

**CITY OF TUCSON / PIMA COUNTY
WATER AND WASTEWATER INFRASTRUCTURE, SUPPLY &
PLANNING STUDY**

DRAFT Phase II Staff Report

Table of Contents

I. Introduction

- Background
- Scope Guiding Principles
- Phase 2 Process

II. Shared Goals and Recommendations

- Comprehensive Integrated Planning
- Respect for the Environment
- Water Supply
- Demand Management

III. Appendices

Technical Reports (available on Study website www.tucsonpimawterstudy.com)

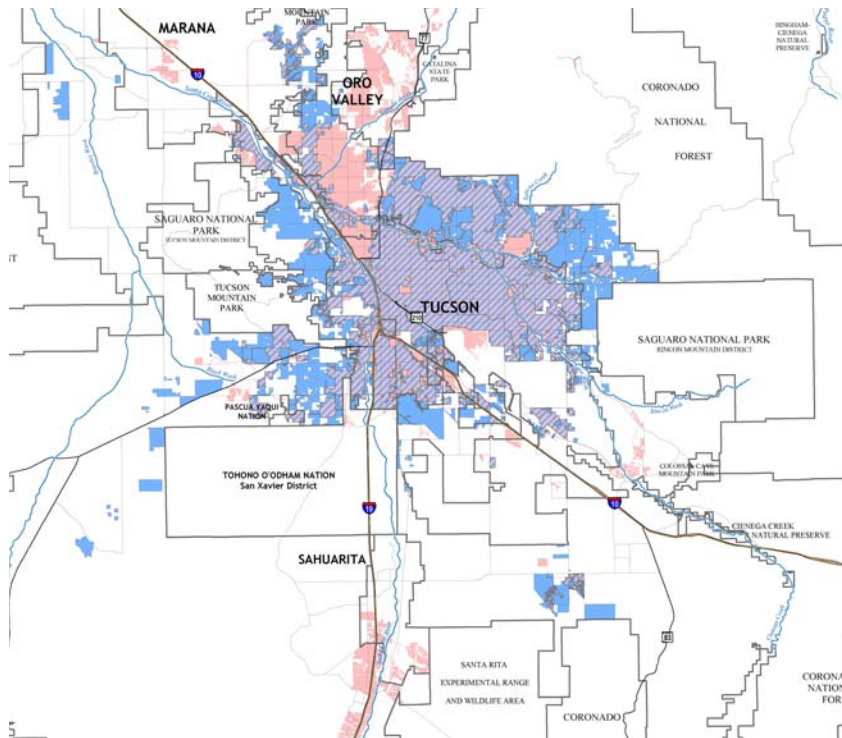
I. INTRODUCTION

Background

On April 1 2008, the Tucson Mayor and Council and Pima County Board of Supervisors adopted a joint Scope of Work for a “Water Infrastructure, Supply and Planning Study” (Joint Study). The Mayor and Council and the Board of Supervisors (Board) anticipate using this Joint 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 includes 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 map below). 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.

The Phase II staff report is a synthesis of 14 technical papers that were prepared by staff and outside experts and presented to the Oversight Committee during Phase II. This report includes joint City/County goals and recommendations. The Phase I and II reports together provide a foundation for the future regional process that is recommended in the scope.

Phase 2 Scope Guiding Principles

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

Phase 2 Report Writing and Committee Process

Report Writing Process

Interdisciplinary teams of City/County staff developed 10 of the 14 technical papers in Phase 2 in response to the scope's guiding principles listed above. The additional 4 papers were submitted by outside parties or utilized consultant assistance. The technical papers were reviewed internally and approved by City/County administration before being distributed and presented to the Oversight Committee. The Committee process for discussing these reports is described below.

The technical reports range in length from 20 to 50 pages and each includes a set of recommendations. There was considerable overlap and a number of cross cutting issues among all the reports. As such, following the completion of all the reports, the staff interdisciplinary technical teams worked together to synthesize the entire body of work including 1) Grouping of recommendations first by the major categories and then further clustering of similar recommendations within the major categories 2) Identifying a shared goal for each cluster of similar recommendations; 3) Editing the recommendations to reduce redundancy and increase clarity and specificity where appropriate; and 4) Identifying and prioritizing the key issues for Phase II. The outcome is 19 goals across four major categories (comprehensive, integrated planning, respect for the environment, water supply and demand management) and 52 recommendations for how to achieve these goals.

Following is the list of the original 14 Technical Reports by major category with the authoring entities noted. The technical papers are included in the appendices of this report which is available on the study website.

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 Restoration (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)

Citizen Oversight Committee Process

In Phase II, the Oversight Committee consisted of eleven members who are listed below. There were three members of the Committee who 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, Citizens Water Advisory Committee
Christopher Brooks, Citizens Water Advisory Committee*
John Carlson, Regional Wastewater Reclamation Advisory Committee
Marcelino C. Flores, 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*

Bonnie Poulos, Pima County Planning and Zoning Commission
Mark Stratton, Regional Wastewater Reclamation Advisory Committee
Vince Vasquez, Citizens Water Advisory Committee
Alternate: Bob Cook, Pima County Planning and Zoning Commission
** new member in Phase II*

The Oversight Committee met 11 times between April and December 2009 to conduct Phase II of the joint scope of work. This represents approximately 44 hours of meeting time, and does not include the staff time to prepare the technical papers nor the committee members' considerable time spent outside the meetings in reviewing the technical papers and background information prior to meetings and writing down their perspectives for inclusion in the Phase 2 Committee Report. The City and County are incredibly grateful for the Committee members' enormous commitment and dedication to this process. The staff/committee combined effort is unprecedented in our history.

II. SHARED GOALS AND RECOMMENDATIONS

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. Water, in and of itself, does not provide answers for how to manage growth in a sustainable manner. A wiser approach is to develop a rational plan for growth incorporating planning for water resources along with other public infrastructure and services to achieve sustainability from an environmental, financial, economic and social perspective.

In the past, Tucson Water and Pima County Regional Wastewater Reclamation Department 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, but have responded to demand for it. In addition, we have not connected land use planning efforts or water planning efforts with planning of other services and infrastructure such as transportation, stormwater, parks, etc. Instead each of these services has been planned in a “silo” which has contributed to unmanaged growth, environmental problems, infrastructure and service deficits, and has diminished public resources. The continuation of this disjointed and reactive planning model is not sustainable. Directing growth, both its form and location is critical to creating a sustainable water future. We must anticipate with a broader view where we are providing water with where and how we want growth to occur.

The Growth technical paper prepared as part of Phase II of the study 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 the 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, we do have 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 form and location of growth, it is important to also consider type of growth. Is it just rooftops and retirees or does it include high paying jobs and young professionals? A theme from Phase I was that our local economy is overly dependent on growth and 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.

This section of the report focuses specifically on Tucson City limits and unincorporated Eastern Pima County, and not 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 2 of the Study (see appendix for the papers):

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 technical papers were written to address the following guiding principles from the scope of work 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

Goals and Recommendations

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, but density is just 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. Increased density, along with good urban design and integrated land uses has a variety of benefits including:

- Reduced car passenger miles
- Fewer miles of road per capita
- Lower water consumption
- Lower energy consumption and greenhouse gas emissions
- Improved public health

- More walkable neighborhoods and urban spaces
- Public services at lower cost to taxpayers
- More transit opportunities
- More types of housing choices

It is important to note that density does not mean uniformity. In fact 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.

A critical element that must be considered is that 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 for infill and increased density to 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.

Recommendations

- 1.1 The City and County should require and incent new development and redevelopment projects to implement smart growth principles and concepts and contribute to a sustainable urban form including:
- 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 as well as incentives should be developed to implement these concepts including:

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

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

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 surrounding urban form.

GOAL #2: DIRECT GROWTH TO SUITABLE GROWTH AREAS

There are areas within the Tucson region that are more and less suitable for new development to occur. 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 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.

This being said, 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 through 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.

Related to this, 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 2 technical report on Growth looked at which areas of the community are most suitable for new development based on a variety of factors and constraints. Factors were used to define preferentially weighted variables such as proximity to existing infrastructure and employment centers, while constraints eliminated certain lands from consideration such as parks, federal lands, protected open spaces, hillsides, etc. This type of growth modeling was a helpful educational tool in Phase 2 and would be a beneficial exercise to undertake as a region.

Five suitable growth areas emerged from this analysis as 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 as well as price and availability of vacant land have shaped where growth has occurred. While these forces will continue to be major influences, this 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 identified as most suitable for development which include the following:

- Infill into the existing built environment (highest priority)
- Outside of the Conservation Lands System
- Within the Houghton corridor
- Within the Southlands area
- Within the Southwest area

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 in order to make use of existing infrastructure and minimize the consumption of raw land.

A variety of policy and legislative tools as well as incentives 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.

- 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 and could help inform the City General Plan update and County Comprehensive Plan update.

GOAL #3: INTEGRATE LAND USE PLANNING AND WATER RESOURCES PLANNING

Historically water resources 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. While 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 organization.

Clearly, the availability of water is a basic necessity for new development to occur, but there are often many options allowed by State law for new development to obtain water. Water service may be available from a municipal or private water provider, by drilling a well and pumping groundwater, or for small-scale developments, 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”).

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 infrastructure, as well as 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 (CAGRDR), 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 (“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 declines and the adverse impacts associated with continued groundwater declines. Recommendations 3.1 and 3.2 address how Tucson Water’s water service policy might be formalized by the Mayor and Council and 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 to Mayor and Council and the public 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, additional information regarding water resource impacts when considering individual development proposals. This 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 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 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 graywater. 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 of extending the obligated service area. These expansion decisions should be done on a sub-regional basis (vs. a parcel-by-parcel basis) in advance of specific water service requests. Any decision to expand the obligated 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 area within specific sub-regions.
 - Suitability of growth area
 - Affect of extensions on future water resource needs for the City’s existing obligated area

- Fiscal sustainability of development and potential for future annexation
 - Appropriateness of timing/phasing of development
 - Economic impact/benefits
 - Urban form sustainability
 - Environmental implications of development
 - Environmental implications of not providing water service
- 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 resources 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.

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 not being subsidized by existing ratepayers. Both utilities require developer contributions to expand their systems and have development fees in place to cover off-site improvements and centralized facilities. In addition, Tucson Water has an impact fee in place 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 have done a decent job in recent years of instituting impact fees 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 tax base as a community is 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. The City’s current budget shortfall and inability to keep up with basic services like streets, parks and public safety, are another example of the problem. Our current infrastructure deficits and budget challenges suggest we cannot afford to provide the needed services and investment for the community we’ve built, and 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 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 pre-existing 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.”

Respect for the Environment

Respecting the environment means that water is recognized as not only a key for continued economic expansion, but as the key for 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, and certain water reservations for the environment must 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.

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 on the rapidly shrinking riparian systems for survival within the County.

Ecosystems are not static or isolated systems. They are continually subjected to changes in natural trends such as drought or climate change-induced temperature increases. 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 habitat or ecosystem preservation 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; where renewable water is available as either stream flow, rainwater, or reclaimed water; and where hydro-geologic conditions are favorable. The City and County have a significant inventory of land that may be suitable for environmental restoration and enhancement.

The goals and recommendations in this section come from the following background technical papers that were prepared as part of Phase 2 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 scope of work 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?

Goals and Recommendations

GOAL #1: PRESERVE EXISTING RIPARIAN AREAS THROUGH COORDINATED REGULATION, POLICY, AND OUTREACH

Riparian ecosystems are unarguably 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; providing recreation 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 to 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). Without addressing water management issues, immediate protection of riparian areas through these mechanisms may not be sufficient to ensure their long-term protection.

Increased groundwater pumping near perennial streams and shallow groundwater areas pose a threat for existing riparian areas that may only be alleviated through efforts to reduce pumping, including 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.

Implementing this goal includes fostering increased public awareness of the benefits of healthy ecosystems and a willingness to support protection and maintenance of them.

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.

Recommendations

- 1.1 The City and County 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 The City and County should evaluate the effectiveness of programs and policies, within their respective jurisdictional areas and water service areas, regarding the protection of groundwater-dependent and hydro-riparian areas from groundwater withdrawal and surface water diversions.

This protection will be accomplished by evaluating the feasibility of prohibiting, where legally possible, new non-exempt wells (>35 gpm) and limit pumping of new exempt wells (<35 gpm) within and near shallow groundwater ecosystems and initiating a public awareness and conservation campaign targeting exempt well owners in sensitive shallow groundwater areas to educate them on the important connection between water and riparian areas.

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 resources – land, water, expertise, and money. 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 for there to be 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 or areas 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 may work with the many existing groups that have expertise, resources, and passion to offer to this effort. Not including all of these organizations makes the job of regional restoration more difficult and 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 should also be viewed as a local economic 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 seniors with time available to share and an interest in doing so are all populations that could benefit from an opportunity to be directly involved in 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 will 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) establishment.
- 2.2 The City and County will 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;
 - Continue to evaluate 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 will continue to work with ADEQ to develop water quality standards and designations specifically for habitat restoration.

GOAL #3: ENSURE THAT PUBLIC PROJECTS ARE MUTLI-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, they occur on municipally owned lands, and there is some capital or operating budget available, albeit usually a limited budget.

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 is significant environmental and social benefits to creating small pockets of desert-adapted habitat (i.e. 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 be developed in a coordinated manner that supports preservation and restoration or 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. For example by:

- 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; and
- 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 will identify areas within the existing built environment characterized by an abundance of impervious surfaces and identify opportunities for additional stormwater management. This would have 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 AND 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 relate to future population and economic needs for water, and vulnerabilities associated with climate change, 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.

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, and 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 our growing collection of pilot restoration projects to demonstrate 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.
- 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, 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. Ecosystem water needs 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; 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 and uses for this pool related to 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, and the CEP would be used like an “investment pool” to support a myriad of restoration opportunities instead of a few. As such, this 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 flexibility to be used where ever there would be a benefit, whether associated with HCP or not.

Successful outcomes of this goal would include (1) finalization of the Conservation Effluent Pool (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, 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.

Water Supply

Appropriately managing current water resources to ensure they are renewable, sustainable, reliable, and efficiently used as well as looking to additional water supplies in the future are key elements of a sustainable water 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 dependence on groundwater to 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 |
| Total | 217,441 |

The Phase I report estimated that approximately 1.1 million people can be served by Tucson Water with these supplies. This represents approximately 360,000 more customers than are currently being served by Tucson Water. These 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 2 Growth technical paper on Growth 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 area further, Tucson Water may or may not need new resources in the future for the purposes of serving new growth and development depending on build-out numbers.

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, graywater systems, and maximizing the use of effluent and reclaimed water.

The information in this section comes from the following background technical papers that were prepared as part of Phase 2 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 scope of work 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

Goals and Recommendations

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 River shed 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 currently considering the feasibility of acquiring, developing and distributing water to enhance the reliability and diversify 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, leading 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 make purchases or reserve allotments well in advance of actual need.

Recommendations

- 1.1 As the ADD Water stakeholders' 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 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 taken into account.

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. Locally renewable sources of water are effluent and rainwater. Effluent is typically put to use through the reclaimed system and through 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 they should be considered an important component of our community's water resource portfolio going forward.

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). It shouldn't be assumed that reclaimed water makes 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 a particular site and its needs. Graywater is another recycled water resource used in a similar manner to the reclaimed system, typically replacing potable water for outdoor watering but with the added benefit of being used on-site.

Rainfall is another important local source of water that when captured and harvested can be used to replace potable water. The sporadic nature of rainfall, however, requires that proposed uses be adaptable to seasonal rainfall patterns and annual variability. Rainwater harvesting (which can be done at the lot-scale or community-scale, which is considered stormwater) is an ancient technology that is becoming increasingly appealing, particularly in southwest urban areas. 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.

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 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 a particular site and its needs.
- 2.3 Tucson Water and Pima County Wastewater should continue to assess the potential water supply benefits as well as the adverse consequences of expanded gray water use within their respective service areas.
- 2.4 The City of Tucson and Pima County will continue encouraging rainwater harvesting on both residential and commercial 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 and the Arizona Department of Environmental Quality to ensure appropriate standards are in place to protect public health and the environment. In some cases however, the way these regulations are set up stand in the way of our ability to achieve Goal #2 above, to maximize our use of locally renewable water supplies. The regulatory changes recommended below would not compromise public health or water quality standards but would assist in our ability to attract reclaimed customers, would 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 to groundwater turf users proximate to reclaimed lines to convert to reclaimed water in lieu of pumping.
- 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

The Tucson Water reclaimed system that has been constructed over the past 25 years is extensive in nature and most of the customers for whom there is an economic incentive to convert to reclaimed water have 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.

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 reclaimed expansion considerations.

That being said, there is capacity for expanding the reclaimed system, and staff recommends establishing expansion targets, prioritizing customer, and creating 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, industrial) who can pay the full costs of reclaimed water should pay; explore

options to encourage potential customers who currently have no financial incentive to join the system to join, 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 Incorporate the consideration and evaluation of the use of reclaimed water 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 global warming, climate change, and drought potentially affecting local water demand, local rainfall, and future flows of the Colorado River. Recent drought events regionally, 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 as prepared as a community for drought in the variety of ways it may get triggered and manifest itself. There is less need for certainty in forecasts than there is for a regularly monitored credible range of possibilities that the utilities and the community can prepare for.

A multi-pronged preparedness strategy can make the community more resilient to a variety of possible future scenarios and 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 and 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 shortage related to drought. 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 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, and other types of uncertainties, such as new technology, changing regulations, or altered patterns of development in the Tucson area.

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 graywater), and mandates (ordinances and standards) that reduce the demand for water on the customer side of the meter, as opposed to water savings through system efficiencies, e.g., leak detection and repair.

All the easy things have been done. What is next?

“In this region we have done all the cheap and easy things to save water and extend their supplies so everything done from here on out must be justifiable fiscally, environmentally, and socially (triple bottom line) and must be weighed against any and all other engineered or acquisition solutions to water supply issues.”

--Val Little, Water Casa Technical Paper on Water Conservation

Tucson Water is a national leader in water conservation programming 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, and 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 global warming, 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 on a social, economic and quality of life basis. 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. As such, scenario planning should be conducted in an open public forum with regional stakeholder and climate change experts' participation.

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 scope of work for this Study, including:

- 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

Goals and Recommendations

GOAL #1: INCREASE THE EFFECTIVENESS OF CONSERVATION PROGRAMMING THROUGH COORDINATED PLANNING AND EVALUATION

The desired outcomes of this goal are that more rigorous evaluation and monitoring fosters increased adaptability to changing and unpredictable drought and climatic conditions, 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 respond to changing conditions that impact the Colorado River, not only local conditions. Nonetheless, we are in a time of great

uncertainty with global warming, climate change, and drought potentially affecting local water demand, local rainfall, and future flows of the Colorado River. Current scientific understanding is 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 manifest itself.

Monitoring of water use trends can increase our ability to target both inefficient uses as well as areas that have the highest use. Baseline studies to characterize water use in different customer classes should be conducted to assist in evaluating the effectiveness of future programming. Future 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.

Recommendations

- 1.1 The City and County 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 are communicated through the 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 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 are 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 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 and acknowledgement of the Sonoran Desert environment. Yet there are many different drivers and goals for water conservation resulting 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 will also be more readily identified when reviewed in the context of a tangible goal.

A critical first step in Phase III 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 Goal #1.

Examples of hypothetical community-wide water use efficiency goals to consider include:

- Ratio of potable to non-potable use in municipal water consumption decreases a certain percent
- Achieve a 40 percent increase in use of non-potable water supplies for outdoor purposes community-wide by 2020
- Achieve a 20 percent increase in irrigation efficiencies of existing turf facilities and commercial landscapes community-wide by 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 education and information programs region-wide 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 to absorb rainfall. For example, landscape restrictions developed in the name of water conservation may lead to such sparse

landscapes that 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, measurable water efficiency* and water conservation goals community-wide. 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, 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 efficiency in from the beginning in new development.

Both the City and County have an array of ordinances that, directly and indirectly, affect new developments’ ability 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 effectuate 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 which gives it greater flexibility to enact regulations than the County which is not a Charter government and as such 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 regulations.

In Pima County, new planned construction typically occurs in suburban areas and in the context of larger subdivisions and master planned communities. This affords greater opportunities to impact urban form, such as through the design of large scale stormwater harvesting features,

than in the urban core. Increasingly, Pima County is implementing performance based and incentive based approaches to achieving water efficiency outcomes in new planned development.

A case in point is water harvesting and graywater. The City of Tucson's recent adoption of the Water Harvesting Ordinance that affects new commercial development and the Graywater Ordinance that affects new residential development are precedent setting, prescriptive tools that strengthen 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 graywater and water harvesting practices. This approach does not establish a predetermined quantifiable or measurable amount of water conservation 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 at the time land is rezoned assessing water supplies, impacts and mitigation measures. The developers are to 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 are to 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 and provide the flexibility to employ new innovative methods that are 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 and going forward 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.

Although Pima County supports use of graywater in appropriate areas, there is a concern about it's 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 graywater systems. The need to flush the lines with water would offset the potential water reduction gains from use of graywater in those neighborhoods. As such Pima County supports further analysis and coordination of design standards for graywater to address this issue.

In the long run, the adoption of common goals community-wide will assist all regional jurisdictions in evaluating their development and building standards and developing or updating 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 on-going innovation of new and better techniques, including but not limited to strategies to maximize reuse of graywater, rainwater and reclaimed water for multiple benefits.

Recommendations

- 3.1 A joint City/County staff team, working with stakeholders, reviews their existing water conservation regulations for consistency with water efficiency goals. Where appropriate, the team recommends new requirements with a priority focus on landscape requirements that maximize non-potable water sources and water harvesting techniques. The team also evaluates 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. Incentives to residents, Home Owners Associations and builders should be considered (*this is further described under Goal 4, Recommendation 4.1*)
 - Updating standards for high efficiency toilets.
 - Incorporating the concepts of structured plumbing including trunk, branch twig piping systems, and pipe insulation into the plumbing code.
 - Developing common green building standards
 - Continuing to coordinate the review and update 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 will be enabled to 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 question of why we are conserving and what are the uses of save water will 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 scope of work, 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*, which also was a major theme during the Tucson Water Conservation Task Force process.

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 trade offs 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 with the emphasis being on ensuring that use of the water is efficient and minimizes waste.

Water rates can play an important role in reinforcing the concepts of efficiency, and 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 confusing to the public.

Incentive mechanisms 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 ways to overcome the public perceptions that conserving water will ultimately hurt their quality of life and increase their water bills.

Recommendations

- 4.1 The City and County, working in cooperation with regional stakeholders, 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 public opinion survey questions to explore public perceptions of quality of life trade offs associated with water efficiency measures 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.

Key Educational Topics

- Raise awareness of progress in achieving goals
- Link between water consumption and energy
- Drought response measures
- Reasons for conserving and uses of saved water
- Coordinated media messages & education for all sectors of the community including youth
- Local training and certification requirements for all facets of the landscape industry, plumbing industry, water auditors, property managers, etc.
- Rainwater harvesting
- Greywater use

- Common vocabulary for communicating about water, stormwater, wastewater, environment, etc.
- Joint pilot projects featuring best practices and new technologies

GOAL #5: INCREASE 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, graywater reuse and/or reclaimed water. Additionally, 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 evaluating only 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 graywater, for outdoor needs, further analysis of potential unintended consequences of such a goal is recommended. Some issues to consider include examination of tradeoffs in terms of balancing the allocation of water to meet social equity and environmental goals. For example, could this impact 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 and a one size fits all policy may not accommodate our ability to optimize resources in meeting the broad range of human, environmental and economic supply needs and goals.

Recommendations

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

Supporting vegetation using harvested stormwater 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; and
- 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, continues to conduct research and analysis on estimated volumes of harvested rainwater available at the lot scale and costs and benefits of water harvesting as a source of additional water supply and as a stormwater management tool.