

# CHAPTER ONE: INTRODUCTION

## 1.1 INTRODUCTION

In May 2010 the Arizona Department of Water Resources (ADWR) published the *Demand and Supply Assessment 1985-2025, Tucson Active Management Area* (Assessment), a compilation and study of historical water demand and supply characteristics for the Tucson Active Management Area (TAMA) for the years 1985-2006 (ADWR, 2010). The Assessment also calculated seven water supply and demand projection scenarios through the year 2025. ADWR conducted the Assessment in preparation for promulgation of the *Fourth Management Plan for Tucson Active Management Area* (4MP) as required by the *1980 Groundwater Management Act*, also referred to as the *1980 Groundwater Code* (Code). After publication of the Assessment, ADWR presented a summary of the document to the Groundwater Users Advisory Council (GUAC) for the TAMA. The TAMA GUAC is a five-member council appointed by the Governor to represent the groundwater users in the area on matters relating to the development, use and conservation of water within the TAMA (A.R.S. § 45-420(A)).

The 4MP is effective from two full calendar years after the date of the 4MP noticing until the first effective date of the Fifth Management Plan (5MP). The Fifth Management Plan (5MP) will be developed to cover the period from 2020 through 2025.

The management plans serve as tools to assist ADWR in achieving the management goal of each Active Management Area (AMA). The statutorily established management goal of the TAMA is to attain safe-yield, on an AMA-wide basis, by the year 2025. Achievement of safe-yield requires that there be a long-term balance between the amount of groundwater pumped from the TAMA annually and the amount of water naturally and artificially recharged in the TAMA annually. Groundwater withdrawals in excess of natural and artificial recharge lead to groundwater overdraft. The Code identifies management strategies to reduce total groundwater withdrawals in the AMA. These management strategies may include conservation programs for all major water using sectors, as well as replacement of groundwater use with renewable water supplies. Management plans also include programs to encourage use of renewable supplies and a water management assistance program. Enforcement provisions and monitoring programs are also included in the management plans. A description of ADWR's overall water management approach for the TAMA is included in this management plan's conclusion in Chapter 12, Water Management Strategy.

The statutory management plan process requires ADWR to conduct formal public hearings after completion of the proposed management plan (A.R.S. § 45-570). In these hearings, ADWR presents information in support of the proposed plan and a summary of any comments provided by the GUAC on the draft management plan. ADWR also takes public comment on the proposed plan. Before the plan is adopted, the Director of ADWR prepares a written summary of matters considered at the hearing and findings on those matters, and may adopt the plan as presented or with modifications.

In addition to the management plans, other water management tools exist that limit use of groundwater. The Assured Water Supply (AWS) Program, and the Underground Water Storage, Savings & Replenishment (Recharge) Program, are focused on use of renewable water supplies and are important vehicles for achievement of the AMA management goals and ADWR's water management objectives.

## 1.2 THE ASSURED WATER SUPPLY PROGRAM

The AWS Program was created by the Code to preserve groundwater resources and promote long-term water supply planning in the AMAs. AWS Statutes and Rules limit the use of groundwater by new residential and commercial subdivisions. Every person proposing to subdivide land within an AMA must demonstrate the availability of a 100-year water supply.

In 1995, ADWR adopted the AWS Rules to implement the AWS Program. Under the AWS Rules, developers can demonstrate a 100-year supply by satisfying certain criteria described below, and by either obtaining from ADWR a Certificate of Assured Water Supply (CAWS) for a new subdivision, or by obtaining a written commitment of service from a water provider for which ADWR has issued a Designation of Assured Water Supply (DAWS) for a municipal water provider's water service area.

An AWS demonstration must include proof of the following criteria: 1) water supplies will be of adequate quality; 2) water supplies will be physically available for 100 years; 3) water supplies will be legally available for 100 years; 4) water supplies will be continuously available for 100 years; 5) any groundwater use will be consistent with the management goal for the AMA; 6) any groundwater use will be consistent with the management plan for the AMA; and 7) the developer or water provider has the financial capability to construct the necessary water storage, treatment and delivery systems. The Arizona Department of Real Estate will not issue a public report that allows the developer to sell lots within an AMA without an AWS demonstration. For more information on the AWS Program, please visit the ADWR website at: [www.azwater.gov/AzDWR/WaterManagement/AAWS](http://www.azwater.gov/AzDWR/WaterManagement/AAWS).

The AWS Rules require consistency with the management goal of the AMA. To meet this goal some providers may join the Central Arizona Groundwater Replenishment District (CAGR) to replenish groundwater use within their water service areas (See <http://www.cagr.com/>). Other providers use renewable supplies, such as Central Arizona Project (CAP) and reclaimed water, for municipal uses associated with a DAWS and/or a CAWS issued in the AMA. Pursuant to the AWS Rules, however, a certain volume of groundwater is allowed to be used. These groundwater allowances are intended to help municipal providers transition over time from groundwater to renewable supplies.

When a DAWS or CAWS is issued, a groundwater allowance account is established. ADWR credits additional allowable groundwater to these accounts based on a number of factors. The AWS Rules allow for a limited volume of groundwater to be pumped based on formulas for each AMA. For a CAWS in the TAMA, the amount of water that may be added to the groundwater allowance account is reduced over time, to zero by 2025. For new municipal providers seeking a DAWS, the initial groundwater allowance is set at zero.

The AWS Rules also allow applicants for a DAWS or CAWS in the TAMA to add to their groundwater allowance by using grandfathered groundwater right extinguishment credits. Extinguishment credits are issued by ADWR when a grandfathered groundwater right holder extinguishes either: 1) a type 1 non-irrigation grandfathered right, 2) a type 2 non-irrigation grandfathered right, or 3) an irrigation grandfathered right at a reduced volume through a process described in the AWS Rules. The extinguishment credits are calculated differently for each AMA. An applicant for an AWS determination that acquires extinguishment credits can pledge such credits to demonstrate that all, or a portion, of the applicant's projected groundwater use is consistent with the AMA's management goal.

Water users in the TAMA have made significant strides to reduce groundwater mining and increase the use of renewable water supplies. The TAMA was able to achieve a safe-yield condition in 2011, 2012, and 2013 because the volume of net natural recharge that occurred was supplemented by incidental recharge and the addition of cuts to the aquifer. In the TAMA, total groundwater use in these three years was about 13 percent greater than the 1985 - 2013 long-term average net natural recharge. Historical groundwater overdraft in the TAMA lowered water levels by up to 200 feet in the City of Tucson (Tucson Water) central well field. However, Tucson Water has reduced groundwater pumping and utilized more stored and recovered CAP and reclaimed water in recent years.

Historical land subsidence has occurred in several areas of the TAMA. Recent data obtained by ADWR through its land subsidence monitoring program indicates that land subsidence rates in the TAMA have

been substantially reduced. In some areas, primarily associated with recharge sites, land subsidence has actually reversed and rebounding has been observed. But land subsidence is projected to increase if groundwater pumping continues in these areas. Decreased well productivity has been observed in some areas due to lowering of the water table and associated land subsidence.

The AWS requirements are an important tool to help move towards achievement of the management goal of the TAMA, but the AWS requirements only apply to new subdivisions, and are not enough by themselves to ensure achievement and maintenance of the TAMA's goal of safe-yield.

### **1.3 THE UNDERGROUND WATER STORAGE, SAVINGS AND REPLENISHMENT (RECHARGE) PROGRAM**

Prior to the adoption of the Code, more groundwater was pumped from Arizona's aquifers than was naturally recharged back into the aquifers. This imbalance resulted in significant depletion of certain aquifers. Replacing groundwater use with renewable water supplies and recharging renewable water underground reduces this aquifer imbalance. Artificial recharge is also a means of storing available renewable water supplies for future use. Artificial recharge is an increasingly important tool in the management of Arizona's water supplies, particularly in meeting the goals of the Code.

The Arizona Legislature established the Underground Water Storage and Recovery Program in 1986 to allow persons with supplies of renewable water in excess of their demands to store that water underground for recovery at a later time. In 1994, the Legislature enacted the Underground Water Storage, Savings, and Replenishment Act, which further refined the program. Under this program, a person wishing to store, save, replenish, or recover water must secure permits from ADWR. For more information on the Underground Water Storage, Savings and Replenishment (Recharge) Program, please see Chapter 8 and visit the ADWR website at [www.azwater.gov/AzDWR/WaterManagement/Recharge](http://www.azwater.gov/AzDWR/WaterManagement/Recharge).

In many cases, permitted artificial recharge under the Recharge Program requires a certain percentage of the recharged volume to be made non-recoverable in order to benefit the aquifer. These required non-recoverable volumes are called *cuts to the aquifer*. The cuts apply to the storage of water for long-term storage credits, but do not apply to water that is stored and recovered within the same calendar year. In the TAMA, the cumulative sum of historical annual cuts to the aquifer as of 2013 was approximately 202,000 acre-feet (ac-ft).

### **1.4 GOVERNMENTAL AND INSTITUTIONAL SETTING**

In the TAMA, water management activities are carried out by a number of entities. City, county and regional government functions include retail water delivery, flood control, wastewater management, water quality management and planning and zoning. Several user groups, advisory committees, citizens' groups and other organizations provide input in developing legislative and policy guidelines and educational programs relating to water resources use and conservation. The GUAC for each AMA advises the Statewide AMA Director and makes recommendations on groundwater management programs and policies for the AMA, and comments to the Statewide AMA Director on draft management plans for the AMA before they are promulgated by the agency director (A.R.S. § 45-421(1)).

The Arizona Water Protection Fund (AWPF) was established in 1994 to provide grant money for projects that protect or restore the state's rivers, streams and associated riparian habitats. Funds obtained through AWPF grants may be used to purchase Central Arizona Project (CAP) water or reclaimed water for these purposes. The AWPF Commission, with the ADWR Director serving as a nonvoting ex-officio member, oversees the grants process. AWPF staff is located within ADWR.

At the state level, the Arizona Department of Environmental Quality (ADEQ) regulates water quality. ADWR and ADEQ jointly participate in specified activities related to protection of groundwater quality and remediation. The Arizona Corporation Commission (ACC) regulates the activities of private water companies, particularly with respect to rate-setting. The Arizona Department of Real Estate (ADRE) works with ADWR to ensure that new subdivisions comply with the AWS requirements.

Federal water management activities in the Tucson area include the US Bureau of Reclamation's (Reclamation) involvement in regional water supply planning and research into storage and use alternatives for CAP water. Reclamation also participates in negotiations to provide water resources to tribal communities on behalf of the US Secretary of the Interior and has trust responsibilities for reclaimed water allocated under the Southern Arizona Water Rights Settlement Act (SAWRSA). Additional Federal water management activities include a recent Army Corps of Engineers' River Basin Study, the Environmental Protection Agency's Superfund Program and the National Pollutant Discharge Elimination System (NPDES) permit program. The US Geological Survey works independently and in conjunction with ADWR and others in the collection and analysis of hydrologic and subsidence-related data and flood warning information.

## 1.5 TUCSON AMA WATER MANAGEMENT CHALLENGES

While the TAMA has made improvements in managing its water supply, it will continue to face a number of water management challenges in the fourth and fifth management periods. These include:

- *Meeting and Maintaining the Safe-Yield Goal*

During the second and third management periods significant actions were taken toward reaching safe-yield, including establishment of the Arizona Water Banking Authority (AWBA) and the AWS Program. The TAMA Assessment revealed that the TAMA has been at or near the safe-yield goal in recent years. However, not all municipal uses are required to replenish or offset groundwater pumping, and the municipal sector can continue to grow, representing potential for increased groundwater demand. Additionally, agricultural and industrial users are not required to replenish or offset groundwater pumping. All of these factors will be challenges for the TAMA to meet and maintain the goal of achieving safe-yield.

- *Utilization of Available CAP Supplies*

A past challenge has been achieving full utilization of available CAP supplies, including excess supplies that may only be available in the short term. Augmentation efforts continue to be a focus during the fourth management period, in order to offset future shortages and to achieve other management objectives. CAP supplies remain the primary renewable water source for the TAMA, and full utilization is imperative to allow for future growth that is consistent with achieving and maintaining safe-yield.

- *Increased Utilization of Reclaimed Water*

The Assessment identified potential for reduced groundwater dependency in the TAMA through increased direct reuse of reclaimed water. Reclaimed water represents an alternative renewable supply to CAP water that can be used to mitigate CAP shortages and protect against the impacts of drought. Developing mechanisms to maximize use of reclaimed water will be a water management focus in the TAMA during the fourth management period. ADWR will participate with other stakeholders in future discussions regarding potential uses for reclaimed water.

- *Physical Availability of Groundwater within the TAMA*

Physical availability of groundwater within specific geographic sub-areas of the TAMA has been a challenge in the past and must continue to be addressed. While recognizing that the groundwater management goal for the TAMA is defined as achieving safe-yield on an AMA-wide basis, localized water management is also desirable to fully achieve the Code's stated policy of "protecting and stabilizing the general economy and welfare of this state and its citizens...." Localized issues such as land subsidence may arise in areas experiencing rapid or marked declines in water tables. Other localized challenges may include water quality concerns and infrastructure limitations that constrain access to renewable water supplies. The AWS Rules require applicants to prove the physical availability of groundwater in the area for which the AWS is being applied. If there is insufficient physical availability of groundwater to meet the current, committed and projected demand for that area, an applicant would need to demonstrate other water supply sources that are physically available and meet the other AWS Rules criteria in order for an AWS determination to be issued. Recharge activities conducted by the AWBA, the CAGR and others also have the potential to address local water management issues. Addressing these major challenges is an important part of the TAMA's groundwater management strategy.

- *Renewable Supplies*

Groundwater and non-groundwater sources are managed under different statutes with different approaches. As municipal growth increases the demand for renewable supplies, sound management of all sources of water supply is warranted, including a plan to respond to shortages due to long-term or short-term drought conditions. Pending and current water storage projects that bank renewable supplies for future shortages is one effective management tool to mitigate drought impacts. There are significant challenges to management of both renewable and finite water supplies, but it is necessary to ensure the economic stability, health and welfare of the TAMA residents.

- *Limitations of the Management Plan Authority*

The 4MP includes conservation requirements for water users within the municipal, industrial and agricultural water use sectors. Although conservation is an effective means of managing available supplies and can help move the TAMA closer to safe-yield, conservation alone cannot bring the TAMA to safe-yield. Individual water user choices, city and county ordinances and regional cooperative water management efforts, while outside of ADWR's authority to require or enforce, can result in significant additional progress toward safe-yield.

In recent years the TAMA as a whole has been in a safe-yield or even surplus condition relative to overdraft. To continue on this path, effective water management must take a long-term perspective and be regional in scope. Water management programs must include both demand management and supply augmentation components in order to maintain safe-yield into the future. Integrated and coordinated adaptive water management strategies, which could be developed conjunctively with ADWR and water users, considering economic impacts and providing flexibility could ensure increased water supply stability in the future.

Some of the challenges to achieving and maintaining safe-yield include:

- Not all uses of groundwater are required to be replenished or offset by renewable supplies.
- The amount of net natural recharge is still (as of 2013) less than total groundwater withdrawals. See Chapter 3 of this plan. In recent years, the TAMA has been in a safe-yield condition in part due to cuts to the aquifer and incidental recharge.

- As mentioned above, achieving safe-yield AMA-wide is the TAMA goal. However, it is also important to be aware of localized areas within the TAMA becoming dewatered, resulting in potential land subsidence and wells going dry.
- Significant water management benefits have been realized through CAP water wheeling arrangements among Tucson AMA providers. In the future, additional wheeling arrangements, possibly including the wheeling of non-project water through CAP infrastructure, will be important to consider.

## **1.6 TUCSON AMA 4MP PROGRAMS**

The 4MP primarily addresses water conservation, underground storage and recovery and water management assistance during the fourth management period. A.R.S. §§ 45-567, 567.01 and 567.02 direct that the following components shall, or may, be included in the 4MP:

- Irrigation water duties or intermediate irrigation water duties for agricultural users
- Historic cropping program for agricultural users
- Agricultural Best Management Practices Program
- Non-Per Capita Conservation Program for municipal providers
- Total Gallons Per Capita per Day (GPCD) Program for municipal providers
- Monitoring and distribution system requirements for municipal providers
- Additional conservation requirements for non-irrigation uses
- Program for additional augmentation of the TAMA water supply
- Groundwater quality assessment for the TAMA
- Conservation assistance program
- Program for the purchase and retirement of grandfathered rights
- Recommendations to the AWBA

The regulatory requirements for groundwater users and water distribution systems are printed in italics for easy reference and are located at the ends of Chapters 4, 5, 6 and 8.

## **1.7 CONCLUSION**

The 4MP outlines the statutorily mandated conservation requirements, discusses the region's water management needs and presents ADWR's suggestions for water users to achieve the TAMA's water management goals and objectives. Continued commitment from water users in the TAMA, ADWR and the public is necessary to reduce dependence on groundwater, to achieve the statutorily established water management goal of achieving safe-yield by 2025 and to maintain it thereafter. With the support of the community, ADWR will respond to evolving water challenges and needs while maintaining technical assistance and regulatory programs that ensure a dependable water supply for Arizona's future.

## Bibliography

ADWR. (2010). *Demand and Supply Assessment, Tucson Active Management Area*. Phoenix: ADWR.