Water Resources Element

EXECUTIVE SUMMARY

The Water Resources element describes the currently available and planned water supplies and how projected growth will be served during normal and drought periods.

Water supply availability: develop sufficient supply sources to provide water during normal and drought periods.

Reclaimed water use: maximize direct and indirect uses of reclaimed water with consideration to quality, public acceptability, reliability and cost feasibility.

Groundwater use and artificial recharge: maintain safe-yield levels of groundwater use.

Water quality: Meet or exceed all federal and state mandatory drinking water standards.

Water conservation: implement cost-effective water conservation programs.

Financing: maintain the Water Resources Acquisition Fee at a level to provide adequate funding for the cost of water resources to serve new development.

INTRODUCTION

The Water Resources element addresses the surface water, groundwater and reclaimed water supplies currently available to the city of Phoenix. It also provides an analysis of how the future growth projected in the General Plan will be adequately served by the legally and physically available water supplies, or by planned additional supplies.

Water is essential to human health and welfare. Phoenix is located in a desert, which creates the need for sensitivity and long-range vision regarding the use, conservation, and protection of the water supply. This can be accomplished only through the efforts of the entire community.

Phoenix has maintained a long-range water resources plan since 1985. The first plan was completed in response to Arizona's Groundwater Management Act (GMA). The GMA requires that cities and private water companies within Active Management Areas (AMAs) develop renewable water supplies and cease groundwater mining by the year 2025. Over the last 20 years, Phoenix has diligently pursued acquisition of new supplies, and constructed the infrastructure required to treat and deliver water to new residents and businesses. A summary of the current water resources plan follows the goals and policies.

The following goal and policies guide the development of the Phoenix Water Resources Plan.

GOAL 1 **WATER RESOURCES:** PROVIDE A RELIABLE SUPPLY OF HIGH QUALITY WATER AT A REASONABLE COST, WHILE BALANCING SOCIAL, ECONOMIC, AND ENVIRONMENTAL IMPACTS OF WATER RESOURCES DEVELOPMENT PROJECTS AND WATER DEMAND MANAGEMENT PROGRAMS.

GOAL 1A **WATER SUPPLY AVAILABILITY:** WATER SUPPLIES SHOULD BE AVAILABLE TO PROVIDE FOR DEMANDS DURING BOTH NORMAL AND DROUGHT CONDITIONS.

Policies:

1. Develop sufficient sources of water to provide reliable supplies during years of normal water supply availability, to all areas of the city and those planned for annexation to the city.

2. Develop sufficient supply sources to provide for normal demands, with voluntary water conservation programs in place, under the following drought and infrastructure emergency conditions:

   - ❑ Droughts with a recurrence interval equal to or greater than once in 100 years (equal or greater than one-in-100 chance of occurring in any year).

   - ❑ Untreated water supply system breakdowns or outages having an equal or greater chance than one-in-100 of occurring in any year.

GOAL 1B **RECLAIMED WATER USE:** BENEFICIAL USE OF RECLAIMED WATER SHOULD BE MAXIMIZED.

Policies:

1. Maximize efficient direct and indirect use of reclaimed water, giving due consideration to water quality, public acceptability, cost, and reliability of service.

   Recommendation:

   A. Develop programs to educate the public about the benefits of reclaimed water.

2. Minimize the need for advanced treatment of effluent by maximizing reclaimed water use for turf irrigation, agricultural exchanges for surface water, and industrial uses.

3. Maximize beneficial use of reclaimed water products, through direct deliveries for turf irrigation and industrial uses, water exchanges, and groundwater recharge and recovery.

4. Require new turf facilities of five acres or larger to use, or prepare to use, reclaimed water in areas where it is or will be available.

GOAL 1C **GROUNDWATER USE AND ARTIFICIAL RECHARGE:** GROUNDWATER SHOULD BE USED AND RESTORED IN A WAY THAT BALANCES OR INCREASES GROUNDWATER SUPPLIES.

An important aspect of the Groundwater Management Act is a limitation on the degree to which groundwater levels may be lowered through groundwater pumping. The Phoenix Water Resources Plan 2000 shows that Phoenix will meet safe-yield goals for groundwater use, and that water levels will be maintained above the limit of 1000 feet below land surface mandated by Arizona's Assured Water Supply Program. Groundwater withdrawals will utilize pumping credits allocated to Phoenix through the Assured Water Supply Program, or credits obtained through future recharge of CAP water or reclaimed water.

Policies:

1. Use renewable surface water rather than groundwater whenever possible.

2. Use groundwater in a manner consistent with the goals of the Arizona Groundwater Management Act. Maintain groundwater table elevations over the long-term throughout the service area and minimize adverse environmental impacts of excessive groundwater use, such as land subsidence (the sinking of the land surface).

3. Recharge sufficient groundwater in city-operated or jointly-owned facilities or through the Central Arizona Groundwater Replenishment District, to balance long-term annual average groundwater use in excess of natural recharge and to minimize groundwater level declines throughout the service area.

GOAL 1D **WATER QUALITY:** WATER QUALITY SHOULD BE MAINTAINED OR IMPROVED TO MAXIMIZE SAFETY AND AVAILABILITY OF WATER SUPPLIES FOR URBAN USES.

Policies:

1. Meet or exceed all mandatory state and federal drinking water standards.

   Recommendation:

   A. Continue to cooperate with and assist federal, state, and regional agencies involved with the management and quality of Phoenix's water resources.

2. Strive to minimize the concentration of total dissolved solids in the water delivered to customers.

   Recommendation:

   A. Provide leadership in identifying salinity water quality issues and the solutions to those issues.

3. Manage groundwater withdrawals to contain groundwater contaminant plumes and assist in cost-effective groundwater cleanup programs.

4. Assist in the enforcement of regulations governing all activities that impact groundwater and drinking water quality.

5. Develop programs that minimize or prevent the deterioration of water quality.

6. Maintain programs and regulations at the local level to achieve compliance with applicable federal, state, and county laws and regulations.

   Recommendation:

   A. Upgrade and continue to use both treatment of wastewater and the Phoenix Industrial Pretreatment Program.

7. Continue the educational and assistance program for community residents and businesses regarding the use and disposal of substances that pollute the water supply.

GOAL 1E WATER CONSERVATION: WATER CONSERVATION MEASURES SHOULD BE IMPLEMENTED THAT PROVIDE A BENEFICIAL REDUCTION IN WATER USE.

The city recognizes that being located in the Sonoran Desert creates a need for sensitivity and long-range vision regarding the use, conservation and protection of its water quality and supply. Water conservation plays an important role in Phoenix's plan for providing adequate water supplies for the future. Per capita water use for the city of Phoenix includes all water provided by the city to residential and nonresidential uses, divided by the city's resident population. The city first established a water conservation program in the 1980s when per capita water usage was approximately 260 gallons per capita per day (GPCD). Phoenix has been able to achieve significant reductions in per capita water use through passing low-flow plumbing fixture codes, implementing public education programs, developing commercial and industrial water conservation programs, and implementing reclaimed water programs,. The city has been able to comply with the year-2000 conservation target established by Arizona Department of Water Resources (ADWR) of 224 GPCD. The water demand projections in The Water Resources Plan 2000 are reduced based on the assumption that overall GPCD water use will continue to decline by 5 to 6 percent over the next 50 years. The projected decline is due to low-flow plumbing fixtures being installed in new and existing homes, and the result of projected water rate increases over the planning period.

Policies:

1. Minimize the future need for imported water and local groundwater through economic and environmentally sensitive water conservation programs.

   Recommendation:

   A. Provide appropriate controls, incentives and technical assistance that support water conservation. These may include: landscaping guidelines; low-flow and low water usage guidelines; water price and rate structure modifications; development of voluntary conservation plans with large volume water users; and permitting and developing improved

guidelines and requirements for the reuse of treated wastewater.

2. Continue implementing water conservation programs to reduce capital investment in distribution systems and treatment plants through reduction in water demands.

3. Implement cost-effective water conservation programs to reduce the need for high-cost water supply projects.

Recommendation:

A. Select new water conservation measures as alternatives to development of new supplies, when the measures result in beneficial reductions in water use. These measures include improving efficiency through retrofit of inefficient uses, using arid region plants, and requiring use of best available water conservation technology.

4. Focus conservation efforts on voluntary programs such as public education and less on implementing mandatory restrictions.

Recommendation:

A. Develop an aggressive, comprehensive education program for the public, individuals, businesses, and institutions.

5. Continue research on the effectiveness of structural, mechanical and behavioral modifications in reducing water demands.

6. Maximize the use of drought-tolerant vegetation in landscaped areas throughout the city and promote the use of Xeriscape techniques, while maintaining the character of existing neighborhoods.

7. Pursue creative, innovative, and environmentally-sound methods to capture and use storm water, urban runoff, and wastewater for beneficial purposes.

GOAL 1F ENVIRONMENTAL CONSIDERATIONS: PUBLIC ACQUISITION, TREATMENT, AND DISTRIBUTION OF WATER RESOURCES SHOULD BE BALANCED WITH ENVIRONMENTAL CONCERNS BY INCLUDING ENVIRONMENTAL BENEFITS AND COSTS IN THE ANALYSIS OF ALTERNATIVE PROJECTS.

GOAL 1G FINANCING: FUNDING SHOULD BE MAINTAINED THAT SUPPORTS PLANS FOR WATER RESOURCES

Future water supply acquisitions will be expensive relative to Phoenix's existing water supplies. Most water supply projects and acquisitions are paid for with Capital Improvement Program bond funds. To help provide funds for repaying bond debt and developing a pay-as-you go fund for water resources, Phoenix implemented a Water Resource Acquisition Fee in 1990. The fee is charged at the time building permits are issued for all new residential and commercial buildings. It is based on the estimated costs of the water resources projects listed in the city's Water Resources Plan. When the plan is updated, the fee is updated. The Water Resources Acquisition fee helps to reduce the impacts of the costs of new supplies on increases in water rates charged to residents and businesses in Phoenix.

Policy:

1. Maintain the Water Resources Acquisition Fee at a level that provides adequate funding for acquiring new water resources and water demand management programs to meet the needs of new development.

PHOENIX WATER RESOURCES PLAN

The following summarizes the Water Resources Plan Update 2000.

Where the Water Comes From and How it is Used

<u>Water Supplies</u>

- The Salt River Project (SRP) supplies surface water from reservoirs on the Salt and Verde rivers, and groundwater wells to about 30 percent of the water service area entitled to water delivered by the SRP. This area with rights to this water, known as the On-Project area, is generally located south of the Arizona Canal.

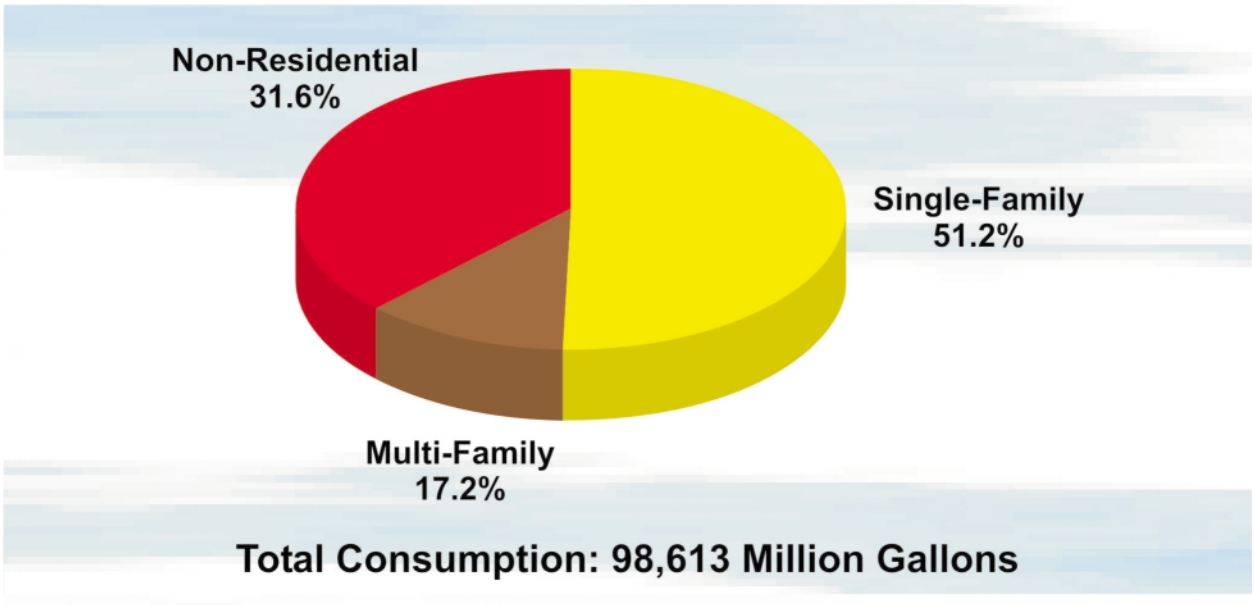
- The Central Arizona Project (CAP) supplies most of the surface water to the remainder of the service area, referred to as the Off-Project and Non-member Area. The CAP supply is supplemented by other sources, such as reclaimed water (highly treated wastewater effluent), Gatewater (water SRP stores for Phoenix behind spillway gates at Horseshoe Dam on the Verde River) and New Conservation Space water (water SRP stores for Phoenix in the New Conservation Space at Modified Roosevelt Dam).

- The city of Phoenix also uses some groundwater from wells it operates. Phoenix has been able to reduce its groundwater use to less than 5 percent of total water deliveries, conserving this limited resource for use in the future during droughts or other water system emergencies.

Water Use

Residential customers consume about 68 percent of all water produced, more than all industrial and commercial customers combined. About 60 percent of residential consumption is used indoors and 40 percent is used outdoors.

FIGURE 1
DISTRIBUTION OF WATER CONSUMPTION BY MAJOR USER GROUPS 1999-2000



Phoenix operates five surface water treatment plants, and plans to construct two more to provide for population increases within the planning area, as shown on Figures 2 and 3. Also shown are wastewater treatment and water reclamation plants (three existing and one planned) that will play an important role in providing recycled water for the future.

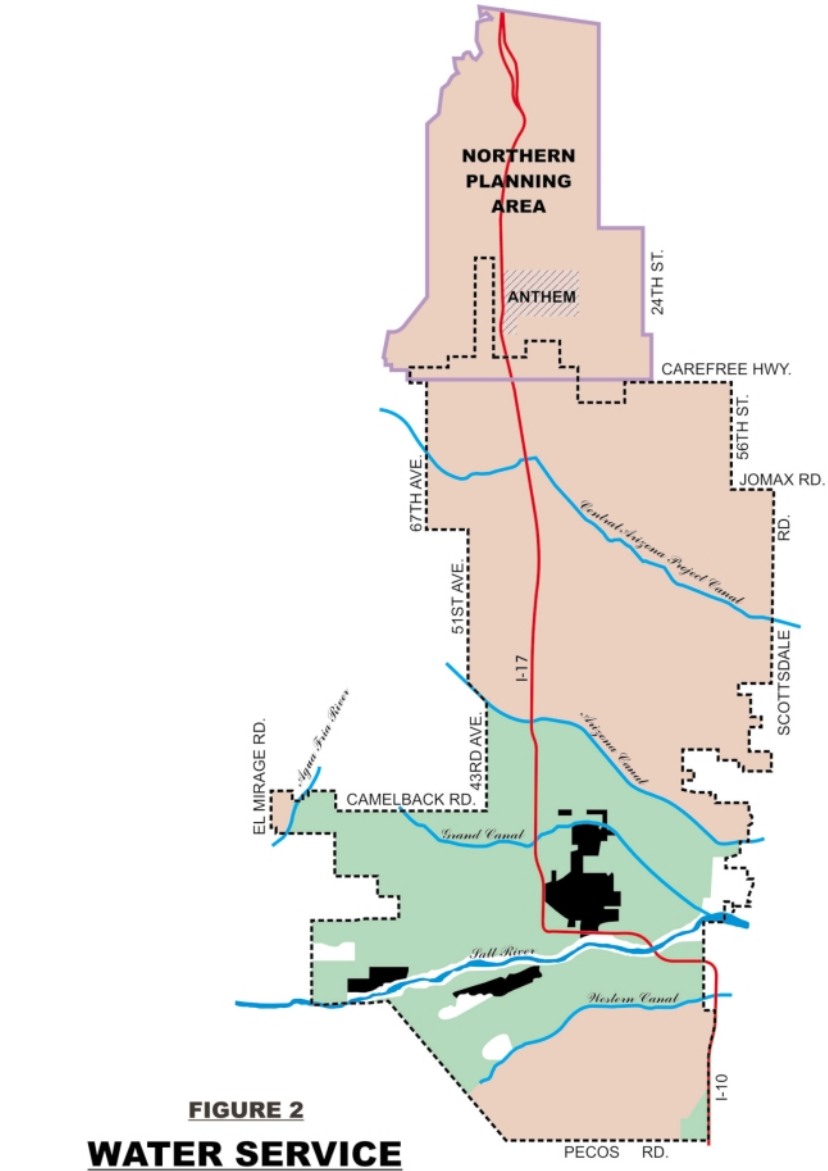
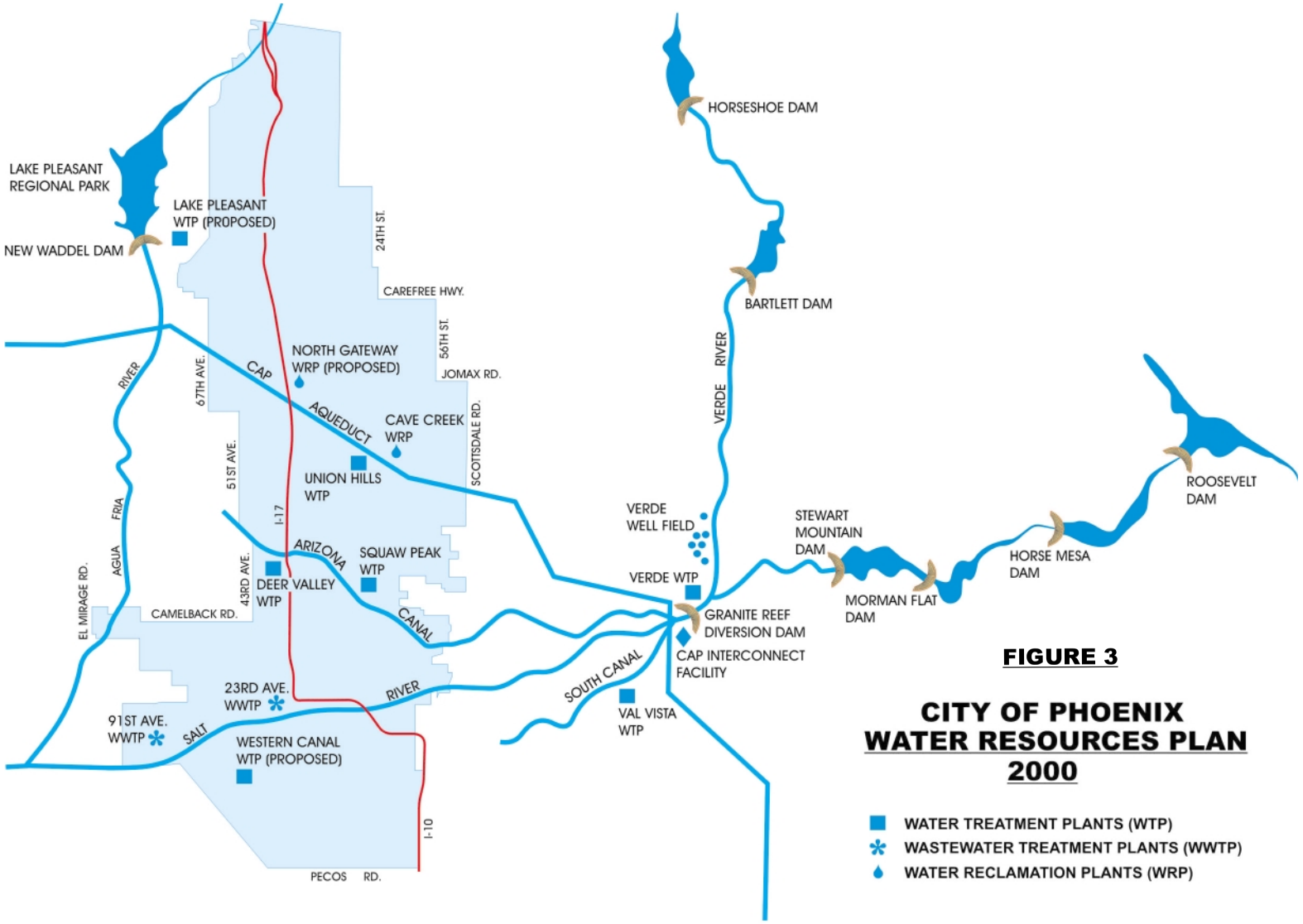


FIGURE 2

WATER SERVICE PLANNING BOUNDARIES

- OFF - PROJECT LANDS
- MEMBER LANDS
- WATER RIGHT AREAS
- NON- MEMBER WITHOUT WATER RIGHTS
- OFF - PROJECT LANDS EXCLUDED FROM PLAN
- CITY OF PHOENIX LIMITS
- NORTHERN PLANNING AREA


LAKE PLEASANT REGIONAL PARK
NEW WADDEL DAM
LAKE PLEASANT WTP (PROPOSED)
24TH ST.
CAREFREE HWY.
56TH ST.
JOMAX RD.
NORTH GATEWAY WRP (PROPOSED)
CAP AQUEDUCT
CAVE CREEK WRP
SCOTTSDALE RD.
67TH AVE.
51ST AVE.
I-17
UNION HILLS WTP
ARIZONA CANAL
SQUAW PEAK WTP
DEER VALLEY WTP
43RD AVE.
CAMELBACK RD.
EL MIRAGE RD.
AGUA FRIA RIVER
23RD AVE. WWTP
91ST AVE. WWTP
SALT RIVER
WESTERN CANAL WTP (PROPOSED)
I-10
PECOS RD.
HORSESHOE DAM
BARTLETT DAM
VERDE RIVER
VERDE WELL FIELD
VERDE WTP
GRANITE REEF DIVERSION DAM
CAP INTERCONNECT FACILITY
SOUTH CANAL
VAL VISTA WTP
STEWART MOUNTAIN DAM
MORMAN FLAT DAM
HORSE MESA DAM
ROOSEVELT DAM
FIGURE 3
CITY OF PHOENIX
WATER RESOURCES PLAN
2000
WATER TREATMENT PLANTS (WTP)
WASTEWATER TREATMENT PLANTS (WWTP)
WATER RECLAMATION PLANTS (WRP)
NORTH

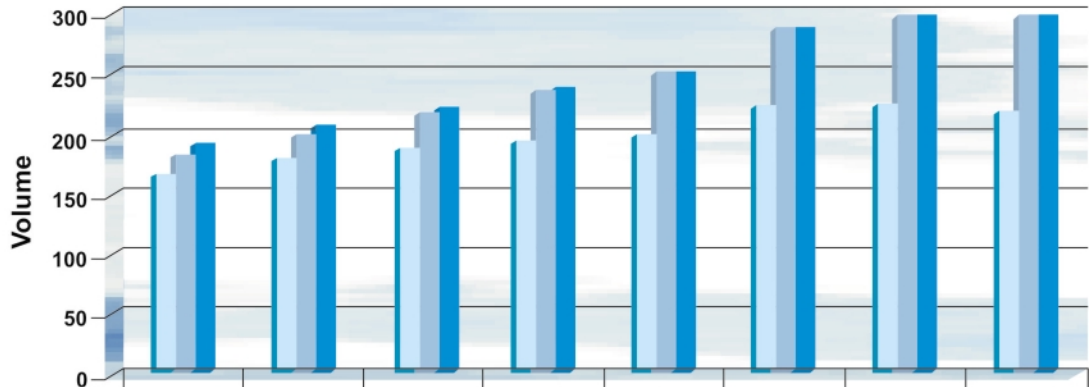
Water Supply and Demand in the On-Project Area

Population in the On-Project area is expected to increase from approximately 661,000 in 2000 to 975,000 by the year 2050, based on 1997 projections by the Maricopa Association of Governments. Annual water demands are expected to increase from 167,000 acre-feet per year (AF/YR) to 216,000 AF/YR by 2050. Many areas within the city of Phoenix have early water right priority dates for Salt and Verde River water. Figure 4 indicates that pursuant to these rights water supplies delivered through SRP during normal water supply years will be adequate to provide for projected needs in this part of the service area.

Current Supply and Demand Situation for the Off-Project and Non-member Area

Over the last 15 years, Phoenix has taken concrete steps to obtain new water supplies for the growing off-project and non-member area. By 2050, the area's population is expected to reach 1,350,000. Figure 6 shows the water supplies currently available to the area to meet future demands. These supplies include several CAP water allocations, allocations from Indian water rights settlements, Gatewater, reclaimed water projects and rights to water stored behind Modified Roosevelt Dam. Acquisition of new water sources has enabled Phoenix to obtain an Assured Water Supply Designation through the year 2010 from the Arizona Department of Water Resources (ADWR). This means that the state has certified that Phoenix's water supplies can support projected population growth in the service area through the year 2010 for a period of at least 100 years. This is the maximum designation that has been granted by ADWR to date. Figure 5 indicates that currently available supplies will meet projected water demands through approximately the year 2017. However, Phoenix will need to acquire an additional 119,000 AF/YR of supply to meet the projected 2050 Off-Project and Non-Member area demand of 357,000 AF/YR.

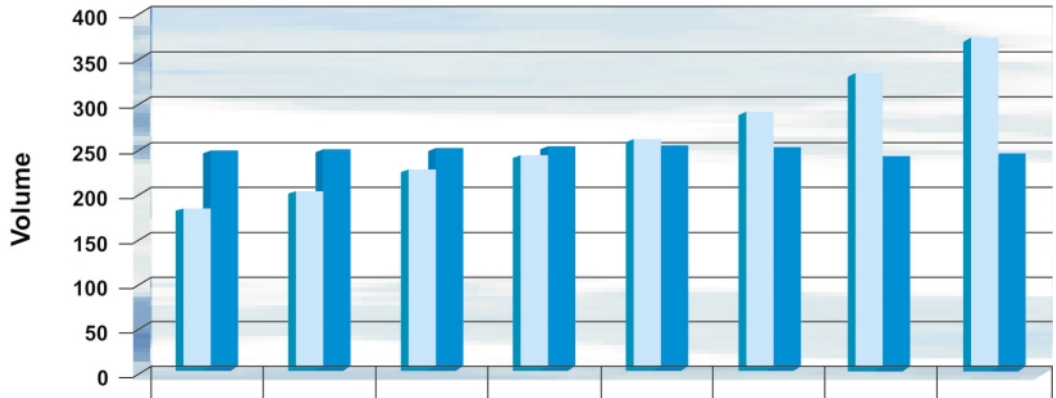
FIGURE 4
ON-PROJECT SUPPLY VS. DEMAND FOR NORMAL YEAR
(1,000 ACRE FEET / YEAR)



	2000	2005	2010	2015	2020	2030	2040	2050
Minimum Demand	167	176	179	186	193	220	221	216
Maximum Demand	180	196	215	232	249	288	298	298
Supply Availability	189	204	219	234	249	288	298	298

Minimum Demand based on the 95 percent statistical hot weather demand adjusted for new golf course demands, price elasticity and the impacts of low-flow plumbing fixtures. City of Phoenix Finance Department Report, March 31, 1999.
Maximum Demand based on historical SRP billed water deliveries.
Supply based on Assessment Water at 3 acre feet per acre plus normal flow and special pump right water as needed to meet demands.

FIGURE 5
OFF- PROJECT / NON MEMBER SUPPLY VS DEMAND FOR NORMAL YEAR (1000 ACRE FEET / YEAR)

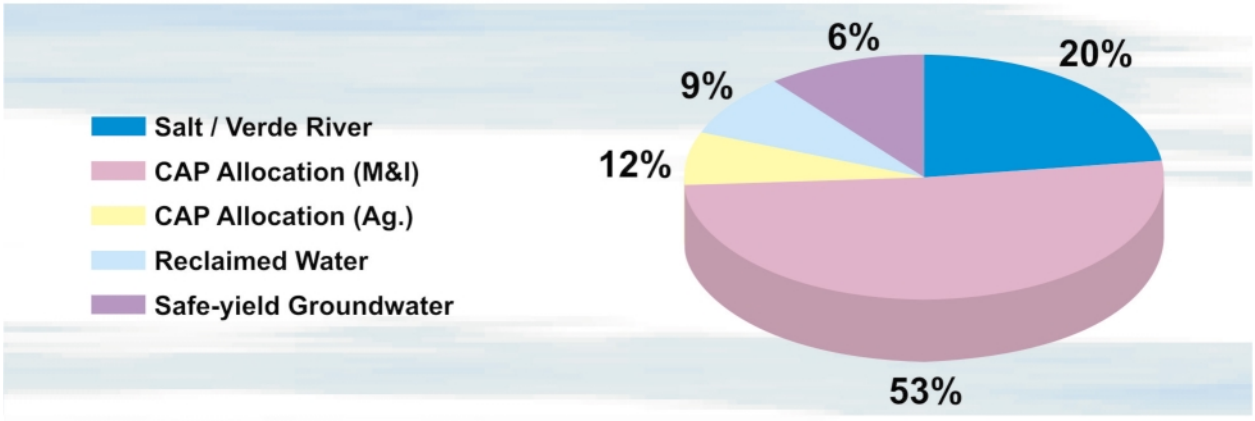


	2000	2005	2010	2015	2020	2030	2040	2050
Hot Weather Demand	178	196	220	236	252	283	326	357
Supply Availability	241	243	244	246	248	245	235	238

Hot weather demand based on the 95 percent statistical hot weather demand adjusted for new golf course demands, price elasticity and the impacts of low-flow plumbing fixtures. City of Phoenix Finance Department Report, March 31, 1999.

Supply based on current off-project and non-member water supplies as shown in the Water Resources Plan Update 2000.

FIGURE 6
OFF- PROJECT and NON MEMBER WATER SUPPLIES YEAR 2000



Additional CAP Allocations Likely by 2005

Phoenix is currently involved in negotiations for several additional CAP water allocations. The U.S. Secretary of the Interior allocated up to 12,000 AF/YR of municipal and industrial CAP water to the Arizona State Land Department for lands within Phoenix. The Phoenix Water Resources Plan assumes that this water allocation will be transferred to Phoenix as State Trust Lands north of Jomax Road are sold for development.

Negotiations for a comprehensive settlement of the Gila River Indian Community (GRIC) water rights claims were ongoing during 1999-2000. Although the agreement has not been finalized, substantial agreement has been reached on most major points. The draft settlement agreement calls for Phoenix to lease 15,000 AF/YR of municipal and industrial priority CAP water for a period of 100 years, beginning in 2005. The reallocation of remaining uncontracted for CAP allocations to municipal and industrial users is also linked to the settlement. In January of 2000, ADWR recommended that Phoenix receive 8,206 AF/YR of the total to be re-allocated. Assuming Phoenix receives these three allocations totaling 35,206 AF/YR as planned, 84,000 AF/YR of additional supplies will be needed by 2050 to provide projected demands.

Where Will Other New Off-Project Supplies Come From?

Additional CAP Agricultural Priority Water

The ADWR expects the U.S. Secretary of the Interior to re-allocate agricultural priority CAP water to municipal users. It is anticipated that a new pool of water totaling approximately 97,000 AF/YR will be made available. A reasonable expectation for a fair share for Phoenix is 20,000 AF/YR. The Water Resources Plan 2000 assumes this allocation will be made in two blocks of 10,000 AF/YR, in 2010 and 2020, respectively. However, this agricultural priority water is subject to a 100 percent cutback during future shortages on the CAP system. Therefore, the city would need develop new groundwater pumping capacity to handle future shortages due to droughts on the Colorado River watershed.

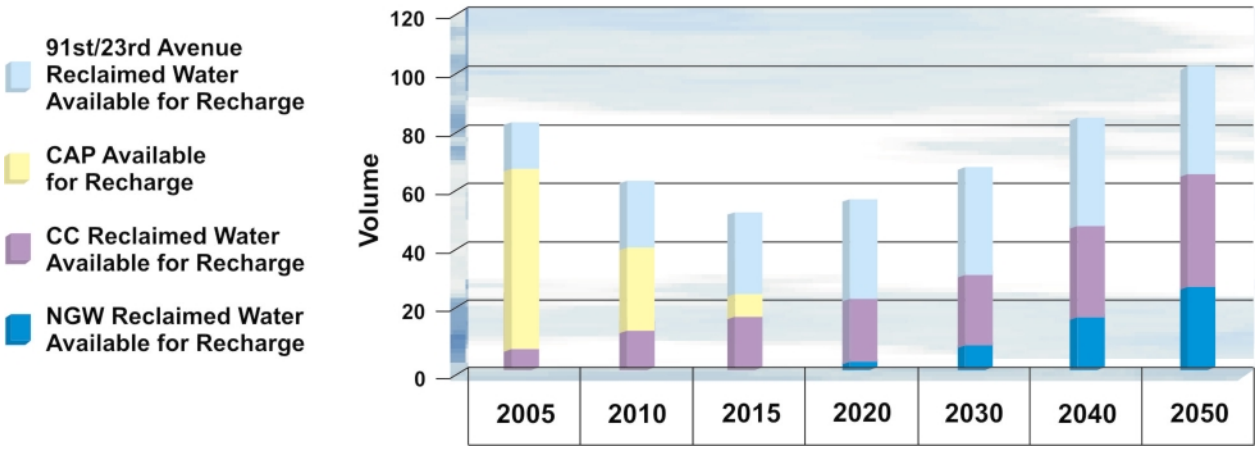
McMullen Valley Water Transfer

In 1986 Phoenix purchased 14,000 acres of agricultural land within the McMullen Valley, 80 miles west of the city. The purchase was made with the intention that, at some future date, the land would be retired from agricultural uses, and groundwater once used to grow crops would be pumped and transported to Phoenix for municipal use. The city has conducted extensive studies of the Valley's water resources to identify the quantity of good-quality water that is available. In addition, the Arizona Groundwater Transfer Act of 1991 granted an entitlement of six million acre-feet of withdrawal to Phoenix. Based on this work, the Water Resources Plan calls for the water transfer shortly after the year 2030, and that an average of 38,000 AF/YR would be withdrawn during non-drought years. In drought years, when some of Phoenix's other water supplies are reduced, 50,000 AF/YR would be used. Phoenix will need to construct a new well field, pumping and pipeline facilities to the CAP canal, and enter into a water wheeling agreement with the Central Arizona Project to transport the water to its water treatment plants.

Groundwater Recharge and Recovery Using Reclaimed Water and Surplus CAP Water

Phoenix completed initial construction of the Cave Creek Water Reclamation Plant in 2000 and is currently under design on the North Gateway Water Reclamation Plant (see Figure 3). In addition extensive water distribution systems are being constructed to deliver highly-treated reclaimed water for irrigation of golf courses, parks, school yards and other large turf areas. Water that cannot be used for turf irrigation represents a large potential future water supply using groundwater recharge and recovery techniques. Surplus CAP water allocations available to Phoenix over the next 15 years can also be recharged and credits later recovered through wells. Figure 7 indicates that 100,000 AF/YR of reclaimed water could be available for recharge and recovery by 2050, including uncommitted reclaimed water produced at the 91st Avenue and 23rd Avenue Plants. Water from the 91st Avenue Wastewater Treatment Plant may be recharged in the planned Agua Fria Linear Recharge Project. A feasibility study for this project has been completed and an Environmental Impact Statement Study is in progress.

FIGURE 7
CUMULATIVE POTENTIAL WATER AVAILABLE FOR RECHARGE
(1000 ACRE-FEET / YEAR)

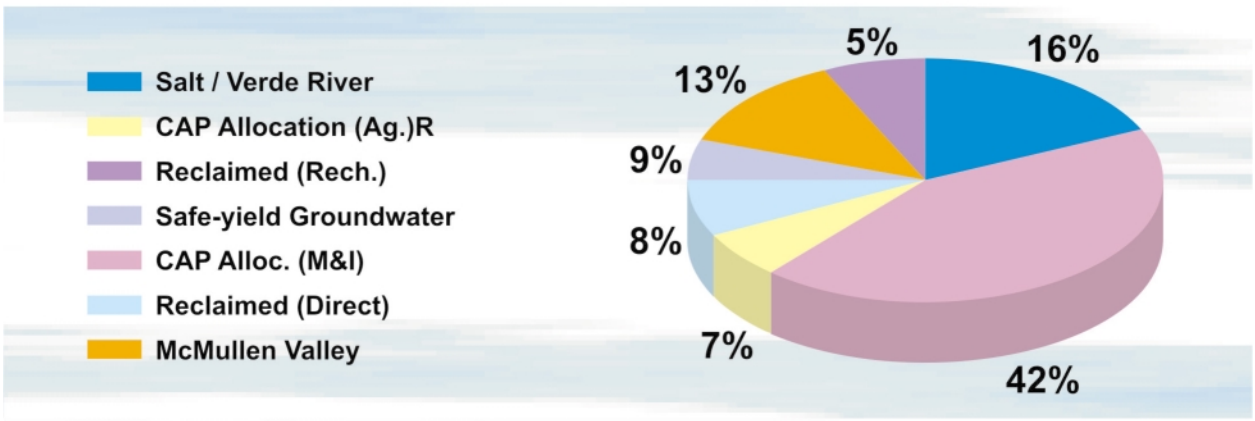


The Water Resources Plan 2000 calls for recovery of 26,000 AF/YR of water beginning in approximately 2050. During drought years when surface water supplies are reduced, recovery of credits through back-up wells would be needed as soon as 2030. Some groundwater pumping will likely be required sooner to manage groundwater levels and water quality issues, and to supply water to portions of the service area where surface water delivery capabilities may be limited. Figure 9 shows the general areas where recharge and recovery activities are planned.

Technical studies will be conducted over the next few years to establish the best recharge and recovery strategy for the service area.

Should some of the potential new water sources discussed above not come to pass, another potential source of new supply is additional long-term leases of CAP water from Arizona Indian Communities. Indian water leases, at this time, are considered as a secondary supply source due to anticipated high cost.

FIGURE 8
OFF- PROJECT and NON MEMBER WATER SUPPLIES
YEAR 2050



Will Phoenix Have Enough Water During Future Droughts?

Water supplies delivered through the Central Arizona Project and the Salt River Project may be reduced during future droughts on the watersheds. Recent formation of the Arizona Water Banking Authority (to store surplus CAP water underground now for later recovery during droughts) has resulted in a more optimistic drought supply projections for the CAP system than previously thought. In addition, the U.S. Bureau of Reclamation has revised its operating criteria for the Colorado River reservoir system to increase water supply reliability and reduce the amount of supply reduction. During a severe drought on the Colorado River and a declared shortage on the CAP system, it is projected that CAP supplies would be reduced by 30 percent. Withdrawals by the Central Arizona Project of water stored by the Water Bank would make up 10 percent of the reduction, leaving a net supply reduction of 20 percent. Fortunately, CAP shortages are not expected until after the year 2030, when the upper Colorado River Basin states (Utah, Colorado, and Wyoming) will be utilizing more of their allocation of Colorado River water.

Also subject to reduction during droughts are Salt River Project (SRP) water supplies (on-project supply) and Phoenix's off-project supplies derived from the Salt and Verde River watershed. Between 1898 and 1904, the most severe drought of record occurred on the Salt and Verde River watershed. If a drought of this magnitude were to occur again, SRP would have to reduce water allocations by at least 33 percent. Fortunately, lands within the city of Phoenix have relatively early priority dates for rights to flows in the Salt River. Projections of Normal Flow rights available to Phoenix indicate that even with a 50 percent reduction in SRP's Stored and Developed water allocation, sufficient supplies would be available to meet on-project water demands through the planning period, if residents and businesses reduce water consumption by 10 percent through additional conservation efforts. The city of Phoenix maintains a Drought Management Plan authorized by the City Code that outlines the emergency water conservation programs that could be implemented to achieve a voluntary 10 percent water use reduction across the service area. With the acquisition of the additional CAP allocations discussed above; the McMullen Valley project; the drilling of approximately 33 new wells by the year 2050 to recover groundwater storage credits; and emergency water conservation programs; Phoenix should have sufficient supplies even during a simultaneous reduction in CAP and SRP water allocations due to drought.

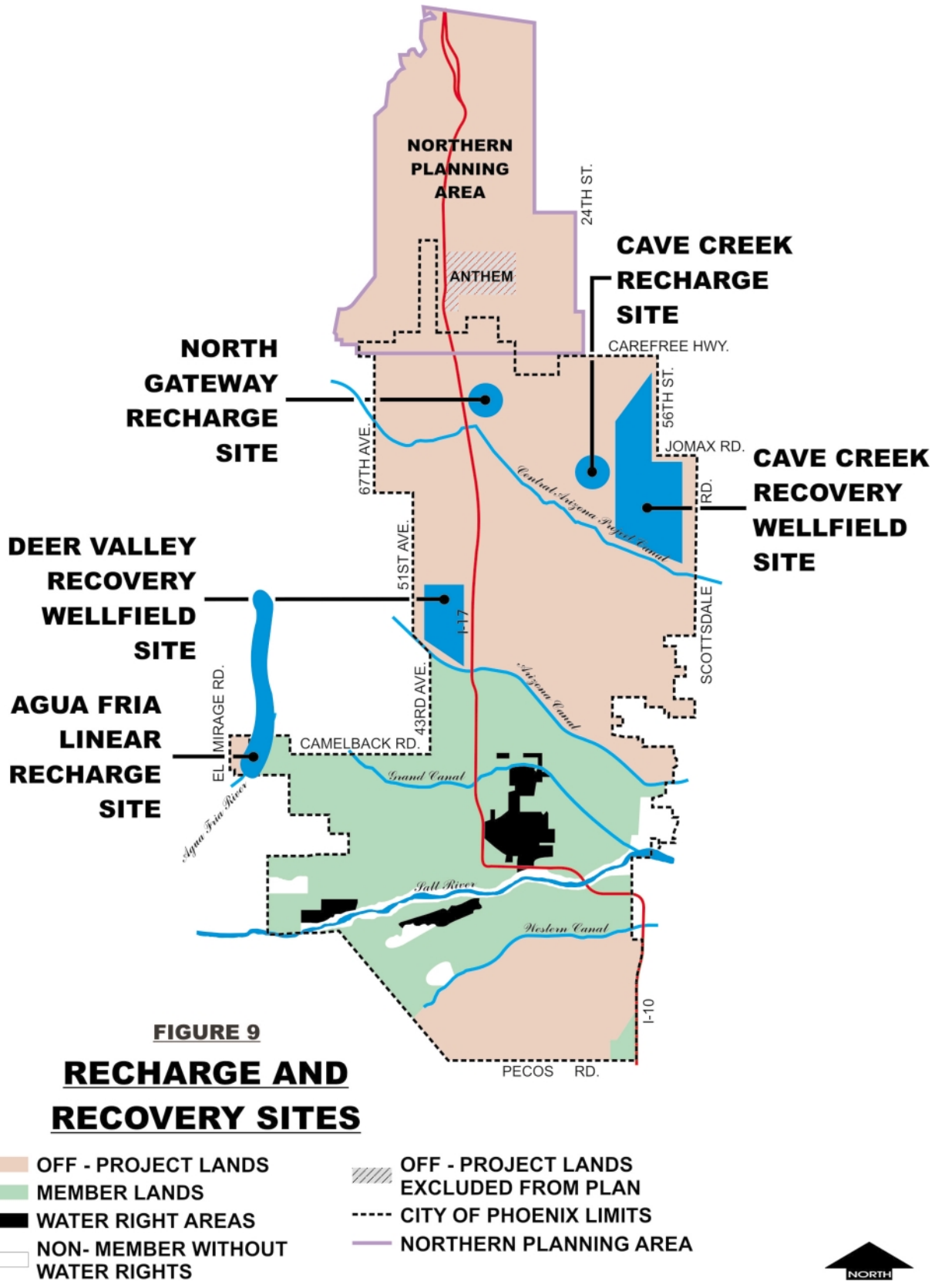


FIGURE 9

RECHARGE AND RECOVERY SITES

- OFF - PROJECT LANDS
- MEMBER LANDS
- WATER RIGHT AREAS
- NON- MEMBER WITHOUT WATER RIGHTS
- OFF - PROJECT LANDS EXCLUDED FROM PLAN
- CITY OF PHOENIX LIMITS
- NORTHERN PLANNING AREA