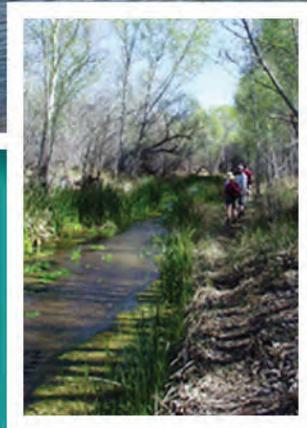
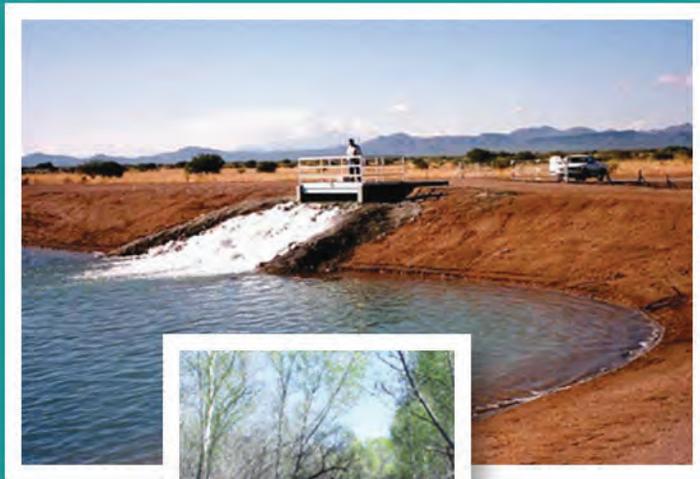
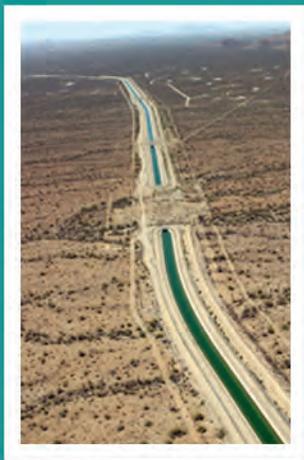


A City of Tucson  
and Pima County  
Cooperative Project



*Phase 2 Final Report*  
**Water &  
Wastewater**

*Infrastructure, Supply &  
Planning Study*



*December 2009*

## Acknowledgements

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### **City of Tucson Mayor and Council**

Robert Walkup, Mayor  
Regina Romero, Ward 1  
Rodney Glassman, Ward 2  
Karin Uhlich, Ward 3  
Shirley Scott, Ward 4  
Steve Leal / Richard Fimbres\* Ward 5  
Nina Trasoff / Steve Kozachik\* Ward 6  
*\*New Council Member as of December 2009*

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Richard Elias, Chairman, District 5

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We would also like to acknowledge the dedicated public who spent many hours attending meetings, listening to presentations, asking questions, providing suggestions, and helping to shape the final content of the report.

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[www.tucsonpimawaterstudy.com](http://www.tucsonpimawaterstudy.com)

# Message from Oversight Committee and Staff

The Joint Oversight Committee and staff from City of Tucson and Pima County are pleased to present our report from Phase II of the "Water and Wastewater Infrastructure, Supply and Planning Study." We began this study in April 2008. In May 2009, we published our Phase I report. With the release of this Phase II report, we complete the assignment Mayor and Council and the Board of Supervisors gave us.

After twenty months of research, study, analysis, and public deliberations, the staff and Committee believe we have accomplished your goals for us. In our Phase I report, we presented a detailed assessment of Tucson Water and Pima County Regional Wastewater Reclamation Department, accompanied by an assessment of our current water and wastewater supplies.

In Phase II, Mayor and Council and the Board of Supervisors directed that City and County staff reach agreement on a range of topics that we categorized under the headings "Comprehensive Integrated Planning," "Respect for the Environment," "Water Supply," and "Demand Management." This report details agreement between the City and County staff, and provides the Joint Oversight Committee's additional comments, reviews, and concerns for going forward.

The organization of this report preserves the different roles filled by staff and Committee, respectively, in undertaking our joint task for Phase II: to identify key issues and common goals related to a wide range of land use and water resource planning topics implicated in a sustainable water future for our region.

*City and County staff* provided technical expertise in addressing the topics identified in the scope of work. They deliberated extensively in the development of their technical papers in order to arrive at consensus recommendations which were then vetted and approved by City/County administration. This work is synthesized in Section III of the Report.

*The Joint Oversight Committee* members expressed their values and perspectives as citizens and appointees from their respective planning commissions or advisory committees. In Sections I and IV, the Committee introduces the broad topics of sustainability and values, and provides its conclusions and recommendations concerning the work completed in Phases I and II as well as how the effort should continue in the future. The Oversight Committee commends the staff work and generally supports the City/County shared goals and recommendations.

The strength of the Phase I and Phase II efforts lies in the thorough compilation of information and the deliberative process among technical staff, Committee members and the participating public. This process fostered mutual understanding of common facts regarding planning for a sustainable water future. Additionally, the values that emerged while discussing technical papers provide a window into the larger set of community values that must be considered in planning for a sustainable water future. The vast areas of agreement provide a solid foundation from which to continue City/County



<sup>1</sup> By a vote of 10-1, the Committee generally accepts goals and recommendations in section III. Specific comments from individual committee members concerning the shared goals and recommendations are located in Section IV, B of this report.

coordination in implementing specific actions to advance water sustainability. Surfacing areas of divergence is also valuable for highlighting the range of interests and values that exist in the larger regional community and for creating a reference point for future regional dialogue.

After months of working closely together, we have agreed upon several recommendations to the Mayor and Council and Board of Supervisors. In the Phase I report, the Joint Oversight Committee reached two conclusions about water and wastewater: (1) "Overall, our water and wastewater systems are reliable and well maintained" and (2) "Tucson Water has a reliable and renewable water supply for the near term." The Committee still believes these two statements, recognizing that these two facts provide a firm foundation for facing the opportunities and challenges of the future.

We (Committee and staff) agree that we face opportunities and challenges for the future, and we further agree that now is the best time to prepare to meet these opportunities and challenges. There are several drivers of these opportunities and challenges, including **uncertainty** (climate change and drought); **costs** (for maintaining, rehabilitating and replacing our existing infrastructure; diversifying our water supply; and complying with new water and wastewater quality standards); and **growth** (to provide for new water and wastewater demands and the infrastructure to meet that demand).

To meet and benefit from these opportunities and challenges, we are recommending a new direction in how we think about and do water and wastewater resource planning. This new paradigm includes recognizing where we are now (in an arid environment with water scarcity); envisioning a sustainable water future (water now and in the future for people and the environment from renewable sources); and recognizing four elements of water resource planning (comprehensive planning, respect for the environment, water supply reliability, and demand management.)

Second, we are recommending an action plan with 19 shared goals and 56 recommendations, as well as some considerations for future planning processes.

We believe identification of the new paradigm and the accompanying action plan are decisive first steps for achieving the ultimate goal: a sustainable water future, for ourselves and for future generations. We are fully aware that we are recommending **first steps** and that the Joint Study is the beginning--not the end--of a longer journey. But, as the Chinese adage says, a journey of a thousand miles begins with a single step." We say, "Let's get started."

The Joint Oversight Committee and City of Tucson and Pima County staff hereby submit our Phase II report and respectfully recommend the following actions by the Mayor and Council and Board of Supervisors:

1. Mayor and Council and Board of Supervisors should hold a joint public hearing on both the Phase I and Phase II reports from the water/wastewater study;
2. Mayor and Council and Board of Supervisors should adopt a joint resolution accepting the Phase I and II reports;
3. Mayor and Council and the Board of Supervisors should adopt a joint resolution approving the recommendations described in this Phase II Report, and direct city and county staff to report back to their respective governing body with a detailed action plan and schedules for translating the action plan into ordinances, resolutions, and intergovernmental agreements;
4. Mayor and Council and the Board of Supervisors should help a regional process/ dialogue on a sustainable water future to be convened, and commit resources to assuring that it can happen. The City and County should use the adopted Phase I and Phase II reports as City's and County's positions in these dialogues.
5. Mayor and Council and the Board of Supervisors should refer the Phase I and Phase II reports to the full City Water Advisory Committee, Regional Wastewater Reclamation Advisory Committee, and both Planning and Zoning Commissions with a request that these public advisory committees monitor implementation of the adopted action plan and that these committees submit an annual report assessing progress on implementing the action plan.

# I. OVERSIGHT COMMITTEE'S INTRODUCTION TO THE REPORT

## A. The Need for a New Paradigm

Since the 1860s, the paradigm for water resource planning in the Tucson basin has been:

*"Let the people come, we guarantee to provide enough water."*

Land use planning and water resource planning have been unconnected, both institutionally and conceptually. Local land use planners assumed—and water resource managers guaranteed—that there would be water available to satisfy continued growth. But, during the last century, we overwhelmed the capacity of the Santa Cruz River as a water source; we over-drafted the Santa Cruz River basin aquifer; perennial surface flows in the Santa Cruz River near Tucson ended; and our region currently depends heavily on imported water from the Colorado River.

We know now we are poised to go in another direction. Defining a sustainable water future for this community will require large scale changes and paradigm shifts in how we approach water supply management on a municipal and regional scale. It will require new financial models for operating water utilities, political will to recommend full-cost pricing of water, and considerable education and outreach to the community. It will also require unprecedented regional cooperation in management of water supplies.



Ground subsidence

In the near term our water supply portfolio is in reasonably good shape, but we want to start now to think creatively and realistically about a sustainable water future, for ourselves and for the future. Diversifying and augmenting water supplies is necessary for the current population, and will also help to serve those who will move here in the future.

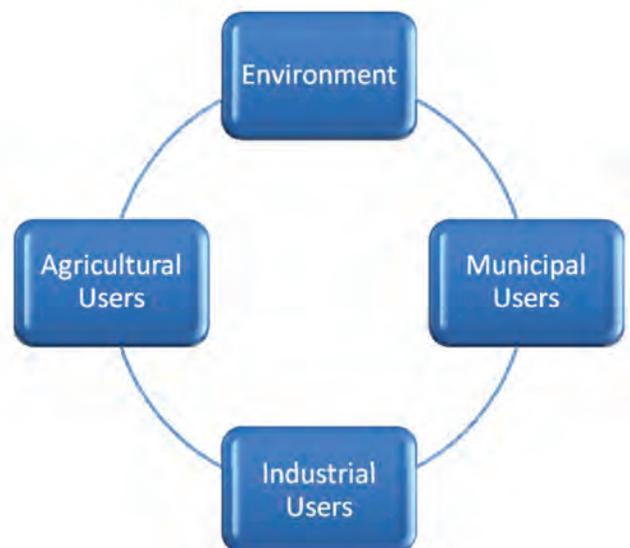
We need to build a sustainable water future on three principal pillars:

- aggressive demand management
- new water supplies
- guiding the coming growth increment in terms of urban form/density and location

The new paradigm for water resource planning and management:

- recognizes scarcity and uncertainty
- puts the environment at the table where water is distributed
- balances water supply and demand management
- builds upon the crucial link between urban form and water resources
- elevates public dialogue to a central position in future planning

## Water Use Sectors in the New Paradigm



# How We Plan with a New Paradigm

## Recognize where we are now

- We live in an arid environment
- We face an era of scarcity in water supplies and financial constraints



## Envision a Sustainable Water Future

1. Water for people and for the environment, now and in the future
2. Learn from the desert and make ourselves drought resistant/tolerant
3. To the extent possible, all water supplies will be from renewable sources



## The Elements of Water Resource Planning



## B. Defining Sustainability

As they responded to the Scope of Work, both Committee and Staff frequently referenced “sustainability” in their discussions, and developed numerous lists of ideas and elements over the course of Phases I and II that attempted to say what a “sustainable water future” involves. Our work during Phase I documented how elusive the concept is in practice.

Historically, settlers to the Western states gradually institutionalized in laws a commodified “use it or lose it” water ethic, whereas the prevailing view among indigenous communities has been that water is more than simply a commodity. Water is a common resource that supports all life, and therefore ethical management meant conservation: One should take only what one needs.

A renewed desire for “sustainability” in the modern era implies a responsibility to assure that our water demands do not outstrip the water supplies which must support the current population of users (including the environment), newcomers, and the generations to follow. New water users and uses may emerge that we cannot now predict, and

**Working Definition of “A Sustainable Water Future”**

Our planning and monitoring activities assure a renewable water supply sufficient to support economic vitality, community vibrancy, and environmental viability, now and in the future, by continuously adapting to changing conditions in our region.

**Renewable Water Supply**

<p><b>Economic Vitality</b></p>	<p><b>Social Vibrancy</b></p>	<p><b>Environmental Viability</b></p>
<p>Diverse economy, with desirable jobs &amp; growth potential</p>	<p>A good quality of life for all people of our community</p>	<p>of both local and distant ecological systems contributing to our water portfolio</p>

future generations will be called upon to remake their definition of a “sustainable water future” in response to conditions emerging in their time. Thus, making plans without building in frequent monitoring of demand, supply, and ecological systems viability--in the face of changing environmental, social, climate and economic conditions--will most likely result in failure to realize sustainability goals.

“Sustainability” in the modern era also implies a regional purview. Water supplies in the Tucson basin extend across and impact a variety of jurisdictions. Moreover, our region imports a significant supply of water from the Colorado River, and as we import water from outside the Tucson basin, we impact other potential users (and vice versa) along with the environmental viability of places outside of our community.

These considerations provide the context in which we work--as the City and County, and as the Tucson basin region--to plan a sustainable water future.

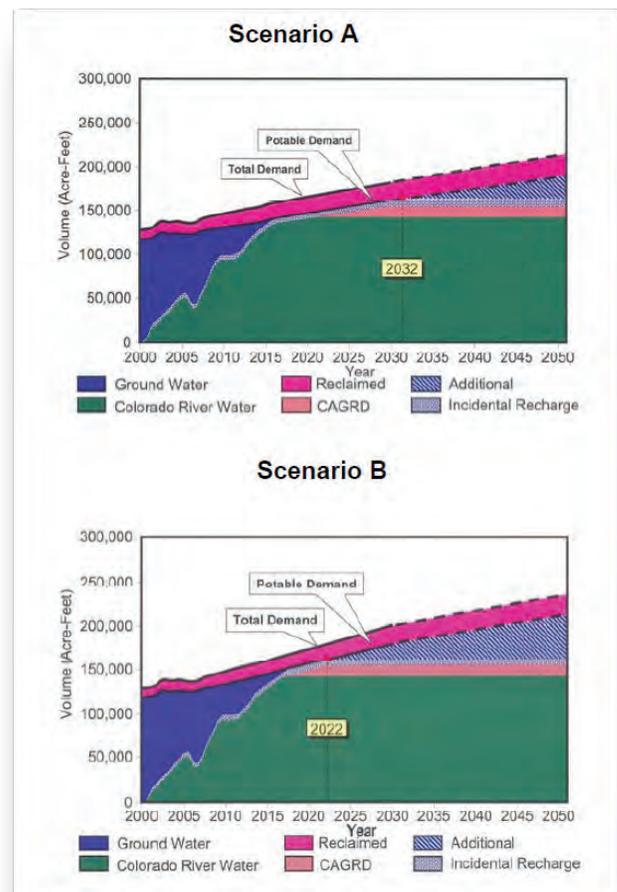
### C. Addressing Uncertainty

The technical papers of Phase II detailed a multitude of uncertainties when trying to plan for the future. Prognostication is not an exact science. Therefore, our community must be prepared for many eventualities that cannot be precisely quantified, including extended local and regional drought, climate change, population fluctuation, changes to urban structure/land use, and water availability.

Since figures resulting from modeling and scenarios can vary widely (especially the further we are projecting into the future), we need to think in terms of ranges (high/low), and, update our prognostications every five years to reflect actual and new indices. City and County plans, in fact, are currently updated on such a schedule.

The technical recommendations in Section III of this report address drought and uncertainties. In addition, **the Oversight Committee offers the following specific recommendations to manage risk:**

- ✓ Scenario planning is currently undertaken by both Tucson Water and Pima County Wastewater, and should be continued. Use scenario planning as a tool to assess the changing planning environment, including the potential for extended drought or permanent climate change. Likewise, economic uncertainties, the level of water demand, and the pace/size/location of population growth can all be addressed in scenario planning. Use a sensitivity analysis method, where scenarios are built from X% plus or minus the baseline model/scenario that is likely to occur. Two major calculations to consider are probability of occurrence and potential magnitude of impacts/costs. In all cases, assumptions of each scenario should be delineated.
- ✓ When modeling, some variables to consider are:
  - the year(s) to be looked at
  - the expected water supply for that time period (high/low)
  - possible extended drought effects
  - potential new supplies resulting from better wastewater treatment, rainwater and greywater harvesting, and savings from less per capita use
- ✓ Do a regionally-coordinated drought planning effort for the public’s benefit, as it would be helpful to develop concepts and approaches that are understood by all. And pay attention to special needs of the environment during drought.



- ✓ Evaluate and consider social and financial impacts of drought on citizenry, and develop ways to address them in an equitable manner.
- ✓ Renewable supplies are more reliable than mined groundwater (which guarantees depletion), but are not fully risk-free. The availability and volume of renewable water supplies are not guaranteed in the face of changing local and extra-regional climactic conditions, and include reliance on water of distant origin that must be brought to our area through mechanical means. Future legal issues pertaining to renewable sources may also be a limiting factor.

## D. Principles Intrinsic to Achieving Water Sustainability

We believe the following principles are intrinsic to achieving water sustainability. These are not new principles and, to varying extents, they are already in practice. We believe, however, that the principles should be stated as clearly as possible and widely adopted.

The principles are consistent with the new paradigm and definition of water sustainability presented above and should inform implementation of the recommended action plan. We also believe that these principles should guide and inform any regional dialogue on water and wastewater.

### **Principle 1: Water is an essential part of life for humans and the environment. Delivery of water and wastewater must maximize both quantity and quality.**

In this report, we focused on water and wastewater quantity and the charge that the City and County acquire, develop, and deliver water and wastewater in sufficient supply to meet the social, environmental, and economics needs of the present and the future. Access to the water necessary for life is a right--not a privilege--and access to water must never be comprised for private or personal gain, or for any other reason.



*Photo on right by Daniel Lobo*

The human community and the environment depend utterly on the City and County delivering water and wastewater that meet or exceed all current and future federal, state and local regulatory standards. There are contaminants of known and emerging concern for which standards have not been set and might not be set for years, if at all. City of Tucson and Pima County staff will continue to monitor progress in the scientific literature and regulatory literature in measuring the risks associated with these contaminants, and will keep Mayor and Council, the Board of Supervisors, and the public fully informed on the status of the scientific literature. When in doubt, we should design management strategies that err on the side of caution.

### **Principle 2: The environment must be considered a user, not simply a provider, of water resources.**

The environment provides the biophysical foundation for human life, and water is a critical element for the continuing functioning of all ecological systems. Impacts to the natural environment must always be considered in planning, allocation, and siting decisions such that water is reserved for maintaining a healthy environment.



*Birds in Flight at Tres Rios del Norte*

### **Principle 3: Policies affecting water and wastewater must be open to wide public discussion in a completely transparent process.**

Open, inclusive, and transparent public dialogue and deliberative processes lead to better policies and decisions than does “deal-making” outside of the public eye. No interests should be excluded from deliberative processes.

Mayor and Council and the Board of Supervisors already comply with many statutes, rules and regulations on open meeting laws, notification, and due process. Indeed, this Oversight Committee was appointed to provide public input and transparency. The Oversight Committee also went to great lengths to achieve greater transparency and public participation. In retrospect, we recognize how difficult it is to catch the public’s attention in a world of so many messages, daily concerns, and distractions. Achieving openness, inclusiveness, and transparency requires we remain vigilant, especially during times when tough decisions must be made. In addition, it is essential that expert information informs the public process.

### **Principle 4: Water is an economically-valued resource and must be managed with due consideration to its economic value.**

All costs and benefits of water and wastewater policies need to be identified and measured in order to establish baseline facts concerning the net outcomes of policy options or projects under consideration.

*In addition to financial costs, the following must also be assessed:*

- (A) energy costs in the physical management and transportation of water
- (B) opportunity costs (what other opportunities are being foreclosed if we decide on a given option)
- (C) environmental costs
- (D) social quality of life costs

Equity and social justice issues related to cost and quality of life must also be addressed in evaluating policy proposals and projects. We need to consider the community’s ability to pay: 20% of our population lives below poverty level. How will we afford major expenditures? How will households afford to pay for their water needs?

## II. DESCRIPTION OF PHASE II

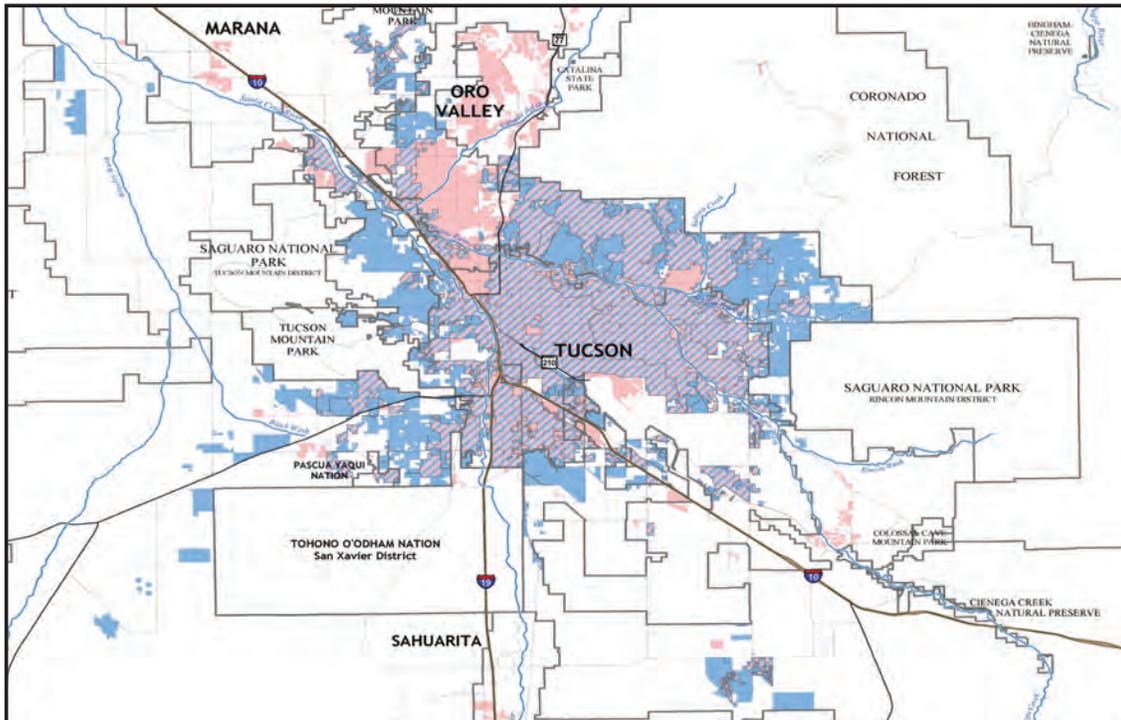
### A. Background

On April 1, 2008, the Tucson Mayor and Council and the Pima County Board of Supervisors adopted a joint Scope of Work for a “Water Infrastructure, Supply and Planning Study” (hereafter, “Joint Study”). The Mayor and Council and the Board of Supervisors (Board) anticipated using the study to improve City-County collaboration on water and wastewater issues and to develop a common understanding of basic facts and critical factors related to planning for a sustainable water future. This common set of baseline facts and information meant developing a complete inventory of water and wastewater systems, and identifying key issues and common goals related to a wide range of land use and water resource planning topics.



The long-term goal of the five-phased study is to define and develop a sustainable water future for the entire eastern Pima County region. The effort began in Phases I and II with a cooperative City/County fact finding process relying primarily on their respective staffs to gather existing information. To provide independent review and oversight of staff work, Mayor and Council and the Board appointed a Joint City/County Oversight Committee (Committee), consisting of four members each from the Citizens Water Advisory Committee, the Regional Wastewater Reclamation Oversight Committee, and two members each from the jurisdictions’ Planning and Zoning Commissions, for a total of twelve members.

Phases I and II focused on Tucson Water and Pima County Regional Wastewater Reclamation Department and their service areas (see accompanying map). In Phase I the objective was to compile a baseline set of facts and information related to the condition and capacity of water and wastewater infrastructure, available water supplies in the City/County Service Areas and various planning factors. The Phase I report assembled facts about the water and wastewater systems and resources as well as identified critical factors associated with water sustainability. The report is available on the Study website [www.tucsonpimawaterstudy.com](http://www.tucsonpimawaterstudy.com).

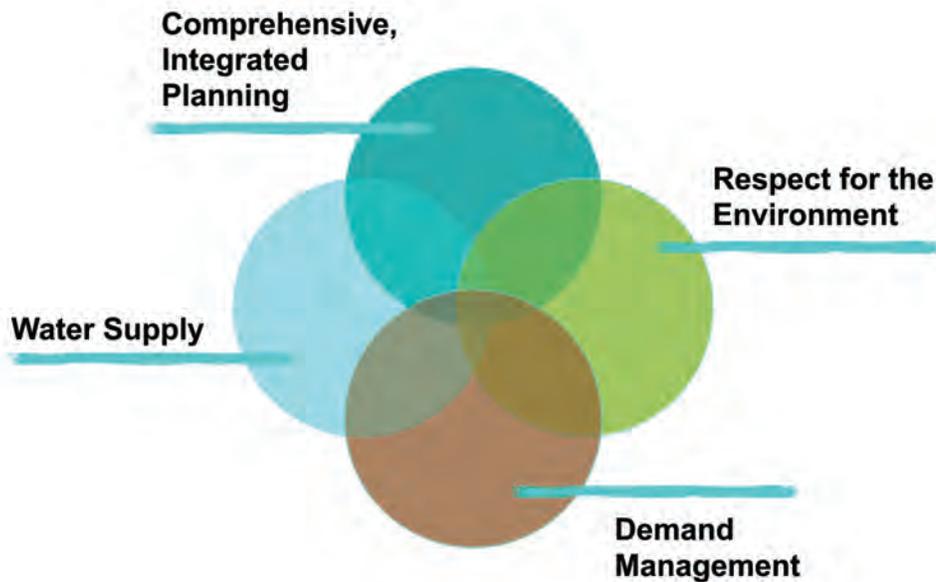


In Phase II, the objective was to establish a common set of water resource development and water conservation goals. The Scope of Work for Phase II identified a range of topics related to land use and water resources planning, environmental needs for water, water supply and demand management. To address these topics City/County staff, and in some cases consultants, developed 14 technical papers and presented them to the Oversight Committee during Phase II.

The Phase II report synthesizes the 14 technical papers, includes joint City/County goals and recommendations, and reports the Committee's review and deliberations. Together, the Phase I and II reports provide a foundation for the future regional process that is recommended in the scope.

## B. Guiding Principles for Phase II as Detailed in the Scope of Work

The adopted Scope of Work for Phase II includes a set of guiding principles which are grouped into four categories as follows:



### Comprehensive, Integrated Planning:

- Urban form, water and infrastructure planning will directly influence where future population growth will occur
- Locating future population should be done in a manner so as not to disadvantage or adversely impact existing residents
- New growth must be located where it is beneficial to the environment, economy, and conservation of our resources
- Large scale infrastructure systems to support the growth centers must be integrated with existing urban infrastructure systems that are in place
- Land use planning must be integrated with water resources and infrastructure for each jurisdiction

### Respect for the Environment:

- Ensure an appropriate and proper balance between the reservation of water for consumption and growth, and the acknowledgement that our environment is also a consumer of water resource, and certain water reservations for the environment must be made and sustained

### Water Supply:

- Long-term water supply cannot occur at the expense of our existing residents or the environment
- Increase the use of reclaimed or recycled water on turf irrigation to substitute for groundwater use
- Enhance regional collaboration efforts to acquire new, renewable water supplies, such as long-term CAP leases

### Demand Management:

- Increase consistency of water conservation standards and ordinances
- Water conservation should be viewed as protecting a future water supply, not simply making more population growth possible
- Drought management planning should be consolidated

## C. Description of the Phase II Process

### The Citizen Oversight Committee

In Phase II, the Oversight Committee was comprised of eleven members listed below. Three members of the Committee resigned at the end of Phase I and were replaced by three new members\*, one of whom later resigned and was not replaced.

James T. Barry, Committee Chair, Citizens Water Advisory Committee  
Christopher Brooks, Citizens Water Advisory Committee\*  
John Carlson, Regional Wastewater Reclamation Advisory Committee  
Marcelino C. Flores, Committee Vice Chair, Regional Wastewater Reclamation Advisory Committee  
Bruce Gungle, Pima County Planning and Zoning Commission  
Rob Kulakofsky, Regional Wastewater Reclamation Advisory Committee  
Tina Lee, Citizens Water Advisory Committee  
Joseph Maher, City of Tucson Planning Commission\*  
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*\* new member in Phase II*

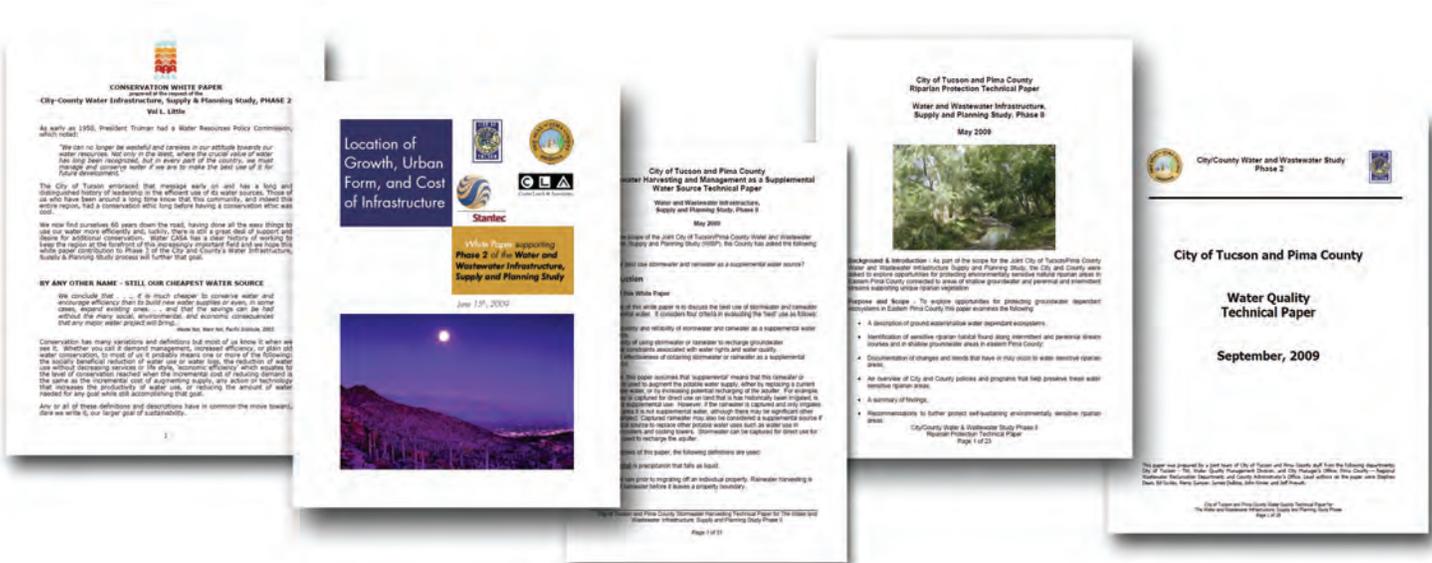
The Oversight Committee met 11 times between April and December 2009 to conduct Phase II of the study. This represents approximately 44 hours of meeting time, and does not include the staff time to prepare the technical papers described below nor the committee members' considerable time spent outside the meetings in reviewing the technical papers and background information prior to meetings, as well as the time dedicated to preparation of this final Phase II report.



*Meeting of the Oversight Committee, October 2008*

# Technical Reports

Interdisciplinary WHITE teams of City/County staff developed 10 of the 14 technical reports in Phase II in response to the scope's guiding principles listed above. The additional four papers were submitted by outside experts or utilized consultant assistance. The technical reports range in length from 20 to 50 pages and each includes a set of recommendations. The reports were reviewed internally and approved by City/County administration before being distributed and presented to the Oversight Committee for their meetings throughout Phase II.



1. Integrating Land Use Planning with Water Resources and Infrastructure (City/County staff)
2. Location of Growth, Urban Form, and Cost of Infrastructure (Stantec Consulting, Inc. in cooperation with Curtis Lueck and Associates and City/County staff)
3. Utility Cost of Growth (City / County staff)
4. Environmental Needs for Water (City/County staff)
5. Riparian Protection (City/County staff)
6. Stormwater Management (City/County staff)
7. Additional Water (City/County staff)
8. Water Quality (City/County Staff)
9. Reclaimed Water (City/County staff)
10. Drought Planning (City/County staff)
11. Water Conservation (City/County staff)
12. Water Conservation (Val Little, Water CASA)
13. Water as an Economic Resource (Tucson Regional Water Coalition)
14. Population Primer (Jim Barry, Chairman, Oversight Committee)

## **The Role of City and County Staff**

Staff from the City and County contributed their technical expertise in Phase II by developing and presenting the 14 technical reports described above. They also fulfilled the Committee's administrative and coordinating tasks. Following completion of the study portion of Phase II, the staff turned their attention to writing the technical section of the Phase II report (Section III). Among the 14 technical reports, there was considerable overlap and a number of cross cutting issues, so the staff interdisciplinary technical teams worked together to synthesize the entire body of work by

- Grouping recommendations first in major categories and then further clustering similar recommendations within these major categories
- Identifying a shared goal for each cluster of similar recommendations
- Editing the recommendations to reduce redundancy and increase clarity and specificity where appropriate
- Identifying the key issues for Phase II

The resulting Section III of this report summarizes issues and identifies 19 goals across four major categories (comprehensive integrated planning, respect for the environment, water supply, and demand management) and 56 recommendations for how to achieve these goals.

## **The Role of the Oversight Committee**

The Oversight Committee contributed community perspectives that overlap with, but also go beyond, the expert knowledge from City and County administration and staff. In this report, Committee members:

- detail the emergence of a new water and wastewater planning paradigm
- offer their working definition of a sustainable water future
- identify the community values they want to see reflected in water and wastewater planning and provide a list of four principles and criteria for assessing policy options and projects under consideration by the City and County

Where they differ from the technical issues, goals, and recommendations of Section III, Committee members offer their individual perspectives. Finally, they provide additional recommendations for future phases of this project.

## **An Unprecedented Collaboration**

The City and County are profoundly grateful for the Committee members' enormous commitment and dedication to this process. The combined jurisdictional and staff/committee combined effort is unprecedented in our history.

# III. SHARED GOALS AND RECOMMENDATIONS

Part III of this report summarizes information from the 14 technical reports and identifies goals and recommendations in four categories that were co-developed by planning staff from the City of Tucson and Pima County. The following chart shows these goals and recommendations at-a-glance; a narration of issues and explanations of goals and recommendations follows the chart.

## Comprehensive Integrated Planning

### 1 Encourage sustainable urban forms

- 1.1 Require and encourage smart growth principles

### 2 Direct growth to suitable growth areas

- 2.1 Encourage growth in four (4) suitable growth areas / existing built environment as highest priority
- 2.2 Link capital planning and land use planning / direct investment to desired growth areas
- 2.3 Acquire open space to define desired growth areas
- 2.4 Conduct regional growth scenario modeling

### 3 Integrate land use planning and water resources planning

- 3.1 Conduct comprehensive water resource planning outside of the obligated service area
- 3.2 Consider obligated service area expansion based on above analysis and additional criteria
- 3.3 Continue to track resources for new development / County Water Element, City Water Checkbook
- 3.4 Pursue wheeling and recharge agreements
- 3.5 Work toward regional solutions to address any hydrological pumping/recharge disconnect

### 4 Growth should pay for itself over time and be financially sustainable

- 4.1 Put mechanisms in place to ensure fiscal sustainability of new development
- 4.2 Continue to ensure “growth pays for growth” in water and wastewater financial planning

## Respect for the Environment

### 1 Preserve existing riparian areas through coordinated regulation, policy, and outreach

- 1.1 Continue preservation through acquisition, regulation, education and outreach
- 1.2 Address non-exempt wells and surface water diversions affecting riparian areas

### 2 Identify needs and opportunities for future restoration

- 2.1 Develop regional policy on regulatory compliance projects
- 2.2 Collaborate regionally on riparian restoration
- 2.3 Work with ADEQ on water quality standards for habitat restoration

### 3 Ensure that public projects are multi-benefit, including restoration, stormwater management, recharge, and public amenity

- 3.1 Pursue multi-benefit public projects using reclaimed water
- 3.2 Pursue stormwater management opportunities in areas dominated by impervious surface

### 4 Ensure the future of riparian and aquatic habitat along the effluent-dependent reach of the Santa Cruz River

- 4.1 Advocate for changes to allow full recharge credit for Secretary of Interior effluent
- 4.2 Develop a “Lower Santa Cruz River Management Plan”
- 4.3 Build upon pilot restoration demonstration projects to develop a portfolio of multi-purpose projects
- 4.4 Incorporate in-channel and off-channel recharge facilities

### 5 Develop water supply for the environment

- 5.1 Finalize the Intergovernmental Agreement (IGA) for the Conservation Effluent Pool
- 5.2 Link water conservation to environmental preservation/restoration

## Water Supply

### 1 Work collaboratively to acquire new water supplies for reliability

- 1.1 Maximize opportunities to acquire water supplies through regional cooperation and the “Acquire, Develop and Deliver” (ADD) water process
- 1.2 Tucson Water should acquire additional supplies to buttress its Central Arizona Project (CAP) allocation and serve growth in the obligated service area
- 1.3 Consider all costs and benefits in the acquisition of new supplies

## **2 Maximize and make efficient use of effluent and other locally renewable water supplies**

- 2.1 Balance uses of effluent - reclaimed, environment and aquifer recharge
- 2.2 Continue to implement Regional Optimization Master Plan (ROMP) improvements
- 2.3 Stay vigilant about water quality
- 2.4 Evaluate reclaimed expansion from the perspectives of efficiency and overall water resource portfolio
- 2.5 Continue to evaluate greywater expansion
- 2.6 Continue to encourage rainwater harvesting

## **3 Address regulatory barriers to maximizing local supplies**

- 3.1 Address groundwater credits to provide incentives to convert to reclaimed
- 3.2 Move to Class A+ water for the reclaimed system
- 3.3 Work with Arizona Department of Environmental Quality (ADEQ) and Arizona Department of Water Resources (ADWR) regarding water quality standards for riparian projects

## **4 Foster increased use of reclaimed water through system expansions, increased effluent allocations, and incentives**

- 4.1 Expand financing options
- 4.2 Maintain private payer and explore pricing incentives to encourage conversion
- 4.3 Lower operating cost by increasing system efficiencies
- 4.4 Consider reclaimed water in new developments
- 4.5 Consider other uses of reclaimed water for municipal and environmental supply needs
- 4.6 Increase the amount of effluent dedicated to reclaimed
- 4.7 Attract additional reclaimed customers based on efficiency considerations and benefits achieved

## **5 Be prepared for climate change and drought**

- 5.1 Continue multi-pronged planning approach
- 5.2 Use scenario planning

# **Demand Management**

## **1 Increase the effectiveness of conservation programming through coordinated planning and evaluation**

- 1.1 Collect uniform data on water use patterns to identify conservation potential
- 1.2 Use triple bottom line and cost/benefit analysis to improve conservation programming
- 1.3 Employ an adaptive planning approach to drought preparedness

## **2 Establish common water conservation goals and targeted methods**

- 2.1 Establish regional, measurable water efficiency and conservation goals
- 2.2 Develop regional water conservation approaches

## **3 Manage demand through design of the built environment**

- 3.1 Review development regulations for consistency and improved potable water conservation

## **4 Manage demand through changing behaviors**

- 4.1 Gather public input regarding quality of life trade-offs associated with water efficiency
- 4.2 Advance a regional approach to conservation education, communication, pilot projects and training

## **5 Increase the use of rainwater and stormwater to reduce demands on potable supplies**

- 5.1 Develop design guidelines for neighborhood stormwater harvesting
- 5.2 Analyze expanded water and stormwater harvesting potential and benefits

## A. Comprehensive, Integrated Planning

Water and growth are connected in a variety of ways. Extensions of water and wastewater infrastructure and the availability of water resources influence growth. On the flip side, growth influences the need for water resources and infrastructure. Water is one factor that influences and limits growth, but it is not the sole driver or single limiting factor. As other communities have demonstrated, more water can be acquired at additional cost if growth is desired. What is needed is a rational plan for growth—including the efficient allocation, distribution, and use of all available water resources along with other public infrastructure and services—that remains sustainable from environmental, financial, economic, and social perspectives.

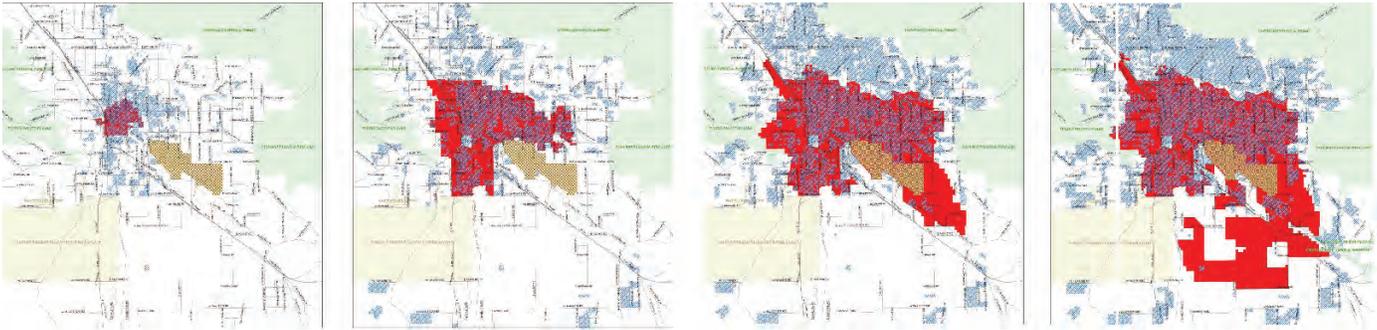
In the past, Tucson Water and Pima County Regional Wastewater Reclamation Department (RWRD) have operated in the context of a large planning area, extending service throughout the region based on demand. This approach has led to continual expansion of the service areas without regard to appropriate location or form of growth.



At the same time, our land use planning efforts have largely been jurisdictional and site-specific, rather than comprehensive and regional. We have not directed growth, instead, we have responded to demand for it. In addition, we have not connected land use and water planning efforts with planning of other services and infrastructure such as transportation, stormwater, parks, etc. Each of these services has been planned in a “silo,” and this practice has contributed to unmanaged growth, environmental problems, infrastructure and service deficits, and diminished public resources. The continuation of this disjointed and reactive planning model is not sustainable. Managing growth—both its form and location—is critical to creating a sustainable water future. We must consider in tandem (a) where we provide water and (b) where and how we want growth to occur.

The Phase II Growth and Urban Form technical paper does not attempt to predict the likelihood, timing, or scale of growth, but rather attempts to answer the question: If growth does occur, how can we accommodate it in the most sustainable manner possible? The paper addresses the forms and location of growth and makes the point that quality of growth is more important to focus on than quantity of growth. As a community, we have much more control over where growth occurs and how it is designed than we do over its likelihood, timing, or scale. Our region clearly has natural limits to growth based on available land, water, financial resources, and economic conditions. But within these constraints, there is capacity for significant growth to take place, perhaps doubling the current population. Efforts aimed at preventing or limiting growth can have negative side effects such as increasing housing cost, deterring economic growth, and pushing growth to ex-urban areas.

In addition to the form and location of growth, it is important to also consider the type of growth. Is it only rooftops and retirees? Will it include high paying jobs and young professionals? A theme from Phase I was that our local economy is overly dependent on growth and real estate development and that this is not healthy or sustainable. While our population is likely still going to grow at some rate, there is no guarantee that in the future we will grow in the same manner as we have in the past. Declining growth is not necessarily a bad thing. Diversifying our economy can help to make our community more resilient to changing growth trends.



*Rapid Tucson growth – 1950, 1970, 1990, 2005*

A key aspect of integrated planning is to identify opportunities to invest in and optimize use of our existing infrastructure. To achieve sustainability goals, changes to the existing infrastructure must begin by improving the efficiency and flexibility of the existing built environment, including roads, parks, public services, water, wastewater, and stormwater systems. In addition to considering the location and form of growth, integrated planning also needs to consider the efficient allocation, distribution and use of all available water resources including stormwater, effluent and potable water.

This section of the report focuses specifically on Tucson city limits and unincorporated Eastern Pima County, and does not address the other jurisdictions in the region. The goals and recommendations in this section come from the following background technical papers that were prepared as part of Phase II of the Study

1. Integrating Land Use and Water Resources Planning
2. Urban Form and Population Growth
3. Utility Cost of Growth
4. Economic Value of Water
5. Population Primer

The full technical papers are provided online as appendices to the report. They were written to address the following guiding principles provided in the for the Study:

- Urban form, water, and infrastructure planning will directly influence where future population growth will occur
- Locating future population should be done in a manner so as not to disadvantage or adversely impact existing residents
- New growth must be located where it is beneficial to the environment, economy, and conservation of our resources
- Large scale infrastructure systems to support the growth centers must be integrated with existing urban infrastructure systems that are in place
- Land use planning must be integrated with water resources and infrastructure for each jurisdiction

## **Goal #1: Encourage Sustainable Urban Forms**

Urban form refers to the design, arrangement, appearance, and functionality of the built environment, including how compact or spread out development is and the amount and types of land uses co-located together. Urban form is most easily measured by density, however, density is but one aspect of urban form. Elements of a sustainable urban form are outlined in Recommendation 1.1 below.

The Growth technical paper takes a quantitative look at the effects of urban form and finds that small increases in density can have significant positive impacts on a whole host of factors related to sustainability and quality of life in our community, including

- Reduced car passenger miles
- Fewer miles of road per capita
- Lower water consumption per household
- Lower energy consumption and greenhouse gas emissions
- More walkable neighborhoods and urban spaces that contribute to improved public health
- More efficient delivery of public services and infrastructure
- More transit opportunities
- More types of housing choices



*Examples of urban forms: office (left) and medium/high density residential (right) – graphics taken from Growth technical report*

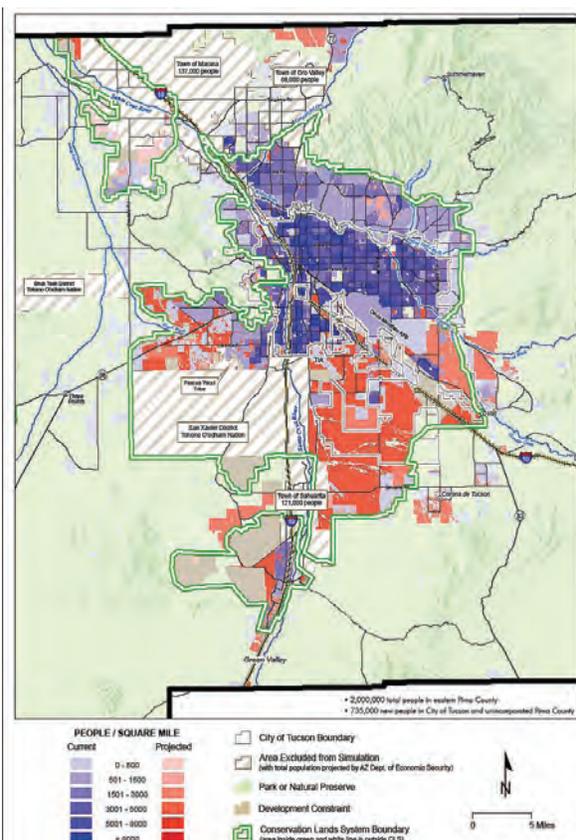
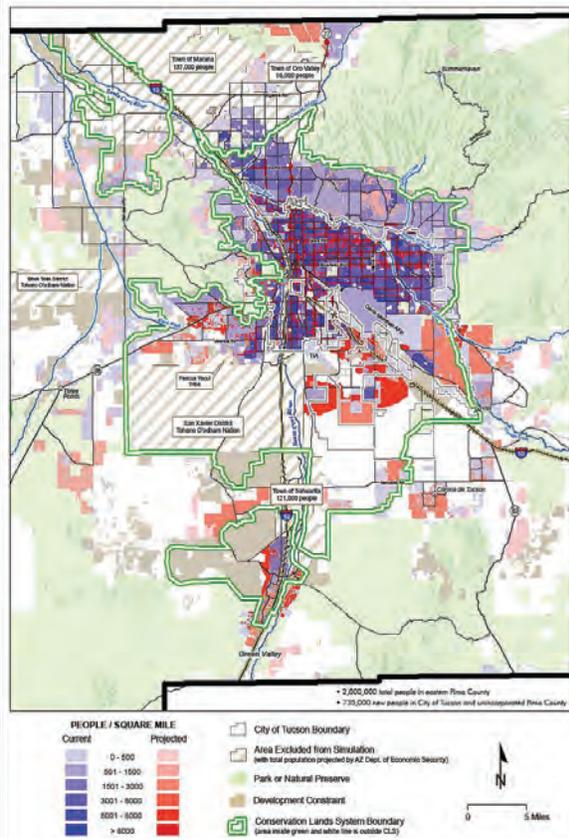
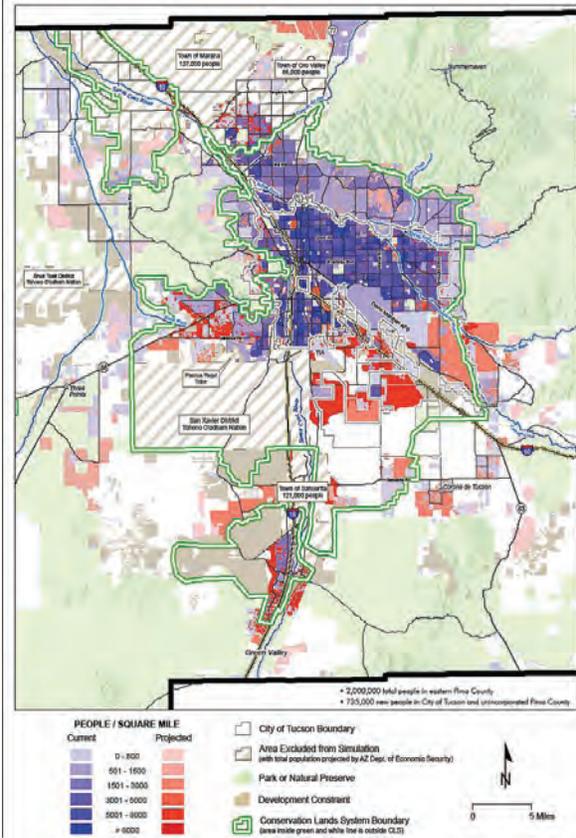
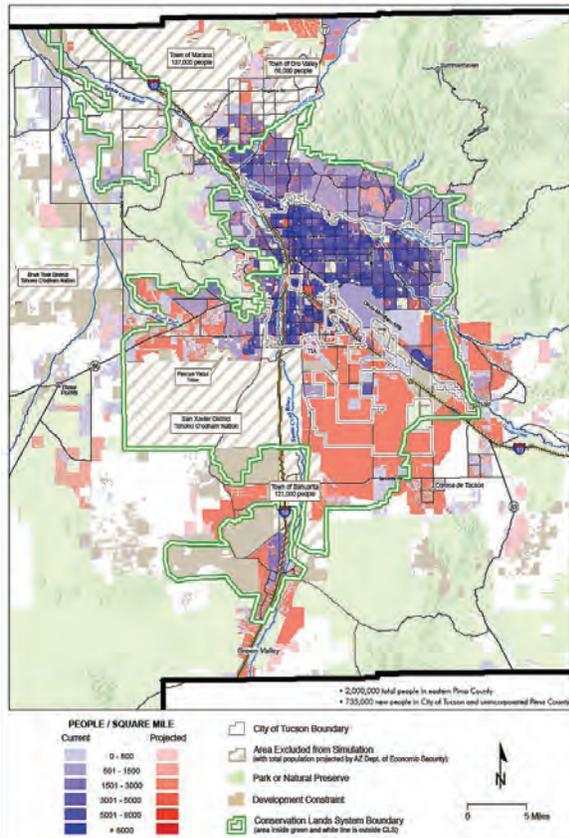
It is important to note that density does not mean uniformity: It means greater diversity in the built environment with more choices for how and where people live, work, and get around. Increases in density are typically done in nodes and select locations, not by densification of the entire community. In fact, protecting historic areas, rural areas, and single family neighborhoods are important components of a sustainable urban form.

To be functional and desirable, density must come with amenities. Our current growth pattern has meant that we have not been able to afford the necessary investments in our community, and has led to significant service and infrastructure deficits. Revenue “freed up” from better directed growth and infill should be invested in the existing built environment in order that infill and increased density can be sustainable, provide community benefits, and be accepted by residents.

In the Growth technical paper, four urban form scenarios were modeled: a status quo scenario, an enhanced habitat protection model, a taxpayer savings/infrastructure efficient model, and a transit oriented model. Both quantitative and qualitative results of each are discussed. The modeling exercise points out that as we grow, we have choices as a community and that we are not relegated to grow in the same form as we have in the past. In fact, it is clear that continuing our same pattern of growth is not a sustainable option going forward.



*Tucson's urban core at night– graphics taken from Growth technical report p. 64*



Four Urban Form Scenarios

## Recommendations

1.1 The City and County should require and incentivize new development and redevelopment projects to implement smart growth principles and concepts, and contribute to a sustainable urban form that includes

- Mix of uses
- Open space preservation
- Higher densities/ density by design
- Housing choice
- Transportation options
- Access to jobs and services
- Reduced water and energy consumption
- Infrastructure efficiencies

A variety of policy and legislative tools should be developed to implement these concepts including:

- General and Comprehensive Plan Policies
- Land Use Code changes
- Other relevant legislative actions
- Incentives

As part of their updates to the City General Plan and County Comprehensive Plan, City and County staff should involve the public in discussions about smart growth and sustainable urban form concepts and explore implementation tools.

The City and County should support the emerging regional visioning process as a way to engage the community in a discussion of the importance of urban form. This regional visioning process can contribute to reaching a broad consensus on community values concerning urban form.

## Goal #2: Direct Growth to Suitable Growth Areas

There are areas within the Tucson region that are more suitable for new development to occur than others. More suitable areas for growth are generally those that have the fewest environmental impacts and are closer to infrastructure and the existing built environment. Less suitable areas for development are located far from the existing built environment, lack services and infrastructure, and require long commutes due to lack of jobs/housing mix. Based on these criteria, infill and reinvestment in the existing built environment is identified as the highest priority and most sustainable location for future growth and development to take place.

Nevertheless, it is important to recognize there are limits on how much can be done to direct growth. Private property rights, land availability, and market forces play a significant role in where growth and development occur. Development will continue to take place in less suitable areas based on underlying zoning and as a result of lot splitting in the unincorporated area. The key point of this goal is that the City and County should do more to influence where the majority of future growth and development takes place in urban and suburban areas through where we invest public resources and build infrastructure.

Similarly, it is important that where we extend water and wastewater services matches up with where we want growth to occur. Historically, this linkage has not been made. The Phase II technical report on Growth, Urban Form and Cost of Infrastructure looked at which areas of the community are most suitable for new development based on a variety of factors (e.g. proximity to existing infrastructure and employment) and constraints (e.g. the elimination of certain lands from consideration, such as parks, federal lands, protected open spaces, hillsides). This type of growth modeling was a helpful educational tool in Phase II and would be a beneficial exercise to undertake as a region.

Four suitable growth areas emerging from this analysis are described in the recommendations below. The recommendations describe steps the City and County can take to steer growth toward these locations through policy, regulations, infrastructure investment, and open space acquisition. Timing and phasing of growth in each of these are also important to consider. In the past, market forces and the availability of vacant land have shaped where growth has occurred. While these forces will continue to be



Market forces play a significant role in growth (Photo by Daniel Lobo – must credit)

major influences, the technical paper recommends that the City and County take a more active role using the tools described above to direct growth toward suitable locations. Because of the significant State Land holdings in future growth areas, the timing of State Land disposition is a key issue that must be addressed.

## Recommendations

2.1 The City and County should take steps to encourage growth and new development in areas that are within or adjacent to the existing built environment, are outside of the conservation land system, and are identified as most suitable for development. Such areas include the following:

- Infill into the existing built environment (highest priority)
- Within the Houghton corridor
- Within the Southlands area
- Within the Southwest area

In order to make use of existing infrastructure and minimize the consumption of raw land, revitalization of downtown as well as infill and reinvestment in the built-up areas of the community (inside and outside city limits) should be the highest priority for locating future growth. Infill should be done in a manner that is economically, environmentally, and socially advantageous.

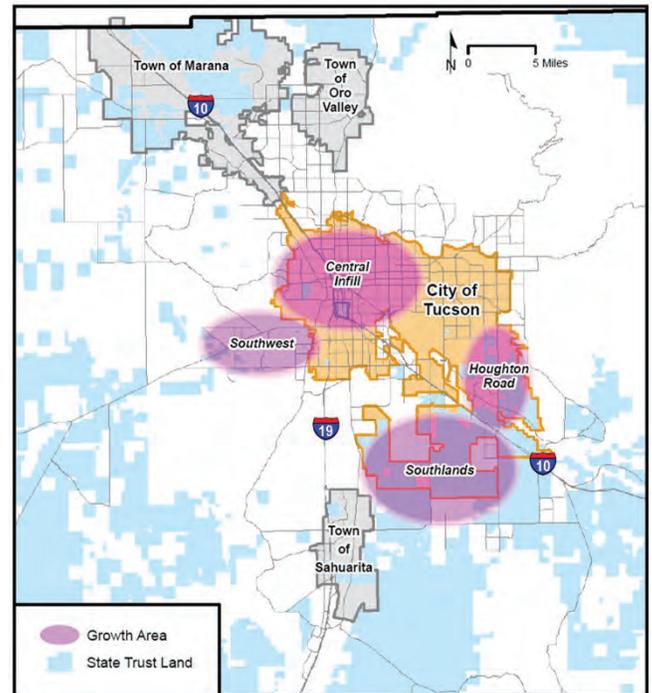
Again, a variety of policy and legislative tools should be developed to encourage growth in these locations including:

- General and Comprehensive Plan policies
- Land Use Code changes
- Other legislative actions
- Differential impact fees
- Incentives

City and County staff should involve the public in discussion about location of growth and tools to direct growth to these areas as part of their updates to the City General Plan and County Comprehensive Plan.

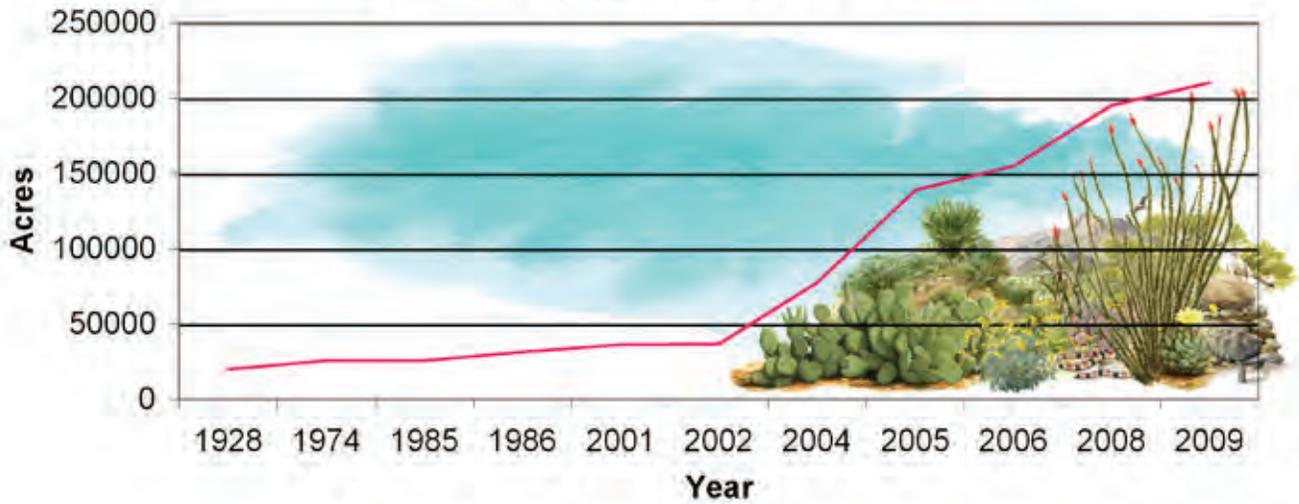
2.2 The City and County should influence the location of future growth through where infrastructure is built and public services are provided. The City and County should establish a joint land use/capital improvement planning staff team to plan for the timing, sequencing, location, and funding of infrastructure and public services to serve identified growth areas. Financial and infrastructure planning should occur ahead of development pressures. For infill areas, policies should focus on planning for and funding needed investments and improvements that must go along with higher densities and redevelopment. The County has already begun an effort to inventory the planning related activities of its various public works departments, and this could be replicated for the City prior to a joint process getting underway. Updates to the City General Plan and County Comprehensive Plan should set forth policy that requires this process take place.

2.3 The City and County should influence the location of future growth through the acquisition of open space. With the support of voters, the County will continue funding the acquisition of natural areas for conservation, recreation, and the protection of water resources. Natural preserves assist in defining the urban form, as well as providing multiple benefits such as recreational opportunities, conservation of water resources and natural floodplain functions, and protection of scenic views. In some cases, purchasing land outright or through conservation easements is the most realistic way to preserve areas not suitable for development.



Future recommended growth areas – from Growth Technical Report, p. 76

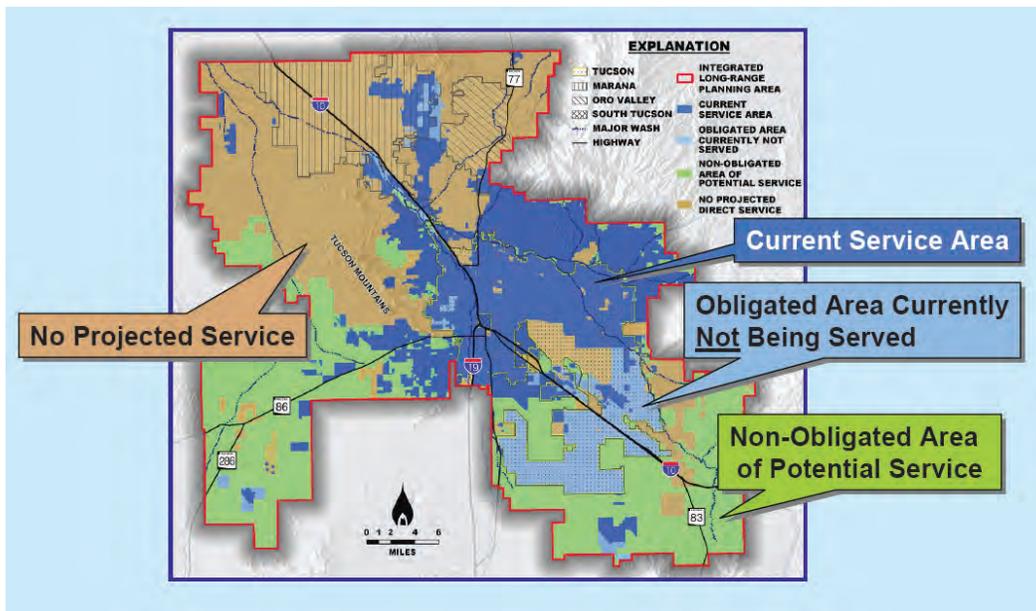
## Pima County Open Space Acquisitions



2.4 The City and County should continue to work with PAG to do growth and urban-form scenario modeling on a regional level (including Marana, Oro Valley, Sahuarita, South Tucson, the Tohono O’odham Nation, the Pascua Yaqui Tribe, the San Xavier District and others) similar to the modeling done for the City/County service area in the Growth and Urban Form technical paper. This work could help inform or be done in conjunction with the emerging regional visioning process, as well as inform the City General Plan update and County Comprehensive Plan update. Ideally this analysis should also be done at the Southern Arizona and Sun Corridor scales.

### Goal #3: Integrate Land Use Planning and Water Resources Planning

Historically water resource and infrastructure planning have not been considered with land use planning. Part of the difficulty stems from the fact there are numerous water providers--both public and private-- with numerous service area boundaries, and typically, these do not line up with the boundaries (and are not the same entities) of those responsible for land use planning and decision making. Tucson Water (operated by the City of Tucson) is the largest water provider in the region. Tucson Water serves a significant population outside of City limits in unincorporated Pima County and in other jurisdictions. This has made it difficult to connect land use planning and water planning even within the City



Tucson Water's Service Area

Clearly, the availability of potable water is a basic necessity for new development to occur, but there are often many options allowed by State law to obtain water for new development. Water service may be available from a municipal or private water provider, or by drilling a well and pumping groundwater, trucking in water, or relying on rainwater harvesting. On the flip side, making water service available by extending water infrastructure can help encourage growth in a particular direction (“build it and they will come”).

Wastewater is also an important consideration as well since any development exceeding one home per acre is required to connect to the public sewer system. The location and capacity of the Pima County Wastewater Reclamation Department’s (RWRD) treatment and conveyance facilities have a significant impact on the location and form of growth. Pima County RWRD’s system includes both centralized and decentralized/subregional treatment facilities, and both are important considerations when planning for growth. Advanced planning to identify a site for a future sub-regional facility in the southeast growth area is underway and represents an important step toward integrating water resources and land use planning. Planned upgrades to RWRD’s centralized facilities as part of the Regional Optimization Master Program (ROMP) program are another critical element in planning for growth. The high quality effluent that will be produced as a result of ROMP will be available for more effective and more versatile use in aquifer augmentation and riparian enhancement. It will provide additional benefits in expanding the reclaimed system, centralizing biosolids processing, improving odor control, enhancing the environment, and potentially generating solar energy.



*ROMP includes a Water Reclamation Campus with solar energy and sustainability features*

In the future, RWRD intends to continue identifying opportunities to achieve increased energy and wastewater treatment efficiencies within its existing and future decentralized facilities. In addition, collaborative work among effluent-rights holders can lead to optimal use of the effluent generated at these facilities through enhanced integrated planning of reclaimed water and recharge systems that best meets human, environmental and economic needs for water.

The historic disconnect between land use planning and water resource and infrastructure planning has a number of negative impacts, including (1) continued groundwater level declines in some areas of the valley impacting both existing residents, customers, businesses, and the environment; and (2) the stimulation of growth in places that lack adequate water and other types of public infrastructure and services, causing costly impacts to local governments, other service providers, and existing tax payers.

The situation is perpetuated by the Central Arizona Groundwater Replenishing District (CAGR), which was created by the State Legislature to allow development to occur in areas without access to renewable water resources, by requiring that replenishment of water occur, but not that it occur in the same location as the pumping. This is known as the “pumping/recharge disconnect.”

The City and County have made efforts in the past couple of years to better connect land use decisions with water considerations. The City instituted an interim moratorium on extending water service beyond the existing Tucson Water obligated service area until the impacts of such extensions could be fully analyzed. The interim policy brings land use considerations into water service decisions, recognizing that the past demand-based service expansion has not been sustainable from a land use planning perspective.

A concern with the current policy is that it does not prevent additional development from occurring outside of the Tucson Water service area. Developers are often able to find alternative access to water which usually means drilling wells, contributing to the pumping/recharge disconnect, and potentially contributing to continued groundwater decline and the associated adverse impacts. Recommendations 3.1 and 3.2 address (a) how Tucson Water's water service policy might be formalized by the Mayor and Council and (b) how these issues created by the policy can be addressed.

The City has also instituted a method referred to as the "water checkbook" to track and communicate with Mayor and Council as well as the public concerning how much renewable water Tucson Water has available to support proposed new developments or businesses.

The County adopted an amendment to the Water Element section of the Pima County Comprehensive Plan. This Amendment provides the Board of Supervisors (as the decision makers regarding land use changes in unincorporated Pima County) with additional information regarding water resource impacts when considering individual development proposals. The information includes whether the proposed development will have access to renewable water supplies, where pumping is proposed in relation to where recharge is proposed, and whether groundwater dependent ecosystems would be impacted. The Water Element should be revisited in the context of the full update to the Comprehensive Plan tying together land use, water, and other public infrastructure and services.

## ***Recommendations***

- 3.1 Outside of the Tucson Water Obligated Service Area in unincorporated Pima County, the City and County should work together to conduct comprehensive water resource planning in order to identify sustainable water resources to serve these areas. Water resources should be looked at in a comprehensive manner with the goal of making efficient use of water and matching up sources with needs. This planning effort should address the use of potable, reclaimed, effluent, stormwater, rainwater, and greywater. The City and County should evaluate the life-cycle cost and triple bottom line of decentralized wastewater treatment versus centralized systems in light of energy demands and efficiencies, and integration with recharge and reclaimed water systems. As an example, the City and County should work cooperatively to explore the development and operation of reclaimed water systems and recharge facilities at the County's sub-regional wastewater reclamation facilities.
- 3.2 The above described planning effort should help inform future City considerations for extending the obligated service area. Expansion decisions should be done on a sub-regional basis (rather than a parcel-by-parcel basis) in advance of specific water service requests. Any decision to expand the obligated service area should be formalized through Mayor and Council policy. The following factors should be taken into account in making policy decisions regarding expansion of the obligated service area within specific sub-regions:
- Suitability of growth area
  - Effect of extensions on future water-resource needs for the City's existing obligated service area
  - Fiscal sustainability of development and potential for future annexation
  - Appropriateness of timing/phasing of development
  - Economic impact/benefits
  - Quality and sustainability of urban form
  - Environmental implications of development
  - Environmental implications of not providing water service
  - Social equity and social-justice considerations.

*Note: a discussion of the obligated service area policy was specifically undertaken by the Committee, and by vote of 9-1, The Committee supports the current interim water policy to not extend water services beyond the current obligated service area, and thinks it should remain in place, while further study and analysis contained in recommendations 3.1 and 3.2 take place. The analysis and further study should be timely, address equity, and be updated periodically.*

- 3.3 In addition to the comprehensive, long range planning efforts described above, the City and County should continue to assess and track the impact of individual developments on water resources:
- The County should continue to implement the recent amendment to the Water element of the Comprehensive Plan, providing the Board of Supervisors with the necessary water resource information concerning individual development requests.
  - The City should continue to implement the “water checkbook” method of tracking and communicating to the Mayor and Council how much renewable water Tucson Water has available to support proposed new developments or businesses.
- 3.4 The City should continue to pursue discussions with other water providers regarding potential for wheeling and/or recharge agreements. As an example, Tucson Water and Metro Water/Hub should discuss the potential for wheeling of a portion of metro’s CAP allocation to Metro/Hub through Tucson Water’s integrated potable water distribution system at a cost of service price, in order to reduce Metro/Hub’s groundwater pumping in the immediate area.
- 3.5 The City and County should work together with other jurisdictions to support regional solutions to address the hydrological disconnect between where water is being pumped and where it is being replenished.

<sup>3</sup> *Dissenting vote due to non-support continuation of current interim policy*

## Goal #4: Growth Should Pay for Itself Over Time and Be Financially Sustainable

Tucson Water and Pima County Regional Wastewater Reclamation Department have financial systems in place to ensure that growth is paying for growth and is not being subsidized by existing ratepayers. Both utilities require developer contributions to expand their systems, and both have development fees in place to cover off-site improvements and centralized facilities. In addition, Tucson Water charges an impact fee for the acquisition of new water resources related to growth.

Beyond just considering cost of growth from a water and wastewater perspective, sustainability involves looking at the full cost of new development for all types of public infrastructure and services, over the long term. In addition to capturing growth related costs for water and wastewater, the City and County in recent years have instituted impact and other growth-related fees to pay the initial capital investment to serve new development (for roads and parks in the County, and for roads, parks, public safety, and general services in the City). But impact fees do not provide for the ongoing cost of serving development.

Our current pattern of development and the tax base in our community are not fiscally sustainable, as evidenced by the infrastructure deficits throughout our community. The 20-Year Regional Transportation Authority Plan, for example, is largely a “catch-up” plan and includes projects that were warranted decades ago. The situation is similar for City and County bond packages. Another example of the problem is the City’s current budget shortfall and inability to keep up with basic services like streets, parks, and public safety. Our current infrastructure deficits and budget challenges suggest we cannot afford to provide the needed services and investment for the community that we have built. As we grow, we should not continue to exacerbate or replicate this problem.

One contributor to this issue is the large unincorporated area in Pima County that does not generate the revenue that incorporated areas do (no sales tax and less state shared revenue coming in). In the past this issue has been framed as an “annexation/no annexation” debate. A sustainable water future is one in which we move beyond annexation debates and instead focus on fiscal sustainability for our entire community. Fiscal sustainability considers the life cycle cost of development, including how ongoing maintenance and the provision of public services are paid for, in addition to upfront capital costs. It also addresses the adequacy of revenues collected to provide necessary public services, fairness and



*Best Financial Practices in the water and wastewater industries*

equity related to who pays for services, who receives services, and the level of investment we are making throughout the community.

## **Recommendations**

- 4.1 Future development should be evaluated in terms of fiscal sustainability from both the capital (initial construction of infrastructure) and operating (ongoing public services and maintenance of infrastructure) perspectives to ensure that new development is self-sustaining and not subsidized over the long term by current residents and businesses.
- 4.2 The Tucson Water Department and the Regional Wastewater Reclamation Department should continue managing their water/wastewater infrastructure capital improvement programs in a manner that is consistent with the latest nationally-accepted industry best practices and continue to ensure that each year's water/wastewater Financial Plan adequately and demonstrably provides mechanisms so that "growth pays for growth."

## **B. Respect for the Environment**

Respecting the environment means that recognizing that water is not only key to our continued economic expansion, it is also essential to a vibrant and healthy environment. There must be an appropriate balance between the reservation of water for consumption and growth, and the acknowledgment that our environment is also a consumer of water resources: certain water reservations for the environment should be made and sustained.

A large percentage of the historic area of riparian habitat in southeastern Arizona has been lost to or degraded by past human activities. In addition, changing environmental circumstances further threaten remaining riparian areas, especially those already made vulnerable by human actions.



*Tanque Verde Creek – from Riparian Report p. 10*

The City and County share policy goals to (1) minimize additional loss of riparian habitat, (2) protect existing riparian areas against vulnerability to climate change and continuing human actions, and (3) where circumstances allow, restore degraded ecosystems back to greater functionality.

Preservation of existing natural resources and ecosystems that support native and migratory species is a higher level objective than restoration. As such, restoration must be considered in the context of efforts to preserve habitats and critical ecosystem functions before they become degraded. The objective of restoration is recovery of some components of viable ecosystem functions, such as plant communities and habitat structure. Enhancing vegetation can result in sustainable habitat that can help restore ecosystem functions of river corridors and support the wildlife species that depends for survival on the rapidly shrinking riparian areas within the County.

Ecosystems are not static or isolated systems. They are continually subject to natural trends such as drought or temperature increases associated with climate change. They are also subjected to human impacts such as changes in water quality or quantity resulting from urban runoff, pumping, upstream diversion, or invasion by non-native species. Restoration and/or preservation of habitats and ecosystems must be considered in concert with mechanisms and resources needed to maintain the long-term integrity of these areas. The most efficient and effective means of ensuring that valuable resources remain for future generations is through preservation of the remaining functional riparian ecosystems.

Restoration requires a commitment of land, water, labor, expertise, and above all, financial resources. The cost of large-scale restoration can be very expensive. There are major opportunities for restoration projects in the County. These projects are most feasible where: land is available; renewable water is available as either stream flow, rainwater, or reclaimed water; and hydro-geologic conditions are favorable. The City and County have a significant inventory of land that may be suitable for environmental restoration and enhancement.



May 2006



May 2008

*Riparian stress when surface flow is unavailable – Santa Cruz River*

The goals and recommendations in this section come from the following background technical papers that were prepared as part of Phase II of the Study (see appendix for the papers):

1. Stormwater Management
2. Riparian Protection
3. Water for the Environment

These technical papers were written to address the following topics identified in the for this Study, and by Oversight Committee members:

- How and where can we best use stormwater and rainwater, effluent and reclaimed water for environmental benefits and quality of life?
- What are the existing and future water demands for the environment and how should the community prioritize these needs?
- Why are environmental projects that improve ecosystem functions important?
- How and where can we best preserve and improve ecosystem functions?
- Where are future opportunities for environmental projects in proximity to existing and future water resources?
- What are the opportunities for protecting environmentally sensitive natural riparian areas, including areas of shallow groundwater and perennial and intermittent streams that support unique riparian vegetation, in Eastern Pima County?

## **Goal #1: Preserve Existing Riparian Areas Through Coordinated Regulation, Policy, and Outreach**

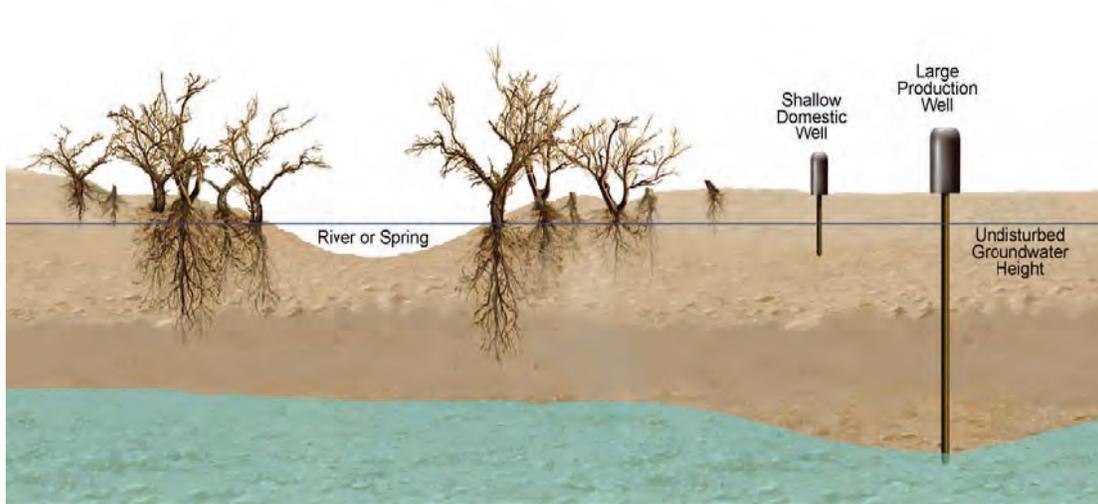
Riparian ecosystems are without question one of the most valuable natural resources in the Tucson region. Riparian areas provide habitat for a large percentage of wildlife species and also provide natural ecosystem functions related to recharge, flood management, and water quality. These areas also have significant aesthetic/amenity and economic value through providing recreational opportunities, increasing adjacent land values, and drawing large numbers of visitors to our region for ecotourism.

This first goal commits the City and County to a coordinated approach in preserving existing riparian areas to the maximum extent possible. The City and County will continue to preserve areas through the implementation of the Conservation Land System, the acquisition of existing habitat, and the refinement and continued enforcement of their respective watercourse protection regulations. Other mechanisms for preserving riparian areas should also be jointly explored, such as transfers of development rights (TDRs). However, immediate protection of riparian areas through these mechanisms may not be sufficient to ensure their long-term protection, unless water management issues are also addressed.

Increased groundwater pumping near perennial streams and shallow groundwater areas poses a threat for existing riparian areas that may only be alleviated through efforts to reduce pumping, such as switching groundwater consumers to renewable water sources. Even riparian habitats with an adequate water supply currently may require supplemental irrigation in the future during extended drought or as a result of changing water needs due to climate change.

Implementation of this goal will need to include fostering increased public awareness of the benefits of healthy ecosystems and the public's willingness to support their protection and maintenance.

Many historic hydro-riparian areas have been lost to declining groundwater tables and water diversions, yet these areas provide essential habitat for riparian-obligate species and desirable bird and wildlife watching locations. Preservation of these areas is critical to ensuring that their environmental and economic value is not lost.



*Effects of groundwater over-pumping on riparian habitats, from Riparian Report, p. 4*

## **Recommendations**

- 1.1 The City and County should continue to preserve existing riparian areas to the maximum extent possible through land acquisition, regulatory land use controls that limit encroachment into floodplains and riparian habitat, and education and outreach.
- 1.2 Within their respective jurisdictional and water service areas, the City and County should evaluate the effectiveness of programs and policies addressing the protection of groundwater-dependent and hydro-riparian areas from groundwater withdrawal and surface water diversions.

The city and county should promote changes to state law regarding drilling and pumping of wells within and near shallow groundwater ecosystems.

## **Goal #2: Identify Needs and Opportunities for Future Restoration**

So much former riparian habitat has been lost that real efforts must be made to improve degraded habitats and to restore areas no longer functioning as healthy riparian systems. Restoration of riparian areas, however, takes significant land, water, expertise, and money resources. Given the current financial environment, the vulnerability of western water sources, and the implications of climate change, restoration needs to be approached thoughtfully, systematically, and comprehensively in order to make any kind of meaningful progress.

Up to this point, restoration has mainly taken place in response to regulatory requirements or opportune circumstances favoring specific projects, such as grant funding, land availability, or related construction of other infrastructure. To build on our current portfolio, we need a regional framework for restoration that identifies needs and opportunities, the resources (land, water, expertise, etc) available and needed, and potential partners. This more strategic and regional view toward restoration will help us make the most of our future restoration efforts.

To implement a regional restoration strategy, the City and County should work with the many existing groups that have expertise, resources, and passion to offer as partners. Without including these organizations, the job of regional restoration is more difficult. Moreover, there is added value in recognizing the commitment of these organizations to protect the local environment and make the Tucson region a better place to live.

Restoration can also be viewed as a local economic and community-building opportunity. By employing local talent and community volunteers, we support the development of a local green economy.

Community involvement in restoration also builds a sense of stewardship among participants.

Children who have had limited opportunity to interact with nature, at-risk youth, and interested seniors are all populations that would enjoy benefits from volunteer opportunities for helping with riparian restoration.

Another form of stakeholder and community engagement is through the development of a mechanism to link water conservation efforts to the dedication of additional water volumes to be used for environmental purposes such as riparian restoration. A number of organizations are currently working on such an effort. This linking will also help address public concerns that water conservation ultimately just increases land development and urban sprawl.

## ***Recommendations***

- 2.1 The City and County should work with stakeholders to develop a shared regional policy for addressing those regulatory compliance projects that require water for short-term or long-term (permanent or seasonal) plant establishment.
- 2.2 The City and County should work with stakeholders to develop a regional collaboration for riparian restoration. This effort should include exploring or continuing to pursue:
  - Enhancing the value of in-lieu mitigation funds received for compliance with local watercourse protection ordinances to fund restoration activities
  - Opportunities to partner with non-governmental entities that operate mitigation banks and/or undertake restoration activities
  - Evaluation of existing County and City-owned lands for suitability for environmental conservation and restoration
  - Opportunities to secure grant funding for environmental restoration
  - Partnering with experts to identify long-term water quality implications for restoration areas, such as the impacts of higher salinity of CAP, effluent, and reclaimed water
- 2.3 The City and County should continue to work with ADEQ to develop water quality standards and designations specifically for habitat restoration.

## **Goal #3: Ensure that Public Projects are Multi-Benefit Including Restoration, Stormwater Management, Recharge and Public Amenity**

The City and County are continually undertaking capital improvement projects that involve the development or utilization of water sources. The municipalities build and operate trails, parks, stormwater management basins, flood control projects, recharge facilities, and wastewater treatment infrastructure. In many cases, these projects have a dedicated water source and supply infrastructure, occur on municipally owned lands, and have some capital or operating budget available (usually limited).



*Tres Rios del Norte Project*



*Stormwater and reclaimed water are used in the Kino Environmental Restoration Project*

Rainwater is a free, high-quality renewable source of water available for restoration, albeit of a source of limited and variable amount. The City and County share the goal of prioritizing efforts to develop a regionally consistent approach toward utilizing rainwater harvesting for environmental restoration. While rainwater harvesting can rarely be done at a scale to support the highest water consuming habitats (i.e. meso- or hydro-riparian habitat), there are significant environmental and social benefits to creating small pockets of desert-adapted habitat (e.g..upland or xero-riparian habitat) within the fabric of the urban community.

The cost-effectiveness and methods for optimizing use of stormwater and rainwater for environmental enhancement should be further evaluated. Rainwater harvesting should also be an element of all public projects where feasible, and encouraged and/or required for private developments. In addition to the environmental and recreation/amenity value of using harvested rainwater to irrigate urban habitats, these small-scale, low-cost activities also have stormwater management and water quality benefits.

The significant public interest in rainwater and stormwater harvesting presents an opportunity for public/private partnerships to advance pilot projects and to provide meaningful ways for individuals to directly participate in improving the future of the region.

A key strategy going forward is to develop restoration standards for capital improvement projects and ensure that all opportunities to include restoration are taken. Future City and County policies and Capital Improvement Program budgets for public projects will need to be developed in a coordinated manner that supports preservation and restoration of riparian habitat

## ***Recommendations***

3.1 The City and County should pursue cost-effective, multiple-benefit, broad scale public projects that utilize reclaimed water to accomplish goals such as aquifer augmentation, riparian restoration, habitat protection, environmental enhancement, turf irrigation, and recreational opportunities in combination with flood control and stormwater management facilities, parks and trails, and water recharge and wastewater disposal activities. Some examples are:

- Incorporating ecosystem restoration adjacent to wastewater treatment facilities
- Exploring ways for recharge facilities to support restoration
- Retrofitting existing large stormwater detention basins to support riparian habitat
- Including environmental restoration opportunities as a component in all new stormwater management projects, so that optimal amounts of stormwater are retained for reuse before being discharged to the respective stormwater conveyance systems
- Incorporating, where possible, rainwater harvesting and ecological amenities into other public projects
- Development of a joint policy that incorporates rainwater harvesting, stormwater detention, non-potable water use, recreation, and ecological amenities to the extent feasible in Capital Improvement Projects budgets, especially in open space areas

3.2 The City and County should identify areas within the existing built environment characterized by an abundance of impervious surfaces, and identify opportunities for additional stormwater management in order to achieve water quality, stormwater management, and environmental benefits. To accomplish this, the City and County would need to develop a plan that identifies site-specific locations and standards for implementing stormwater management projects.

## **Goal #4: Ensure the Future of Riparian & Aquatic Habitat Along the Effluent-Dependent Reach of the Santa Cruz River**

The significance of the effluent-dependent Santa Cruz River to wildlife has been acknowledged in various planning efforts. This habitat has developed over the past couple of decades as a result of effluent disposal from the Roger Road and Ina Road Wastewater Treatment Facilities. The riparian habitat along the Santa Cruz River is seen as vulnerable over the long-term because there is no certainty that effluent will remain available to maintain or improve the habitat.

Effluent in the river is owned by a variety of entities, but principally by the Secretary of the Interior and the City. The Secretary of the Interior is required to use the effluent indirectly to “firm” the Tohono O’odham Nation’s access to CAP water during times of shortage. Effluent rights holders maintain the option to withdraw their share of effluent from the river channel. The effluent currently being discharged into the river also includes a portion owned by the County and smaller amounts owned by other water providers. In-stream flows and in-channel recharge are compatible. Improving incentives for in-channel recharge can provide an incentive for maintaining in-channel flows.

The realities of the new economic climate, uncertainties related to future population and economic needs for water, and vulnerabilities associated with climate change all require that we evaluate the existing conditions along the effluent-dependent reach of the Santa Cruz River. Since there are no immediate plans by the Secretary of the Interior or other effluent owners to remove effluent from the river, effluent could continue to flow for some time into the future. This provides the opportunity to plan for future conditions and evaluate strategies and alternatives to maintain habitat while minimizing water demand.



*Effluent-dependent habitat along the Santa Cruz River*

## **Recommendations**

- 4.1 The City and County should advocate for changes to state statutes to grant full recharge credits to the Secretary of Interior for effluent used to sustain the flows in the Santa Cruz River and the riparian corridor.
- 4.2 The City and County, along with other regional partners, should develop a “Lower Santa Cruz River Management Plan” that would identify the most effective and sustainable means for using effluent and other renewable water supplies to support and enhance valuable habitat in the Santa Cruz River corridor.
- 4.3 As part of the Management Plan and building upon the Regional Flood Control District’s current cooperative efforts, the City and County should develop partnerships with other effluent rights holders and stakeholders to use the growing collection of pilot restoration projects as demonstration of their potential to maintain and enhance aquatic and riparian

habitat along the Santa Cruz River. The City and County can then identify a portfolio of multi-purpose projects for long term implementation in the context of the Management Plan. For example, areas such as the reach between the Rillito and the Canada del Oro confluence (where stormwater flows are more concentrated) could be emphasized.

4.4 The City and County should incorporate into both in-channel and off-channel recharge facilities features which also use the water to support riparian and/or aquatic habitat.

## Goal #5: Develop Water Supply for the Environment

An overarching consideration is that healthy, functioning ecosystems need water. If habitat and riparian areas are to be enhanced or restored, an adequate amount of water must be available to meet the needs of each particular ecosystem.

Water needs of riparian habitats vary depending on the ecosystem type, and density and maturity of vegetation. Upland and most xero-riparian systems can be supported solely on natural rainfall and stormflows within watercourses. Some xero-riparian and all meso- and hydro-riparian require more than just natural rainfall and stormflows, either through perennial watercourse flows, shallow groundwater, concentration of stormwater, or artificial sources such as effluent or pumped groundwater. In addition, ecosystem water needs can vary seasonally, annually, and over periods of years. A permanent supply of water may only be needed for some aquatic ecosystems. The water needs of ecosystems are likely to increase over time as a result of the higher predicted temperature and lower effective precipitation resulting from climate change.

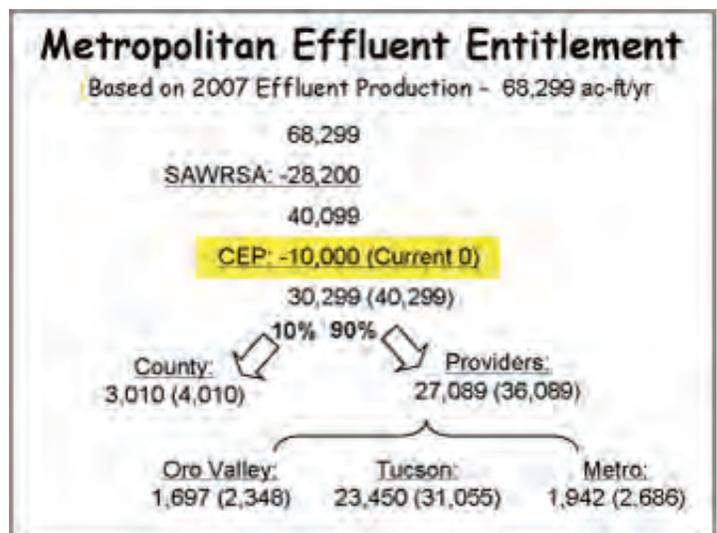


Restoring or enhancing ecosystems requires that the seasonal water needs of a system that cannot be met through rainfall and natural stream flow be addressed through artificially supplemented sources. Often additional water is needed only for supplemental irrigation during plant establishment or during extended drought; accordingly, a permanent supply of water may only be needed for some aquatic ecosystems.

The provision of water for restoration purposes is not a simple issue. In order to balance the water needs for individual restoration projects with the ability to commit appropriate water supplies, it is important to match each restoration project with the least expensive water supply of suitable quality that is physically available for use at the restoration site. Cost, competing demands, variations in quality, and complexity of capture or delivery variously affect the primary water resources in the City/County area (which include groundwater, CEP water, reclaimed water, secondary effluent, stormwater and harvested rainwater).

The only existing commitment of water to be used for environmental purposes is the Conservation Effluent Pool (CEP), consisting of up to 10,000 acre feet of effluent per year. The CEP could be derived from the Roger, Ina and Randolph treatment facilities. Uses for this pool related to Endangered Species Act (ESA) compliance have preference.

The City and County need to finalize and adopt the implementing agreement for the use of CEP. By developing restoration projects that only need supplemental water for a short establishment period (3-5 years), more projects can be completed over time. In so doing, the CEP would be used like an “investment pool” to support a myriad of restoration opportunities instead of a few. Such an agreement should



reflect shared goals regarding the use, including an emphasis on short term use rather than permanent commitment of water, and, a priority for restoration projects associated with Habitat Conservation Plans (HCPs), but with flexibility to be used wherever there would be a benefit (whether associated with HCP or not).

Successful outcomes of this goal would include (1) finalization of the CEP implementing agreement; (2) initiation of the “Tucson Environmental Water Banking Program” and (3) acquisition of water rights through the County’s Open Space Bond Program dedicated to preservation or enhancement of existing riparian areas connected to those land acquisitions.

### Recommendations

- 5.1 The City and County will finalize the IGA for the Conservation Effluent Pool (CEP), which will annually provide up to 10,000 acre feet of effluent for environmental enhancements. This agreement will be delivered to the City Mayor and Council and the County Board of Supervisors for review and approval.
- 5.2 The City and County will work with stakeholders and other resource experts to link water conservation to the protection of future supplies and to environment preservation/restoration by identifying mechanisms to reserve water saved through conservation programs for specific environmental uses/projects. This will allow community members to directly contribute to environmental protection and enhancement as a result of their individual actions to reduce their use of potable water. It would also provide a mechanism to develop a water source, beyond the CEP, that can be dedicated to projects with an environmental benefit.

## C. Water Supply

Key elements of a sustainable water future include: appropriately managing current water resources to protect public health and safety; assuring that water resources are renewable, sustainable, reliable, and efficiently used; and looking to additional water supplies in the future. Phase I of the Study documented Tucson Water’s currently available water supplies and found that the utility has a reliable and renewable water supply for the near term. Over the past decade, Tucson Water has made significant investments in infrastructure to recharge and deliver Colorado River water, moving from a dependence on groundwater to reliance on this renewable supply. The following table from the Phase 1 Executive Summary provides a snapshot of Tucson Water’s annual water resource portfolio.

Water Resource Type	Annual Water Supply (AF)
CAP	144,191
CAGR	12,500
Incidental Recharge	5,500
Local Groundwater	24,750
Effluent	30,500
<b>Total</b>	<b>217,441</b>

The Phase I report estimated that approximately 1.1 million people can be served by Tucson Water with this supply portfolio--approximately 360,000 more customers than are currently being served by Tucson Water. The numbers are based on assumptions about per person water consumption rates and are subject to uncertainties associated with future reliability of water resources, but these numbers provide a ballpark estimate.

The modeling done in the Phase II Growth and Urban Form technical paper found that in the future, Tucson Water may be obligated to serve somewhere between 330,000 and just over 500,000 additional people within its obligated service area. Without expanding its obligated service area further, Tucson Water may or may not need new resources in the future for the purposes of serving new growth and development: it will depend on the actual build-out numbers and per capita water use.

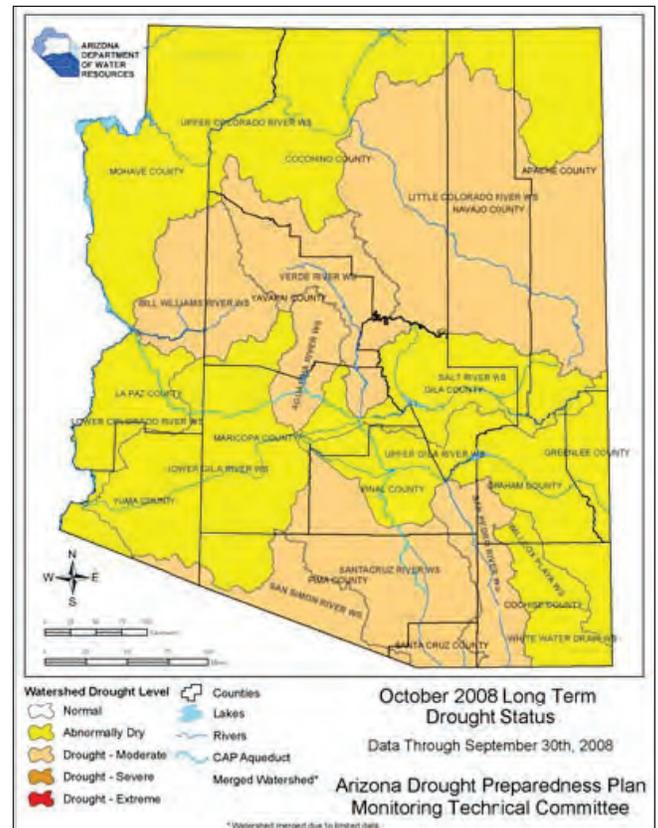


Tucson Water's CAVSARP Facility (photo by Lance and Erin Willet – must credit)

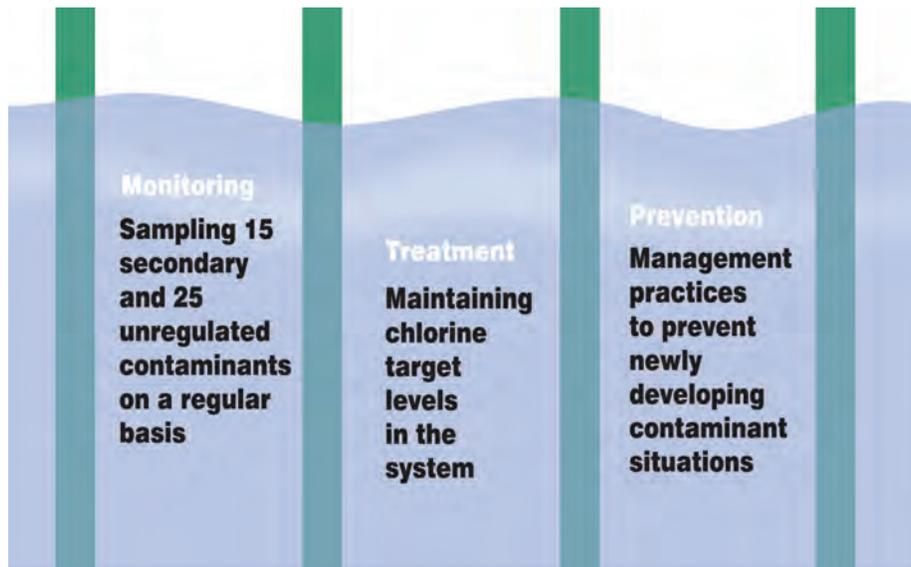
However, we are in a time of uncertainty with climate change and drought potentially affecting local water demand, local rainfall, and future flows of the Colorado River. In this context, we need to act conservatively and responsibly when it comes to managing our water resources and build in a buffer. We should further diversify our water resource portfolio so that we are not overly dependent on imported water that is vulnerable to shortage. We should increase conservation and maximize our use and re-use of renewable locally-generated water sources such as rainwater harvesting, stormwater capture and recharge, greywater systems, and use of effluent and reclaimed water.

A comprehensive approach to sustainability must also recognize that protecting, preserving, and ultimately improving water quality is a principal objective. Otherwise, water quality may limit the use of available water resources in the regional portfolio and detract from sustainability. Pima County Regional Wastewater Reclamation Department (RWRD) and Tucson Water must maintain their operations in compliance with current water quality standards and must also anticipate future regulations that may identify new pollutants (emerging contaminants) or new water treatment technologies.

While effluent is a significant component of the region's renewable supply, it is also a source of discharge of trace levels of emerging contaminants, including endocrine disrupting compounds, pharmaceuticals, and personal care products for which no regulatory standards have been set. Tucson Water protects drinking water sources with a "multiple barrier approach" for certain identified emerging contaminants such as 1,4-dioxane, uranium, radon, perchlorate, and the range of trace organics detected in effluent. Through planned ROMP improvements, RWRD is acting to increase removal of organic compounds and reduce concentrations of many emerging contaminants by achieving improved solids retention and de-nitrification. Studies have shown that this approach to nutrient removal can result in removal rates greater than 90% for many endocrine disrupting compounds. Higher quality effluent renders it a more flexible resource that strengthens sustainability. ROMP upgrades allow effluent use to be more effective and more versatile for aquifer augmentation and riparian enhancement. Furthermore, it allows Tucson Water's reclaimed system to qualify as A+, the highest quality category recognized.



From drought appendix



*Tucson Water's multiple barrier approach*

The information in this section comes from the following background technical papers that were prepared as part of Phase II of the Study (see appendix):

1. Additional Water
2. Reclaimed Water
3. Drought
4. Water Quality

This section addresses the following guiding principles listed in the for the Study:

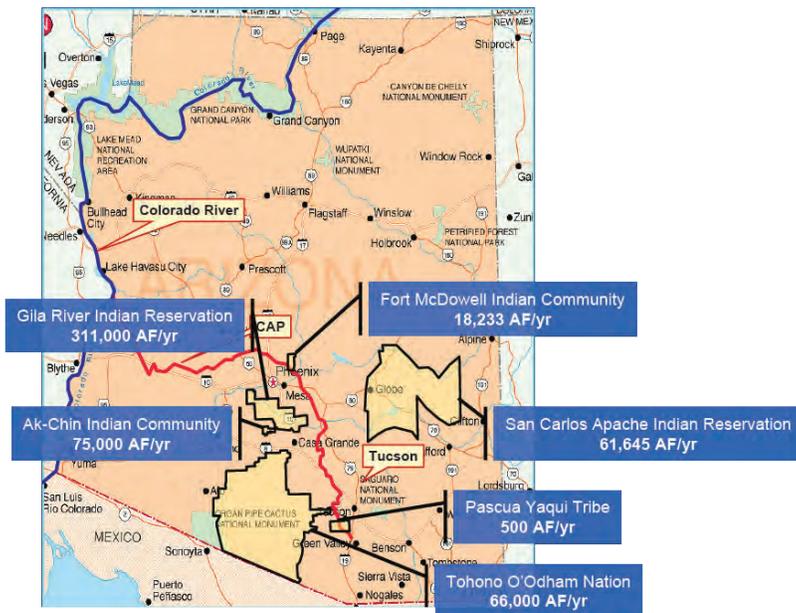
- Long-term water supply cannot occur at the expense of our existing residents or the environment
- Increase the use of reclaimed or recycled water on turf irrigation to substitute for groundwater use
- Enhance regional collaboration efforts to acquire new, renewable water supplies, such as long-term CAP leases

## **Goal #1: Work Collaboratively to Acquire New Water Supplies for Reliability**

While Tucson Water does not have an immediate supply issue, it is prudent that Tucson Water secure new, renewable water resources in order to assure future reliability of our current water resource portfolio. Increasing the amount of water and diversifying the types of supplies in our portfolio will improve reliability. This is particularly important in the face of potential extended drought and climate change and the impact this could have on the Colorado Rivershed and local conditions.

The most promising available avenue for securing new water resources is the “ADD Water” (Acquire, Develop, Deliver) process being conducted by the Central Arizona Water Conservation District. The ADD Water process (explained in more detail in the Phase II technical paper on Additional Water Resources) is evaluating options for acquiring, developing and distributing water to enhance reliability by diversifying currently available water sources of CAP customers to meet future demands. Tucson Water has been an active participant in this process since its inception.

The most likely sources of additional water that could be acquired through the ADD process are excess CAP water, leasing contracted CAP Indian water, main stem Colorado River Water, and imported groundwater. Additional sources of water would be delivered through the existing CAP infrastructure, will be much more expensive than current CAP water, and will require interested entities to made purchases or reserve allotments well in advance of actual need.



(Left) Indian CAP allotments are potential water sources; (Right) The Central Arizona Project (photo by Link576 – must credit)

## Recommendations

- 1.1 As the ADD Water stakeholder process proceeds, local water providers and users should maximize opportunities to acquire ADD water supplies and explore options to finance these additional supplies when they become available.
- 1.2 All Municipal and Industrial priority CAP allocations will be vulnerable in times of severe shortage on the Colorado River. Therefore, Tucson Water should take the necessary steps to have additional, more reliable water resources to reinforce and buttress its CAP water allocation to serve growth in the existing built environment and the yet-undeveloped areas of Tucson Water’s Obligated Service Area.
- 1.3 The City and County should continue to jointly plan for the acquisition of additional supplies to maximize shared system efficiencies and to achieve their respective sustainability goals. These goals should collectively take into account social, economic, and environmental factors to ensure that all costs and benefits are considered.

## Goal #2: Maximize and Make Efficient Use of Effluent and Other Locally Renewable Water Supplies

A sustainable water future is one in which we continue to broaden our view of water resources and place a greater priority on locally-renewable resources (effluent and rainwater). Effluent is typically put to use in the reclaimed system and for aquifer augmentation, while rainwater is put to use through stormwater capture and rainwater harvesting. Greater emphasis should be placed on maximizing the use of these resources and, going forward, they should be considered an important component of our community’s water resource portfolio.

While the reclaimed system is an important tool for putting effluent to use, there are multiple valued uses for effluent and these uses should be maintained over time (the reclaimed system, environmental purposes, and aquifer augmentation). Use of reclaimed water does not make sense everywhere because the reclaimed system is expensive to construct and requires energy to move water through it. The use of reclaimed water should be evaluated in the overall context of maximizing the community’s water resource portfolio. The key is matching up the most effective and resource-efficient water source with the needs of a particular site.

Greywater is another recycled water resource used in a similar manner as the reclaimed system, typically replacing potable water for outdoor watering but with the added benefit of being used on-site, and thereby eliminating energy and infrastructural costs of transport.



*Native vegetation irrigated with harvested stormwater at Highland Vista Park – from Stormwater paper*

Rainfall is another important local source of water which, when captured and harvested, can be used to replace potable water. However, the sporadic nature of rainfall requires that proposed uses be adaptable to seasonal rainfall patterns and annual variability. Rainwater harvesting is an ancient technology that is becoming increasingly appealing, particularly in the Southwest's urban areas. Harvesting can be done at both the lot scale, and at the community scale (and then it is considered stormwater). Rainfall is not a resource managed by water utilities, so has typically not been seen as part of the "water resource portfolio." But this view is changing. The City now has in place ordinances to require greywater systems in new residential construction and rainwater harvesting for new commercial development. The County has enacted land use regulations requiring water efficiency targets be met, including putting to use effluent/reclaimed and rainwater.

Implementing ROMP is the single most effective step to be taken to minimize concerns about emerging contaminants and, through water quality improvement, to bolster effluent's role in providing a sustainable water supply.

## ***Recommendations***

- 2.1 The City and County should continue to balance the uses of effluent, dedicating it to the reclaimed system, to environmental purposes, and for aquifer augmentation/recharge credits.
- 2.2 Continue to implement ROMP improvements as currently planned and budgeted.
- 2.3 The City and County should remain vigilant about water quality by continuing efforts at source control, maintaining proactive system monitoring, conducting public outreach & education, and staying abreast of research and regulatory developments related to emerging contaminants in water and wastewater systems.
- 2.4 The City and County should evaluate the use of reclaimed water for particular sites--with the goal of maximizing the community's overall water resource portfolio--by matching up the most effective and resource-efficient water source with the needs of a particular site.
- 2.5 Tucson Water and Pima County Wastewater should continue to assess the potential water supply benefits as well as the adverse consequences of expanded greywater use within their respective service areas.
- 2.6 The City of Tucson and Pima County will continue encouraging rainwater harvesting on residential, commercial, and government properties to defray the high costs associated with stormwater management, and to develop a new source of local, renewable water supply.

### Goal #3: Address Regulatory Barriers to Maximizing Local Supplies

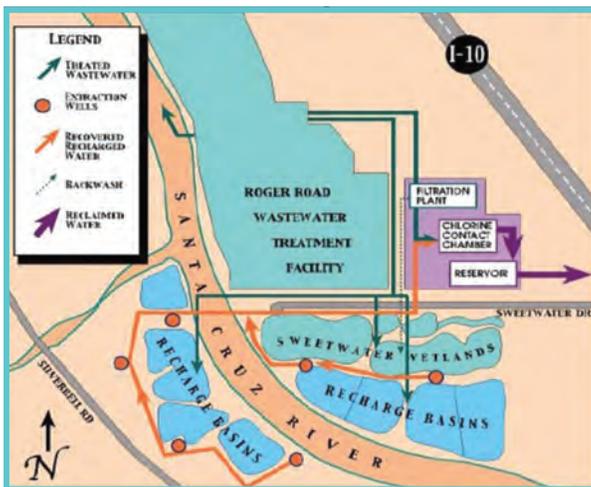
The use of effluent and the reclaimed system are regulated by the Arizona Department of Water Resources (ADWR) and the Arizona Department of Environmental Quality (ADEQ). They ensure that appropriate standards are in place to protect public health and the environment. In some cases however, our ability to maximize our use of locally renewable water supplies is impeded by the way these regulations are set up. The regulatory changes recommended below would not compromise public health or water quality standards but would assist in our ability to attract reclaimed customers, lower the cost of operating the reclaimed system, expand the potential customer base, and allow additional environmental restoration projects using effluent to be constructed.

#### Recommendations

- 3.1 Refine policy and regulations governing the accrual of groundwater credits to provide incentives for conversion to reclaimed water from groundwater pumping. Groundwater turf users proximate to reclaimed lines would be eligible.
- 3.2 Develop alternative operational and permitting strategies to achieve a Class A+ or equivalent water supply for the reclaimed system.
- 3.3 The City and County should continue to work with ADEQ and ADWR to develop water quality standards, permits, and designations specifically for riparian projects.

### Goal #4: Foster Increased Use of Reclaimed Water through System Expansions, Increased Effluent Allocations, and Incentives

Tucson Water has constructed a very extensive reclaimed system over the past 25 years, and most of the customers for whom there is an economic incentive to convert to reclaimed water have already been connected to the system. The reclaimed system currently has over 900 customers and utilizes 42 percent of Tucson Water's effluent allocation and 27 percent of Pima County's allocation.



Tucson Water's Reclaimed Water Plant and adjacent Sweetwater Wetlands

The use of reclaimed water must be considered within the broader context of sustainability, with the goal of maximizing our water resource portfolio as a community. There are other valued uses for effluent besides use in the reclaimed system (environmental and aquifer augmentation purposes) and there are other water resources that should be considered for outdoor irrigation such as stormwater and rainwater harvesting. Resource efficiency, energy requirements and infrastructure cost should be primary considerations driving expansion of the reclaimed system.

There is additional capacity for expanding the reclaimed system. The City and County should establish expansion targets, prioritize customers, and create options for overcoming financial and regulatory issues that have been barriers to maximizing our use of reclaimed water in the past.

## Recommendations

- 4.1 Expand financing options, including considering the use of General Obligation Bonds to pay for extensions to the reclaimed system without relying solely on paying customers and revenue bonds.
- 4.2 Maintain the current policy that a private customer with a revenue source (e.g. golf courses, industry) who can pay the full costs of reclaimed water should pay. In addition, explore options to encourage potential customers who currently have no financial incentive to join the system, such as phased-in rates and expanded potable-water ratepayer subsidies.
- 4.3 Work to lower the costs of operating the reclaimed system through efficiency improvements.
- 4.4 City and County staff should incorporate the consideration and evaluation of the use of reclaimed water in specific developments into the City and County development review processes.
- 4.5 Tucson Water and Pima County will continue to evaluate opportunities to expand reclaimed water and remediated groundwater use to meet both municipal and environmental-enhancement supply needs.
- 4.6 The City and County should increase the amount of their effluent allocations used in the reclaimed system.
- 4.7 Identify, prioritize and pursue additional reclaimed customers based on the following criteria:
  - Proximity to existing reclaimed infrastructure
  - Cost to join the system
  - Energy, operating, and maintenance costs
  - Potable and groundwater savings
  - Opportunity to mitigate environmental impacts of existing groundwater pumping
  - Turf areas that provide greatest public benefit
  - Availability of other water resource options



## Goal #5: Be Prepared for Climate Change and Drought

We are in a time of uncertainty with climate change and drought potentially affecting local water demand, local rainfall, and future flows of the Colorado River. Recent drought events occurring regionally and nationally (and even internationally) demonstrate the need for our community to be strategically prepared for sustained drought conditions.

Because of the level of uncertainty we face, an adaptive, flexible, and regularly updated scenario planning approach is needed to ensure we are prepared as a community for drought in the variety of ways it may get triggered and be manifested. There is less need for certainty in forecasts than there is for a regularly monitored credible range of possibilities for which the utilities and the community can prepare.

A multi-pronged preparedness strategy can make the community and its water resources more resilient to a variety of possible future scenarios. These should include such approaches as diversification of water supplies, water demand management (including increasing reliance on locally generated non-municipal delivery options such as water harvesting), and development and maintenance of necessary infrastructure. Elements of this planning approach are already underway. The Utility's Water Plan 2000-2050 incorporates management of water demand through various tools including water conservation programs as well as City ordinances to help delay implementation of costly infrastructure improvements and "stretch" the water supplies currently available. Preserving readiness in the groundwater system by regular maintenance on wells, pumps, and reservoirs allows the Utility to bring these facilities into service if needed due to a drought-related shortage. In addition, maintaining adequate and well-functioning recharge facilities such as CAVSARP and SAVSARP, as well as effluent recharge facilities, adds reliability to water supplies in times of drought.

## Recommendations

- 5.1 Continue a multi-pronged planning approach that includes diversification of water supplies, increased demand management, and development and maintenance of necessary infrastructure.
- 5.2 Use scenario planning as a tool to assess the changing planning environment, including the potential for extended drought or permanent climate change, as well as other types of uncertainties such as new technology, changing regulations, or altered patterns of development in the Tucson area.

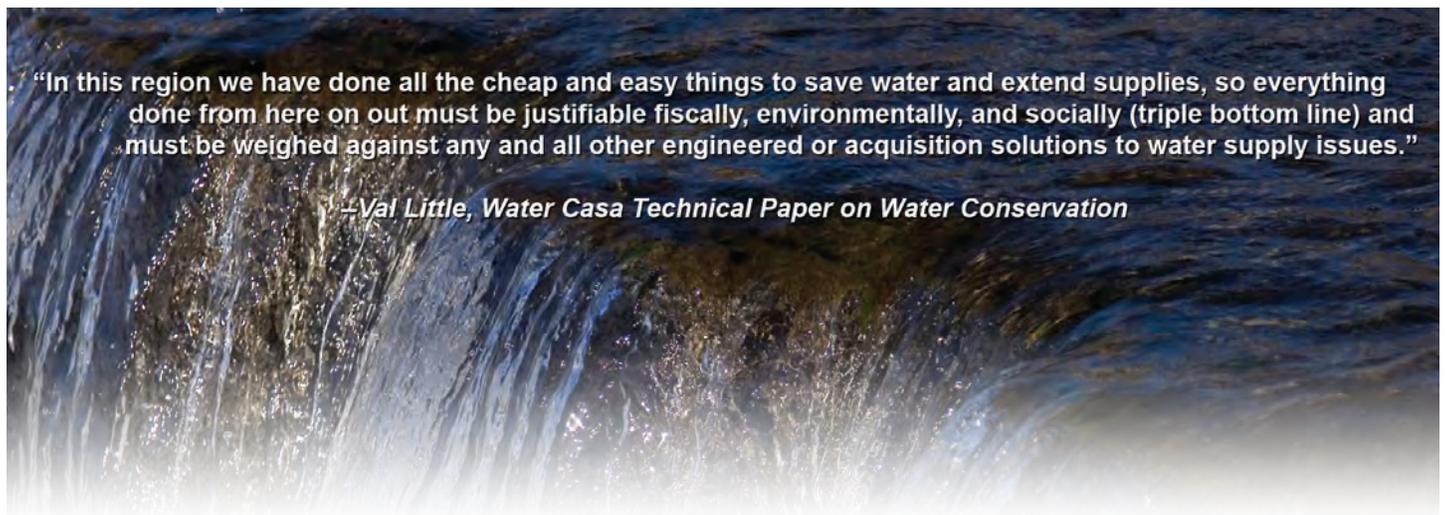


*From Drought Mgmt Plan*

## D. Demand Management

Demand Management is a critical element of a sustainable water future because reducing demand for water protects our future water supplies. Key demand management tools include education, incentives (rates and rebates), reuse and recycling (e.g. water harvesting and greywater), and mandates (ordinances and standards) that reduce the demand for water on the customer side, as opposed to water savings through system efficiencies, e.g., leak detection and repair.

Tucson Water is a national leader in water conservation programs with over three decades of high profile, diverse programming targeted to specific customer classes: single family residential, commercial, multi-family, and large turf, among others. These efforts have made a significant contribution to the conservation ethic in the regional community and to the sustained reductions in per capita water use.



For all water utilities, there is need to balance water conservation with the need to have a reliable revenue stream to manage utility operations and to ensure equity in the recovery of revenue requirements. Tucson Water's current conservation program, under the guidance of the Community Conservation Task Force (CCTF), has led to more rigorous evaluation of water conservation using an economic framework. The Integrated Resource Planning model selected for use in the CCTF allows for the comparison of the costs of various conservation methods against the costs of various supply augmentation options. As a result, demand reductions can be put in the context of how they impact both the cost and timing of introducing new water supplies to the community. These factors can then be included in the Utility's strategic resource planning process. This model, together with the Water CASA Evaluation and Cost Benefit Analysis Study, offer methods that can be further developed and applied to inform decision-making around setting measurable goals, and evaluating the cost effectiveness of conservation programming.

Uncertainties associated with climate change and drought underscore the need for enhanced planning and evaluation. Sustained drought coupled with climate change could affect the community's ability to address drought impacts to social, economic, and quality of life considerations. Because of the level of uncertainty we face, adaptive, flexible, and regularly updated scenario planning approaches are needed to ensure we are prepared as a community for drought in the variety of ways it may be triggered and manifested. The question of who is at the table doing the scenario planning is critical. Scenario planning should be conducted in an open public forum with participation of regional stakeholders and climate-change experts..

The demand management goals and recommendations in this report come from four technical papers:

1. Water Conservation (City/County staff)
2. Water Conservation (Val Little, Water CASA)
3. Drought Planning
4. Stormwater Harvesting

These technical papers were written to address the following guiding principles listed in the for this Study:

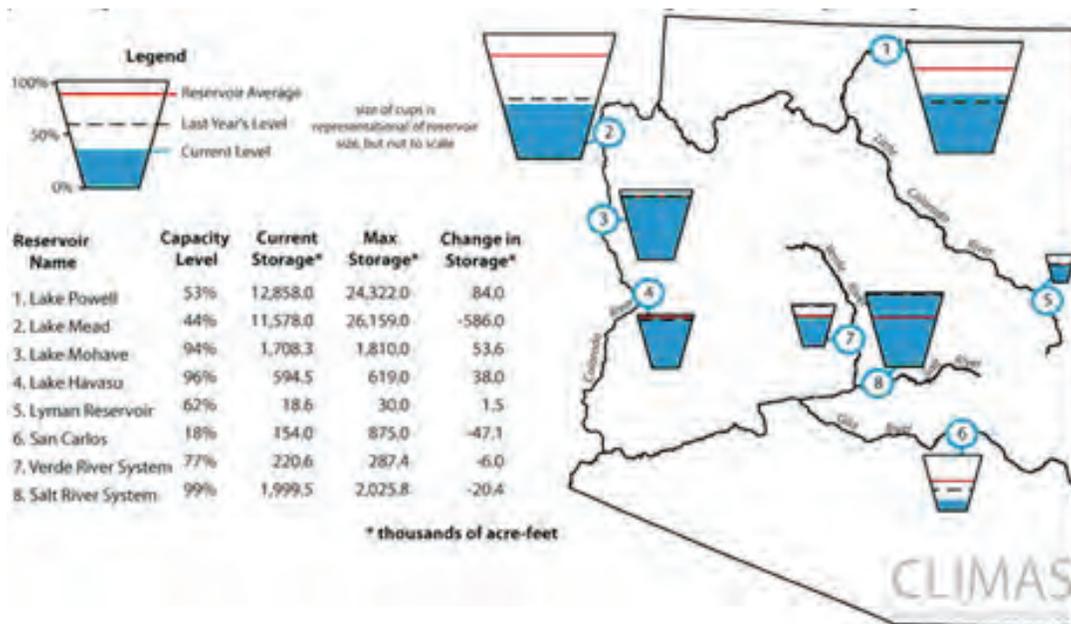
- Increase consistency of water conservation standards and ordinances
- View conservation "as protecting a future water supply, not simply making more population growth possible"
- Consolidate drought management planning

## **Goal #1: Increase the Effectiveness of Conservation Programming Through Coordinated Planning and Evaluation**

More rigorous evaluation and monitoring foster increased adaptability to changing and unpredictable drought and climatic conditions, as well as increased understanding of conservation potential and more effective conservation programming.

Consolidation of City/County drought management plans is not preferable because, as a water provider, the City has different drought planning requirements than the County. In addition, the City's drought management plan is unique because of the City's reliance on CAP water, which necessitates monitoring and establishment of measures to also be able to respond to changing conditions outside our region that impact the Colorado River. We are in a time of great uncertainty with climate change and drought potentially affecting local water demand, local rainfall, and future flows of the Colorado River. Current scientific understanding of changing climate systems holds that the past is no longer a reliable predictor of the future. Increased monitoring and scenario planning is needed to ensure we are prepared as a community for drought in the variety of ways it may get triggered and be manifested.

Monitoring of water-use trends can increase our ability to target both inefficient uses as well as areas that have the highest use. Studies to characterize water use in different customer classes should be conducted in order to establish a baseline for evaluating the effectiveness of future programming. Measurement of progress towards goals and evaluation of program effectiveness will strengthen future conservation programming efforts. Additionally, enhanced efforts to evaluate conservation programs and monitor water use trend data can encourage additional innovation in water conservation research, methods, measurement, and reporting.



Arizona Reservoirs, 2009 (from Oversight Committee Drought Primer)

## Recommendations

- 1.1 The City and County should partner with ADWR and other stakeholders in collecting uniform data on existing water use patterns to identify conservation potential and to support development of water efficiency and conservation goals. Measures should be communicated through coordinated information campaigns to ensure widespread public awareness of progress towards goals. Potential water use trend evaluation elements include:
  - indoor versus outdoor water use
  - lot size
  - persons per household
  - commercial and industrial accounts
  - non-potable use vs. potable use
  
- 1.2 The City of Tucson and Pima County should continuously improve the effectiveness of their conservation programming through integrated resource planning techniques, including triple bottom line analysis and evaluation of cost / benefit economic thresholds. Results of evaluations should be used to revise programs as needed.
  
- 1.3 In the face of uncertainty related to drought and climate change, the City and County should employ an adaptive planning approach that incorporates the following:
  - Bringing experts together to brainstorm current and future vulnerabilities under a range of scenarios
  - Scenario planning as a tool to assess the changing planning environment including the potential for extended drought or permanent climate change
  - Periodic review and frequent updates to the Drought Response Plans to incorporate the latest information on drought and climate change
  - Integrating climate change impacts over time to re-define “normal conditions” when assessing drought
  - Evaluation and consideration of the social and financial impacts of drought on the utilities and their customers, and ways to address them
  - Employing conservative approaches and a multi-pronged preparedness strategy that includes diversification of water supplies, demand management, and development and maintenance of necessary infrastructure to preserve options for the future

## Goal #2: Establish Common Water Conservation Goals and Targeted Methods

Underlying all water conservation and water use efficiency efforts is a shared ethic of wise stewardship of water resources within the Sonoran Desert environment. Yet there are many different drivers and goals for water conservation that result in different strategies, messages, and methods among water utilities for achieving water-use reductions.

In the long term, developing shared goals provides a necessary foundation for increasing consistency and promoting regional dialogue and coordination. Having tangible goals will enable identification of consistent and appropriate methods and tools for achieving the goals. Opportunities for increased consistency in ordinances and standards are more readily identified when reviewed in the context of a tangible goal.

A critical first step in the next Phase of this project is therefore to work with the other water providers to establish common water efficiency goals based on the conservation potential identified through the enhanced planning efforts implemented in Demand Management Goal #1.



*Community water harvesting project on 9th Avenue right-of-way (Photo by Brad Lancaster, used with permission)*

Some community-wide water use efficiency goals to consider might include:

- Decreasing the ratio of potable to non-potable use in municipal water consumption by a specified percentage
- Achieve a 40 percent increase in use of non-potable water supplies for outdoor purposes community-wide by the year 2020
- Achieve a 20 percent increase in irrigation efficiencies of existing turf facilities and commercial landscapes community-wide by the year 2015
- Establish a common (voluntary) gallons per capita per day target

Efficiency goals and measures aimed at reducing waste--as opposed to restricting use--help achieve both quality of life benefits as well as water use reduction outcomes. Common water-use efficiency goals can lead to more balanced efforts to conserve water and result in multiple benefits, including but not limited to, reduced per capita consumption of potable water resources, equitable provision of public green spaces to provide recreational amenities and mitigation of urban heat island effects, energy efficiency, and flood attenuation, retention and detention.

A shared community-wide water efficiency or water conservation target can also support more consistent region-wide education and information programs, which will in turn help people see the benefits of conserving water.

In planning for further water use reductions, caution is needed to ensure that the unintended consequences of achieving a low rate of water use do not degrade overall quality of life. These restrictions could aggravate urban heat island impacts resulting from fewer tree plantings or urban flooding and erosion from a decrease in landscape areas that absorb rainfall. For example, landscape restrictions developed in the name of water conservation may lead to such sparse landscapes that they negatively impact the visual aesthetic of a community and/or reduce the ability to equitably provide for public amenities such as parks and ball fields.

## ***Recommendations***

- 2.1 The City of Tucson and Pima County should evaluate options for working with regional stakeholders to establish common, community-wide measurable water efficiency and water conservation goals. Although the City and County can initiate the dialogue, ultimately this goal needs to be advanced through a regional process. Such a process might be convened by an existing regional entity such as Pima Association of Governments (PAG), Southern Arizona Water Users Association, the University of Arizona Water Resources Research Center, and/or Water CASA.
- 2.2 Building from the community-wide water efficiency goals, City of Tucson and Pima County, in cooperation with regional stakeholders, should develop a menu of water efficiency and water conservation options such as targeted strategies, policies, actions, regulations, and programs.

### Goal #3: Manage Demand through Design of Built Environment

The design of the built environment has a significant impact on long-term water usage rates. By incorporating consistent low water usage development standards into new construction and establishing land forms that reduce the “water footprint” of the built environment, the City and County have an opportunity to build in efficiency at the outset of new development.

Both the City and County have an array of ordinances that, directly and indirectly, affect the ability of new developments to achieve meaningful water conservation. However, there is a need for City and County staff to systematically assess and compare their respective regulatory and policy requirements to remove areas of conflict. The resulting determination of what must be done to remove, or minimize, areas of conflict must reflect the different approaches that the City and County currently employ to implement water conservation. The City relies upon a prescriptive philosophy, while the County depends upon a performance/incentive based philosophy. Alignment of regulatory and policy requirements must also acknowledge the City and County’s different statutory authorities and the different opportunities available at different scales of development, e.g. within the largely built out urban core vs. the suburban and rural environments.

The City is a Charter form of government. As such, the City has greater flexibility to enact regulations than does the County, which is limited in its regulatory powers by state statute. Additionally, the City of Tucson has enforcement mechanisms that are not available to Pima County. The ability to enforce regulations is a critical factor in realizing successful water conservation outcomes through regulation.

In Pima County, new planned construction typically occurs in suburban areas and in the context of larger subdivisions and master planned communities. These afford greater opportunities to impact urban form, such as through the design of large scale stormwater harvesting features, than are available in the urban core. Increasingly, Pima County is implementing performance-based and incentive-based approaches to achieving water efficiency in planned new development.

A case in point is water harvesting and greywater. The City of Tucson’s recent adoption of the Water Harvesting Ordinance that affects new commercial development and the Greywater Ordinance that affects new residential development are precedent setting, strengthening the City of Tucson’s commitment to advancing water use efficiency. The City’s Water Harvesting Ordinance mandates that all new commercial construction provide 50% of landscape irrigation needs through harvested rainwater beginning in 2010.

Pima County, on the other hand, relies more heavily on a performance-based approach. The Water Resources Element of the Comprehensive Plan Policy, along with the Green Building and LEED programs, require new development (especially planned development) to employ water conservation measures which currently emphasize greywater and water harvesting practices. This approach does not establish a predetermined quantifiable or measurable amount of water conservation



Simple graywater harvesting setup (Left photo by Brad Lancaster, used with permission)

that the new development must achieve. Instead, the objective of this performance-based approach is to ensure that water conservation measures and practices will, in fact, be implemented when new developments are built. Developers are now required to submit a water management plan assessing water supplies, impacts and mitigation measures at the time that the land is rezoned. The developers may either develop their own project-specific water conservation measures or select from a standardized menu of water conservation measures to be included in the water management plan. In both instances, the identified water conservation measures must be incorporated into the site design as a condition of rezoning.

Pima County's perspective is that this type of performance based approach enables adaptation to advanced efficiencies that emerging technologies will offer. It provides the flexibility to employ new and innovative methods tailored to site-specific conditions during the land development process.

Regardless of the approach, both the City and County recognize the significant public interest in use of rainwater harvesting. Going forward, both are committed to conducting further research into where and how to optimize the use of these methods at the neighborhood and lot scales of development (where the greatest potential exists). Additionally, Pima County Flood Control District--with its statutory authority for flood control--is embracing opportunities to realize water conservation benefits through its stormwater management program.



*Rainwater catch basin in neighborhood – left, from Stormwater Paper; right, photo by Brad Lancaster, used with permission*

Although Pima County supports use of greywater in appropriate areas, there is a concern about its viability as a water conservation method in certain neighborhoods where the sewer system was not designed to accommodate the lower flows that would result from the installation of greywater systems. The need to flush the lines with water would offset the potential water-reduction gains from use of greywater in those neighborhoods. Pima County supports further analysis and coordination of design standards for greywater to address this issue.

In the long run, the community-wide adoption of common goals will assist all regional jurisdictions in evaluating their development and building standards, allowing them to develop or update them in ways that are best suited to achieving the goals. Each jurisdiction can then develop appropriate strategies and methods to achieve the goals using a common menu of best practices and consistent standards. This environment fosters ongoing innovation of new and better techniques, including but not limited to strategies for maximizing reuse of greywater, rainwater and reclaimed water for multiple benefits.

## **Recommendations**

3.1 Working with stakeholders, a joint City/County staff team should review their existing water conservation regulations for consistency with water efficiency goals. Where appropriate, the team should recommend new requirements with a priority focus on landscape requirements that maximize non-potable water sources and water harvesting techniques. The team should also evaluate the feasibility and benefits of

- Developing joint landscape, building, and zoning standards that increase the potential for on-site capture, storage, and use of rainwater.

- Offering incentives to residents, Home Owners Associations, and builders (this is further described under Goal 4, Recommendation 4.1)
- Updating standards for high efficiency toilets
- Incorporating into the plumbing code the concepts of structured plumbing including trunk, branch twig piping systems, and pipe insulation
- Developing common green building standards
- Continuing to coordinate the review and updating of drought ordinances
- Explore the possibility of requiring new facilities funded by County or City bonds to maximize LEED Silver water conservation credits

## Goal #4: Manage Demand through Changing Behaviors

This goal seeks to foster more effective water conservation outcomes through enhanced and better coordinated education and information efforts. Building from the adoption of shared goals, regional water providers and jurisdictions can develop more targeted and consistent messages and conservation programs. This will increase public awareness of and commitment to goals, and will reduce confusion across jurisdictional boundaries. Addressing the questions of (a) why we are conserving and (b) how saved water will be used, can enhance the success of education programs.

During the course of this Study, some members of the public expressed concerns that water conservation is a tool to fuel future growth at the expense of the quality of life of existing residents. This issue was also recognized in the Study, which asked staff to explore how water conservation can be seen as "...protecting existing supplies and not simply making more population growth possible." This issue boils down to the need to answer the question, why are we conserving?



*Water violation, photo by Tucson Water*

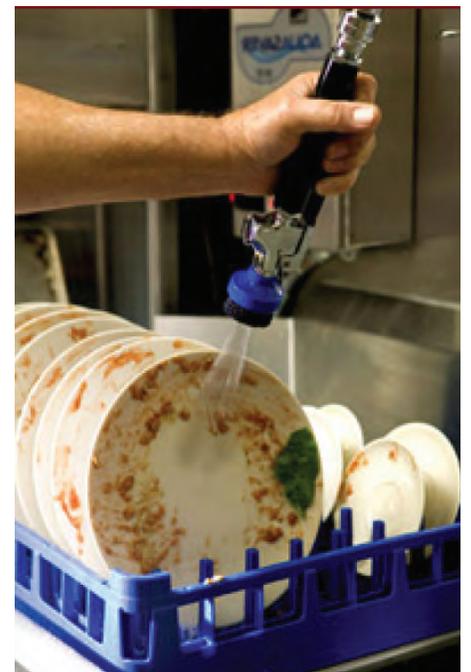
The staff technical paper on Water Conservation answered this question as follows:

- To protect and restore current groundwater conditions
- To preserve options for the future
- To conserve energy used to deliver water
- To preserve quality of life

Consideration of public perceptions of quality-of-life tradeoffs will enable the benefits of conserving water to be effectively communicated in the future. Conservation programs must emphasize lasting, long-term improvements in water use efficiency and minimizing waste.

Water rates can play an important role in reinforcing concepts of efficiency, while outreach and education programs can provide the knowledge needed to implement efficient practices. However, the relationship between establishing rates to encourage water use efficiency or conservation and their potential impacts on annual revenue streams is complicated and can be confusing to the public.

Incentives such as rebates for efficient fixtures and appliances establish a clear link to the benefits for conserved water, and represent another strategy to address public concerns. Future efforts to coordinate messages about the reasons to conserve water and the linking of water that is conserved to specific projects that reflect quality of life values are two possible ways to overcome the public perceptions that conserving water will ultimately hurt their quality of life and/or increase their water bills.



*Tucson Water's Spray Valve Program*

## Recommendations

4.1 The City and County, working in cooperation with regional stakeholders, should gather public input regarding water efficiency measures and goals and consider it in the planning and decision making process. An initial step should be to define a list of public opinion survey questions that explore public perceptions of quality-of-life tradeoffs associated with water efficiency measure, and preferred strategies to achieve shared goals. Methods for gathering public input on these questions should also be explored.

4.2 The City of Tucson and Pima County should explore the feasibility and benefits of consolidating existing programs and fostering regional approaches and partnerships for advancing water conservation and drought education, communications, pilot projects, and training.



## Goal #5: Increase Use of Rainwater and Stormwater to Reduce Demands on Potable Supplies

The intent of this goal is to reduce use of potable water to meet outdoor needs to the maximum extent feasible through optimization of harvested rainwater, greywater reuse and/or reclaimed water. As projects with multiple benefits are developed, the impacts of these benefits--such as use of water harvesting for increased floodwater retention, limiting the migration of contaminants, reduction in demand on potable resources, mitigation of the urban heat island effect and habitat restoration--must be considered rather than simply evaluating the costs and benefits from a water supply perspective.

The Water CASA technical paper on water conservation recommends adopting a goal to eliminate potable water for all outdoor water use. Although staff supports a strong emphasis on maximizing use of renewable water resources such as reclaimed water, rainwater and greywater for outdoor needs, we recommend further analysis of potential unintended consequences of such a goal. Some issues to consider include examination of the tradeoffs in balancing the allocation of water to meet social equity and environmental goals. Could this impact, for example, the region's ability to support recreational turf in areas (potentially low income areas) without access to non-potable supplies? Additionally, there may be areas where the most cost-effective approach is to use groundwater supplies to shore up depleted aquifers that threaten sensitive ecosystems and to balance those withdrawals with recharge of effluent in other areas. The balancing of water needs and water availability requires flexibility and adaptability. A one-size-fits-all policy may not accommodate our ability to optimize resources in meeting the broad range of human, environmental, and economic needs and goals.

*Rainwater cistern (photo by Brad Lancaster, used with permission)*



## ***Recommendations***

- 5.1 The Pima County Regional Flood Control District, in cooperation with the City of Tucson and other regional stakeholders, should develop design guidelines/standards to maximize the potential for use of stormwater at the neighborhood scale.

Using harvested stormwater for vegetation will eliminate the need for some landscape watering. Stormwater flow paths can be depressed to encourage the potential for infiltration, and native vegetation can be planted that will thrive in these depressed flow paths. Such a strategy will have the additional benefit of reducing flood peaks and improving stormwater quality. To accomplish this, the City and County will review existing policies and regulations and

- Identify opportunities to increase the incidence of water harvesting in private developments through new or expanded incentives and improved consistency between City and County requirements
- Evaluate how development standards and HOA regulations may need to be modified to accommodate this strategy
- Develop retention/detention standards that allow these areas to be better utilized as mini-restoration sites, including maintenance standards and siting of basins within a development/project
- Develop restoration standards that encourage the creation of higher-value habitat areas without sacrificing the retention/detention function of the basins

- 5.2 The Pima County Regional Flood Control District, in cooperation with the City of Tucson, should continue to conduct research and analysis on estimated volumes of harvested rainwater available at the lot scale, as well as costs and benefits of water harvesting as a source of additional water supply and as a stormwater management tool.

# IV. OVERSIGHT COMMITTEE CONCLUSIONS

By a vote of 10-1, the Committee generally accepts the City and County’s Shared Goals and Recommendations in section III. In part A below, the Committee adds its recommendations for future phases of this work. In part B, specific comments from individual committee members concerning Section III are included.

## A. Recommendations for Future Phases

### Take a Regional Approach to Water and Wastewater in the Tucson Active Management Area (AMA)

Throughout the process of Phase II, Committee members noted that other jurisdictions in the Tucson AMA and private water providers were not at the table. In the future, they will need to be effectively engaged if we are to take a regional approach to a sustainable water future.

*Regional cooperation is key to a sustainable water future.* The process of City and County cooperation through Phases I and II of this study gives hope to the idea that it is possible to reach common ground across the communities and jurisdictions in the Tucson basin. Cooperation across communities and jurisdictions can

- (A) avoid inefficiency, inequity, and overuse of watersheds and ecological systems
- (B) create a regional identity and water goals to which everyone impacted can contribute
- (C) help us do a better job of achieving integrated land use and water management planning and implementation targets

Regional water users mutually depend on groundwater in order to both meet annual demand and have access to a reserve supply for use during extreme drought. We need to understand the strengths and weaknesses of private water utilities and other organizational structures for water provision. Our region has increasingly depended on the Colorado River in recent



Multi-agency cooperative initiatives include Tres Rios del Norte, the Avra/Black Wash Riparian Project, the Kino Environmental Restoration Project, and constructed recharge projects

years, which means that Tucson’s annual water supply is more closely tied to annual Rocky Mountain snow pack and management of the reservoir system (Lake Mead, Lake Powell) than to local weather patterns.

Clearly, our water planning will have to consider the Colorado River watershed. We are entitled to water through state statutes and by virtue of the “law of the river” governing Colorado River water. But we are not the only jurisdiction contemplating these issues, nor are we the largest, wealthiest, or most politically potent. We need to recognize the limits on our degrees of freedom in choosing our water/wastewater future. As a region, we should be keeping a close eye on what “significant others” in our future are doing.

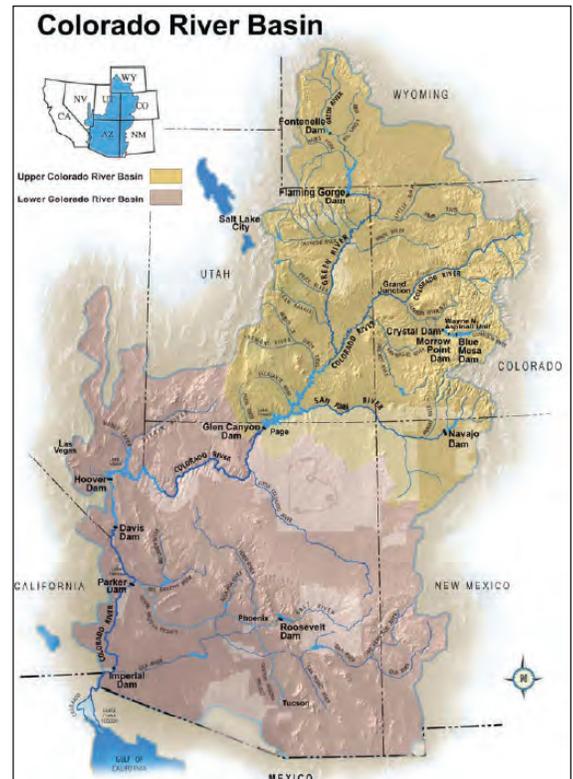
Finally, approximately 30 percent of Tucson Water users live outside city limits and have no direct say in the governing process. A regional cooperation venue creates a place for their voices to be heard.

The most realistic model for a regional water/wastewater dialogue is Pima County’s Sonoran Desert Conservation Plan process. We should not be unrealistic: *this takes a great deal of time*. It includes a lot of people, multiple points of view, lots of patience, and lots of disagreements while we search for common ground. This Joint Study (and all of its products) sets a baseline for the amount of detailed facts, assumptions, and uncertainty that must be brought to a regional table.

*The City and County should commit to helping a regional process be convened as well as committing the resources to assuring that it can happen.* Staff involved in the first two phases of this process should continue to be involved in future phases in order to provide continuity.

Specific recommendations:

1. Decide on a method for regional cooperation, including how it will be housed and institutionalized.
2. Involve all jurisdictions, private water utilities, and other stakeholders in such regional cooperation.
3. Develop common water conservation policy tools and targets across the region (the Tucson AMA), including standards and ordinances. This step can help evolve our ability for regional cooperation and effectiveness in managing water resources, and may be an appropriate early task for regional cooperation.
4. Create water education programs that can be shared throughout the Tucson AMA.
5. Where growth should occur (and urban form) is a regional issue and should be discussed as such.
6. Integrate planning and implementation for infrastructure, urban form, environmental protection/restoration, and drought planning, and coordinate at the regional level.
7. Implement programs to limit or stop groundwater pumping near groundwater-dependent ecosystems and perennial & intermittent streams. These programs would include:
  - overcoming regulatory barriers that promote ground-water pumping
  - creating regional policies that protect environmentally-sensitive areas so that conservation land system remains viable
  - providing for continued use of effluent (“reclaimed water”) to restore environmentally-degraded riparian areas
8. Study the desirability and feasibility of wheeling renewable drinking water or reclaimed water to areas that currently have no access and are over-pumping groundwater. Support the shared use of community infrastructure through cost-effective wheeling agreements for delivery of effluent, surface water, imported groundwater, and/or stored renewable supplies in order to achieve greater integration, reliability, flexibility and reliance on renewable supplies throughout the region.



(Bureau of Reclamation)

9. Work as a region to bargain for additional water resources and monitor what “significant others” in our future are doing.
10. Cooperate as a region to change State regulations to allow for more advantageous use of harvested rainwater, stormwater, and reclaimed/greywater for environment preservation/restoration, recharge and irrigation.
11. Include other regional stakeholders who would also benefit from additional water supplies in an exploration of options other than what CAP is evaluating through its ADD process.
12. Encourage utilities to cooperate in recharging renewable water near areas of groundwater pumping.

## **Assure Effective Community Participation in the Process of Determining and Realizing a Sustainable Water Future in the Region**

Non-expert community members are critical consumers, critics, and partners in water and wastewater management allocations, policy, and planning. “Community members” organize themselves at different scales: individuals, households, neighborhoods, and institutions (e.g. industries and businesses, schools). All of these domains of participation are implied in use of the terms “stakeholders,” “constituents,” and “the public.”

Effective participation of non-expert stakeholders requires that they acquire a basic understanding of issues, options, and decision tools. They need to understand the science, the areas of uncertainty, the areas of disagreement, and any needs for additional information without delaying decisions that must occur in the absence of perfect information.



*Community members at a Water Study meeting, September 2008*

Stakeholders need to input their interests, values, and preferences for quality of life, and understand how various options under consideration will impact themselves, their environment, and the public good, both now and in the future. And, they need to help assure – by their careful and considered choices and actions as consumers and economic and environmental actors – a sustainable water future.

A need to organize actions according to scale. Actions on the part of constituents at different scales (individual to institutional) all matter when it comes to water issues. When issues, goals, and recommended actions are classified and measured according to scale, it becomes easier for the public to understand and participate effectively at all levels – household, neighborhood, in jurisdictional policies, the Tucson AMA, and policies of the seven states that use the Colorado River as a water supply. Proposed recommendations/solutions should be organized and matched to appropriate scale: individual, neighborhood, region. Proposed policies should also be matched to appropriate jurisdictional levels: city, county, state, multi-state, and national.

Public officials need to demonstrate that they are listening to constituents, because no effort can be sustained without their buy-in. When constituents take time to give input and participate in processes, public officials need to figure out how to effectively use that information – it must be **BOTH** received and addressed. Simply collecting information and posting it does not mean that the input has been addressed. There will need to be methods of analyzing and processing public input and participation, and communicating back to members of the public about the concerns and suggestions they have expressed.

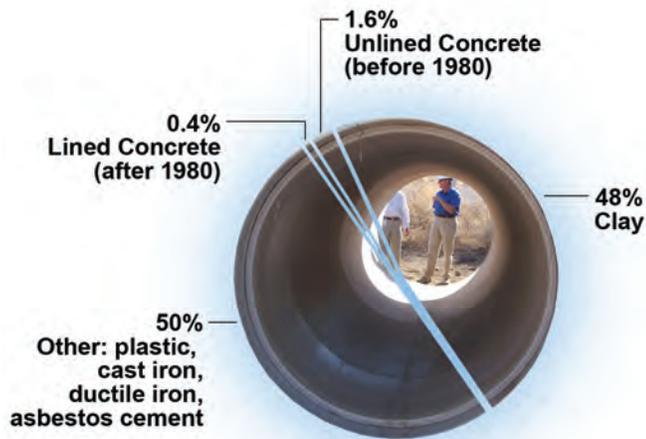
**Specific Recommendations:**

1. Develop a specific plan to increase the visibility of water issues and engage the community effectively in future discussions. The plan must go beyond simply “identifying stakeholders” or relying on staff to process the issues.
2. Continue to work toward community consensus on the definition of “sustainability,” because planning for a sustainable water future requires community agreement.
3. Provide ongoing education and outreach to the public through a variety of media on the amount and dependability of water providers’ supply portfolios, including:
  - CAP M & I subcontract water deliveries
  - Effluent supplies
  - The proactive measures that local water providers and the Arizona Water Bank are doing to store reserve supplies for times of extreme shortage on the Colorado River
  - The large amount of groundwater available in the Tucson basin as a reserve supply
  - The Seven-basin State Shortage Sharing rules
4. Develop consistent drought planning concepts and approaches that can be understood by the public, even though area plans may need to differ.
5. Decide how to assure that water conserved by current community stakeholders will not simply go to support increased population growth, but will serve other important community values. One suggestion: results of conservation efforts should be made available for riparian (and other related biological) conservation efforts.
6. Where possible, involve the public in monitoring and adaptive management. There are many wonderful examples across our nation of public involvement in a variety of large-scale environmental resource- management issues. Public involvement fosters development of a conservation ethic, and helps the public begin to understand the complexity of decision considerations that public officials must address in reaching strategies and actions to assure a safe and reliable water supply.

## Address Cost Issues More Fully

As the technical reports emphasized, we do not now have a crises of water shortages and if managed well, we have many options to reduce per capita demand and reduce our draw on groundwater supplies. All of the water-related issues need to be addressed in a comprehensive and coordinated way. We also need a commensurate way of accounting for and comparing alternatives: One way is through economic analyses that assign costs and benefits.





*Aging infrastructure is a critical factor in cost calculations*

In general, Committee members felt that Phase II technical reports and discussions lacked economic analyses and reference to the economic environment in which this discussion is taking place. Economic vitality is one of the three important components of sustainability. Cost signals provide evaluative information and measures that are critical to weighing proposals under consideration. The Section III Shared Goals and Recommendations for Demand Management, for example, largely stuck to engineering solutions and prescriptive methods of demand management. We need softer methods of demand management such as are available through pricing and economic signals.

Price signals are an essential tool for achieving efficient use and allocation of water supplies. Current retail water rates do not match claims of scarcity. Water rates should be re-evaluated to understand their role as a demand management tool, to ensure rates are more closely aligned with value of the resource, and ensure that revenues are sufficient to support near-, mid-, and long-term infrastructure investments. For example, utility fees could be structured to discourage wasteful water use.

It is important to recognize and emphasize that we are entering an “Era of Replacement” for water and wastewater infrastructure that serves the existing population—including the need to take wastewater treatment to a new level because of federal and state requirements. How will we pay for new infrastructure and rehabilitation of aging infrastructure? What are the social issues related to costs?

Another glaring weakness in our analyses was the looming issues of energy, energy costs, and the carbon footprint. We did not adequately discuss these issues; they were not called out in our for Phase II. They should be considered in future phases.

Opportunity costs are an important cost consideration as well. When we make decisions in one direction, we need to make sure that we know what other opportunities are being foreclosed by such a decision. Opportunity costs should be analyzed and reported transparently in all policy and project proposals.

Finally, the “who pays?” question needs to be addressed in all deliberations, and equity criteria applied.

Specific recommendations:

1. Consider relative costs of various supply sources. Before acquiring new water sources, consider the cost of conservation for increasing our water resources and reducing our water needs, and compare this figure to the cost of additional infrastructure and energy to bring in new supplies.
  - Reclaimed water policies should consider cost of treatment and cost of delivery
  - The long-term effect of salinity/mineral content in any new water sources should be considered as part of cost analyses
  - Wastewater treatment agencies should determine the additional treatment costs associated with more potent effluence streams due to conservation

2. Provide community-wide conservation goals and standards that maximize acre-feet saved per community dollar spent, focusing policies and finite economic resources where most efficient.
3. Provide consumers with proper economic signals related to marginal cost of new supplies by not using average cost pricing.
4. Support the use of General Obligation (GO) Bonds for extension of the reclaimed system to areas where there is a public benefit. GO Bonds allow for costs to be distributed to all beneficiaries of public benefits such as environmental restoration or groundwater pumping reduction.
5. The idea of wheeling agreements provides benefits to riparian areas, but this approach does not take into account the economic reality for the water providers or the customers they serve. As many of these water providers are governed by the Arizona Corporation Commission, their ability to recapture lost revenue due to the higher cost-only alternative water resources is limited. This issue must be considered when evaluating proposals for wheeling agreements.



*(Park Service)*

## **B. Comments from Individual Committee Members**

By a vote of 10-1, the Committee registered their general agreement with the goals and recommendations of City and County staff in section III. Some committee members had specific comments they wished to make explaining their ideas and concerns. They are included below.

### **Comments by Marcelino C. Flores, Vice Chair, Oversight Committee**

What I enjoyed most as a member of the City/County Water and Wastewater Infrastructure and Supply Planning Oversight Committee is knowing that we were part of an unprecedented collaborative process between the City of Tucson and Pima County. The fact-finding discovery work of Phase I was phenomenal. Each meeting highlighted critical findings and the Appendices are rich with even more detailed information, setting the stage for discussion of a sustainable water future. A closer examination of the historical relationship of technology, policy, and the environment could demonstrate how often technology--with economic benefits at each turn--is used to overcome challenges that later lead to adverse environmental impacts followed by inept policy reaction. How do we fare with current best management practices?

In the last two hundred years we have substantially depleted the sustainable resources of the Tucson watershed which has been inhabited for over four thousand years. When the river stopped flowing, deep well turbines were introduced to mine groundwater. Who knew there would be a drought that would kill thousands of cows? When signs of subsidence were emerging we built a canal and a policy that assured we would work toward 'safe yield.' As safe yield eludes the AMAs, the energy and water nexus becomes more critical. And as drought persists we have, at the state level, authorized CAGR to let our children, and advanced technology, deal with those issues.

Given so many reasons it is easy to see why we may choose to continue with an 'every man for himself' mentality. A paradigm shift that was not discussed is perhaps focusing technological advances and cost effective efficiencies in the area of replacing our aged infrastructure; as opposed to cloud seeding research and desalination. If our region learns how to best work together using meaningful policies to plan, fund, and rebuild the existing infrastructure, how many cities would want to know how it was done? Keep in mind, at the end of the day, Tucson is at the end of the canal at the top of the hill. We should be driven to work together as a region in the areas of policy development to assure economic vitality, social vibrancy, and environmental viability.

I am uneasy about the process moving forward from Phase II in a meaningful and productive manner primarily because there are 19 goals and 56 recommendations. Intuitively, a prioritization of goals and recommendations could aid in the implementation as, in time, each goal would be addressed and recommendations with the higher chances of success could demonstrate a need for continued support. Before these goals and recommendations are prioritized, I perceive that the recommendations are interdependent and goals are interrelated. For example, recommendations under the Comprehensive, Integrated Planning Goal #2; *Direct Growth to Suitable Areas: 2.4 Regional scenario modeling can inform 2.2 the location of future infrastructure supporting 2.3 the acquisition of open space.*

Moreover, Demand Management Goal 2 Recommendation 2.1 *Evaluate options for working together and establishing efficiency standards* leads to Goal 3 Recommendation 3.1 *Review conservation regulations for consistency with water efficiency goals.* But doesn't Goal 4 Recommendation 4.1, *a public survey to explore quality of life trade-offs associated with water efficiency measures,* need to occur first?

I hope to see that a sound commitment to future phases and the regional dialogue undertaken by City/County is mirrored by all regional stakeholders.

### **Comments by Vince Vasquez, Member, Oversight Committee**

I would like to express my appreciation for the opportunity to participate in the City/County Study as a City of Tucson CWAC appointee. It has been an honor and pleasure to work with such a talented and thoughtful group – staff, consultants, and Oversight Committee members – to address the City and County's water management issues. Committee meetings included good-natured and insightful deliberations that are documented in the Phase II Report (Sections I & IV).

The Phase II Report also provides a consolidated set of policy goals and recommendations from City and County staff (Section III). I support the following staff recommendations that I believe are a positive step toward sustainable regional water planning: 1) work collaboratively as a region to acquire additional water supplies; 2) share regional infrastructure through cost-effective wheeling and/or recharge agreements; 3) construct additional recharge projects to maximize use of effluent for Assured Water Supply purposes; 4) use County General Obligation Bonds to help fund reclaimed line

extensions; 5) use cost analysis to compare effectiveness of various conservation measures against supply acquisition; and 6) manage risk and address uncertainty by investing in additional water supplies, demand management, and critical infrastructure. However, there are a number of staff's goals and recommendations that I strongly believe need further deliberation and/or specific clarifying amendments prior to final approval of the Phase II Report. Consequently, I did not support the Committee's general endorsement of staff's goals and recommendations. My primary outstanding concerns are:

- Staff's goals and recommendations include support of cost analysis methods to inform water management decisions, but there are significant policy endorsements regarding rainwater harvesting and reallocating water for the environment that lack such analyses. Prior to final approval of the numerous recommendations and statements in the report associated with these two issues, I recommend adding qualifying language committing: 1) to study the cost-effectiveness and reliability of rainwater harvesting compared to other demand management and supply augmentation alternatives; 2) to study the net benefits associated with reallocating water out of municipal providers' supply portfolios for specific environmental restoration projects, and compare to the net benefits of use in municipal and industrial sectors prior to finalization of reallocation decisions; 3) to determine which supplies (stormwater, effluent, or potable) are most suitable and cost-effective for environmental restoration projects and how to equitably finance projects such that costs are shared by all beneficiaries.
- Staff's report includes an unfair characterization of the purpose and role as well as the challenges facing the Central Arizona Groundwater Replenishment District (CAGRDR) in the Tucson AMA. Every water provider in the region (including Tucson Water) withdraws water outside the area where recharge occurs. Significant volumes of water are withdrawn from recovery wells outside the "area of impact" in the service areas of water providers with Designations of Assured Water Supply, contributing far more to groundwater declines in the Tucson AMA than CAGRDR membership. I recommend deleting those sections of the report that wrongly attribute regional groundwater declines and the so-called "pumping/recharge disconnect" to the CAGRDR and its members. See also the letter from CAWCD on this issue, included in the appendices to this report.
- Staff's section titled "Comprehensive, Integrated Planning" drifts too far into urban form/design for a study centered on water management. Not enough time was spent on these topics to warrant the detailed recommendations found in this report. Issues such as encouraging mixed use development, density, housing diversity, transportation options, access to jobs, etc., are important and complex topics that should be fully discussed in the regional land planning process, but eliminated from this report. Finally, recommendations and statements attributing current infrastructure deficits and budget challenges to growth should be substantiated and/or rewritten with a more balanced tone and an demonstrated understanding of measurable economic benefits such as job creation, sales/income/property tax generation, etc.

## V. CITY/COUNTY COOPERATIVE EFFORTS UPDATE

As was discussed in the Phase 1 Report, the Scope of Work for the Water Infrastructure, Supply, and Planning Study called for the City of Tucson Water Department (Tucson Water) and Pima County Regional Wastewater Reclamation Department (RWRD) staff to improve communication and coordination between the two agencies, and make progress on three initiatives:

1. Cooperatively pursue and develop a joint constructed recharge project for City and County effluent being discharged to the Santa Cruz River;
2. Finalize the Conservation Effluent Pool Intergovernmental Agreement Amendment; and
3. Finalize the location of a wastewater reclamation facility in the Southeast Area.

This section will review the background and previous progress on each of these issues and provide an update of activities and outcomes since the publication of the Phase 1 Report.

### **Improve Communication and Coordination**

Communication and coordination between Tucson Water and Pima County Regional Wastewater Reclamation Department staff improved significantly since the start of the Phase 1 study effort. Staff from both agencies met almost biweekly as part of a staff technical advisory team that prepares materials and presentations for the Oversight Committee meetings. Staff from other City and County departments also participated in these technical advisory team meetings when the topics covered a broader spectrum of issues, leading to enhanced communication across different departments and staff levels with both jurisdictions. These meetings have also led to increased data sharing and a refinement in the accuracy of each agency's data. In addition, staff from both agencies continued to meet regarding the potential development of a joint constructed recharge project along the Santa Cruz River and in other locations, and the establishment of a site for a wastewater reclamation facility in the Southeast area.

During the Phase 2 effort, City/County staff worked closely to produce 14 technical papers on an accelerated schedule over the past six months. These papers addressed the following topics: Water for the Environment, Additional Water Resources, Water Quality, Water as an Economic Resource, Cost of Growth, Integrated Land Use and Water Resources Planning, Population Growth, City/County Water Conservation, Stormwater Management, Riparian Protection, Reclaimed Water, and City/County Consolidated Drought Management. Over 40 City and County staff have participated in preparing these technical papers.

In addition, an ordinance providing for the directors of both agencies to be non-voting members of each other's advisory committees (Tucson Water's Citizen's Water Advisory Committee and Pima County's Regional Wastewater Reclamation Advisory Committee), was approved by Mayor and Council and the Board of Supervisors. The directors began to serve on these Committees as ex-officio members on January 13, 2009. A joint meeting of these two advisory committees was held on January 21, 2009 to review Phase 1 of the Study. Both committees have received updates on the Water Study as well as agency and Committee activities on a monthly basis.

### **Pursue and Develop a Joint Constructed Recharge Project**

The original intent of this effort was to accrue additional effluent storage credits through the development of a constructed effluent recharge project in or adjacent to the Santa Cruz River. Staff from Tucson Water, RWRD, Pima County Regional Flood Control District (RFCD), and the County Administrator's Office met and established a Working Group in order to move this project forward. The outcomes of the Working Group include an inventory of existing effluent recharge projects located along the Santa Cruz River and an exploratory list of managed and constructed effluent recharge projects that could potentially be sited along the Santa Cruz River. In addition, a series of maps were developed showing the location of potential joint constructed recharge projects. The collective staff also conducted a first-order fatal flaw analysis of the potential projects which took into account project feasibility both in terms of acquiring the necessary permits and achieving stated performance goals.

The results of the first-order fatal flaw analysis forced staff to broaden the exploration for recharge projects. Staff are currently analyzing a promising site in the Houghton Area Master Plan (HAMP) area, which can meet many of the initial objectives, while also opening the door to other benefits.

RWRD is currently discharging approximately XX million gallons (52,352 acre-feet) of treated effluent into the Santa Cruz River from the Roger Road and Ina Road wastewater reclamation facilities. Various entities hold entitlements to this discharged effluent, and they include the Bureau of Reclamation, the City of Tucson, the Metropolitan Domestic Water Improvement District, Pima County, and the Town of Oro Valley. The Bureau of Reclamation, which has entitlement to the largest volume of effluent annually discharged to the Santa Cruz River, manages the federal entitlement as a resource to help meet the federal obligations to provide Central Arizona Project (CAP) water to the Tohono O'odham Nation per the Southern Arizona Water Rights Settlement Act (SAWRSA). A portion of the effluent discharged into the Santa Cruz River recharges the aquifer along various stretches of the Santa Cruz River within the Tucson Active Management Area (TAMA), although some effluent flows beyond the TAMA boundary.

Per State law and Arizona Department of Water Resources (ADWR) regulations, entities that store water or effluent underground at "managed" or "constructed" recharge projects within the TAMA are eligible for storage credits that can be recovered at a later date. In order to accrue credits for this effluent recharge and storage, two constructed and two managed recharge projects are being operated within the floodplain of the Santa Cruz River pursuant to ADWR permits. The two constructed effluent recharge projects, which receive 100 percent credit for the effluent recharged, include the City's Sweetwater Recharge Facilities and Pima County's Marana High Plains Effluent Recharge Project. The two managed effluent recharge projects, which receive 50 percent credit for the effluent recharged in the channel, include the Santa Cruz River Managed Underground Storage Facility and the Lower Santa Cruz River Managed Recharge Project.

The Working Group looked for potential sites based on the following assumptions and constraints:

### **Assumptions**

- Project sites should be preferably located on City of Tucson and Pima County-owned land;
- Project sites should preferably be located within the jurisdictional boundaries of the City of Tucson or unincorporated Pima County; and
- Project sites have potential cost-savings the closer they are located to the source of effluent.

### **Constraints**

- Proximity/adjacency to landfills;
- Proximity to Water Quality Assurance Revolving Fund (WQARF) sites;
- Proximity to already existing underground storage facilities;
- Proximity to the Kinder-Morgan plume; and
- Potential impacts of adjacent sediment mining or other earth-removing operations.

Four potential sites along the Santa Cruz River were identified: three within the Town of Marana and one within the City of Tucson.

The initial reconnaissance-level evaluation of constructed recharge opportunities in proximity to the Santa Cruz River indicated the following constraints:

- a lack of subsurface storage capacity due to the existence of already permitted underground storage facilities located nearby,
- proximity to existing sediment mining operations,
- the presence of nearby groundwater contaminant plumes associated with WQARF (state superfund) sites, and
- potential jurisdictional issues.

Due to the above noted constraints associated with projects along the Santa Cruz River, potential joint recharge projects were also explored in other areas. Upon further study, cooperative staff efforts are now investigating the potential for a single large recharge project in the vicinity of the Houghton Area Master Plan (HAMP) which can meet the original intent to accrue underground storage credits, achieve the initial set of criteria/assumptions and potentially serve multiple purposes. During the next phase the key tasks are expected to be consultant feasibility study on prioritizing potential recharge sites, including acquisition and assessment of subsurface boring/drilling data.

## **Finalize the Conservation Effluent Pool and IGA Amendments**

Largely due to the influence of the Sonoran Desert Conservation Plan, a portion of the 2000 Supplemental Intergovernmental Agreement between the City and County was developed whereby the parties jointly agreed to set aside up to 10,000 acre feet per year of effluent (the Conservation Effluent Pool - CEP effluent) for use as part of a Habitat Conservation Plan (HCP) or on riparian projects. The CEP effluent is to be taken on a priority basis from the effluent produced by the County-operated metropolitan wastewater reclamation facilities.

The City and County are currently negotiating an intergovernmental agreement that will define how the CEP effluent will be managed and allocated to riparian projects. The City and County have the decision-making authority on use of the CEP effluent, and there is a provision in the agreement whereby the Board of Supervisors and Mayor and Council could increase the CEP effluent beyond the allotted 10,000 acre-feet. Recent meetings with City and County staff have resolved the remaining areas of outstanding concern. City staff are currently reviewing the final draft language. The Agreement will then be sent to the City of Tucson and Pima County management for final approval, and then submitted to the Pima County Board of Supervisors and the City of Tucson Mayor and Council for ratification. Target date for ratification is by the end of December, 2009.

## **Finalize the Location of a Wastewater Reclamation Facility in the Southeast Area**

The City and County have long recognized the need for the development of a new wastewater reclamation facility to serve this general area. Such a facility could serve multiple purposes and could prove beneficial to both Pima County and Tucson Water given their respective areas of responsibility. For instance, it would not only increase the efficiency of wastewater conveyance and treatment but it would also serve as an additional source of effluent that can be used in the City's Reclaimed Water System. With regard to the latter, locally produced effluent could be recharged and stored underground on site which could increase the operational efficiency of the City's Reclaimed Water System.

A new large wastewater reclamation facility would help improve wastewater conveyance and treatment in the southeast area and this could provide operational benefits to Pima County's overall wastewater management system which serves the greater metropolitan area. Currently, two major sewer interceptor lines, the Pantano and the Southeast Interceptors, serve the far southeast side of the metropolitan area and convey wastewater from this area to the west and north across the community to the Roger Road and Ina Road Wastewater Reclamation Facilities (WRF) adjacent to the Santa Cruz River. Thus, a wastewater reclamation facility in this area may provide opportunities to reduce the conveyance expansions needed for new wastewater flows through the Pantano and Southeast Interceptors to the Roger and Ina Road facilities.

Under a 1983 Intergovernmental Agreement (IGA) between the City and County, a parcel of City-owned land at Harrison and Pantano was designated for a future County wastewater reclamation facility for this area. The City has historically leased this parcel to the Davis-Monthan Air Force Base (DMAFB) for use as part of the Poorman Gunnery Range. Plans for this facility have never been implemented and the parcel ownership has never been transferred to the County. At this point in time, the Air Force has informed Pima County Management that they consider this parcel to be unsafe for public use due to its proximity to the operations of the Poorman Gunnery Range.

With the task of finalizing a location for a future wastewater reclamation facility to serve the southeast area, staff from Tucson Water and RWRD have met with staff from Pima County Development Services and a representative from Westcor, the development company involved in planning much of the vacant State Trust land in the HAMP area southeast of Tucson. Existing infrastructure serving portions of the southeast area was reviewed, as well as previous studies and planning efforts for this area. Proposed siting objectives and criteria were developed and reviewed.

***Sites Identified From Previous Studies and Planning Efforts.*** In 2006, both agencies began a coordinated evaluation of the future potable water, reclaimed water and wastewater needs of the HAMP area. This evaluation was done in conjunction with the City of Tucson's Urban Planning and Design Department and the State Land Department master planning initiative for the 12,000 acres it hold in the HAMP and its tributary area. Both agencies retained Malcolm Pirnie to produce two parallel and complementary reports – one on water/reclaimed water and one on wastewater. It is important to note that these reports were developed using the same population projections and flow/demand assumptions, the same infrastructure condition and capacity assessments, the same land use assumptions and the same approach for developing cost opinions. The wastewater evaluation portion of the report was completed in February, 2008. The water and reclaimed water portion of the report was released at the end of March, 2008.

Malcolm Pirnie identified several potential reclamation facility sites in its wastewater report:

- Davis-Monthan Air Force Base's (DMAFB) Poorman Gunnery Range at the southwest corner of Harrison and Irvington as discussed above.
- Pima County Regional Flood Control Department (RFCD) land along the Pantano Wash south of East Camino Del Desierto, east of South Perlita Road, west of Old Spanish Trail, and north of East Saguaro Crest Place.
- Sonoran Environmental LLC land along the Pantano Wash east of Harrison and south of Escalante (north of the DMAFB site), along with a parcel of State land immediately to the west of this site (to meet setback requirements).
- City of Tucson land south of Valencia and east of Old Vail Road at the northwest corner of the approximate intersection of Pantano Road and the Southern Pacific railroad.

The first three sites were identified to support the planning scenarios with a reclamation facility sited nearer the Pantano Interceptor (and existing Tucson Water reclaimed facilities), while the fourth site is the only scenario with a reclamation facility located near the Southeast Interceptor.

Other Locations Identified by Staff. During the initial scoping for the cooperative efforts assignments, Tucson Water and RWRD staff, along with Pima County Development Services and Westcor representatives, reviewed the project history, discussed the wastewater and reclaimed water issues in the area and began to develop expanded criteria and objectives for a wastewater reclamation facility in the Southeast/HAMP area. The cooperative working sessions identified additional potential facility sites along the Houghton Road and Interstate 10 corridors. The following additional locations were identified through this work process:

- City-owned property at the northwest corner of Houghton Road and Irvington as described in the 1983 IGA as an alternative to the Poorman Gunnery Range site.
- State-owned land at the intersection of Houghton and Valencia.
- State-owned land in the Houghton Road and I-10 vicinity.
- Land adjacent to the University of Arizona Science and Tech Park, including the IBM Wastewater Treatment Facility (site is currently owned and operated by University of Arizona).
- Wilmot and I-10 vicinity tributary to the state and federal prison sites.
- Land currently occupied by RWRD's Rancho del Lago Pump Station.

Combined with the sites identified in the Malcolm Pirnie report, a total of 10 sites have been identified which will undergo additional evaluation.

The Malcolm Pirnie report identified potential sites in the HAMP area but found no near-term need for a wastewater reclamation facility due to the lack of projected near-term flows from State Land. Staff initially expanded on the Malcolm Pirnie report with additional potential sites for evaluation adjacent to the HAMP area. Subsequently, the area of study has now been further expanded to the entire Southeast Area to include more current and future flows to allow for a comprehensive evaluation of projected population and development and resulting potable water, wastewater and reclaimed water demands in this entire area.

Staff are now working to complete planning-level evaluation of projected flows and reclaimed water needs and will refine acquisition issues related to specific sites. The review will apply expanded criteria and objectives for the wastewater reclamation facility to the 10 previously identified potential locations as well as any new sites identified for the Southeast area. Staff will continue to work with the State Land Department and any other area developers to integrate their planning concepts and assumptions into the overall wastewater conceptual plan for the HAMP/Southeast tributary area. The deliverable of this review will be a refined list of recommended facility plant sites and a conceptual water/wastewater/reclaimed water plan for the entire area, which would be agreed to by both agencies.

In January 2009, RWRD and Tucson Water were approached by the University of Arizona Department of Civil Engineering (U of A) to become involved with a four-year, \$2 million federal grant to study the “Optimization of Conjunctive Water Supply and Reuse Systems with Distributed Treatment for High-Growth Water-Scarce Regions” under the National Science Foundation’s (NSF) Emerging Frontiers in Research and Innovation for Resilient and Sustainable Interdependencies Program (EFRI-RESIN). The City and County agreed to incorporate the grant investigation methods and approach in the conceptual planning for the HAMP Southeast area. Subsequently, Water and Wastewater staff have held nearly monthly workshops with the U of A principal investigators, faculty and graduate students involved with the research grant. In addition to examining theoretical approaches to determining optimal means of integrating water and wastewater infrastructure and the resiliency of these interdependent systems, the utilization of the U of A scientists, as suggested in the Water/Wastewater Study’s scope document, enables the City/County to obtain valuable technical resources while leveraging on the federally-funded support provided by the NSF.

## **Going Forward**

The cooperative projects efforts between City and County staff has been quite successful. Staff coordination and drafting of the reports for Phases 1 and 2 have led to significant positive working relationships which have been utilized to achieve closer cooperation and joint problem-solving on other issues important to both Departments. The research reports created for each of the technical areas studied have helped to coordinate and consolidate policies and to resolve some long-standing policy differences. The CEP agreement has been finalized and is near ratification by both governing bodies. Significant progress has been made with joint evaluations of lasting value for the constructed recharge projects and the location of an east-side reclamation facility and both of these projects are going into their final site determination phases. And perhaps most significantly, the greatest success has been the creation of a new culture of mutual respect and cooperation between Tucson Water and RWRD staff and management. This will be the most lasting result of the cooperative efforts scope of the City-County Water Study and will help ensure that other potential win-win opportunities will be jointly explored in the future.