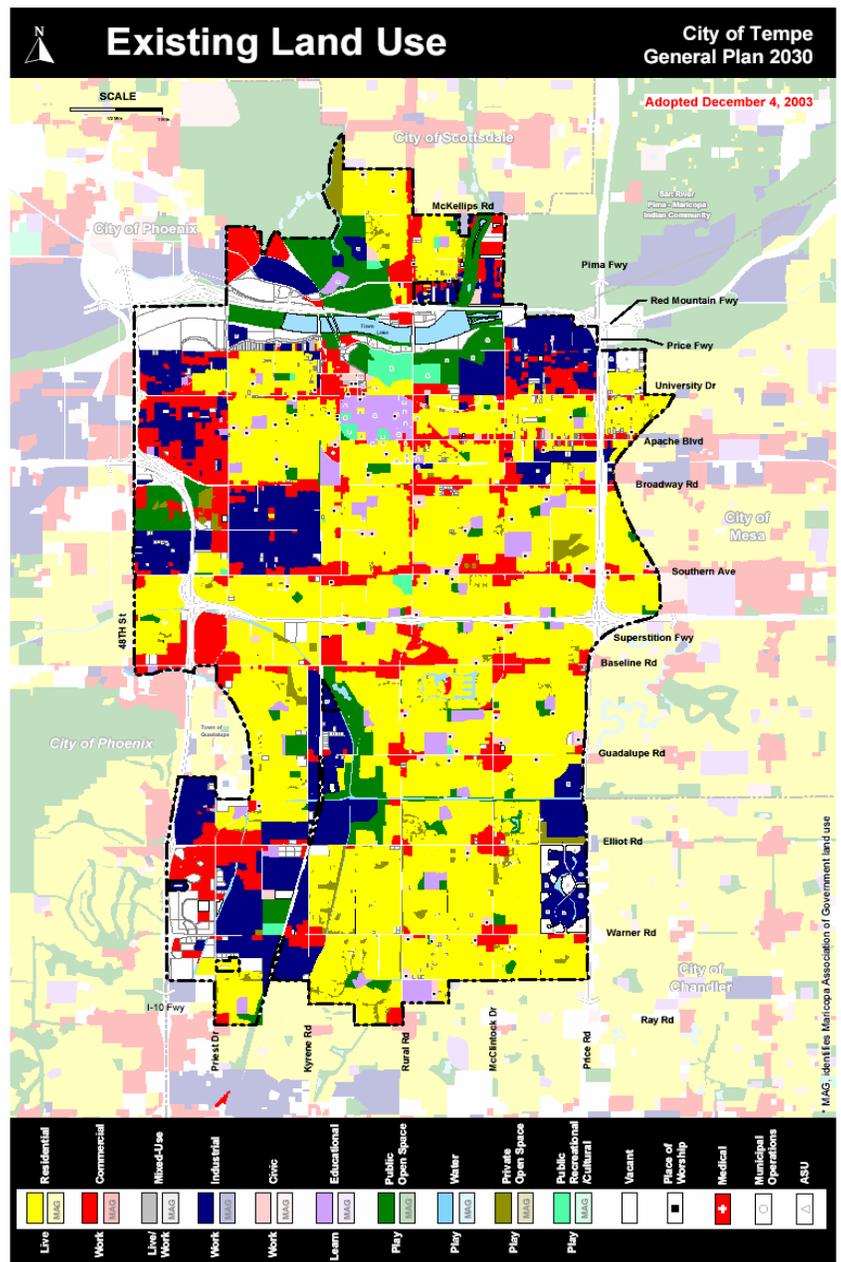
- Leah S. Glaser, Ph.D., "The History of Tempe's Water", August, 2003, Tempe Historical Museum and Tempe Water Utilities Department.
- Mark E. Pry, Ph.D., "Oasis in the Valley—The Story of Water in Tempe", 2004, Tempe Historical Museum and Tempe Water Utilities Department.

For readers interested in more information on the history of water use in Tempe these two publications can be obtained through the Tempe Historical Museum, 809 E. Southern Ave.; Tempe, AZ 85282, (480) 350-5100.

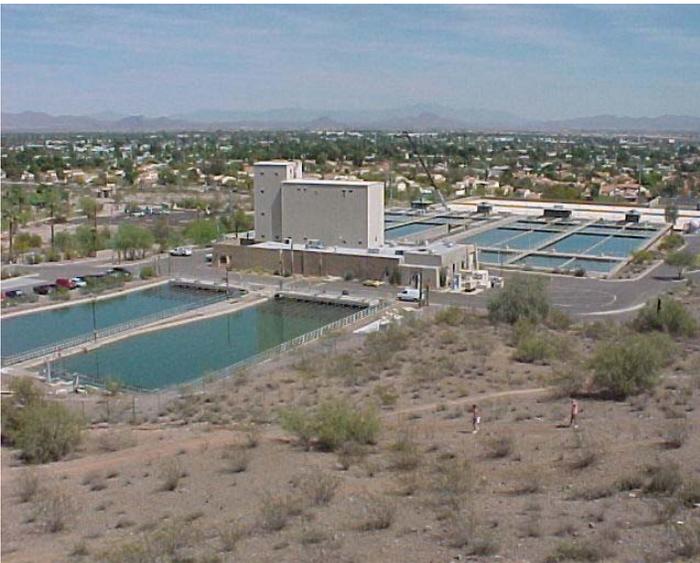
Tempe Water Resources & Water Utilities Department Facilities

The City of Tempe received an Assured Water Supply Designation from the Arizona Department of Water Resources (ADWR) on December 31, 1997 (AWS 97-007, Decision and Order No. 26-002043). The Assured Water Supply Designation certifies that Tempe has demonstrated the physical, legal and continuous availability of groundwater, surface water, Central Arizona Project/Colorado River water and effluent in an aggregate volume sufficient to meet water demands for a minimum of 100 years. Tempe will reapply for an updated Assured Water Supply designation before 2010.

The Tempe Water Utilities Department (WUD) provides water, wastewater, and environmental services to customers within the Tempe Water Service Area. The Tempe Water Service Area includes all lands incorporated within the City of Tempe as well as those within the Town of Guadalupe and several unincorporated county islands. The water service area covers about 42 square miles and is over 95% developed. The City of Tempe is landlocked, bordered by the Cities of Chandler to the south, Mesa and Chandler to the east, Scottsdale to the north, and Phoenix to the west. As such, the boundaries of the Tempe water service area will not grow in the future, however, significant growth through redevelopment and increased density of development in the service area is occurring. This water resources plan update will examine redevelopment trends and areas with increased land use density, including high rise development.



Drinking water delivered to Tempe customers is produced at two water treatment plants, the Johnny G. Martinez Water Treatment Plant and the South Tempe Water Treatment Plant. Both plants are currently rated to treat 50 million gallons of water per day (MGD), for a total surface water system treatment capacity of 100 MGD. An expansion project at the Johnny G. Martinez Water Treatment Plant is planned, which will increase the rated water treatment capacity of that plant to 65 MGD. The Tempe WUD also has eight groundwater wells that are used as a back-up drinking water source and several other groundwater wells used for irrigation, water recovery, and water exchange purposes. Figure 1 shows the locations of these water production facilities in Tempe.



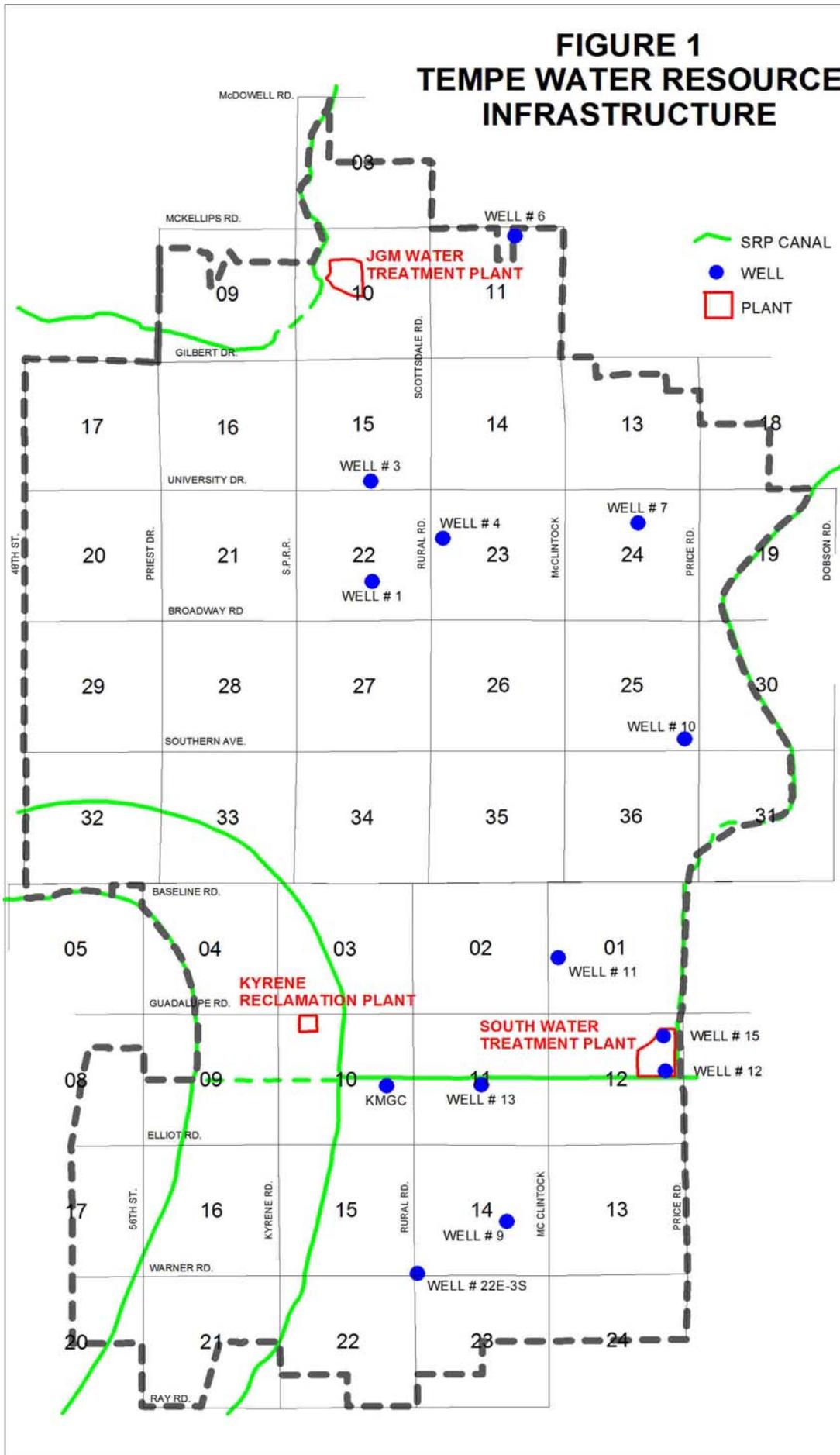
Tempe Johnny G. Martinez WTP

South Tempe WTP



Tempe Well # 9

FIGURE 1 TEMPE WATER RESOURCE INFRASTRUCTURE



Water from Tempe's two water treatment plants and groundwater pumped from production wells that is delivered through the Tempe municipal distribution system to customers (potable water) constitutes the majority of water used within the Tempe Water Service Area. Water supplies are also delivered directly from canals, wells, or water reclamation facilities for non-potable water uses such as residential flood irrigation, irrigation at parks, ball fields and golf courses, lakes, and industrial water uses.



The SRP Cross-cut Canal delivers water to the Martinez WTP



Flume from canal to Martinez WTP



Water pumps at the Martinez WTP



Elevated water storage reservoir

Tempe Water Supplies

The City of Tempe relies on renewable surface water supplies, effluent (reclaimed water), safe-yield groundwater supplies, and surface water or reclaimed water that has been stored in groundwater aquifers. Renewable surface water sources make up more than 95% of Tempe's annual water supply in an average year. These water supply sources include:

Salt River Project

The Salt River Project (SRP) supplies Tempe surface water from six reservoirs on the Salt and Verde Rivers. The Salt/Verde River watershed covers an area over 13,000 square miles, from the headwaters of the Verde River in north central Arizona and the headwaters of the Salt River in the White Mountains of eastern Arizona, down to the desert in the Salt River Valley.

Established in 1903, the Salt River Valley Water Users Association (SRVWUA) is the private water association of the Salt River Project. The SRVWUA was formed by farmers and ranchers in the Salt River Valley who together pledged over 200,000 acres of their land as collateral to repay the loan for one of the first Federal Reclamation Projects: construction of the Theodore Roosevelt Dam. Roosevelt Dam, at the confluence of the Salt River and Tonto Creek 60 miles northeast of the Salt River Valley, was completed in 1911.

The second component of the Salt River Project is the Salt River Project Agricultural Improvement and Power District, which oversees the power generation side of SRP. The Power District, established in 1937, was formed as a unit of government, and as such is able to issue municipal bonds.

Today SRP serves water to a service area of over 248,000 acres in the Salt River Valley, delivering nearly 1,000,000 acre-feet of water per year to SRP shareholder lands. The SRP water service area is approximately 88% urbanized, with about 12% of lands still used for agriculture. SRP delivers water supplies to the Cities of Chandler, Gilbert, Glendale, Mesa, Peoria, Phoenix, Tempe and Scottsdale. These communities treat SRP water supplies at their city-owned water treatment plants for delivery to SRP shareholder lands within each city.

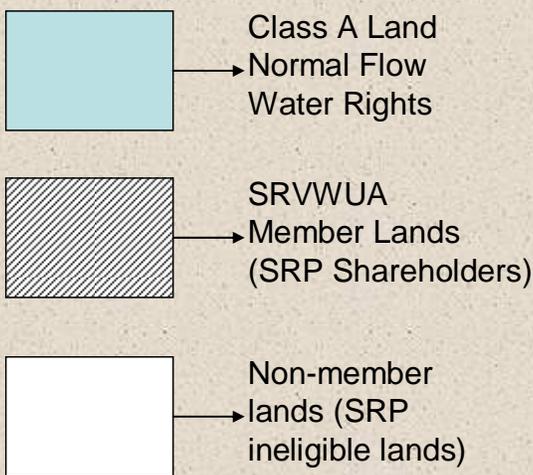
SRP water supplies available to Tempe are limited to use on SRP member lands in the Tempe Water Service Area. SRP also delivers surface water from the Salt and Verde Rivers appurtenant to Class A normal flow lands in Tempe. Class A lands have decreed water rights that pre-date construction of the SRP reservoir system.

These lands are entitled to receive “normal flow” surface water deliveries as determined by court decree (the 1910 Kent Decree). The amount of surface water available for use pursuant to the decree is based on the priority date of the Class A land and the amount of runoff measured on the Salt River and tributaries above the inflow to the SRP reservoir system.

SRP delivers groundwater from SRP wells pumped into canals when needed to supplement surface water supplies. SRP wells are also used to deliver groundwater directly to SRP shareholders and cities. SRP operates a network of over 240 groundwater wells across its water service area.

Approximately 80% of lands within the Tempe Water Service Area are eligible to receive either SRP stored water or decreed normal flow water supplies. Approximately 65% of lands within the Tempe Water Service Area have entitlements to both SRP stored water and normal flow surface water supplies. (See Figure 2 – SRP member lands and Class A lands in Tempe)

SRP water rights status for lands in the Tempe water service area



Approximately 80% of the lands in Tempe have senior Class A surface water rights, SRP member land surface water rights, or both

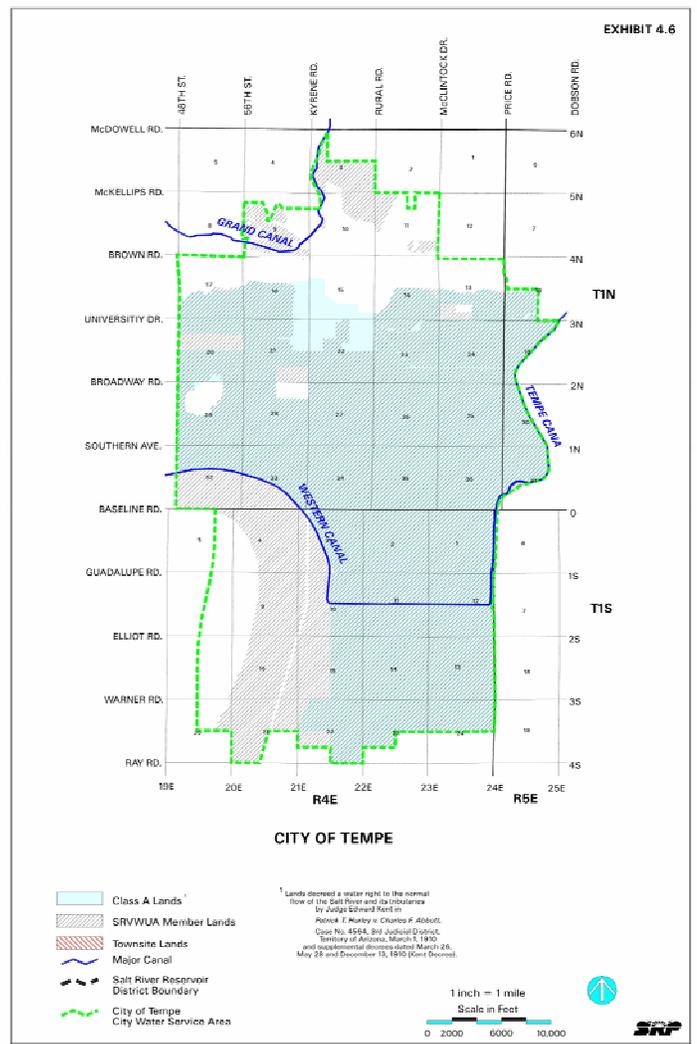


Figure 2

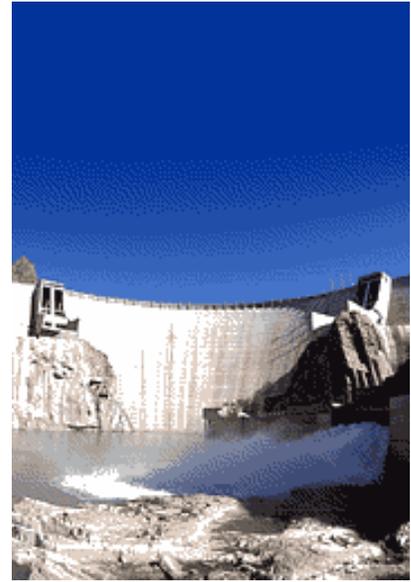
Salt River Project Dams



Horseshoe Dam



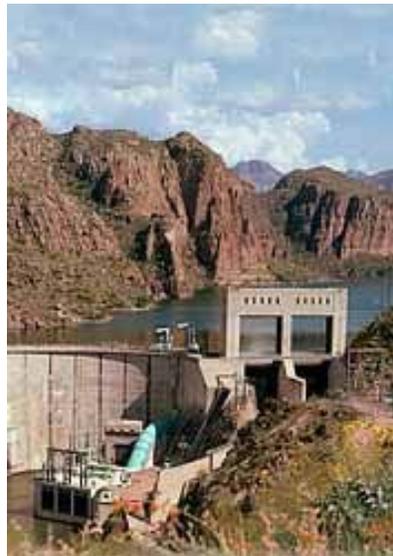
Bartlett Dam



Roosevelt Dam



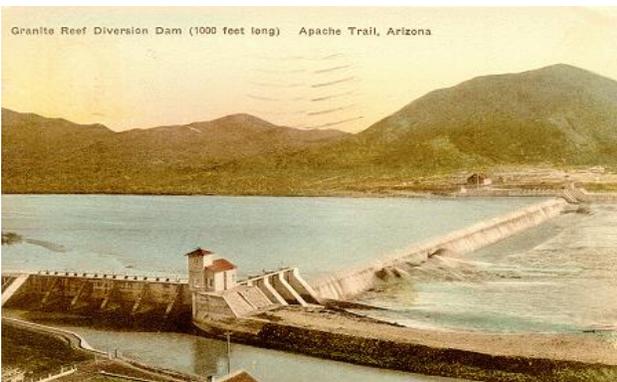
Horse Mesa Dam



Mormon Flat Dam



Stewart Mountain Dam

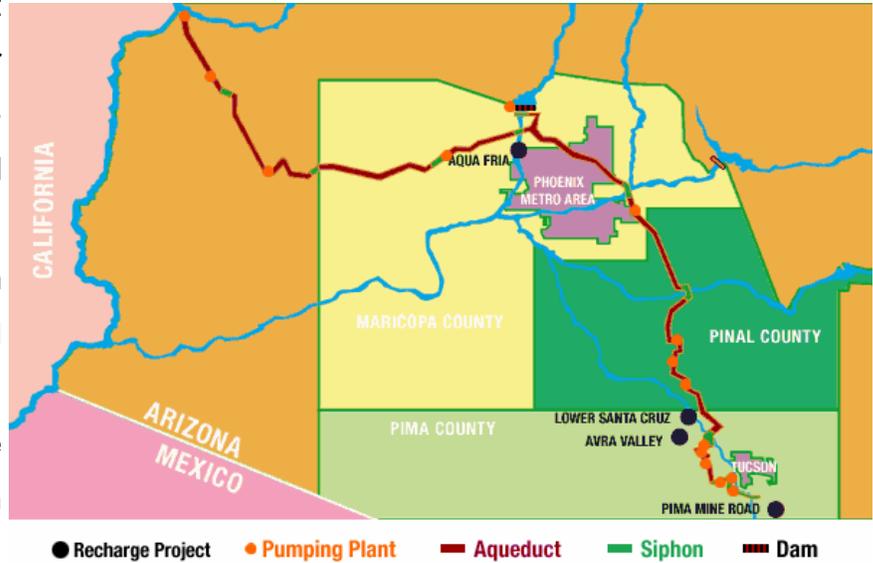


Granite Reef Diversion Dam



Central Arizona Project

The Central Arizona Project (CAP) supplies Colorado River water to the City of Tempe and other municipalities, agricultural water users and Indian communities in Central Arizona. CAP pumps Colorado River water from Lake Havasu in western Arizona and delivers it to water users in Maricopa, Pinal and Pima Counties through the 336 mile CAP canal, terminating south of Tucson.



The seven Colorado River basin states entered into the Colorado River Compact in 1922. The Compact apportioned the use of Colorado River water among the upper and lower basin states, with the upper basin states of Colorado, Wyoming, Utah and New Mexico allocated 7.5 million acre-feet, and the lower basin states of Arizona, California and Nevada allocated 7.5 million acre-feet each year. Disputes over Arizona's share of the lower basin apportionment delayed the adoption of the Compact by the State of Arizona until 1944. Colorado River water allocations in the lower basin:

- Arizona has an annual allocation of 2.8 million acre-feet
- California has an annual allocation of 4.4 million acre-feet
- Nevada has an annual allocation of 300,000 acre-feet
- (Mexico has an annual allocation of 1.5 million acre-feet pursuant to a 1944 treaty with the United States)



The Colorado River Basin Project Act of 1968 authorized construction of the CAP system to bring a portion of Arizona's Colorado River allocation to central Arizona. In 1971, the Central Arizona Water Conservation District (CAWCD) was created to oversee construction, operation and management of the CAP system. CAWCD is a political subdivision of the State of Arizona, with 15 elected Board members. CAP delivers approximately 1.5 million acre-feet of Colorado River water to central Arizona each year. In Tempe, CAP water is used to meet water demands on lands not entitled to SRP water supplies, about 20% of all lands within the Tempe Water Service Area.

Modified Roosevelt Dam New Conservation Space (NCS)

Authorization of the Central Arizona Project included a regulatory storage component and upgrades to existing dams and infrastructure. One of the early sites proposed for a regulatory storage reservoir was the Orme Dam, proposed to be constructed at the confluence of the Salt and Verde Rivers. A Presidential review of water projects in 1977 recommended that Orme Dam and several other dams be eliminated, and replaced by alternative dam locations. In 1981, the Secretary of the Interior identified a proposed alternative action, Plan 6. Plan 6 included construction of the New Waddell Dam on the Agua Fria River for regulatory storage of CAP water, the expansion of Roosevelt Dam, and a new dam on the Verde River, Cliff Dam. Cliff Dam was later deleted from the plan, but New Waddell Dam and Modified Roosevelt Dam were completed pursuant to Plan 6.

The City of Tempe funded and secured rights to 5% of the new water conservation capacity created when Roosevelt Dam was expanded in the mid-1990s, approximately 13,500 acre-feet of surface water storage capacity. Other cities that participated in the Plan 6 New Conservation Space (NCS) agreement include the Cities of Phoenix, Mesa, Scottsdale, Chandler and Glendale.

Roosevelt Dam NCS water can be used for any beneficial uses within the Plan 6 cities' water service areas. Tempe plans to use NCS water supplies to meet water demand on lands not entitled to SRP water supplies, similar to the use of CAP water supplies in Tempe.

Modified
Roosevelt
Dam



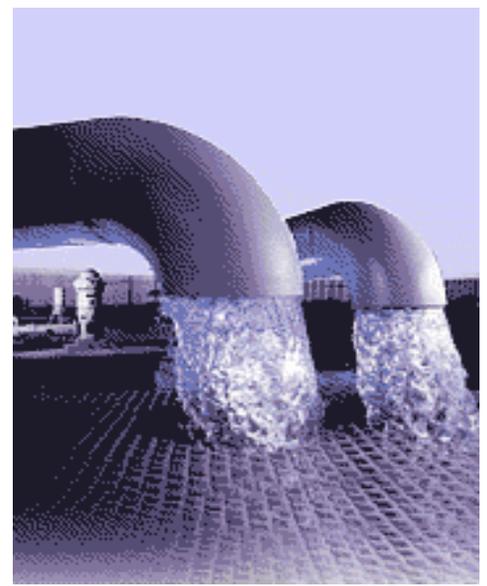
Groundwater

The Arizona State Legislature passed a comprehensive groundwater bill in 1980, which was signed into law by then Governor Bruce Babbitt. The 1980 Groundwater Management Act was created to address the use of groundwater and groundwater overdraft in the most populous areas of the State. These areas are referred to as Active Management Areas (AMAs). There are five AMAs in Arizona: Phoenix, Tucson, Pinal, Prescott, and Santa Cruz. Groundwater users in AMAs are regulated, with limits on how much groundwater can be used in any year. The primary goal of the AMAs is to achieve safe-yield groundwater use by 2025, where groundwater withdrawal and use is balanced by natural and artificial groundwater recharge. The Arizona Department of Water Resources (ADWR) administers programs in each AMA that encourage the use of renewable water supplies and promote water conservation among all water users.

Tempe can withdraw a limited amount of safe-yield groundwater supplies from its wells each year. Water stored in groundwater aquifers through groundwater recharge projects can also be recovered through city wells that are permitted as recovery wells. The use of groundwater from Tempe's municipal production wells over the last decade has ranged from less than 1% to about 7% of Tempe's total municipal water use in a normal year. During periods of prolonged drought, with reductions in available surface water supplies, Tempe's use of groundwater may be increased within allowable limits until watershed conditions improve. The ADWR Assured Water Supply Rules allow for drought exemption groundwater pumping only during periods when normal surface water supply allocations have been reduced due to drought conditions.



Tempe Well #12



SRP Well Site

Reclaimed Water

Wastewater collected throughout the Tempe water service area is treated at the regional 91st Avenue Wastewater Treatment Plant (WWTP) in Phoenix, or locally at the Kyrene Water Reclamation Facility. The City of Phoenix and its Sub-regional Operating Group (SROG) partners Glendale, Mesa, Scottsdale and Tempe jointly own the 91st Avenue WWTP and transmission facilities. The plant is operated by the City of Phoenix for the partnership. Effluent, or reclaimed water, produced at the 91st Avenue WWTP is used for cooling water at the Palo Verde Nuclear Generating Station west



of Phoenix, for irrigation uses by the Buckeye Irrigation Company, and for a riparian habitat project: the Tres Rios Constructed Wetlands Demonstration Project. In the future, reclaimed water from this facility may be used for groundwater recharge and storage credits at the Agua Fria Linear Recharge Project and for riparian habitat at the full scale Tres Rios wetland project.

91st Avenue Wastewater Treatment Plant

Reclaimed water produced at the Tempe Kyrene Water Reclamation Facility (KWRF) is currently used to supply water for irrigation use at the Tempe Ken McDonald Golf Course, industrial water uses and cooling water at the SRP Kyrene Electric Generating Station, and for groundwater aquifer recharge. The Tempe Water Utilities Department has just completed an expansion and technology upgrade construction project at the KWRF. The reclaimed water treatment capacity is now rated at 9.0 MGD. Future uses of this additional reclaimed water supply in Tempe may include supplemental supply for the Tempe Town Lake, additional irrigation reuse sites, and expanded groundwater recharge projects. When reclaimed water is used on lands eligible for SRP water, the SRP water saved is accrued as exchange credits for Tempe.



Tempe Kyrene Water Reclamation Facility

Aquifer Storage Credits (Long Term Storage Credits)

Tempe has water storage permits and/or underground storage facility permits for several recharge projects and groundwater savings programs that provide for the recharge of groundwater aquifers using Tempe’s CAP water, NCS water, or reclaimed water supplies. The water that is recharged establishes aquifer “credits” that can be withdrawn at a later date through recovery wells, especially during times of drought. These projects include:

- Granite Reef Underground Storage Project (GRUSP)
- Tempe Ken McDonald Golf Course Groundwater Recharge Project
- Salt River Project Groundwater Savings Facility
- New Magma Irrigation & Drainage District (NMIDD) Groundwater Savings Facility



GRUSP Recharge Basins

Tempe’s storage capacity at GRUSP is used primarily for the storage of CAP or NCS surface water in the East Salt River Valley groundwater sub-basin for long-term aquifer storage credits. Short term monthly storage and recovery can also be done using SRP surface water supplies. The Tempe Ken McDonald Golf Course Recharge Project formerly used a dry well, or a vadose zone recharge well, to recharge the upper alluvial aquifer using reclaimed water from the Kyrene Reclamation Facility. The Water Utilities Department is planning to increase recharge capacity and upgrade the recharge technology at this site by converting to an aquifer storage and recovery (ASR) injection well system that will be used for both recharge storage and recovery of water from the aquifer for irrigation use at the golf course.

Groundwater savings facility programs are considered “in lieu” recharge projects. Tempe has partnered with SRP and NMIDD in programs to reduce their groundwater pumping through the purchase and direct use of excess CAP water instead of using local groundwater supplies. The groundwater saved accrues as long-term storage credits to Tempe for future recovery and use.

The SROG city partners at the 91st Avenue Wastewater Treatment Plant are in the planning phase of a recharge project in the west Salt River Valley. The Agua Fria Linear Recharge Project will recharge reclaimed water from the 91st Avenue WWTP along the Agua Fria River channel to replenish the aquifer in an area where groundwater levels have fallen over the past several decades. The reclaimed water stored will establish long-term storage credits for the SROG partner cities, and perhaps water exchange opportunities for the SROG cities in the east Salt River Valley.

Tempe Assured Water Supply Designation

The 1997 Assured Water Supply (AWS) Designation for the City of Tempe documented the current water demand for the Tempe Water Service Area, and the projected water demand for 2010. The current and committed annual water demand for Tempe at the time of the AWS Designation (calendar year 1994 was used by ADWR) was 61,262 acre-feet. The total projected annual water demand for Tempe in 2010 was estimated at 70,462 acre-feet. This includes potable water delivered from municipal water treatment plants and wells and non-potable water delivered directly from canals, wells or water reclamation facilities.

Total water use throughout the Tempe Water Service Area in calendar year 2005 was 55,680 acre-feet. In calendar year 2005 a total of 53,461 acre-feet of water was delivered through the Tempe municipal water distribution system (see Figure 3) and 2,219 acre-feet of non-potable water was delivered directly from canals and wells to city parks, recreational ball fields, golf courses, lakes, and riparian habitat areas (see Figure 4). Water use in the Tempe water service area in 2005 is lower than was projected in the AWS study, continuing a trend in declining water consumption in Tempe since the beginning of this decade (see Figure 5).

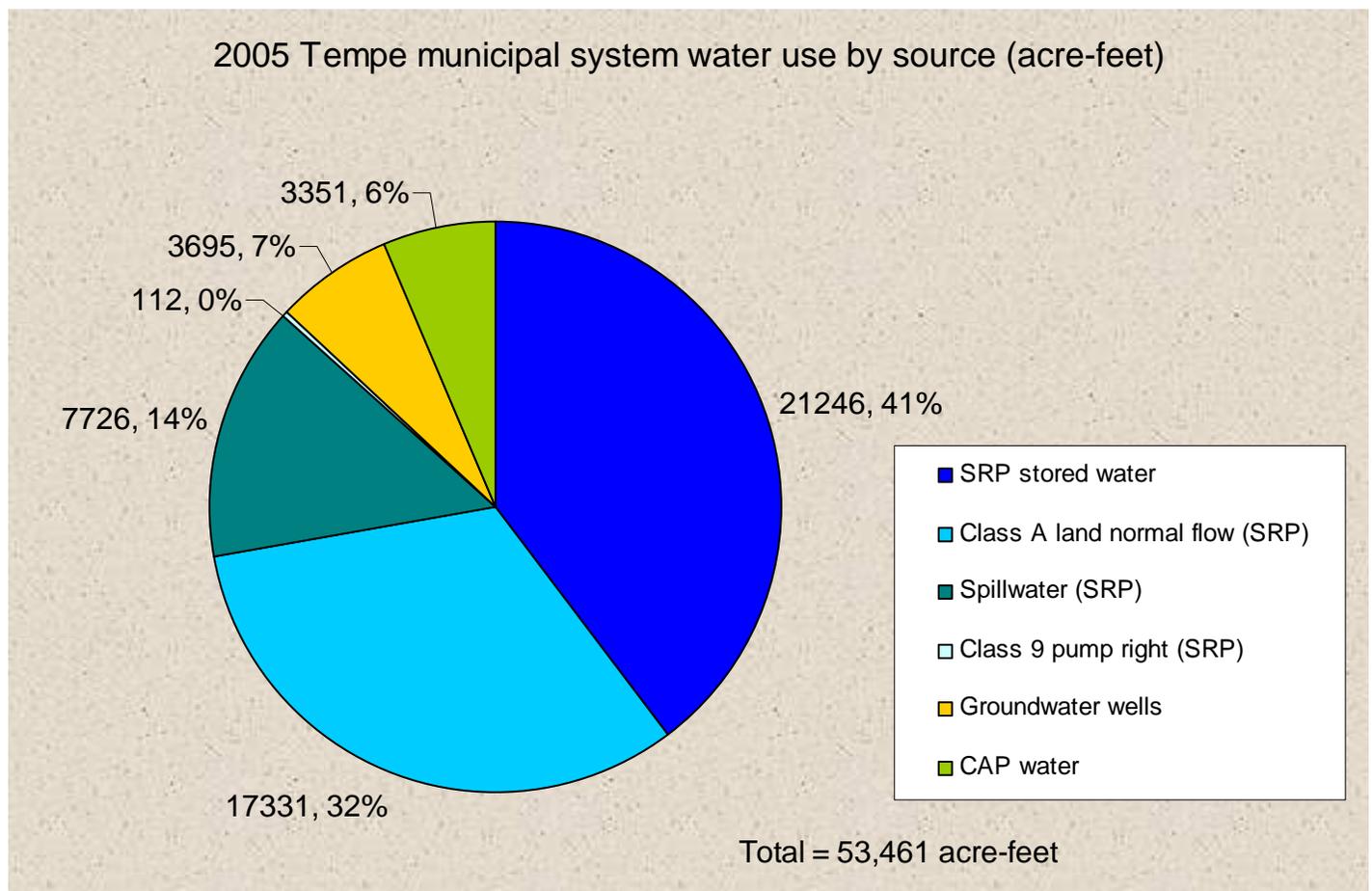


Figure 3

Reclaimed water from the Tempe Kyrene Water Reclamation Facility was used for irrigation at the Ken McDonald Golf Course and to supply cooling water to the SRP Kyrene Electric Generating Station in south Tempe in 2004. Reclaimed water delivered to SRP for power generation uses or to the Ken McDonald Golf Course for irrigation use generates water exchange credits to Tempe that can be charged against surface water deliveries elsewhere in the Tempe water service area. In 2004, these water credits were used for canal water deliveries to the Tempe Town Lake and potable water deliveries to non-member lands in Tempe. During calendar year 2005 the Kyrene Reclamation Facility was out of service for an expansion and technology upgrade project, so no reclaimed water was produced at this facility in 2005.

Other sites that take direct deliveries of non-potable canal water for irrigation use include the ASU Karsten Golf Course, riparian habitat projects in Indian Bend Wash and Papago Park, and 17 city parks and athletic fields, using SRP water, CAP water, or groundwater/recovered storage credits from wells. SRP also delivers water directly to its shareholders in Tempe’s residential flood irrigation neighborhoods.

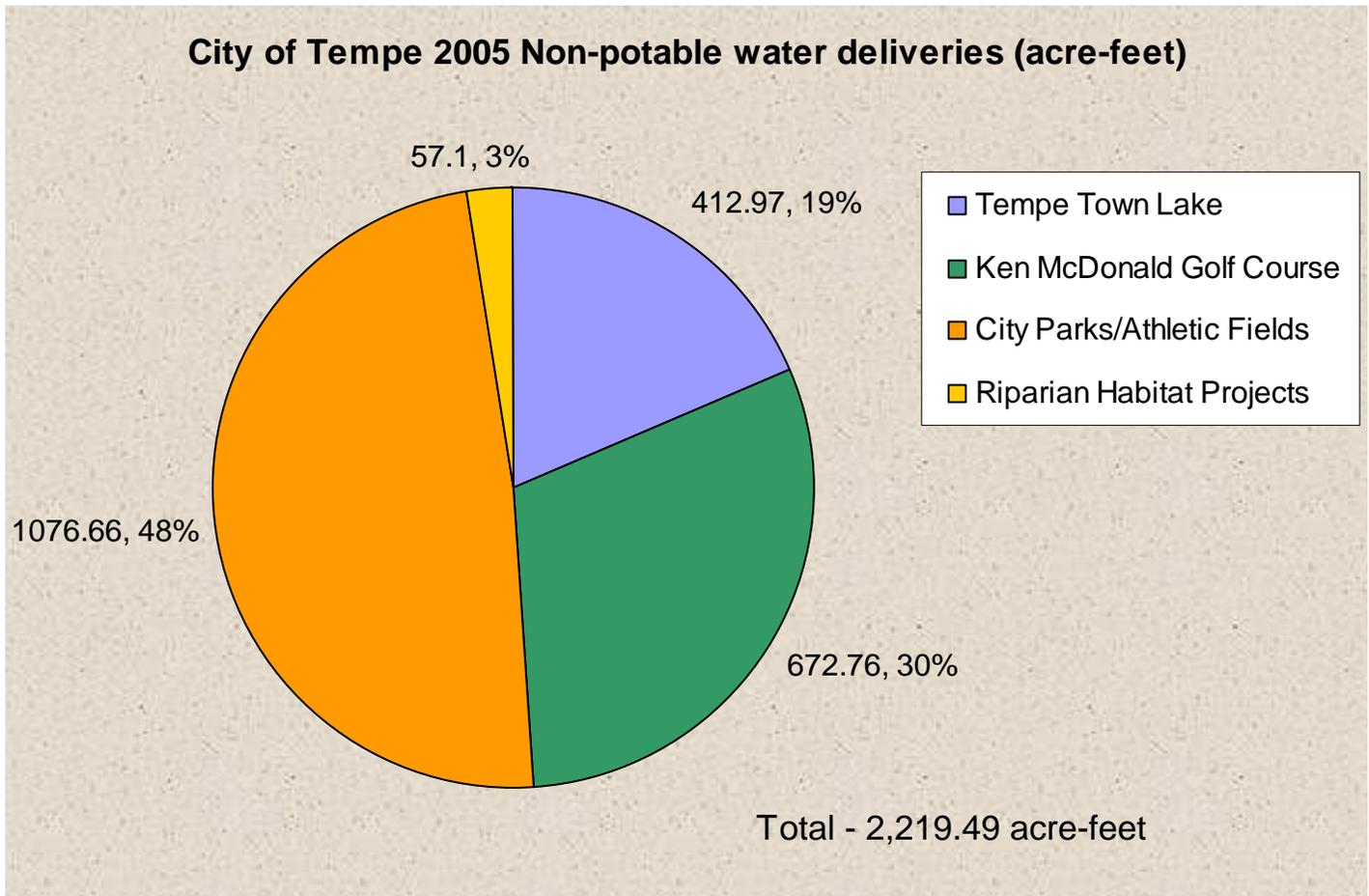


Figure 4

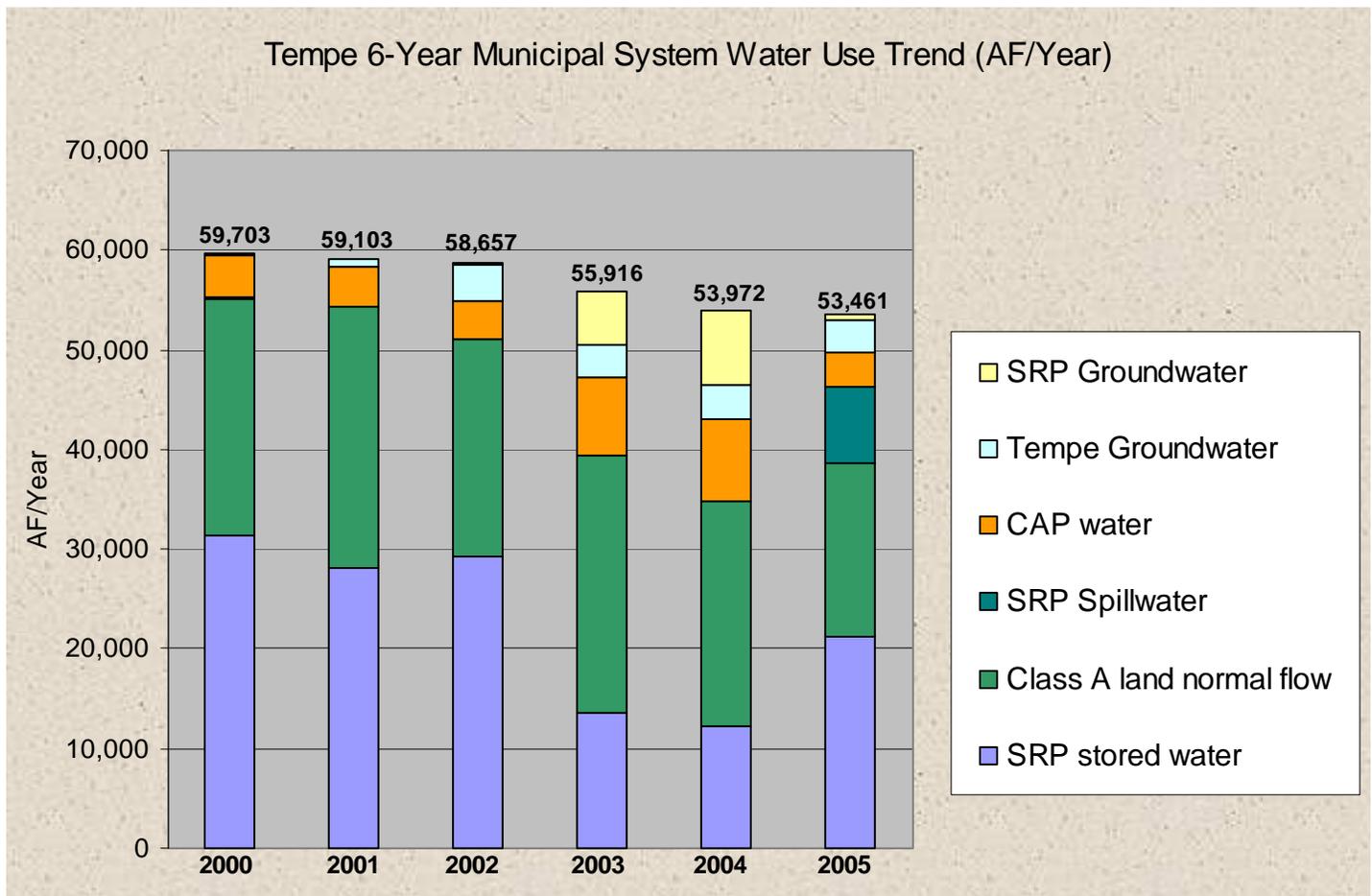


Figure 5

Tempe Assured Water Supply (AWS): Designated Water Supply Availability

The 1997 City of Tempe AWS application and designation demonstrated the physical, legal and continuous availability of water supplies in an aggregate volume of 77,222 acre-feet per year for a minimum of 100 years. The City of Tempe received the AWS Designation from the Director of the Arizona Department of Water Resources in December, 1997, quantifying the following water supplies:

- Salt River Project (SRP stored water + Class A land normal flow) = 60,499 af/yr
- CAP (CAP M & I subcontract) = 4,315 af/yr
- Other CAP (CAP water through settlements and assignments) = 204 af/yr
- Modified Roosevelt Dam NCS = 4,200 af/yr
- Effluent (reclaimed water from Kyrene Reclamation Facility) = 924 af/yr
- Safe-Yield Groundwater (incidental recharge allowance) = 2,685 to 3,108 af/yr
- Phase-in Groundwater allowance = 3,620 af/yr
- Existing Long Term Storage Credits = 352 af/yr
- Total Tempe AWS (all sources) = **77,222 af/yr**

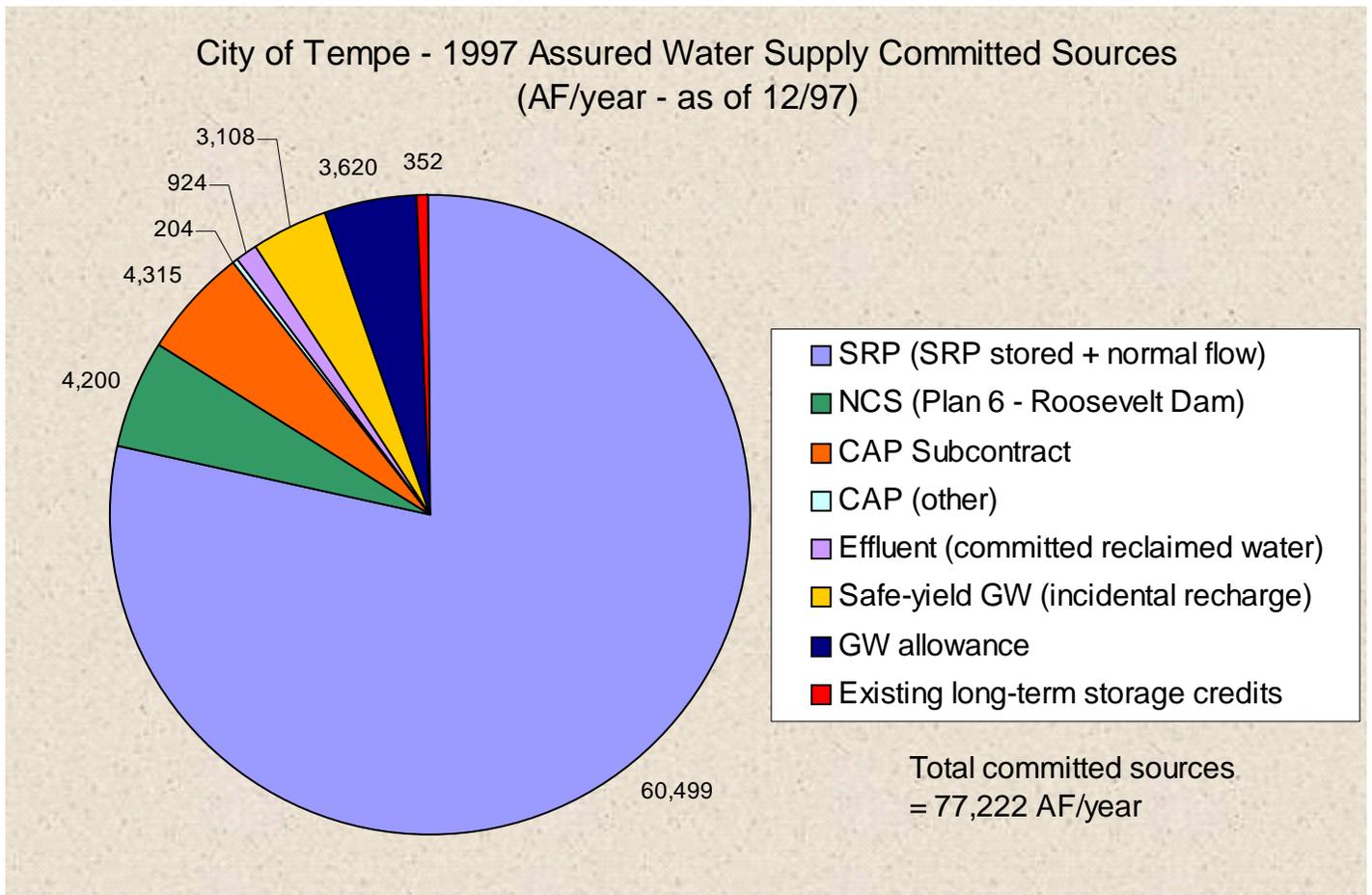


Figure 6

Total water demand in the Tempe Water Service Area in 2010 was projected to be approximately 70,462 acre-feet per year at the time of AWS designation in 1997. The 2010 water demand projection has been revised slightly downward for this water resources plan update, to about 65,000 acre-feet per year, due to the downward trend of water use in recent years (see Figure 5: 2000-2005 total municipal system water use in Tempe).

Available water supplies outlined in the 1997 AWS designation are about 9% to 10% greater than the projected water demand for 2010, using the earlier projected demand of 70,462 acre-feet per year (see Figure 6). The available water supplies in the 1997 AWS designation are about 18% greater than the revised 2010 water demand projection of 65,000 acre-feet per year in Tempe.

One of the objectives of the Tempe Water Resources Plan update is to refine future water demand projections across all water use sectors in the Tempe water service area. Future water demand estimates will be updated using projected land use categories from the Tempe General Plan 2030, with additional detail pertaining to water use projections for areas with a significant increase in density, such as high rise condo and mixed use developments in Tempe. Future water demand projections beyond 2010 will be adjusted as necessary using these planning tools.

Following the AWS Designation in 1997 the Tempe WUD has continued to develop new renewable water supplies and reclaimed water reuse opportunities. The WUD has stepped up the City's groundwater recharge programs to increase our available water supply portfolio and provide additional back-up water supplies for prolonged drought conditions. Tempe has also significantly increased its use of reclaimed water since the 1997 AWS designation and is moving forward on a number of new reclaimed water reuse projects.

At the time of the 1997 AWS designation Tempe had stored approximately 35,000 acre-feet of CAP water in the East Salt River Valley groundwater sub-basin through recharge programs to establish long-term storage credits for future recovery and use. Through 2006 Tempe has now stored over 96,000 acre-feet of water in the aquifer (primarily CAP water plus some reclaimed water) through four permitted recharge programs to establish a large bank of underground storage credits for future water supply requirements and drought protection.

The Tempe WUD plans to continue storing water through these recharge programs in the future. The amount of excess CAP water that can be stored for this purpose in future years depends upon excess CAP water availability and pricing, and groundwater recharge facility capacity. Aquifer storage of reclaimed water will also be part of the City's planned recharge programs for storage credits in the near future. With the completion of the Kyrene Reclamation Facility expansion and upgrades in 2006, the reclaimed water production capacity of that facility has doubled. A portion of the increased reclaimed water supply will be recharged to the upper alluvial aquifer at the Ken McDonald GC Recharge Project for storage and future recovery.

Tempe has increased the use of our reclaimed water supplies over the past five years and created new water exchange opportunities in partnership with the Salt River Project. The 1997 AWS Designation provided for an annual amount of reclaimed water use averaging 924 AF/yr, the maximum amount allowed at the turf reuse facilities that were permitted at that time. With the addition of the SRP Kyrene Generating Station as an industrial reuse site for Tempe reclaimed water, and the SRP surface water exchange credits in return, Tempe can now receive credit for up to about 2,800 AF/yr of reclaimed water used for industrial cooling purposes and golf course irrigation use.

The completion of the Kyrene Reclamation Facility expansion project will provide another 2,000 to 2,500 acre-feet of reclaimed water supplies that can be reused or recharged to the aquifer. Some potential reclaimed water reuse sites that are being examined by the Tempe WUD include Kiwanis Park and Kiwanis Park Lake, supplemental water supply for the Tempe Town Lake, the ASU Karsten and Tempe Rolling Hills Golf Courses, and Rio Salado riparian habitat projects.

The combination of long-term aquifer storage credits and reclaimed water uses added since the 1997 AWS designation provide Tempe with new AWS sources for use within the Tempe Water Service Area in the future. Approximately 2,500 AF/yr of additional AWS sources have been added to Tempe’s water resources portfolio under these programs. These include the addition of approximately 600 AF/yr from the increase in long-term aquifer storage credits through groundwater recharge and storage projects and approximately 1,900 AF/yr in new reclaimed water use credits from the SRP Kyrene Electric Generating Station water exchange.

Reclaimed water delivered to the SRP Kyrene Electric Generating Station is exchanged for surface water supplies delivered to Tempe from SRP. The current exchange ratio for the reclaimed water exchange between Tempe and SRP is 5 acre-feet of reclaimed water for 4 acre-feet of surface water supplies, or 80% credit. Pursuant to the SRP/Tempe Water Delivery and Use Agreement, this ratio will be 1 to 1 after 2010, or 100% surface water credit for all reclaimed water delivered to the SRP Kyrene Electric Generating Station.

When added to the 1997 AWS Designation of 77,222 AF/yr in available supplies, these newly developed water sources increase Tempe’s available annual assured water supplies to over 79,700 AF/yr as of December, 2005. (See Figure 7.)

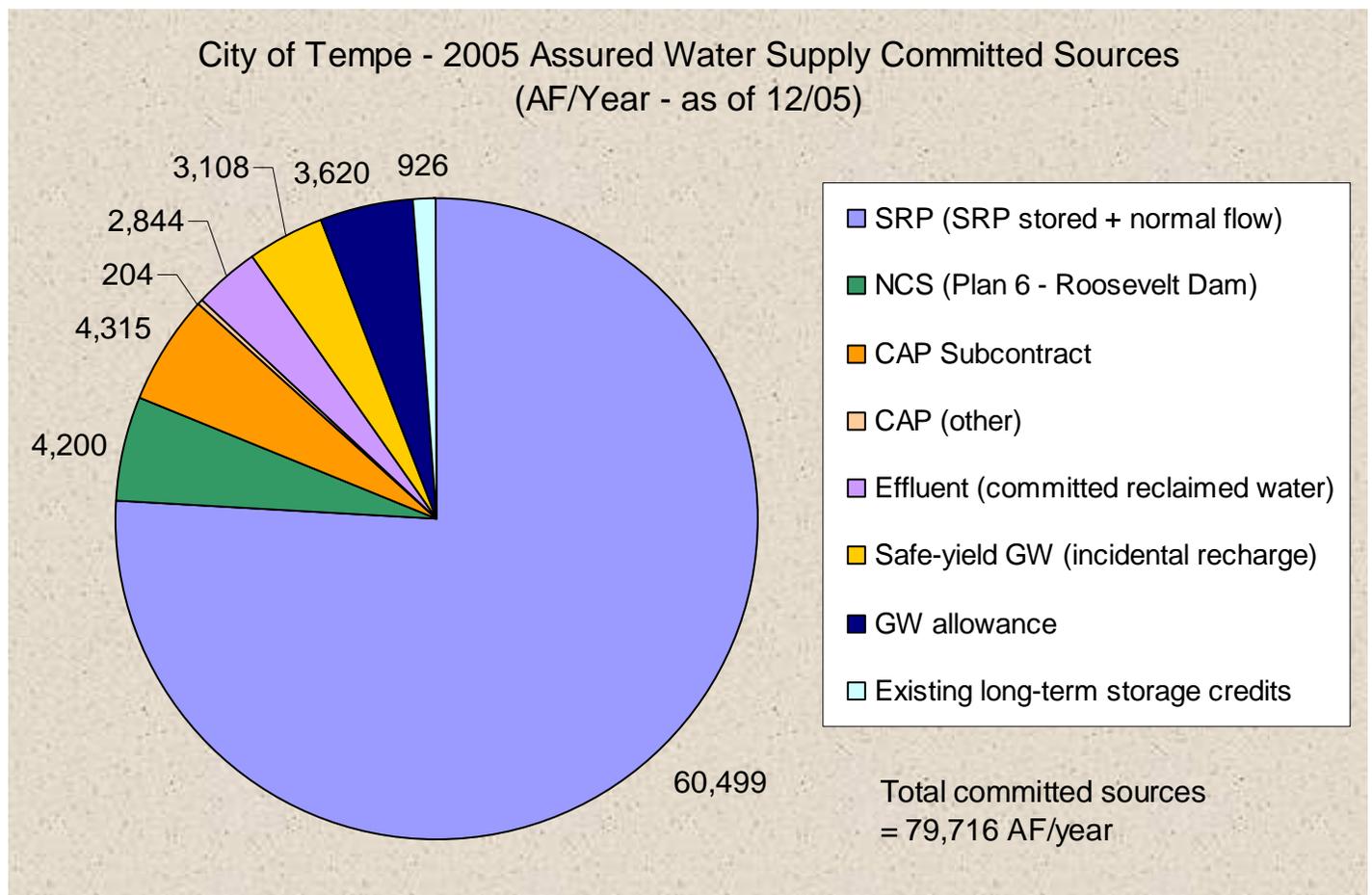


Figure 7

Future Water Demand Projections

In the 1997 application for a designation of assured water supply the Tempe Water Utilities Department utilized several methods to project future water demand for the Tempe Water Service Area. One estimate was made by applying a water demand factor based on land use categories for all acreage within the service area. The second estimate was derived through the use of a 30-year statistical water use trend analysis. Both projections assumed that the water service area would be at or near full development or build out conditions prior to 2020. Both water demand projection methods estimated the full development water demand for the Tempe Water Service Area to be slightly greater than 71,000 acre-feet per year. Water demand for the portions of the Tempe Water Service Area with SRP water supplies was projected to be approximately 62,500 acre-feet per year. Water demand for non-SRP portions of the service area was projected to be approximately 8,500 to 9,000 acre-feet per year.

In 2000 the Tempe Water Utilities Department completed a 20-year Water System Master Plan for the Tempe Water Service Area. The water demand factor projections used in the 1997 AWS study were re-calculated to account for updated acreage classifications. The updated projection for water demand at full development in this study was approximately 74,000 acre-feet per year (see Figure 8). The 2000 Water System Master Plan water demand projection for the portions of the Tempe Water Service with SRP water supplies was approximately 63,000 acre-feet per year. The water demand projection for non-SRP portions of the service area was approximately 11,000 acre-feet per year. The revised water demand factor projection of 74,000 AF/yr at build-out or full development conditions for the Tempe Water Service Area in the 2000 Water System Master Plan was about 4% to 5% less than the currently designated (1997) AWS sources in aggregate.

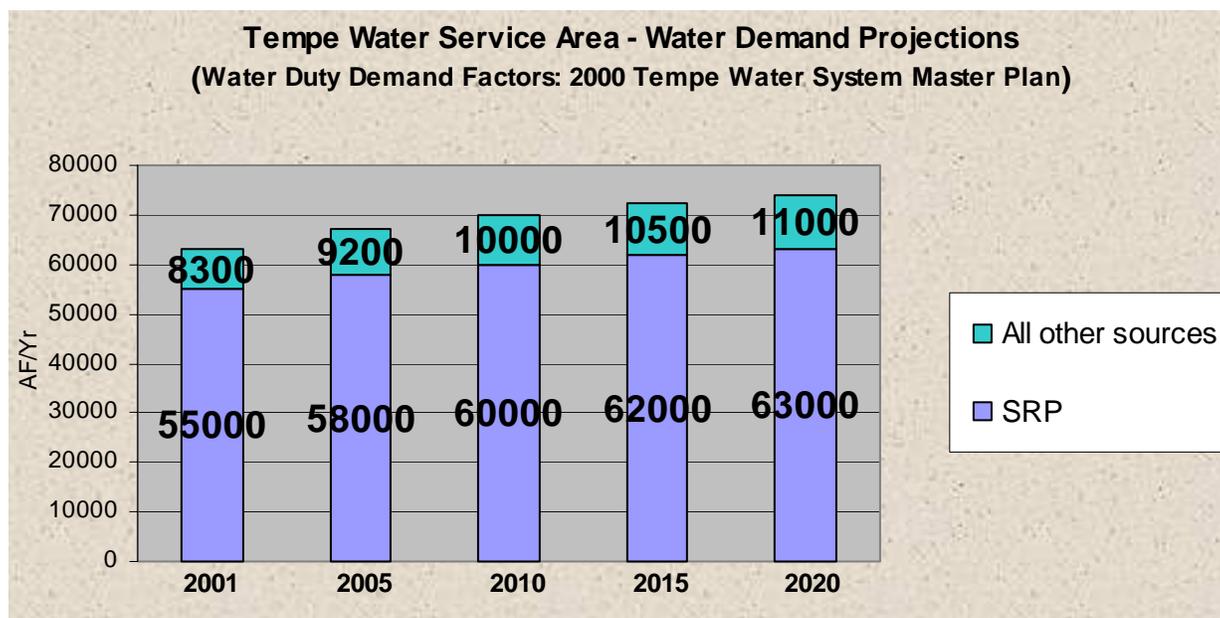


Figure 8

For the purpose of water and wastewater infrastructure distribution and collection system planning the 2000 Tempe Water and Wastewater System Master Plans developed a water demand model that predicts the maximum potential future water demand assuming increased levels of development and overall greater density of redevelopment projects. The maximum potential water demand projection numbers are necessary to properly size the water and wastewater distribution and collection system, to preclude certain portions of this infrastructure from being undersized. The Water System Master Plan model estimated the maximum potential water demand for the Tempe Water Service Area to be approximately 80,800 acre-feet per year. This maximum future water demand is about 4% greater than the currently designated (1997) AWS sources in aggregate, but is only about 1% greater than the currently available total water supply sources in aggregate due the development of new water supplies by Tempe since 1997 (expanded reclaimed water production capacity and re-use, and increased groundwater recharge storage and recovery programs). The AWS designation update prior to 2010 will include these newly developed water supply sources.

December 2006 Tempe Water Resources Plan Water Demand Projections

Development trends in Tempe over the past several years, along with a clearer picture of the density of new planned developments in the downtown, ASU and Tempe Town Lake areas, give us an opportunity to revisit our earlier land use based water demand factors and future water use projections. Increases in water use efficiency and the trend of decreasing water use in Tempe over the past six years must also be taken into account. This section will summarize the 2000 Tempe Water Master Plan water duties and demand factors, and outline the most recent water demand projections for the Tempe water service area using revised and updated water duties for all land use categories, with a new focus on areas of high density development in Tempe.

2000 Tempe Water Master Plan—Water Demand Projections

The 2000 Tempe Water Master Plan presented a summary of the total acreage for all classes of land use in the Tempe water service area. The land use water duties (acre-feet/acre/year) that were developed for the 1997 AWS study were used again in this study. The water duty factors were developed for each land use classification by examining water consumption records and trends in Tempe for each land type (i.e. residential, commercial, industrial, ...). The 1997 and 2000 water demand projections assumed full development conditions in Tempe by about 2020. The total Tempe water demand for 2020 was projected to be approximately 73,400 acre-feet per year. (See Table 1)

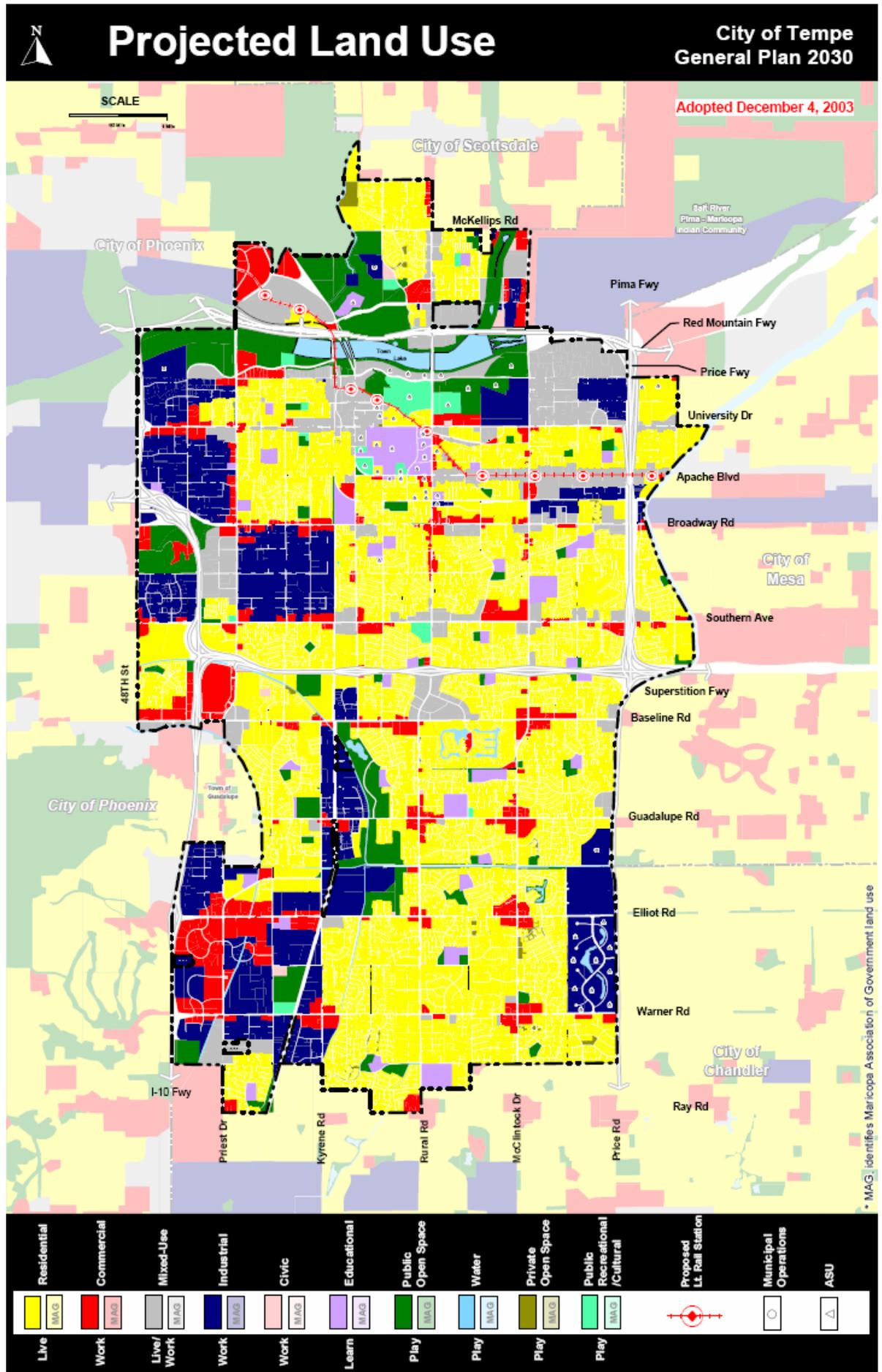
Land Category	Acreage	Demand Factor (af/ac/yr)	Demand (af/yr)	Demand (mgd)
Residential	9,295	2.75	25,561	22.8
Commercial	2,368	2.25	5,328	4.8
Government	297	2.25	668	0.6
Institutional	297	2.25	668	0.6
Industrial	4,001	3.5	14,003	12.5
Education	974	3.5	3,409	3.0
Open Space/Parks	2,551	4.5	11,480	10.2
Rights-of-Way	4,547	0.5	2,274	2.0
Undeveloped	1,506	3.5	6,777	6.1
County Islands	168	3.5	588	0.5
Guadalupe	512	2.45	1,258	1.1
Town Lake	222	6.2	1,376	1.2
Total	26,738		73,390	65.5

Table 1— Water Demand Projections for the Tempe Water Service Area at Full Development Conditions in 2020 (*from Tempe Water Master Plan, December, 2000*)

2006 Tempe Water Resources Plan Update—Water Demand Projections

The Tempe City Council adopted Tempe General Plan 2030 (GP 2030) in 2003. The GP 2030 document outlines all projected land use by category (see Figure 9). Land use categories and associated acreage approved under Tempe GP2030 are being used to revise and update projected water demands for the 2006 Tempe Water Resources Plan. Projected land use categories under Tempe GP 2030 vary somewhat from the categories outlined in Table 1, especially with respect to the category of projected “Mixed Use” development. Mixed Use developments will have both residential and non-residential components, so new water demand factors were developed for this projected land use category. Further analysis of water consumption by land use sector has also led to the development of separate water duty factors for single-family (SF) and multi-family (MF) residential sector land uses. A review of commercial and industrial water use trends in the Tempe water service area indicates that acreage that is in an existing or projected industrial land use category may actually be classified as commercial for water and sewer billing purposes. This may be the case for light industrial land use properties in Tempe that have low water or sewer use, and are categorized as commercial use in the water utility billing system. Due to discrepancies between the GP 2030 projected land use acreage and the utility billing system coding, commercial and industrial land use acreage is combined, with a new water duty developed for water demand projections. (See Table 2)

Figure 9



Land Category	Acreage	Demand Factor (af/ac/yr)	Demand (af/yr)	Demand (mgd)
Residential (SF)	7,689	2.75	21,145	18.9
Residential (MF) + Mixed Use (highest density uses)	3,896	5.0	19,480	17.4
Civic	49	2.25	110	0.1
Commercial +Industrial	5,351	3.0	16,053	14.3
Education	683	3.5	2,391	2.1
Open Space/Parks	1,943	4.5	8,744	7.8
Rights-of-Way	5,220	0.5	2,610	2.3
Recreational/ Cultural	195	3.5	683	0.6
Unassigned	378	3.5	1,323	1.2
County Islands	152	3.5	532	0.5
Guadalupe	512	2.45	1,254	1.1
Water (COT Lakes)	260	6.2	1,612	1.4
Total	26,328		75,937	67.7

Table 2— Water Demand Projections for the Tempe Water Service Area at Full Development Conditions in 2030 (utilizing Tempe GP 2030 projected land uses)

The revised water duty projections assume that redevelopment activities and increased density of development in some portions of Tempe will continue through year 2030, as outlined in Tempe GP2030. Prior water resources planning reports assumed full development conditions in the Tempe water service area by around year 2020. Extending the water demand projections through 2030 and increased density in the Mixed Use and Multi-family Residential sectors results in a slight increase in projected annual water demands at full development:. Using the revised land use classifications and water duties to project water demand in 2030 results in approximately 2,500 acre-feet per year in additional water demands at full development when compared to the earlier projections in the 2000 Tempe Water Master Plan. The revised water demand projection at full development for portions of the Tempe Water Service with SRP water supplies is approximately 65,000 acre-feet per year, and approximately 11,000 acre-feet per year for non-SRP portions of the water service area (see Figure 10).

**2006 Tempe Water Resources Plan
Tempe Water Service Area Annual Water Demand Projections**



Figure 10

The revised water demand factor projection of approximately 76,000 AF/yr at build-out or full development conditions (2030) for the Tempe Water Service Area in this 2006 Tempe Water Resources Plan Update is about 2% less than the currently designated (1997) AWS sources in aggregate (77,222 AF/yr). When compared to the additional AWS committed sources developed by Tempe since 1997, the revised water demand factor projection of approximately 76,000 AF/yr at build-out or full development conditions (2030) for the Tempe Water Service Area in this 2006 Tempe Water Resources Plan Update is about 5% less than the currently committed (2005) AWS sources in aggregate (79,716 AF/yr).

Development of a land use-based water demand model requires that water duties developed for each projected land use sector be applied to all acres designated under that projected land use category in Tempe GP 2030. This may over-estimate future water demand in some projected land use sectors, especially in the category of open space which includes areas such as Papago Park in Tempe. Thus, the future full development water demand projection of approximately 76,000 acre-feet/year is considered to be on the upper-end range of future water demand in the service area.

The future water demand projections for the Tempe water service area will be revised every few years to account for changing patterns in the density or rate of redevelopment activities. Water duties will also be adjusted when needed based on analysis of recent water consumption patterns across different land use sectors.

Tempe Water Utilities Department—Water Resources Planning Initiatives

The Tempe Water Utilities Department water resources planning efforts focus on several key areas:

- Continued reliance on renewable surface water supplies, with emphasis on the protection and legal defense of these water supplies.
- Preserving groundwater reserves for back-up water supply and/or supplemental drought supply.
- Provide safe and secure drinking water supplies to our customers at the lowest possible cost.
- Develop new renewable water supply sources, both surface water and reclaimed water.
- Store currently available excess water supplies in groundwater aquifers for future recovery and use, and develop additional groundwater recharge facility capacity.
- Increase recovery well capacity for backup water supply and drought protection.
- Establish development and redevelopment policies that take into account the water rights status of lands to be developed in the Tempe water service area.
- Maintain an effective water conservation program and develop new conservation initiatives.

Reliance on renewable surface water supplies:

Tempe has a long history of reliance on renewable and sustainable surface water supplies. The Tempe WUD works cooperatively with water supply agencies such as the Salt River Project, the Central Arizona Project, the U.S. Bureau of Reclamation, and water regulatory agencies such as the Arizona Department of Water Resources, to protect Tempe’s renewable water supply interests.

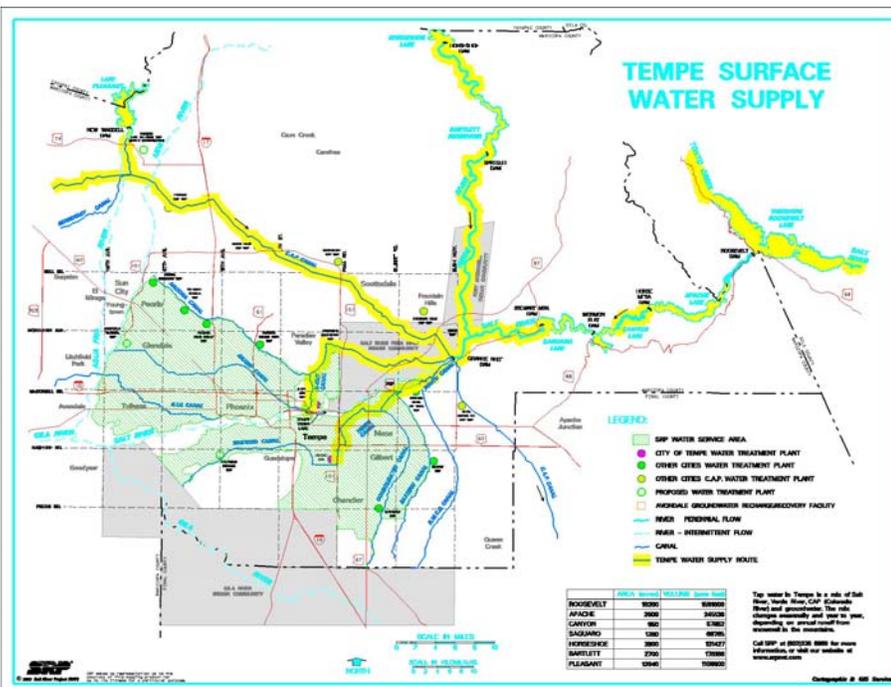


Figure 11

Implementation Strategies

- Protect the water rights to Salt and Verde River water supplies for all lands in the Tempe water service area, including rights pursuant to decreed Class A normal flow lands, SRP shareholder member lands, and rights pursuant to Modified Roosevelt NCS surface water supplies. Surface water supplies from the Salt and Verde Rivers delivered by the Salt River Project are the largest component of Tempe's assured water supply. The WUD will work with the Salt River Project to protect these rights from infringement by other parties with junior rights or users with no established rights to these surface water supplies. Be proactive in protecting Tempe's water resources through active participation in the Gila River General Stream Adjudication and ongoing water rights settlement negotiations with SRP and other water users.
- Continue to fully utilize Tempe ' s CAP M & I water subcontract allotment each year for non-member land water uses and groundwater recharge for long-term storage credits.
- Utilize excess CAP contract water for groundwater recharge and/or direct uses as available.
- Participate in Colorado River and CAP water users' stakeholder groups to protect Tempe's interests in Colorado River water supplies.
- Secure new CAP water or Colorado River water supplies for the Tempe water service area through reallocation or long-term lease for future non-member land water demands.
- Protect water resources and maintain critical habitat through participation in the National Environmental Policy Act (NEPA) and Environmental Impact Statement (EIS) procedures and habitat conservation plans (HCPs) at Roosevelt Lake, the Verde River and Lower Colorado River.
- Continue to participate in regional water supply planning efforts through membership in the Arizona Municipal Water Users Association (AMWUA), the East Valley Water Forum, the Arizona Drought Task Force, and other water users' stakeholder groups for assured water supply rules, well rules, and the Phoenix Active Management Area.



Preserve groundwater for back-up water supply or supplemental drought supply

Tempe's early agricultural heritage and decades of water management partnerships with local and regional water supply agencies and the Federal government have provided today's Tempe residents and business owners with a strong and secure portfolio of renewable surface water supplies. Class A land normal flow water supplies with senior water rights, SRP surface water supplies in storage for SRP member lands, CAP contract Colorado River water supplies, and Roosevelt Dam New Conservation Storage (NCS) Salt River water supplies can provide for nearly all of Tempe's potable water supply needs each year. Tempe's surface water supply portfolio allows the Water Utilities Department to limit the use of groundwater supplies for supplemental drought supply and as a temporary back-up water supply to meet water demands if one or both of Tempe's two water treatment plants are off-line or cannot otherwise meet water demands during that period.

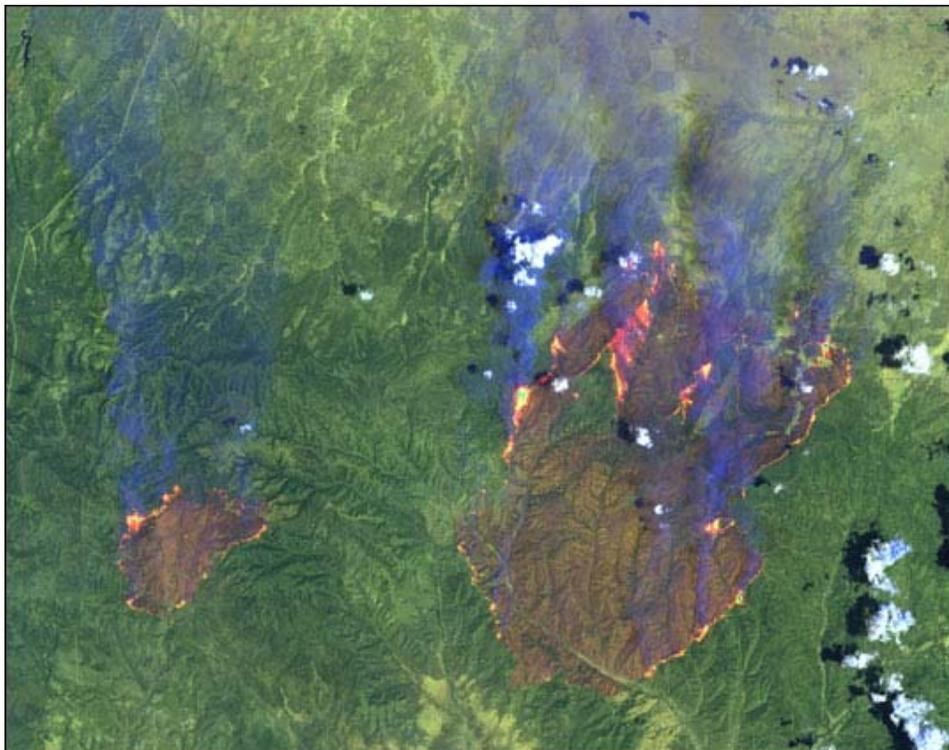
Under the terms of Tempe's Assured Water Supply Designation and Arizona's Assured Water Supply Rules Tempe is limited in the annual amount of groundwater it may withdraw to only incidental recharge (aquifer return flow – safe-yield pumping), and a phase-in groundwater allowance account. Tempe will limit its annual use of groundwater to the volumes allowed under the Assured Water Supply Rules, and use aquifer storage and recovery of renewable water supplies when needed. Tempe's objectives for its groundwater resources is that these supplies be reserved for emergency back-up water supply and for supplemental water supply during times of drought.

Implementation Strategies

- Limit the use of groundwater wells and the recovery of long-term storage credits from wells to back-up water supply conditions or drought conditions when possible.
- Through water accounting provisions track use of groundwater through the year and determine when the use of long-term storage credits is required.
- Continue to develop groundwater use plans tied to the SRP member land water allocation, the CAP M & I subcontract, the amount of NCS water in storage, and the anticipated amount of Class A land normal water delivered. In years with a full 3.0 acre-feet per acre water allocation for SRP member lands, no shortage reductions in the CAP M & I water supply, and near normal deliveries of Class A land surface water there will be no need for groundwater use as a supplemental drought supply. When any one or a combination of surface water supplies are reduced due to drought conditions the annual water supply plan for the Tempe Water Utilities Department may be adjusted to provide for a temporary increase in groundwater use, within the limits of the drought groundwater exemption set by the ADWR Assured Water Supply Rules.

Implementation Strategies, (cont.)

- Increase the bank of renewable long-term aquifer storage credits to provide additional back-up or drought augmentation water supplies when needed.
- Implement technology improvements in surface water treatment capability at Tempe's water treatment plants. In recent years surface water quality in the SRP canals that supply Tempe's water treatment plants has experienced incursions of high turbidity (sediment laden) water during the heavy watershed runoff of winter 2005, and high levels of total organic carbon (TOC) that have proven difficult to treat or have secondary effects such as the formation of disinfection by-products in drinking water. High turbidity events occurred in early 2005 during heavy precipitation on the Salt and Verde River watersheds following several years of drought and large scale forest fires. High TOC events have occurred from mid-2005 through summer 2006, as the runoff from burned areas of the watershed combined with submerged vegetation at Roosevelt Lake have resulted in high TOC levels in water released from SRP reservoirs. Groundwater wells in Tempe have been used as a back-up supply to assist the surface water treatment process during these periods. Technology improvements planned at Tempe's water treatment plants, such as granular activated carbon contactors and UV disinfection, will improve the water treatment capability at each plant and reduce the need to use back-up groundwater wells.



Rodeo-Chediski Fire in the Salt River Watershed
(June, 2002)

Provide safe and secure drinking water supplies to customers at the lowest possible cost

Drinking water can include contaminants such as microbes, radionuclides, inorganic and organic contaminants, and disinfection by-products. Under the Safe Drinking Water Act the U.S. Environmental Protection Agency (EPA) sets legal limits on the levels of certain contaminants which reflect both the level that protects human health and the level that water systems can achieve using the best available technology. Besides prescribing these legal limits EPA rules set water-testing schedules and methods that water systems must follow. The rules also list acceptable techniques for treating contaminated water. Currently, more than 90 contaminants are regulated.

Tempe has consistently met all drinking water standards since passage of the Safe Drinking Water Act in 1974. The Tempe Water Utilities Department constantly reviews upcoming regulations to ensure that current water quality meets all future drinking water standards.

Implementation Strategies

- Plan and manage treatment processes to ensure drinking water is of the highest possible quality.
- Plan and manage water distribution practices to prevent the formation of contaminants within the City's water distribution system.
- Maintain a vigorous water quality sampling and analysis program to detect any current or potential future drinking water limit exceedances.
- Implement planned technology improvements in water treatment infrastructure at Tempe's two water treatment plants.
- Evaluate alternative or new technologies, as they become available, which may produce an even higher quality of drinking water.
- Evaluate and implement distribution system programs, such as increased monitoring and periodic system flushing, to ensure the highest possible level of protection from contaminants for all customers.
- Participate in national and regional partnerships such as the "Partnership for Safe Water", and "Tap Into Quality", where strategies for delivering high-quality drinking water are shared between water providers.
- Annually distribute the "Tempe Water Quality Report", a consumer confidence report which provides customers with summaries of drinking water quality delivered throughout each year. You can view a copy of the most recent Tempe consumer confidence report at:

<http://www.tempe.gov/water/ccr.htm>

The Tempe Water Utilities Department mission is to provide our water and wastewater customers the highest levels of utility service. The Tempe Water Utilities Department is operated consistent with efficient financial and business practices to keep our customers' water and wastewater rates among the lowest in Arizona.

Implementation Strategies

- Gradual phase-in of necessary water and wastewater rate adjustments to minimize impacts on our utility customers and to assure fair and equitable cost of service allocation across customer classifications.
- Design water treatment and wastewater treatment expansions at the most cost-effective facilities on a per-unit treatment cost basis. Planned expansions at the Martinez Water Treatment Plant, the 91st Ave. Wastewater Treatment Plant, and the Tempe Kyrene Water Reclamation Facility are proceeding based on achieving the overall lowest per-unit treatment costs at these facilities, compared to expansions at other facilities or constructing new facilities.
- Work Force Restructuring: The Tempe Water Utilities Department has undergone a re-engineering effort to streamline the utility work force. The re-engineering efforts have resulted in a 9% reduction in the number of positions since 1997 and the implementation of cross training and a skill based pay system. The Tempe Water Utilities Department operating budget has realized a savings of over \$1,000,000 per year through these efforts since 1997.
- Utilization of new technology at Water Utility Department facilities to reduce operating costs.
- Strict enforcement of Tempe's wastewater pretreatment ordinance.
- Relocation of workforce to sites closer to customers, decreasing response time and vehicle mileage.
- Continue to offer more convenient and efficient payment options for our utility customers. The Tempe Customer Service Office offers multiple payment options to our customers, including the Customer Service Office downtown at 20 East Sixth Street, Sure Pay, an automatic payment withdrawal from a customers checking account, or an option to pay your bill on-line.

Develop new renewable water supply sources

The City of Tempe will have sufficient renewable surface water supplies to meet the projected future water demands on SRP member lands and Class A normal flow lands within the Tempe Water Service Area, approximately 80% of all lands within the water service area. For the 20% of the Tempe Water Service Area that is located on non-member land new renewable water supplies should be developed to firm up existing supplies and to assure a more dependable annual supply of sustainable water resources for these areas.

Reclaimed water is an important component of the City of Tempe's renewable water resource portfolio. The City of Tempe's objective for its reclaimed water supply is to fully utilize this resource for a wide range of appropriate non-potable uses. The use of reclaimed water conserves the use of surface water or groundwater supplies and can be used for water exchange purposes resulting in greater water use efficiency.

Implementation Strategies

- Secure new CAP water or Colorado River water supplies for the Tempe water service area through reallocation or long-term lease for future non-member land water demands.
- Continue to store CAP water, reclaimed water, and Roosevelt NCS water through aquifer recharge programs for long-term storage credits and future recovery.
- Develop additional groundwater recharge and underground storage facility capacity.
- Provide reclaimed water to the Salt River Project for industrial use at the SRP Kyrene Generating Station in exchange for surface water credits from SRP.
- Provide reclaimed water to the Ken McDonald Golf Course for irrigation uses, conserving SRP surface water supplies otherwise used to irrigate the golf course. The use of reclaimed water to irrigate the golf course also provides water exchange credits to Tempe.
- Develop additional reclaimed water treatment capacity at the Tempe Kyrene Water Reclamation Facility through expansion of the facility. (*Expansion project now completed.*)
- Utilize new membrane technology in wastewater treatment to improve the dependability and efficiency of the Kyrene Water Reclamation Facility, and to achieve an even higher quality of reclaimed water.
- Store excess reclaimed water for long-term storage credits through the aquifer recharge project at the Ken McDonald Golf Course, utilizing aquifer storage and recovery (ASR) injection wells to store reclaimed water in the upper alluvial aquifer for later recovery.

Implementation Strategies, (cont.)

- Deliver reclaimed water for irrigation reuse at Kiwanis Park after expansion of the Kyrene Water Reclamation Facility in 2006. This reuse program will save over 400 acre-feet of SRP water supplies each year, which will also accrue as exchange credits to Tempe.



Tempe Kiwanis Park

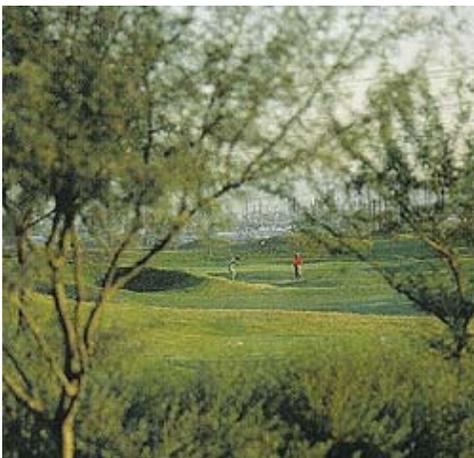
*potential reclaimed water reuse location:
irrigation supply*

- Continue to advance plans to develop additional direct non-potable water reuse sites for reclaimed water produced at the Kyrene Water Reclamation Facility.

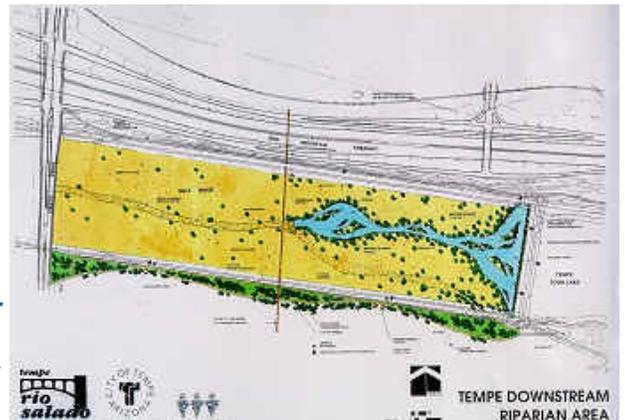
Potential New Reclaimed Water Reuse Sites in Tempe:



Tempe Town Lake: supplemental water supply



*ASU Karsten
GC & Tempe
Rolling Hills GC:
irrigation supply*



*City of Tempe/U.S. Army
Corps of Engineers: Rio
Salado Riparian Habitat*

Implementation Strategies, (cont.)

- Work with the Sub-Regional Operating Group (SROG) partnership at the 91st Ave. Wastewater Treatment Plant to maximize the use of uncommitted reclaimed water from that facility through groundwater recharge projects, water reuse projects, or water exchanges.
- Explore other partnerships for wastewater treatment and reclaimed water reuse.

Store currently available excess water supplies in groundwater aquifers for future recovery and use, and develop additional groundwater recharge facility capacity.

The Tempe Water Utilities Department will continue ongoing efforts to increase Tempe's stored aquifer water supplies for the future through the establishment of a large bank of long-term storage credits. Tempe will plan to continue using CAP M & I contract water, CAP excess contract water, Roosevelt Dam NCS water, and reclaimed water supplies to recharge our local aquifers. These long-term storage credits will be stored for future recovery to meet projected future non-member land water demand and for use during drought periods when surface water supplies are reduced.

The Tempe Water Utilities Department will pursue new opportunities to increase its direct groundwater recharge facility capacity, both at the Tempe Ken McDonald Golf Course Groundwater Recharge Project and by securing additional firm or leased capacity at other existing groundwater recharge facilities or new recharge facilities.

Implementation Strategies

- Continue programs to store CAP contract water and Roosevelt NCS surface water supplies in aquifers through direct recharge projects like the Granite Reef Underground Storage Project (GRUSP) or through in-lieu recharge projects such as Salt River Project Groundwater Savings Facility (SRP GSF).
- Expand the Tempe Ken McDonald Golf Course Recharge Project and improve recharge technology through the installation of up to three aquifer storage and recovery (ASR) recharge wells. Recharge a portion of Tempe's reclaimed water supply to the aquifer for storage credits each after completion of construction at the Kyrene Water Reclamation Facility in 2006.
- Explore opportunities to increase Tempe's firm recharge storage capacity at GRUSP, and examine other opportunities to secure firm recharge capacity at other existing recharge facilities or new recharge facilities.

Increase Recovery Well Capacity for Back-up Water Supply and Drought Protection

Tempe's municipal water system will be better served with a greater level of water production facility redundancy between surface water treatment plants and wells. Increasing Tempe's recovery well production capacity will provide a higher level of back-up water production reliability during droughts, emergencies, or surface water conditions that require the use of wells as a supplemental supply

Implementation Strategies

- Continue to move forward with the 2000 Tempe Water Master Plan recommendation of adding six (6) new production/recovery wells to the Tempe system by 2010. This includes drilling new municipal production wells within the Tempe water service area and establishing direct connections to several existing SRP wells in the Tempe water service area. Several of these new well projects are now in progress.
- Implement production performance and/or water quality rehabilitation projects at several older municipal production/recovery wells.
- Continue to investigate opportunities to implement another recommendation of the 2000 Tempe Water Master Plan: Installation of new production/recovery wells as an alternative industrial water supply for select large industrial water customers. One alternative water supply well project has been studied for the Coca Cola Bottling Plant that shows promise for locating a future well site at that facility.
- Initiate further study of wellhead treatment alternatives for several older City wells that are impacted by low levels of contaminants present in the aquifer, and continue design work on a pipeline to connect one of these wells to the J.G. Martinez Water Treatment Plant to provide blending with surface water.
- Plan for an increase in total municipal production/recovery well capacity from a current level of 20-25 MGD to a level of 40-45 MGD by 2015.
- Negotiate a mutually beneficial agreement with SRP to develop joint use production well projects within the Tempe water service area.
- Examine other partnerships for sharing production/recovery well capacity to be used for supplemental drought supply and aquifer management.

Establish Development and Redevelopment Policies that take into Account the Water Rights Status of Lands to be Developed in the Tempe Water Service Area

The Tempe Water Utilities Department will work with the Tempe Development Services Department, the Tempe Community Development Department and other parties to continue to encourage industries and commercial enterprises considering locating their businesses to Tempe that we will provide them with top rated water and wastewater utility services, with one of the most secure future water supply portfolios of any community in the southwest .

One of the planning tools recommended by the Water Utilities Department in working with the development community to locate new businesses and developments in Tempe is that we take into account the water rights status of lands where the development will occur. Larger, more water-intensive industry, for example, is best served by locating on lands holding the most diverse and senior water rights portfolio. In the Tempe water service area, these areas include SRP member lands that also possess Class A land decreed water rights, approximately 65% of all lands within the water service area (see Figure 2 on Page 10 for more detail).

Another planning tool for future development of industrial uses in Tempe will be the opportunity to work up front with new industries in examining new technologies in water use efficiency and water recycling, or examining the potential for alternative water supplies, such as reclaimed water or on-site recovery wells.

City of Tempe Water Conservation Programs

The Tempe Water Conservation Office was established to provide assistance to Tempe residents and water customers in water use savings and efficiency, and to comply with State mandates and requirements of the Arizona Department of Water Resources (ADWR). The Tempe Water Conservation Office is staffed by two full time professional water conservation experts. The Water Conservation Program offers a variety of educational opportunities, publications, and financial incentives to adopt efficient water use practices at homes and businesses in Tempe. Overall water use in Tempe has declined for five straight years (see Figure 5), due in part to the many successful programs offered by the Tempe Water Conservation Office, which include:

- Residential sector water conservation programs
- Xeriscape landscape conversion rebates
- Low flow toilet rebates, including new multi-family sector rebate program
- Commercial/Industrial sector water conservation programs
- Commercial/Industrial sector water conservation grants
- School programs/grants
- Water wasting ordinance
- Landscape ordinance
- Xeriscape design and irrigation system classes and workshops
- Tiered water rate structure to encourage water conservation and water use efficiency

The City of Tempe's water conservation programs are administered under the ADWR Non-Per Capita Conservation Program (NPCCP). This program focuses conservation efforts across all water use sectors to achieve water use efficiency and water conservation awareness within Tempe's water service area. The Tempe NPCCP consists of a series of "best management practices" agreed upon and stipulated by the State of Arizona to meet the goals of ADWR's Third Management Plan for the Phoenix Active Management Area. The elements of the program agreement include two residential interior measures, five residential exterior measures, two non-residential interior measures, two non-residential exterior measures, and an education measure. Each water conservation measure, or best management practice, is referred to as a Reasonable Conservation Measure, or RCM. The City of Tempe will continue to administer its water conservation programs under the ADWR NPCCP throughout the Phoenix AMA 3rd Management Plan period (through at least 2010), and will transition to the Modified NPCCP under the Phoenix AMA 4th Management Plan.

Implementation Strategies for Water Conservation Efforts Under Tempe's NPCCP

- **Residential Low Flow Plumbing Rebate Program**

This RCM encourages Tempe homeowners to replace older, existing high water use toilets with more efficient models consistent with the Arizona Water Efficient Plumbing Act. Rebates are granted for 50% of the purchase price of these toilets, up to \$75.00 per toilet. The Program is advertised in different venues to insure all residents can participate. Applicants will be required to submit an application form and the original receipt of purchase of these low flow devices to meet eligibility requirements. In 2004, this program was expended to include multi-family residences within the Tempe water service area. The Tempe Water Conservation Office realized the potential to expand this RCM in an effort to target water savings at many of the older multi-family apartment and condo properties in Tempe that were not able to take advantage of the original toilet rebate program for single family properties. The multi-family toilet rebate program also offers a 50% rebate for each installation of a low flow toilet, up to \$75.00 for each toilet. The maximum rebate for any one multi-family property retrofit project is \$5,000.00.

- **City Ordinance Prohibiting the Installation of Plumbing Fixtures in New and Existing Residential Housing that does not meet Water Saving Performance Standards**

City of Tempe ordinance # 98.23 outlines the maximum flow rates of plumbing fixtures that would be allowed to be installed in new residential homes and existing homes that have requested permits for additions or alterations. This ordinance also requires evaporative cooling systems and decorative fountains be equipped with water recycling or reuse systems. Implementation of this ordinance includes an inspection and enforcement program to ensure compliance.

- **Maintain a Water Distribution System Water Audit Program**

One component of this RCM provides for at least 10% of Tempe's water distribution system to be investigated for leaks each year. High-tech ultrasonic devices are utilized to inspect all water distribution pipelines, valves, and hydrants for leaks in designated areas of the water service area each year. In recent years approximately 20% of the water distribution system has been monitored for leaks each year using this technology. Another component of this RCM is administration of Tempe's ten-year water meter replacement program. This program replaces or repairs malfunctioning or leaking meters identified by WUD personnel or residents and records a database for those meters. Other components of this RCM include accuracy of meters at production wells, and tracking monthly water deliveries, water production and water sales to help identify possible losses in the system.

Implementation Strategies, (cont.)

- **Provide Landscape-watering Advice to Residents to Save Water**

Information is made available to any water customer requesting landscape-watering advice.

This information includes:

- ⇒ Publications, flyers, brochures, and water schedule cards that illustrate the value of using irrigation scheduling designed to reduce water lost to evaporation.
- ⇒ Information on the proper setting and adjustment of irrigation timers.
- ⇒ Information on plant evapotranspiration (ET) and how this information can be applied to save water.
- ⇒ Regular schedule of Tempe Water Conservation Office irrigation efficiency and drip irrigation design workshops for residents and water customers.

- **Model Home Ordinance in New Residential Developments**

City of Tempe ordinance #808.9803 requires new model homes in residential subdivisions to meet water efficiency standards. This is accomplished by limiting the amount of water intensive landscaping allowed on model homes to no greater than 20% of the landscaped area. The ordinance for model homes limits the use of water intensive landscape to where it is functionally useful, for example, play areas or close to the home for energy efficiency. The ordinance also requires installation of efficient irrigation systems and plans for plants installed in desert landscaping to be on the State's low water use plant list.

- **Low Water Use Landscape Rebate Program for New and Existing Residential Customers**

This landscape rebate program offers residents a one-time rebate of \$250 to convert a whole front or back yard of grass to low water use desert landscaping (xeriscape), \$500 if both a front and back yard are converted to a xeriscape design. To qualify for the landscape conversion rebate a before-and-after series of photos must be submitted along with the rebate application form and receipts. In conjunction with this rebate program the Tempe Water Conservation Office also offer the following services:

- ⇒ Publications, brochures and information on xeriscaping and low water use plants.
- ⇒ The Tempe Water Conservation Office offers xeriscape workshops to educate residents on appropriate design and installation techniques for installing low water use desert landscapes.
- ⇒ The City of Tempe Water Conservation Office will issue rebate applications upon request. Call (480) 350-2668 to request a landscape rebate application form.

Implementation Strategies, (cont.)

- **Enforcement of Water Efficient Plumbing Fixtures in New Non-Residential Facilities**

City of Tempe ordinance #98.23 is a low flow plumbing ordinance for the non-residential sector relating primarily to fixtures that would be installed in a non-residential setting. Typically, toilet fixtures and sinks are different than those installed in residential properties. Metered faucets and other new conservation devices are becoming commonplace in these settings. This ordinance ensures these fixtures adhere to the standards set forth within the original parameters of the ordinance. The ordinance also covers restrictions on decorative fountains and evaporative coolers.

- **Distribution of Conservation Information to New Non-Residential Customers and Submittal of Water Use Plans**

This RCM requires new non-residential facilities with a potential to use 10 acre-feet or more of water each year to file a water use report. This report details conservation strategies and technology that will be incorporated into their new facilities. These customers must demonstrate they are using the latest technology in process related water use and if a cooling tower will be part of their design. Landscape and domestic water use is also examined. This is also useful from a water demand management perspective, to determine total quantity of water that could be used by the new non-residential facility. The water conservation report is outlined in City of Tempe ordinance # 92.27.

- **Non-Residential Landscape Ordinance**

City of Tempe ordinance #808.9803 limits the amount of water intensive landscape that can be installed in new non-residential developments. The term water intensive is defined as: "Land with a permanent water application system that is planted with plants that are not on the State's low water use list". The ordinance limits the amount of water intensive landscape installed to no more than 20% of the landscape area in excess of 10,000 square feet.

- **Industrial Rebate Grant Program**

This Grant Program offers funds to any non-residential water customer in our service area that can save a minimum of 15% of their total water usage. Areas of water savings can be from process changes, cooling tower reductions, landscape watering savings, or a combination of these efforts. Participating industries or commercial water users have to demonstrate the potential for water use reduction in the grant application and funding is contingent upon the achieved results. Industrial Grants are available for up to 50% of the cost of the project, with a maximum grant of \$20,000.

Implementation Strategies, (cont.)

In business planning, industries may not always look to save money in their bottom line from water use reductions. Water is relatively inexpensive for many businesses compared to other operating expenses, and to show that installation of water saving devices will pay for themselves within several years may be hard to accomplish. This incentive program is designed to help close the installation cost gap so participating companies can realize a reasonable payback time frame on their investments while assisting the City of Tempe's water conservation goals.

- **Public Information and Education Campaign**

This may be the single most important aspect of our water conservation strategy. Continual conservation education is the only way to encourage changes in customer's habits and water use patterns. This RCM addresses all of the other RCM's in the dissemination of information to the public. Some of the current and future program components include:

- ⇒ Xeriscape demonstration garden – To show residents the look and feel of desert landscaping and what could be achieved in their own yards.
- ⇒ Xeriscape Workshops – To demonstrate the proper planning, design, installation and maintenance techniques of desert landscaping.
- ⇒ Drip Irrigation and Scheduling Workshops – To demonstrate the proper design, installation, care and scheduling of water efficient irrigation systems.
- ⇒ Primary school education – The City has contracted to provide all of our Public Schools (Water Conservation Education Assemblies) programs to teach our youngest residents the value of saving our precious natural resources.
- ⇒ Distribution of brochures and literature outlining the most up to date conservation information.
- ⇒ Participation in the Statewide Media Campaign "Water Use it Wisely" – This sends a consistent message to our residents at a much lower cost than we would be able to do on our own.
- ⇒ Marketing water conservation ideas and strategies in a variety of methods through newsprint, direct mailings, water bill inserts, newsletters, and handouts.
- ⇒ Distribution of retrofit kits to bring older pre-1980 homes up to current plumbing code standards. Kits include faucet aerators for the kitchen and bathrooms, toilet displacement devices, and low-flow showerheads.
- ⇒ School Garden Grants Program – Offering grant monies to public schools to introduce gardening, proper watering techniques and low water use plant material to students.

Implementation Strategies, (cont.)

⇒ Continued participation in the Arizona Municipal Water Users Association (AMWUA) Conservation Committee, a regional conservation program comprised of nine neighboring communities working together toward a common goal – Water Use Efficiency.

- **Enforce the water-wasting ordinance**

City of Tempe ordinance # 91.46 is a water-wasting ordinance that prohibits water from leaving a customer's property and going to an easement, alley, sidewalk or right-of-way. This ordinance is intended to prevent water waste from broken irrigation systems or unattended uses of water, such as leaving a hose running. The ordinance is enforceable with fines after a second written warning, however, it is intended primarily as an outreach effort to notify property owners that a complaint has been filed and to work with them to prevent the ongoing waste of water .

- **Work with city staff to develop a comprehensive water conservation plan for city parks and turf-related facilities**

Examine options for additional water conservation potential at city parks, lakes, and turf facilities through system upgrades and new technology.

- **Tiered water rate structure to encourage water conservation and water use efficiency**

The Tempe City Council has established a tiered, or an inverted block, water rate schedule to encourage water conservation savings and the efficient use of water. The water rate schedule effective November 1, 2006 establishes progressively higher water consumption rate charges for each increasing block of water used. The current water rate schedule is outlined in Table 3 on the next page.

The following fee structure shall be established for the consumption rate for water service effective November 1, 2006:

CONSUMPTION	INSIDE TEMPE AND GUADALUPE (PER 1,000 GALLONS)	OUTSIDE TEMPE AND GUADALUPE (PER 1,000 GALLONS)
First 8,000 gallons	\$.93	\$1.20
Next 7,000 gallons	1.00	1.28
Next 10,000 gallons	1.09	1.42
Next 25,000 gallons	1.16	1.50
Next 50,000 gallons	1.28	1.67
Over 100,000 gallons	1.32	1.73

Table 3—Tempe Tiered Water Rate Schedule

Long Range Goals for Water Conservation

- ⇒ Work with non-residential customers to identify new and cost-effective technology to help them save water and make them aware of the Industrial Conservation Grant Program.
- ⇒ Explore the feasibility of a landscape irrigation efficiency ordinance that would create standards for drip irrigation systems.
- ⇒ Expand our arboreal garden in north Tempe that demonstrates low water use desert trees and plants for the public to see their growth characteristics and watering requirements.
- ⇒ Attend more homeowners association meetings and look for creative and cost effective measures related to water use reduction.
- ⇒ Become more familiar with the whole range of multi-family developments in Tempe and look for additional ways to help them reduce their water consumption.
- ⇒ Examine undeveloped lands and lands slated for redevelopment in our service area and make a determination of what their water uses might be. Use a proactive approach to maximize the water conservation potential for new developments.
- ⇒ Examine redevelopment trends in Tempe to determine if there is more conservation potential.
- ⇒ Transition from the current NPCCP plan under the 3rd Management Plan to the Modified NPCCP during the 4th Management Plan.

Tempe Drought Plan Summary

Tempe Drought Plan Background

The Tempe Water Utilities Department prepared a report for the Tempe City Council in 2002 outlining Tempe's drought planning and water management strategies. In 2004, the Tempe Water Service Area Drought Plan was updated with results and data from 2003 and recommendations for implementing Stage 2 of the drought plan if necessary in the future. The Tempe City Council approved the measures outlined in the Tempe Drought Plan at a City Council Issue Review Session in September, 2004.

Stage 1 of the Tempe Drought Plan was implemented in 2003 and 2004 when the SRP Board of Governors reduced the water allocation for SRP member lands from 3.0 acre-feet per acre to 2.0 acre-feet per acre. The 2004 drought plan included additional proposed measures to be included in Stage 2 of the plan if the SRP member land water allocation was reduced to 1.5 acre-feet per acre in any year due to drought conditions, or the CAP M & I subcontract water allocation was reduced by 50% or greater due to drought conditions, subject to further approval by the Tempe City Council.

Overall water use in the Tempe water service area was reduced during implementation of Stage 1 drought planning measures in 2003 and 2004, due in part to following the recommendations of the Tempe drought plan. Total water use for water delivered through the Tempe municipal water system was 58,657 acre-feet in 2002, dropping to 55,916 acre-feet in 2003 and 53,972 acre-feet in 2004 (see Figure 5 on page 19 for more detail). Drought plan measures include reductions in water use at city facilities, a reduction in SRP irrigation water deliveries to city parks and residential flood irrigation customers due to the SRP water allocation cut-back, a voluntary program to encourage water customers to eliminate winter lawn over-seeding, and an increased public information campaign. The following examples illustrate results when Stage 1 measures were implemented in 2003:

- 13.1% reduction in SRP irrigation water use at Tempe city parks
- 15.4% reduction in SRP residential flood irrigation water use in Tempe
- 13.1% reduction in irrigation water use at the Tempe Ken McDonald Golf Course
- No winter grass over-seeding at Tempe city parks or city facilities, except at golf courses
- 9.6% reduction in single family residential water use for the three-month fall period in 2003, reflecting savings from a voluntary program to encourage water customers to eliminate winter lawn over-seeding
- 4.7% reduction in total water use in Tempe in 2003, and another 3.5% reduction in 2004

Other measures that were implemented in 2004 included improvements to several water efficiency rebate programs offered by the Tempe Water Conservation Office. The Tempe Water Conservation Program had previously offered a one-time residential low water use landscape conversion rebate of \$100 for homeowners that converted a whole front or back yard from grass to a low water use xeriscape design. In 2004, the landscape conversion rebate was increased to \$250 for converting a front or back lawn from grass to a xeriscape design, \$500 if both a front and back yard are converted to low water use plants. The larger rebate payout and public information campaign increased the number of landscape conversion rebate applications by about 40% over the first year. To date, over 1,370 xeriscape conversion rebates have been processed for landscape conversions in the Tempe water service area.

The second measure implemented in 2004 was to expand the low flow toilet rebate program to the multi-family residential sector. The Tempe Water Conservation Staff recognized the significant water conservation potential in promoting conversions to low water use toilets at many of the older apartment complexes in Tempe that were still equipped with older, high water use models. Multi-family properties were previously not eligible for this rebate under the toilet rebate program targeted for older, single-family homes. Under the new rebate program, multi-family properties are eligible for a rebate of 50% of the cost of installing each low flow toilet, up to \$75 per fixture. The maximum rebate for any multi-family residential complex is \$5,000.

Augmentation

The other primary component of Tempe's drought plan is water supply augmentation, to plan for alternative water supplies during times of prolonged surface water shortages and provide for the necessary infrastructure to recover these water supplies.

Key elements of water supply augmentation

- *Increase groundwater and recovery well production capacity for back-up water supply and supplemental drought supply*

Action Items

⇒ Two (2) new municipal production/recovery wells have been brought on-line since 2000. A third new well is being equipped and will be brought on-line in 2007, and a pipeline project will connect an existing production/recovery well to the J.G. Martinez Water Treatment Plant. *At least three additional municipal production/recovery wells are planned by FY 2009/2010.*

- ⇒ Rehabilitation of older municipal wells to improve production, performance, and water quality. *Five (5) wells have had significant rehabilitation or modification upgrades in the past three years.*
- *Request approval of a drought groundwater pumping exemption from the Arizona Department of Water Resources (ADWR) pursuant to the Arizona Assured Water Supply Rules*

Action Items:

- ⇒ Due to a reduction in the SRP stored surface water allocation in 2003 and 2004, Tempe is eligible for a drought exemption for groundwater use in both years. Tempe requested approval from ADWR for a drought exemption for 8,622 acre-feet of municipal groundwater use in 2003, and 10,908 acre-feet of municipal groundwater use in 2004, at the time the annual water use reports for those years were filed (SRP groundwater and groundwater from Tempe municipal wells). ADWR has not yet ruled on the exact volume of groundwater use eligible for drought exemption pumping in those years.
- *Store excess CAP water or reclaimed water in groundwater aquifers for future recovery during surface water shortages*

Action Items:

- ⇒ Over 96,000 acre-feet of CAP water and reclaimed water (predominantly CAP water) have been stored in groundwater aquifers by Tempe through direct or in-lieu recharge projects. Over 50,000 acre-feet have been stored since 1998. *Tempe has scheduled delivery of 5,000 acre-feet of CAP incentive recharge water to be stored for long-term storage credits and future use by Tempe at the SRP Groundwater Savings Facility in 2007.*
- *Increase direct use and storage of reclaimed water supplies, and utilize reclaimed water exchange provisions to develop new water supplies*

Action Items:

- ⇒ The Ken McDonald GC Groundwater Recharge Project was fully permitted in 2001, storing reclaimed water in the upper aquifer in addition to reclaimed water used for irrigation at course. *The Tempe Water Utilities Department plans to increase recharge capacity and upgrade to ASR recharge wells at this facility over the next several years.*



⇒ The Water Utilities Department negotiated a reclaimed water exchange agreement with SRP to deliver reclaimed water to SRP Kyrene Generating Station. This exchange initially results in approximately 1,500 to 2,000 acre-feet of new exchange surface water supply per year for Tempe when the SRP Kyrene Generating Station is in full operation. *Provisions of the agreement provide for an increase in the water exchange rate for Tempe in 2010.*



SRP Kyrene Generating Station

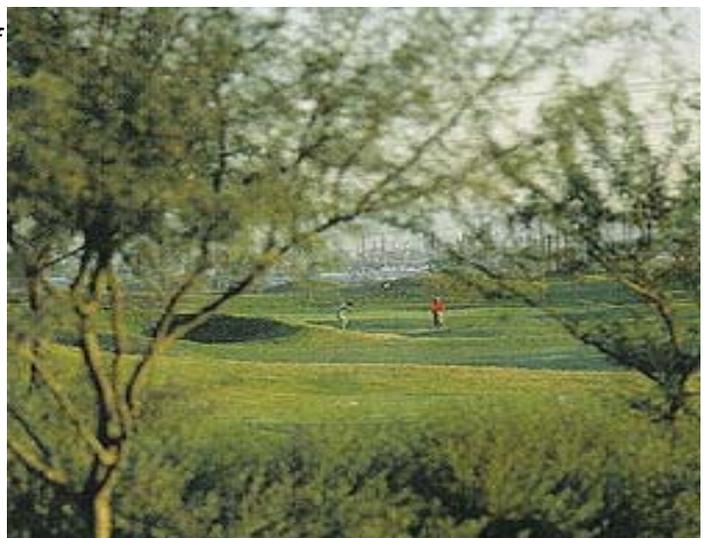
⇒ The Tempe Water Utilities Department plans to add new reclaimed water infrastructure to deliver additional reclaimed water supplies to new reuse sites, potentially including Kiwanis Park, the Tempe Town Lake and adjacent turf facilities such as Rolling Hills Golf Course and ASU's Karsten Golf Course. *The Tempe General Plan 2030 addresses these new uses of reclaimed water in the Water Element chapter and the Growth Element chapter. Tempe General Plan 2030 was adopted by the citizens of Tempe in the May, 2004 election.*



Kiwanis Park



Tempe Town Lake



ASU Karsten Golf Course

- *Increase direct municipal use of available excess CAP water supplies to partially offset reduction in SRP stored water allocation.*

Action Items:

⇒ Total CAP water used in Tempe for municipal water deliveries increased from 4,700 acre-feet in 2002 up to just under 8,000 acre-feet each year in 2003 and 2004. Additional CAP water that was available in those years pursuant to Tempe's excess CAP water contract was delivered to partially offset the reduction in the SRP stored surface water allocation in those years. *Tempe's use of excess CAP water to augment SRP stored surface water shortages ended in 2005 and 2006 with a return to the full SRP stored water allocation for SRP member lands. Excess CAP water availability will decrease in the future as contracting CAP water users grow into use of their full CAP water allocations, or during times of shortage on the Colorado River system.*

Current Drought Status in the Southwest

Near the end of 2004 and through the winter of 2004/2005 significant precipitation across the Salt and Verde River watersheds eased drought conditions in the region. The December, 2004 through May, 2005 runoff on the Salt and Verde River watersheds was 2,249,790 acre-feet, significantly above the long-term median runoff of 651,000 acre-feet from the watershed over this 5 month time period. Slightly over 1,000,000 acre-feet of water spilled over Granite Reef Dam between December 30, 2004 and April 3, 2005, most of it from already full reservoirs on the Verde River side of the SRP system. The New Conservation Storage (NCS) capacity at Roosevelt Dam partially filled for the first time, coming within 3 feet of the maximum water conservation pool elevation and accruing NCS water storage credits for the participating Plan 6 cities.

Drought conditions returned to the Salt and Verde River watersheds during the winter of 2005/2006. The December, 2005 through May, 2006 runoff on the Salt and Verde River watersheds was only approximately 133,000 acre-feet, significantly below the long-term median runoff of 651,000 acre-feet from the watershed over this time period. This was the second lowest winter runoff total on the Salt And Verde River watersheds on record, with the lowest occurring in 2002. The past two winter seasons remarkably demonstrate the extreme annual variability of runoff on the Salt and Verde River watersheds and the water storage benefits provided by the reservoirs on the SRP system and the reservoirs on the Colorado River system.

Following the dry winter of 2005/2006, the 2006 summer monsoon season in Arizona produced above average rainfall and runoff throughout much of the State. In August alone watershed runoff into the SRP reservoir system was over 167,000 acre-feet, exceeding the inflow over the entire 2005/2006 winter runoff season.

At the end of 2006, the SRP reservoir system is at 61% of capacity (Roosevelt Lake is at 64% of capacity). The Colorado River reservoir system is at 57% of capacity (Lake Powell is at 50% of capacity and Lake Mead is at 55% of capacity). Much of Arizona remains under moderate drought conditions at this time according to the U.S. Drought Monitor (Figure 12), however, some improvement in the drought status in Arizona is anticipated (Figure 13).

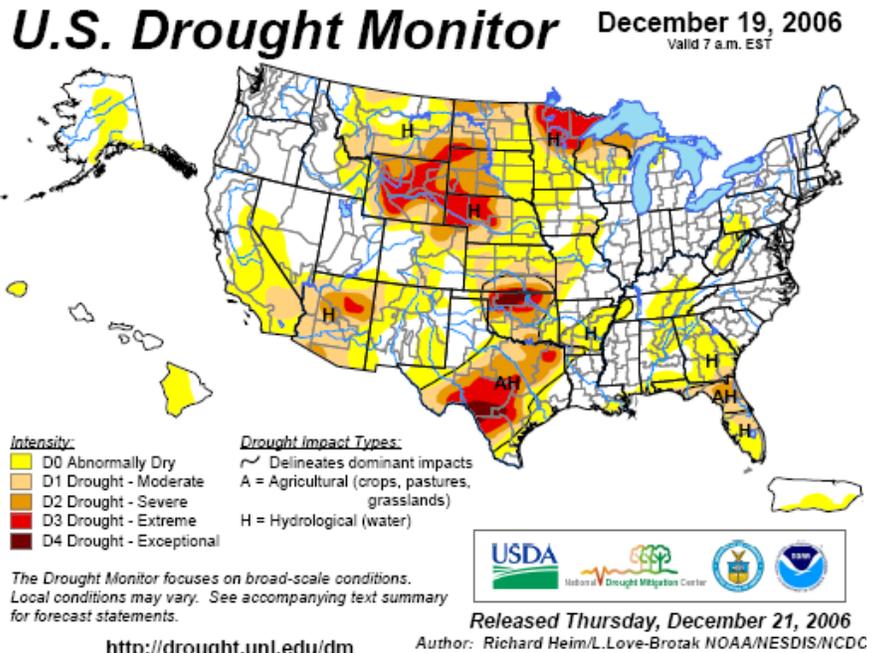
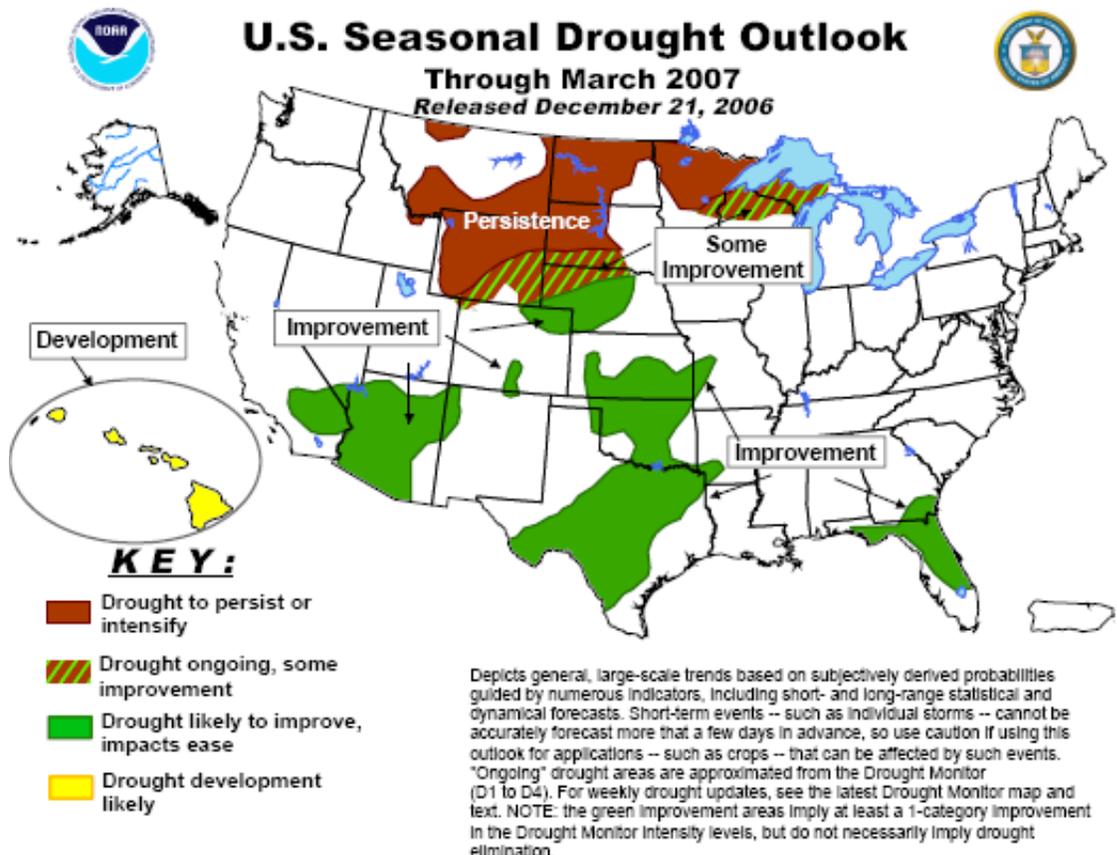


Figure 12

Figure 13



The U.S. National Oceanic and Atmospheric Administration (NOAA) has forecast above-average chances of precipitation in the southwestern U.S. this winter, through at least March, 2007 (see Figure 14).

Above average chances of rain and snow across much of the southwest this winter is being forecast due to the development of weak to moderate El Nino conditions in the Pacific Ocean (see Figure 15). El Nino is a term used to describe warming of water in the equatorial regions of the Pacific Ocean that may result in a shift in the storm track bringing more storms and wetter weather to southern California and the southwestern U.S.

The counterpart to the term El Nino is known as La Nina, a cooling of water in the Pacific that usually results in drier winter seasons in the southwest. Strong La Nina conditions were in effect during the winter of 2002, which was the driest and lowest runoff year on record across the Salt and Verde River watersheds.

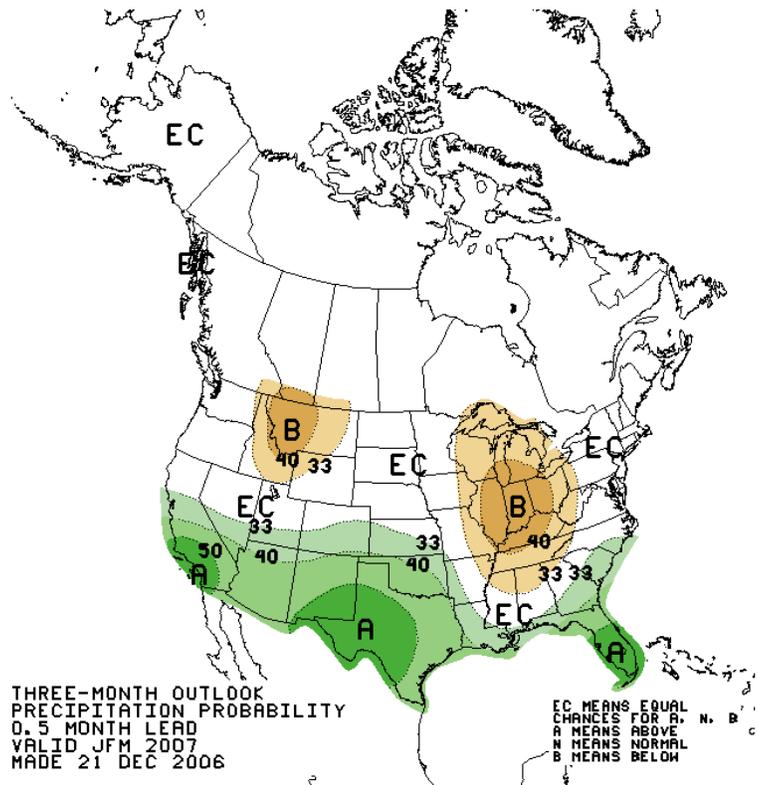
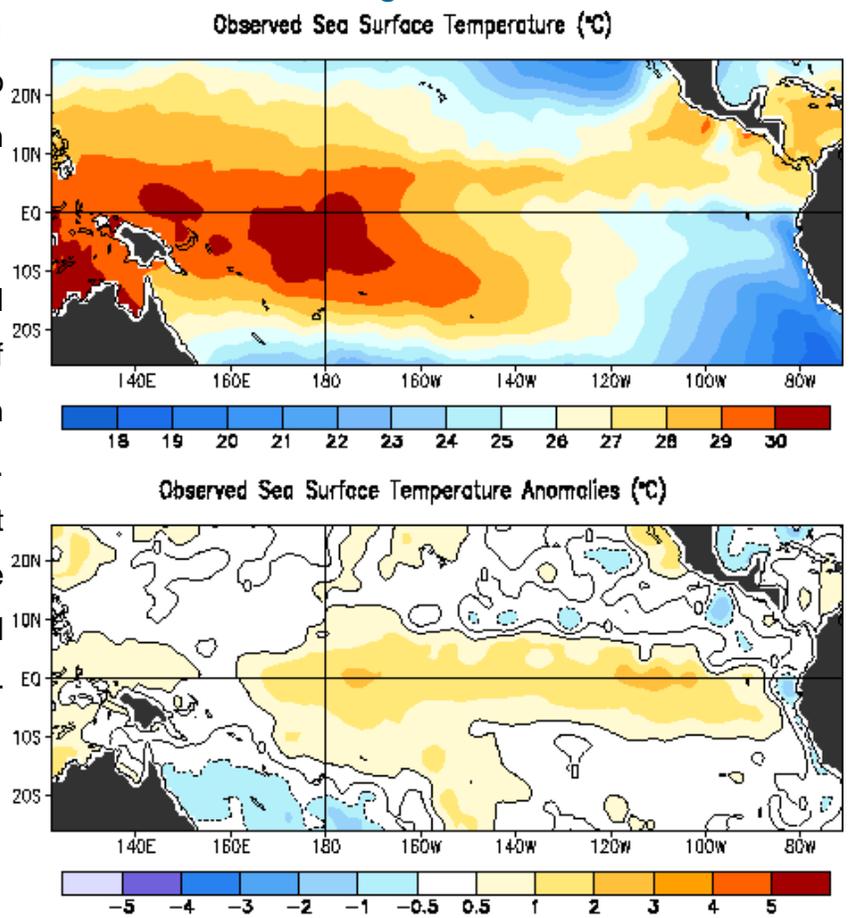


Figure 14



7-day Average Centered on 13 December 2006

Figure 15

Tempe Drought Plan Conclusions

Most climate experts and water managers in the southwest are in general agreement that Arizona entered a long-term drought cycle beginning in 1995/1996 that has continued through the end of 2006, and it is possible that we may be entering the 12th year of this drought period in 2007. During the 11 drought years in this cycle two years experienced above average precipitation and runoff (1997/1998 & 2004/2005 seasons), while nine years had below average to near average precipitation and runoff, demonstrating again that even in drought cycles there is significant variability year to year. The Colorado River watershed entered drought conditions in 1999/2000 that have generally persisted through the end of 2006.

Recent tree ring studies and historical reconstruction of stream flow and climate data sponsored by SRP have concluded that 20 to 30 year drought cycles in the western U.S. have occurred with some regularity over the centuries. These studies have also shown that drought cycles tend to occur in both the Salt/Verde River watershed and the Colorado River watershed during the same time periods. These findings are counter to previous theories that when the Salt River watershed was experiencing drought conditions the Colorado River would not be in drought, or vice versa.

If long-term drought persists, Tempe's drought planning measures will guide us through periods of surface water shortages. Thus far through the 11 year drought cycle Tempe has only had to implement Stage 1 drought measures in 2003 and 2004, due to sound reservoir management by SRP, CAP and the U.S. Bureau of Reclamation, and the availability of groundwater and stored water reserves through both SRP wells and Tempe municipal wells. Combined with our water use reduction measures under Stage 1 and Stage 2 of the drought plan Tempe is well prepared to deal with prolonged drought conditions should they persist.

A copy of the 2004 Tempe Drought Plan can be obtained by calling the Tempe Water Resources Division Office at (480) 350-2608.