

Water Resources Research Center



College of Agriculture and Life Sciences

Water Resource Availability for the Tucson Region City/County Study Oversight Committee October 2, 2008

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2006 Study: Water Resource Availability for the Tucson Metropolitan Area

- Projected the population that could be supported by known water sources to the region under varying assumptions
- http://ag.arizona.edu/azwater/publications.php?rcd_id=12
- Have made over 25 presentations on the study since July 2006
- Metropolitan Pima County focus (not full AMA)
- Based on existing plans and projections, with some assumptions modified for the spreadsheet analysis
 - Tucson Water 2050 Plan as originally released
 - PAG Population Projections for 2030 (longest-term projection available at that time)
 - Other reports
- Study provided regulatory/institutional context
- Simple spreadsheet calculations that can be performed under different assumptions

2006 Study: Water Resource Availability for the Tucson Metropolitan Area (cont.)

- WRRC study, funded by a consortium led by Metropolitan Pima Alliance (~\$30,000)
- Advisory Committee worked with me and research assistant Kelly Mott Lacroix, who now works for ADWR, with my control of final content
- Spreadsheet computations
 - Cost/public investment estimates not developed for the mechanisms to use the identified supplies
 - Not a safe-yield analysis; agricultural and industrial (mining) use of water not considered, nor are environmental demands



Tucson Water Recommended Plan

November 2004

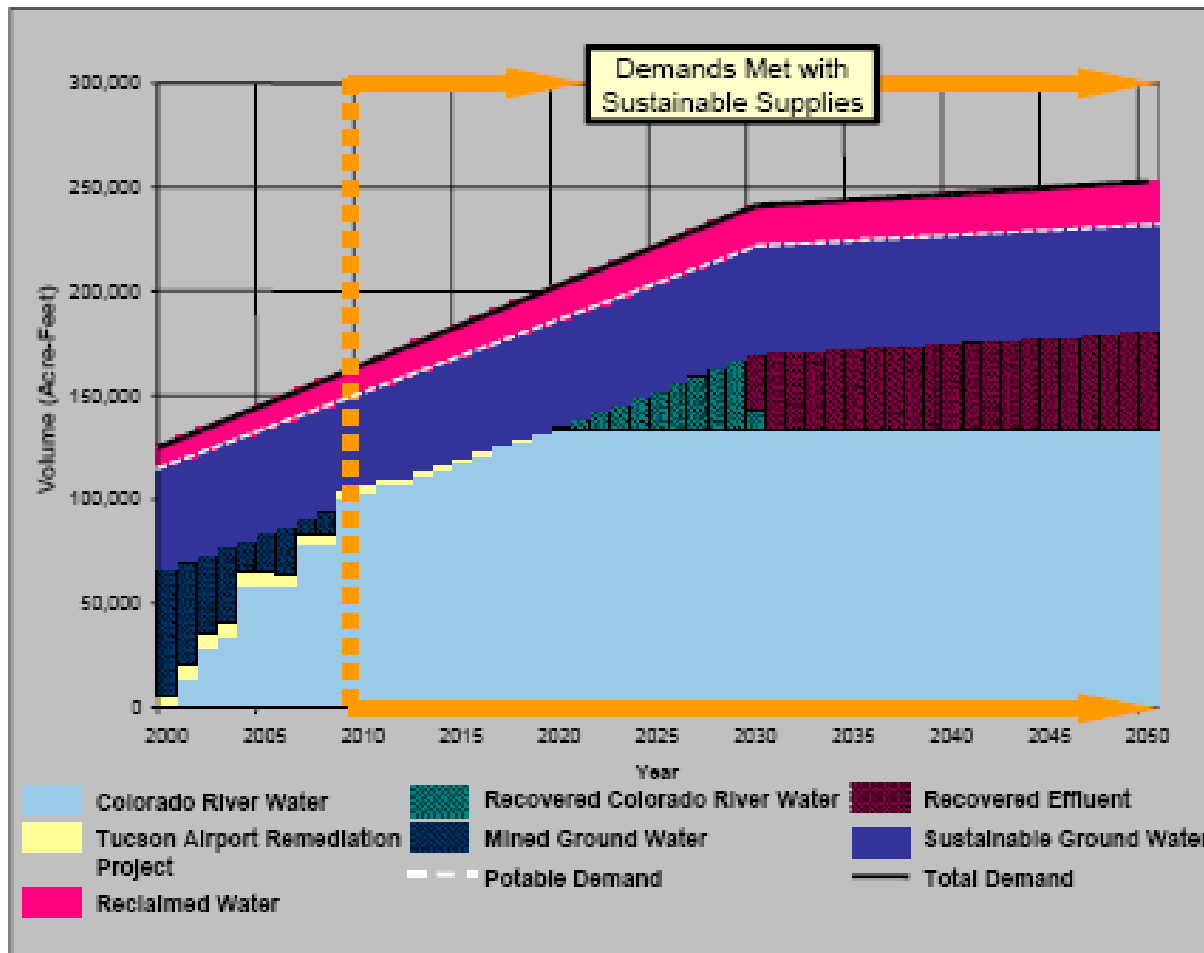


Figure 7-1: Projected Total Demand and Use of Resources for the Recommended Plan.

Source: Tucson Water Plan 2000-2050

Table 6: Breakdown of Tucson Water GPCD

Residential ⁽¹⁾	110
Reclaimed Water	14
Commercial and Industrial Water	35
Lost and Unaccounted for Water	18
Total Water Use	177

Source: Tucson Water Plan 2000 — 2050

Table 1: CAP Current and Pending Allocations in the Tucson AMA

Allocation Holder	Current Allocation^[1]	Pending Allocation^[2]	Total
City of Tucson	135,966	8,206	144,172
Avra Cooperative	0	808	808
Community Water Company (GV)	1,337	1,521	2,858
Flowing Wells Irrigation District	4,354	0	4,354
Green Valley Domestic Water Improvement District	1,900	0	1,900
Town of Marana	47	0	47
Metro Water	8,858	4,602	13,460
Town of Oro Valley	6,748	3,557	10,305
Spanish Trail Water Company	3,037	0	3,037
Arizona State Land Dept.	14,000	0	14,000
Vail Water Company	786	1,071	1,857
Total Non-Indian Water	177,033	19,765	196,798
San Xavier District	27,000	23,000	50,000
Schuk Toak District	10,800	5,200	16,000
Pasqua Yaqui Tribe	500	0	500
Total Indian Water	38,300	28,200	66,500
Total	215,333	47,965	263,298

Source: Tucson Water Plan: 2000 – 2050 and PL 108-451 sec 104 b.1

^[1] These figures are current as of Oct. 3, 2005. Information taken from CAP website <http://www.cap-az.com/about/index.cfm?action=allocations&subSection=7>

^[2] Information on pending allocations was taken from Tucson Water's Water Plan 2000 – 2050.

Scenarios Spreadsheet

2030 Scenarios Worksheet*	M&I + DOI Effluent + Higher GPCD	Half (M&I + DOI) Effluent + Higher GPCD		M&I + DOI Effluent + Lower GPCD	Half (M&I + DOI) Effluent + Lower GPCD
See Notes for Assumptions	Year 2030	Year 2030		Year 2030	Year 2030
PAG Pima County Population Projection ¹	1,496,045	1,496,045		1,496,045	1,496,045
Estimated 2005 Population = 916,026					
Water Supplies/Sources in Acre Feet					
CAGR with Tucson Water ²	35,600	35,600		35,600	35,600
Allowable GW ³	41,100	41,100		41,100	41,100
Exempt Well GW ⁴	4,000	4,000		4,000	4,000
Undesignated GW ⁵	22,000	22,000		22,000	22,000
Effluent ⁶	67,409	33,705		67,409	33,705
Effluent DOI ⁷	28,200	14,100		28,200	14,100
Municipal & Industrial CAP ⁸	195,810	195,810		195,810	195,810
Total Annual Supply in Acre Feet ⁹	394,119	346,315		394,119	346,315
Total Annual Supply in Gallons ¹⁰	128,424,070,269	112,846,926,140		128,424,070,269	112,846,926,140
Assumed Total GPCD ¹¹	165	165		150	150
Water Per Person per annum ¹²	60225	60225		54750	54750
Scenario Population ¹³	2,132,405	1,873,756		2,345,645	2,061,131
Scenario Population less Projected Population ¹⁴	636,360	377,711		849,600	565,086
Ratio of Scenario Population to Projected Pop ¹⁵	1.43	1.25		1.57	1.38

Notes to Table 7

***These calculations are meant to be illustrative only. They are based on many assumptions and are not intended to be forecasts or projections. The worksheet scenarios do not quantify the public investments required to actually utilize the identified water sources. Additional public investments may be required to utilize the resources.**

1. The population projections are for Pima County and are based on Pima Association of Government Projects. PAG estimated population for 2005 was 916,026. The Tucson AMA has different boundaries but includes metropolitan Pima County.

2. The projected replenishment obligations are from the November 2004 CAGR D Plan of Operation, The CAGR D projections do not include replenishment for Tucson, but it is assumed that Tucson will need 12,500 af of replenishment for its AWS. The figure shown has added 12,500 replenishment for Tucson Water added Plan's projection for the Tucson AMA.

3. Allowable groundwater is an estimate of the groundwater pumping that is allowable under the AWS Rules, annualized. (ADWR Est.)

4. Some pumping is going to occur through exempt wells. This is an estimate of the annual pumping based on a 1999 Tucson AMA Task Force Report.

Notes Continued

5. Some water providers are undesignated and allowed to pump groundwater to serve pre-AWS Rules population solely using groundwater (ADWR Est.)

6. This figure is based on Brown and Caldwell's 2006 Metropolitan Area Facility Plan Update Pima County Wastewater Management Projection, accessed from <http://> on March 21, 2006. It includes the projected outputs of the three metropolitan wastewater treatment plants (95,286 af) plus the outputs of the non-metropolitan treatment plants (10,323 af) less the 10,000 af effluent set aside for the conservation pool less the 28,200 af of effluent held in trust for the Tohono O'odham Nation by the Department of the Interior. There are many uncertainties regarding the amount of effluent that will be utilized. They relate to the return flows from municipals uses, the manner in which the effluent is utilized (e.g. managed recharge at 50% credits or constructed recharge or direct utilization through the reclaimed system). The extent of future use of effluent to meet municipal demands may depend on technological innovations as well.

Notes Continued

7. The manner in which the 28,200 af of effluent held by the Secretary of the Interior for the benefit of the Tohono O'odham Nation will likely be used by municipal users in the Tucson AMA, but many uncertainties surround this utilization, as indicated in note 6. In addition, the CAGR D may use some of this effluent for its replenishment. So, there could be double counting involved.

8. This figure represents the subcontracts held by Tucson AMA M&I water providers and the Arizona State Land Dept. (14,000 af) and pending M&I reallocations. The Tohono O'odham Nation hold rights to 37,800 af, with another 28,200 non-Indian priority water associated with the recent federal water settlement. The scenarios assume no leasing of Indian CAP water for non-Indian municipal purposes.

9. An acre foot of water is 325,851 gallons.

10. Total Supply times 325,851

11. Gallons per capita per day is an assumed number that includes all customers and all water sources served by municipal water providers. It includes, for example, golf course use of effluent or reclaimed water provided through a municipal water system. The value of this number for the region will depend on the level of conservation across water using sectors, the mix of newer and older housing stock, the amount of outdoor water use, and other factors.

Notes Continued

12. Annual water use per year, equal to the assumed GPCD times 365.

13. The Scenario Population is the number of people that can be served by the Total Annual Supply, based on assumptions. It equals "total annual supply in gallons" divided by "water per person per annum".

14. This is the difference between the population that the scenario assumptions show can be supported by the assumed water supplies less the PAG projected population. A positive number demonstrates that the identified water supplies can serve more than the PAG projected population.

15. A ratio greater than one indicates that the scenario population is greater than the projected population.

Scenarios Spreadsheet – Assumptions can be modified!

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Sensitivity Analysis

Table 8: Ratio of Scenario Population to Projected Population	Full Use M&I and DOI Effluent	Half Use M&I and DOI Effluent
Base Scenario with a GPCD of 150 (Taken from Table 7)	1.57	1.38
Base Scenario with a GPCD of 165 (Taken from Table 7)	1.43	1.25
Base Scenario with a GPCD of 175 (All Other Calculations Same as Table 7)	1.34	1.18
10% Increase in PAG 2030 Pop. and a GPCD of 175 (All Other Calculations Same as Table 7)	1.22	1.07
No State Land CAP (14,000 af) with a GPCD of 165 (All Other Calculations Same as Table 7)	1.37	1.20
No State Land CAP (14,000 af) with a GPCD of 150 (All Other Calculations Same as Table 7)	1.51	1.32

Recommendations/observations

- Periodic State of the AMA Forum. The effort would involve the Arizona Department of Water Resources, water providers, government entities, the business community and others. It will take time and resources, but the importance of sound planning for our water future requires the effort. (October 2007 Community Conversation)
- Common set of facts important to informed decision making
- Collaborative approach to resolving water challenges is important

Additional Selected Recommendations

- Monitor growth in the CAGRD and consider the implications of that growth on the future availability and cost of water for the Tucson region.
- Develop some understanding the implications of shortages on the Colorado River on the cost and availability of CAP water.
- Support continued efforts to meet the safe-yield water management goal established in statute.
- Encourage regional efforts to explore innovative approaches to water supply treatment, infrastructure investment, and securing additional water supplies.

Additional Comments

Many of the suggested actions are associated with participation in collaborative, broad-based efforts.

Understanding of the nature of the region's water supply challenges requires looking toward the long-term.

Water management is not just the concern of water managers.