

**Arizona
Department of
Environmental
Quality**



**Arizona
Department
of Water
Resources**



**Arizona
Corporation
Commission**



DRAFT

FINAL REPORT

of the

BLUE RIBBON PANEL

ON

WATER SUSTAINABILITY

DRAFT

November 17, 2010

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TRANSMITTAL LETTER

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John Gall, Development Consultant	Arizona Land Quest, LLC
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Steve Olson, Executive Director	Arizona Municipal Water Users Association
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Kathy Chavez, Chair – Public Perception/Acceptance	Karen Dotson, Co-Chair - Public Perception/Acceptance
Ron Doba, Chair – Regulations/Permitting	Tom Buschatzke, Co-Chair - Regulations/Permitting
Steve Olson, Chair – Conservation/Recycling/Efficiency/Energy-Water Nexus	Bob Lotts - Conservation/Recycling/Efficiency/Energy-Water Nexus
David Snider, Chair – Economic/Funding	Bonnie O'Connor, Co-Chair - Economic/Funding

All the Dedicated Individuals who participated in the numerous Working Group Meetings (See Appendix I)

BRP Meeting Presenters

May 7th Meeting

- Melaney Seacat, Senior Program Manager, Pima County Regional Wastewater Reclamation Department
- Nicole Ewing-Gavin, Assistant to City Manager, City of Tucson
- Trevor Hill, President and CEO, Global Water

March 5th Meeting

- Michele Robertson, Groundwater Section Manager, ADEQ
- Charles G. Graf, Senior Hydrologist, Water Quality Division, ADEQ
- Robert A. Lotts, Water Resources Manager, Arizona Public Service Co.
- Karen Collins, Water Sustainability Analyst, Salt River Project
- Sandy Fabritz-Whitney, Assistant Director, Water Management Division, ADWR

February 5th Meeting

- Guy Carpenter, WaterReuse Association
- Dr. Channah Rock, Assistant Professor, Water Quality Specialist, University of Arizona

January 8th Meeting

- Linda Stitzer, Regional Planner, ADWR

ACRONYMS

AAWS	<i>Assured & Adequate Water Supply Program</i>
ACC	<i>Arizona Corporation Commission</i>
ADEQ	<i>Arizona Department of Environmental Quality</i>
ADES	<i>Arizona Department of Economic Services</i>
ADHS	<i>Arizona Department of Health Services</i>
ADOT	<i>Arizona Department of Transportation</i>
ADWR	<i>Arizona Department of Water Management</i>
AMA	<i>Active Management Area</i>
APP	<i>Aquifer Protection Permit</i>
AZPDES	<i>Arizona Pollutant Discharge Elimination System</i>
BADCT	<i>Best Available Demonstrated Control Technology</i>
BMP	<i>Best Management Practice</i>
CAGRD	<i>Central Arizona Groundwater Replenishment District</i>
CAP	<i>Central Arizona Project</i>
CC&N	<i>Certificate of Convenience & Necessity</i>
CGP	<i>Construction General Permit</i>
DAWS	<i>Designation of Assured Water Supply</i>
DSM	<i>Demand Side Management</i>
EPA	<i>Environmental Protection Agency</i>
FERC	<i>Federal Energy Regulatory Commission</i>
GAC	<i>Granular Activated Carbon</i>
GIU	<i>General Industrial Use</i>
GMA	<i>Groundwater Management Act</i>
GPCD	<i>Gallons per Capita per Day</i>
GSF	<i>Groundwater Savings Facility</i>
IGFR	<i>Irrigation Grandfathered Right</i>
IMS	<i>Irrigation Management Service</i>
IPR	<i>Indirect Potable Reuse</i>
IT	<i>Information Technology</i>
KERP	<i>Kino Environmental Restoration Project</i>
MNPCCP	<i>Modified Non-Per Capita Conservation Program</i>
MSGP	<i>Multi-Sector General Permit</i>
NPDES	<i>National Pollutant Discharge Elimination System</i>
NTU	<i>Nephelometric Turbidity Unit</i>
PCP	<i>Personal Care Products</i>
PPCP	<i>Pharmaceuticals and Personal Care Products</i>
PWS	<i>Public Water System</i>
RO	<i>Reverse Osmosis</i>
SIC	<i>Standard Industrial Classification</i>
USF	<i>Underground Storage Facility</i>
WCMP	<i>Water Conservation Management Program</i>
WET	<i>Whole Effluent Toxicity</i>

EXECUTIVE SUMMARY

It is a common understanding that water is crucial to our existence and all living things. Without abundant fresh water supplies life as we know it would not be possible. This is especially true in the arid southwest. However, through extensive commitments to developing, conserving, and protecting fresh water supplies for more than a century, Arizona has flourished in an otherwise inhospitable environment. Early Arizonans made significant contributions to developing water supplies for agricultural, industrial and domestic purposes and set the stage for Arizona to be a recognized leader in sustainable water supply planning and development. Because water is fundamental to economic development and ecosystem health, Arizona leaders continue their commitment to the sustainability of our water supplies to ensure future economic prosperity and enhanced quality of life for current and future generations of Arizonans.

In consideration of Arizona's water supply portfolio and the demands that development increasingly puts on these resources, finding new untapped water supplies is becoming a challenge; however, water planners recognize opportunities for the increased use of all types of recycled water (reclaimed water, gray water, storm water, etc.) to help meet these challenges. Recycling some of these sources of water has been practiced by some Arizona communities and industries (including agriculture) for decades. However, a perception that these sources are "wastes" inhibits the ability to take full advantage of resources right in our own backyard.

On August 28, 2009, Governor Brewer, continuing Arizona's long leadership tradition in water resource planning, announced the formation of the Blue Ribbon Panel on Water Sustainability (Panel). Governor Brewer's announcement highlighted water conservation and recycling as a priority to improve water sustainability and increase its visibility in Arizona. Recognizing that collaboration is essential in planning Arizona's water future, Governor Brewer announced joint chairmanship of the Panel by Arizona Department of Water Resources (ADWR) Director Herb Guenther, Arizona Department of Environmental Quality (ADEQ) Director Ben Grumbles, and Arizona Corporation Commission (ACC) Chairman Kris Mayes (collectively the Executive).

Forty members representing diverse water interests in Arizona - large and small cities, counties, agriculture, industry, Indian Tribes, environmental interests, Arizona universities, legislative leaders, and other experts in Arizona water issues - were appointed to the Panel. A list of Panel members is provided in the *Blue Ribbon Panel Members* section preceding this Executive Summary.

The Panel held its first meeting on January 8, 2010 and was challenged to identify and overcome obstacles to increased water sustainability. The Panel was instructed to provide advice to ADWR, ADEQ and the ACC on the technical, legal, and policy means of promoting water conservation and recycling of wastewater, gray water, storm water, and other waters. Soon after, the Panel set out its purpose as:

To advance water sustainability statewide by increasing reuse, recycling, and conservation to protect Arizona's water supplies and natural environment while supporting continued economic development and to do so in an effective, efficient and equitable manner.

In meeting this purpose, Panel members agreed to the goal of providing recommendations on statute, rule, and policy changes that, by the year 2020 in Arizona, would significantly:

1. Increase the volume of reclaimed water reused for beneficial purposes in place of raw or potable water,

2. Advance water conservation, increase the efficiency of water use by existing users, and increase the use of recycled water for beneficial purposes in place of raw or potable water,
3. Reduce the amount of energy needed to produce, deliver, treat, and reclaim and recycle water by the municipal, industrial, and agricultural sectors,
4. Reduce the amount of water required to produce and provide energy by Arizona power generators, and
5. Increase public awareness and acceptance of reclaimed and recycled water uses and the need to work toward water sustainability.

The Blue Ribbon Panel established five Working Groups, each chaired by a Panel member and open to the public to facilitate discussion of issues and involve the broadest spectrum of stakeholders and technical experts. The five Working Groups and their respective chairs and purposes are as follows:

- **Public Perception/Acceptance**

Chair: Kathleen Chavez, Water Policy Manager, Pima County Regional Wastewater Reclamation

Purpose: Make recommendations for enhancing public acceptance of the use of reclaimed and recycled waters through public education, outreach, and other strategies.

- **Regulations / Permitting**

Chair: Ron Doba, President, Arizona WateReuse Association

Purpose: Identify regulatory impediments and make recommendations to streamline the reuse of reclaimed water.

- **Infrastructure/Retrofit**

Chair: Guy Carpenter, Board of Directors, National WateReuse Association

Purpose: Recommend measures that will facilitate the design, construction, operation and maintenance of new and retrofitted reclaimed and recycled water systems.

- **Conservation/Recycling/Efficiency/Energy Nexus**

Chair: Steve Olson, Executive Director, Arizona Municipal Water Users Association

Purpose: Make recommendations regarding statutes, rules, policies, and strategies for increasing water conservation in the agricultural, industrial, and municipal sectors; increasing the recycling of water that is not considered reclaimed water; and reducing the water cost of energy and the energy cost of water.

- **Economic/Funding**

Chair: David Snider, Supervisor, Pinal County

Purpose: Make recommendations on incentives, approaches to funding, and other mechanisms that will accelerate the reuse of reclaimed and recycled waters.

The chairs and Working Group participants accomplished a stunning amount of work in the few months that followed formation of the Working Groups. Cumulatively, 58 Working Group meetings were held, involving some 320 individuals. The Working Groups identified an abundance of issues, which were summarized in the Interim Report of the Blue Ribbon Panel, dated July 1, 2010. These coalesced into 40 separate issues (Appendix II), which were presented at the Blue Ribbon Panel meeting of August 16, 2010. The Panel further condensed these 40 into 26 priority issues (Appendix III) and directed the applicable Working Groups to write “white papers” analyzing the issues and provide recommendations based on the analyses. The 26 priority issues addressed public perception, public education, research needs, regulatory impediments, efficient use of water supplies, expanded use of rainwater and stormwater, the interface between water and energy, funding and incentives, and more.

A summary of each white paper was prepared. At its meeting of November 5, 2010, the Panel reviewed the white papers and summaries and consolidated them into 18 sets of recommendations in five categories, as follows:

- Education/Outreach
- Standards
- Information Development and Research Agenda
- Regulatory Improvements
- Incentives.

The 18 sets of recommendations actually encompass a total of 63 separate sub-recommendations. As this number of recommendations is too great to provide an abbreviated digest in this Executive Summary, the reader is referred to Chapter 4 for a full description of the recommendations and Appendix V for a summary table.

Chapters 2 and 3 of this Final Report aid in understanding the context of the Panel’s recommendations. Chapter 2 provides descriptions of the legal frameworks in Arizona for regulating reclaimed water, gray water, rainwater harvesting and stormwater, conservation measures, and energy/water nexus relationships. Applicable regulatory programs for ADEQ, ADWR, and ACC are also described.

Chapter 3 addresses the current status and potential opportunities to advance water sustainability in these same areas of interest. Discussions are included regarding the use of reclaimed and gray water, the extent of rainwater harvesting and stormwater utilization, the considerable impact of conservation measures already implemented, and the emerging area of energy/water nexus opportunities.

All of the recommendations of the Panel now move forward for consideration by Governor Brewer, the Legislature, ADEQ, ADWR, and the ACC. A large percentage of the recommendations involve implementation by ADEQ and ADWR, which will challenge the two agencies in light of budget cuts that have reduced staff levels.

Importantly, the Panel recommends no new regulatory programs or major reconstruction of existing programs. Instead, the Panel’s recommendations include improvements to Arizona’s existing toolbox of water management, education, and research capabilities. In the Panel’s opinion, the current programs administered by ADWR, ADEQ, and the ACC constitute an exceptional framework within which water sustainability can be pursued, and improvements to that framework will move Arizona further toward a secure water supply future.

Although implementation will take time because of the large number of recommendations provided by the Panel, a path forward now exists. As the agencies begin work with stakeholders to implement the Panel recommendations, resulting advancements in water conservation and increased use of recycled water will benefit all the citizens of Arizona and stand as a tribute to the dedication and intellect of the participants who contributed long hours to the Panel process.

The Final Report of the Governor’s Blue Ribbon Panel on Water Sustainability, in its entirety, can be accessed at <http://www.azwater.gov/AzDWR/waterManagement/BlueRibbonPanel.htm>.

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BLUE RIBBON PANEL ON WATER SUSTAINABILITY

CHAPTER 1 - Introduction

It is a common understanding that water is crucial to our existence and all living things. Without abundant fresh water supplies life as we know it would not be possible. This is especially true in the arid southwest. However, through extensive commitments to developing, conserving, and protecting fresh water supplies, Arizona has flourished in an otherwise inhospitable environment. Early Arizonans made significant contributions to developing water supplies for agricultural, industrial and domestic purposes and set the stage for Arizona to be a recognized leader in sustainable water supply planning and development. As Arizona continues to enhance its economic development, Arizona leaders continue their commitment to the sustainability of our water supplies to ensure future economic prosperity and enhanced quality of life for current and future generations of Arizonans.

Three State Agencies in Arizona have regulatory and planning authority over water supplies. The Arizona Department of Water Resources (ADWR) is the primary agency responsible for water planning and water rights administration. The Arizona Department of Water Quality's (ADEQ) role is to protect and enhance public health and the environment by ensuring safe drinking water and reducing the impact of pollutants discharged to surface and groundwater. The Arizona Corporation Commission (ACC) has jurisdiction over the quality of service and rates of public service corporations offering water and wastewater utility service .

Since 1980, with passage of the Groundwater Management Act (GMA) and establishment of ADWR, Arizona has aggressively managed water supplies in the Active Management Areas (AMA) – requiring utilization of renewable water supplies in lieu of diminishing groundwater supplies for new growth; prohibiting new agricultural lands developed on groundwater supplies; requiring increased efficiency in the use of all water supplies by the largest water-using sectors (municipal, agricultural and industrial); and encouraging the use of recycled water to meet the increasing water demands for Arizona's communities. The AMA communities have made significant investments to develop renewable supplies such as the Central Arizona Project (CAP), other surface water supplies and reclaimed water as well as developing conservation programs aimed at stretching these supplies into the future. Outside of the AMAs including areas along the Colorado River, individual water users and communities have also taken significant steps to improve their water sustainability. However some areas of the state still have limited access to renewable water supplies and reliance predominantly on groundwater continues.

Even with the recent economic downturn, Arizona is still one of the fastest growing states. While the slowdown in the housing boom reflects that fewer people will move to the area in the next few years, Arizona's population is still expected to grow, and with a 26.7 percent increase in population from 2000 to 2008, Arizona ranks second highest in the country¹. In 1980 Arizona's population was 2,716,546 (ADES, 2008). Between 1980 and 2000, Arizona grew at a rate of just over four percent per year to a population of 5,130,632 (ADES, 2008). Between 2000 and 2008 Arizona continued its high growth rate to a population of just over 6.5 million people. Population growth is expected to continue in Arizona with projections in 2025 and 2055 of 9,588,745 and 13,340,646 people, respectively. While total water use in the State has increased, the percentage increase in total water use has not increased at the same rate as population. Between 1980 and 2009 population increased more than 140 percent yet the estimated statewide water use in 2006 is approximately the same as it was during the period from 1975 and 1980, about 7.5 million acre-feet (ADWR, 1994; ADWR, 2009). This reflects the continued focus on conservation of Arizona's most important resource and a conversion from agricultural to urban demands, primarily in the AMAs. However, if the growth that is expected for Arizona is realized, water managers

¹ Forbes.com @ http://www.forbes.com/2008/12/22/fastest-growing-states-forbeslife-cx_ls_1222realestate.html

must find additional resources to supply these increasing demands while protecting the natural resources and environment of this State that are of equal importance to the quality of life in Arizona.

As we look at Arizona’s water supply portfolio (*Overview of Arizona Water Atlas & Water Use Data*, January 8, 2010 BRP meeting) and the demands that Arizona’s growing population increasingly puts on these resources, finding new untapped water supplies is a challenge; however, water planners recognize opportunities for the increased and efficient use of all types of recycled water (reclaimed water, gray water, rain water, storm water, etc.) to help meet these challenges. Water recycling has long been practiced in some Arizona communities and by Arizona industries (including agriculture); however, a perception that this water is “waste” inhibits the ability to take full advantage of a resource that is right here in our own backyard. Current water supply utilization in Arizona is illustrated in Figure 1, below.

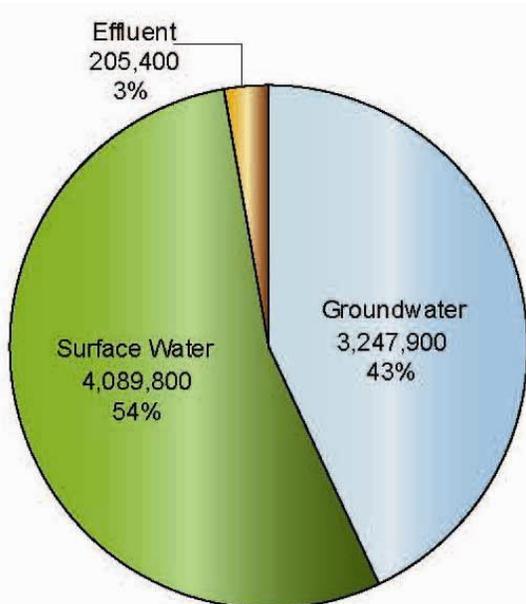


Figure 1 - Arizona Average Water Use by Source 2001 – 2005
(ADWR – *Water Atlas Volume I*, 2010)

As illustrated, the direct and indirect² use of reclaimed water (includes only water that has not been discharged or artificially recharged but is put to a reported beneficial use) represents approximately three percent of the total water use Arizona, approximately 205,000 acre-feet³. This has increased from 1990 when reclaimed water use accounted for less than two percent of the total water supply portfolio. While a significant portion of the reclaimed water is discharged in an unmanaged way into the beds of rivers and streams, benefiting the environment by providing habitat for wildlife and adding aesthetic and economic value to Arizona’s landscape, there may be additional opportunities to more fully utilize these supplies to replace existing uses of limited water supplies. Additionally, an Arizona Supreme Court Decision in 1989, *Arizona Pub. Serv. Co. v. Long*, 160 Ariz. 429, 773 P.2d 988 (1989), confirmed that treated effluent (reclaimed water) is owned by the entity that produces it. The Court ruled that until reclaimed water is returned to the ground as surface water or groundwater, reclaimed water is neither surface water nor groundwater, and therefore a city that produces reclaimed water is free to use it without regard to the laws governing surface water and groundwater. This ruling creates a strong incentive for reuse by allowing those who generate reclaimed water to maintain the right to reuse or sell that water.

² Indirect use refers to the recovery of reclaimed water storage credits

³ There are other significant uses of reclaimed water occurring in Arizona that is either not reported or permitted.

Currently, Arizona, along with California, Florida and Texas, lead the nation in utilization of reclaimed water⁴. Increased utilization of reclaimed water is challenging, however. For example, although ADEQ administers a comprehensive regulatory program governing the safe use of reclaimed water, public perception of water quality limitations still remains the largest obstacle that water managers face. Developing a strong recycled water program must address concerns of public health and safety, significant infrastructure and capital costs, and must confront the “ick” factor associated with reusing water long thought of and referred to as “waste” by both water managers and the public. In order to provide a long-term sustainable water supply for the citizens of this State, water managers must address these long-held perceptions and remove regulatory barriers to ensure Arizona’s continued economic and environmental viability into the future.

Purpose and Goal of Blue Ribbon Panel on Water Sustainability

In recognition of Governor Jan Brewer’s and the Arizona Corporation Commission’s commitment to collaboration on water resource issues, ADWR Director Herb Guenther, ACC Chairman Kris Mayes, and ADEQ Director Ben Grumbles (collectively the Executive) initiated a statewide effort in January of 2010 aimed at improving the long term sustainability of Arizona’s water supplies to meet the challenge of increasing demands through enhanced conservation and recycling.

The Blue Ribbon Panel on Water Sustainability (Panel) was formed to identify and overcome obstacles to increased water sustainability. The Panel has been challenged to provide advice to ADWR, ADEQ and the ACC on the technical, legal, and policy aspects of promoting recycling of wastewater, gray water, industrial process water, and storm water. While there are many opportunities to increase water conservation and recycling, an early priority of the Panel has been a focus on reuse of reclaimed water through detailed examinations of water quality, regulatory impediments, infrastructure requirements and public perception challenges that limit the increased efficient use of this important water supply.

The Panel was established to facilitate discussions between Arizona stakeholders to identify regulatory impediments and draft new strategies to advance water conservation and increase the use of recycled waters. In December of 2009, the Executive identified and invited experts to participate in this effort based on their knowledge and leadership in Arizona water issues. The Panel membership is composed of 40 members representing large and small cities, counties, agriculture, industry, Indian Tribes, environmental interests, Arizona universities, legislative leaders, and other leaders in Arizona water issues.

At its inception, the Panel met to build a common understanding of the issues facing Arizona and the challenges of developing recycled water strategies and increasing water conservation efforts across the State. The Panel worked collaboratively to identify a clear Purpose Statement in order to convey a common understanding to all Panel members and the public on the scope of this effort:

The Purpose of the Blue Ribbon Panel on Water Sustainability is to advance water sustainability statewide by increasing reuse, recycling, and conservation to protect Arizona's water supplies and natural environment while supporting continued economic development and to do so in an effective, efficient and equitable manner.

To achieve this Purpose, the Panel also identified a goal specifically aimed at guiding the work of the Panel towards increased sustainability of Arizona’s water supplies. The Goal of the Panel is to provide

⁴ Water and Wastes Digest @ <http://www.wwdmag.com/EPA-Releases-Updated-Version-of-Guidelines-for-Water-Reuse-article6636>

recommendations to the Executive on statute, rule, and policy changes that, by the year 2020 in Arizona, will significantly:

1. Increase the volume of reclaimed water reused for beneficial purposes in place of raw or potable water.
2. Advance water conservation, increase the efficiency of water use by existing users, and increase the use of recycled water for beneficial purposes in place of raw or potable water.
3. Reduce the amount of energy needed to produce, deliver, treat, and reclaim and recycle water by the municipal, industrial, and agricultural sectors.
4. Reduce the amount of water required to produce and provide energy by Arizona power generators.
5. Increase public awareness and acceptance of reclaimed and recycled water uses and the need to work toward water sustainability.

Working Groups

While the panel continued to develop a common understanding of the issues, five Working Groups were created to facilitate discussion of issues and development of recommendations in advancement of the goals of the Panel amongst a broader spectrum of stakeholders and technical experts (See Appendix I for a listing of Working Group membership). The Working Groups have collectively held 58 meetings since February of 2010 and worked to first identify specific issues for the Panel to prioritize for further research and recommendation development. The five Working Groups and their purpose are identified below.

1. Public Perception/Acceptance – make recommendations for enhancing public acceptance of the use of reclaimed and recycled waters through public education, outreach, and other strategies.
2. Regulations / Permitting – identify regulatory impediments and make recommendations to streamline the reuse of reclaimed water.
3. Infrastructure/Retrofit – recommend measures that will facilitate the design, construction, operation and maintenance of new and retrofitted reclaimed and recycled water systems
4. Conservation/Recycling/Efficiency/Energy Nexus – make recommendations regarding statutes, rules, policies, and strategies for increasing water conservation in the agricultural, industrial, and municipal sectors; increasing the recycling of water that is not considered reclaimed water; and reducing the water cost of energy and the energy cost of water.
5. Economic/Funding – make recommendations on incentives, approaches to funding, and other mechanisms that will accelerate the reuse of reclaimed and recycled waters.

The Working Groups developed Issue Papers identifying approximately 40 issues (See Appendix II), compiled in the Interim Report dated June 30, 2010. Upon consideration of the initial 40 issues, the Panel directed the Working Groups to further research and provide recommendations on 26 issues, including (but not limited to) issues related to public perception, regulatory impediments, efficient use of water supplies, exploring opportunities for effectively utilizing storm water and evaluating the water/energy nexus. These 26 issues are identified in Appendix III.

The Working Groups developed White Paper Recommendations of each of the 26 issues for the Panel to discuss. Summaries of the White Papers also were prepared for each of the 26 issues. After review of the White Papers and Summaries, the Panel decided which Recommendations to move forward for consideration by the Governor, the Legislature, the ACC and the Executive. The White Papers are included as Appendix V in this Report.

CHAPTER 2 – Legal and Regulatory Framework for Water Sustainability

Reclaimed water

Recycling of treated sewage effluent, out of necessity, long preceded any administrative framework in Arizona. In 1926, an activated sludge sewage treatment plant was built at Grand Canyon Village expressly to provide reclaimed water for nonpotable needs. The sole water supply for the community since 1901 had arrived in tank cars on the Atchison, Topeka & Santa Fe Railroad--at a cost of \$3.09 per 1000 gallons (Fleming, 1980). Upon completion of the treatment plant, reclaimed water was used for toilet flushing at El Tovar Hotel, boiler feed, cooling water for the power plant at Grand Canyon Village, and makeup water for the steam locomotives. With a design capacity of 130,000 gallons per day, the plant greatly reduced the demand for potable water. The facility has the distinction of being the first operational water reclamation plant in the United States (Metcalf & Eddy, 2007).

Arizona's first rules regarding reuse of reclaimed water were promulgated much later, in 1972, by the Arizona Department of Health Services (ADHS). These rules established effluent quality requirements for various irrigation uses and industrial reuse and monitoring requirements for the wastewater. Guidance published in that period by ADHS (1978) stated:

Reuse of treated sewage effluents is encouraged. However, the potential public hazard caused by reusing effluents must be weighed carefully in the study of reuse methods. Additional treatment of the effluent may be required prior to reuse.

At that time, the published bacterial limits were lax compared to today's standards, reflecting the state of the industry then for sewage treatment plants (i.e., secondary treatment).

After the Environmental Quality Act of 1986 created ADEQ, administrative responsibility for the reuse rules (which had been revised in 1985) was transferred to ADEQ. During this timeframe, the practice of reusing wastewater continued to grow. In its 1997 report to the Legislature and Governor, ADEQ identified effluent from about 175 wastewater treatment plants in Arizona that was being reused. Under those rules, ADEQ issued reuse permits with a duration of five years to end users of reclaimed water. ADEQ reported that 43 such permits were issued in FY 1997, the greatest number ever issued in a single year (ADEQ, 1997) up to that time.

In the summer of 1997, ADEQ initiated a major stakeholder process to rewrite its water quality permitting rules, including its reuse rules. This effort culminated in the promulgation of transformative rules for the Aquifer Protection Permit (APP) and reclaimed water programs. These rules became effective in January, 2001. In connection with this stakeholder and rulemaking effort, the Legislature explicitly clarified ADEQ's authority over reclaimed water, stating that the ADEQ director shall:

Adopt, by rule, technical standards for conveyances of reclaimed water and a permit program for the direct reuse of reclaimed water. [A.R.S. 49-203(A)(6), effective January 1, 2001]

The reclaimed water rules adopted in 2001 are the ones in effect today. This rule framework provides a comprehensive approach to regulating the reuse of reclaimed water in Arizona, including permitting requirements, reclaimed water quality standards, allowable end uses, and technical standards for conveyances of reclaimed water. The 2001 rules were written to ensure the safe use of reclaimed water while removing impediments from the previous rules to facilitate more widespread reuse. However, there may be opportunities to modify the 2001 rules in recognition of almost 10 years of experience with the program and 10 years of advances in the science and technology of reclaimed water reuse. Looking for

these opportunities is the primary objective of the Regulations & Permitting and Infrastructure/Retrofit Working Groups established by the Blue Ribbon Panel.

The 2001 reclaimed water rules consist of three sets of rules, each addressing a critical component of Arizona's reclaimed water program. A fourth component, central to modernizing Arizona's approach to sewage treatment and incentivizing further use of reclaimed water, is the BADCT (Best Available Demonstrated Control Technology) part of the APP rule applicable to sewage treatment plants. The BADCT provisions were developed in concert with the three reclaimed water rule packages to provide a unified approach to regulating the treatment and reuse of domestic wastewater. A thoroughly revised APP rule, which included the sewage treatment plant BADCT provisions, was also adopted by ADEQ in January, 2001. Together, these four components comprise Arizona's framework for regulating reclaimed water. Each is briefly described below.

Reclaimed water conveyances [A.A.C. Title 18, Ch. 9, Art. 6, R18-9-601 through 603].

These provisions consist of a basic set of technical criteria for the design and construction of reclaimed water distribution systems. The provisions:

- address pipeline and open water conveyances,
- apply to conveyances transporting reclaimed water from the treatment plant to “the point of land application or end use,”
- prescribe a few overall performance standards, and
- address aspects of pressure and pressure testing, minimum separation distance from water and sewer pipes, pipe identification and marking, and signage.

The rule prescribes compliance with the criteria, but ADEQ requires no notification of proposed construction, performs no review of design plans, and issues no permit relating to construction activity. ADEQ receives no information on the extent to which reclaimed water distribution system projects constructed by utilities comply with the technical criteria in rule.

Direct reuse of reclaimed water [A.A.C. Title 18, Ch.9, Art. 7, R18-9-701 through 720].

This article governs ADEQ's system for reclaimed water permitting. In 2001, ADEQ completely overhauled its permitting approach for reclaimed water. Before 2001, end users were required to apply for an individual reclaimed water permit. This permit required monitoring and reporting of the quality of reclaimed water reused by the end user. This was a major burden for end users and an impediment to the advancement of reuse in the state. In 2001, ADEQ changed the permitting approach to rely heavily on simplified general permits for end users. General permits were established for end users of the five classes of reclaimed water (A+, A, B+, B, and C) designated in the reclaimed water quality rule. Responsibility for monitoring and maintaining the quality of reclaimed water was shifted to the sewage treatment plant owner/operator under provisions of the APP issued to the plant. In other words, the generator of the reclaimed water, i.e., the entity with control over treatment, became responsible for complying with the reclaimed water quality standards. Thus, from the end user's perspective, ADEQ could craft simple general permits with provisions relating to operation, maintenance, and reporting of volumes of reclaimed water used. The simplest end use general permits are for use of Class A+ and B+ reclaimed water, as the low nitrogen content in these two “plus” classes of water minimizes concerns that over application during irrigation will cause a violation of the Aquifer Water Quality Standard for total nitrogen.

In the same rule, ADEQ established a general permit for a reclaimed water agent [A.A.C. R18-9-718]. This permit allows an entity like a homeowners association, for example, to take responsibility for the delivery of reclaimed water, operation and maintenance, and report filing for multiple end users, eliminating the need for each end user to obtain a separate general permit.

The rule also established a general permit for a reclaimed water blending facility [A.A.C. R18-9-717]. This general permit allows a facility to blend reclaimed water with other water, except industrial wastewater or reclaimed water from an industrial wastewater treatment plant. The permittee specifies the class of reclaimed water that is to be produced by the blending and must monitor the blended water to ensure that the water quality standards for the applicable class of reclaimed water are met.

Finally, the ADEQ rule allows an end user to apply for an individual permit if none of the general permits are applicable.

Reclaimed water quality standards [A.A.C. Title 18, Ch. 11, Art. 3, R18-9-301 through 309].

This article, also enacted in 2001, established five classes of reclaimed water based on protection of public health and groundwater quality (A+, A, B+, B, and C). Allowable end uses are listed corresponding with the water quality class designations.

- Class A reclaimed water is:
 - reserved for open access uses (access to the reclaimed water by the general public is uncontrolled)
 - considered essentially pathogen free based on meeting a limit of no detectable fecal coliform organisms
 - filtered to meet a 24-hour average turbidity limit of 2 NTU (nephelometric turbidity unit)
 - acceptable for irrigation of food crops, residential and school ground landscape irrigation, toilet and urinal flushing, recreational impoundments, snowmaking, and other uses requiring highly treated water
 - upgraded to the A+ designation if the water is further treated to remove total nitrogen to below 10 mg/l (that is the drinking water standard for total nitrogen)
 - also acceptable for all Class B and C uses.

- Class B reclaimed water is:
 - allowable for restricted access uses (access to the reclaimed water by the general public is restricted)
 - must meet a limit for fecal coliform organisms of 200 colony forming units per 100 ml (substantially equivalent to the ADEQ Surface Water Quality Standard for full-body contact)
 - acceptable for irrigation of golf courses, orchards, vineyards, and other restricted access irrigation; landscape impoundments; livestock watering (dairy animals); concrete mixing; and similar designated uses
 - upgraded to the B+ designation if the water is further treated to remove total nitrogen to below 10 mg/l (that is the drinking water standard for total nitrogen)
 - also acceptable for all Class C uses.

- Class C reclaimed water:
 - must meet a fecal coliform limit of 1000 colony forming units per 100 ml
 - is acceptable for certain restricted uses including irrigation of sod farms and fiber, seed, and forage crops; livestock watering (non-dairy animals); and silviculture.

Under this article, ADEQ may also set reclaimed water quality requirements for industrial reuse on a case-by-case basis.

BADCT for sewage treatment facilities [A.A.C. Title 18, Ch. 9, Art. 2, Part B, R18-9-B201 through B206].

In 2001, and revised by modifications in 2005, ADEQ adopted a Best Available Demonstrated Control Technology (BADCT) standard for sewage treatment plants under its APP program that requires tertiary treatment in all new or significantly expanding wastewater treatment plants. Under this standard, high quality denitrified, disinfected wastewater must be produced.

- For plants with a design capacity of less than 250,000 gallons per day, limits are set for fecal coliform and *E. coli* bacteria that allow the treated wastewater to meet the Class B reclaimed water quality standard (actually Class B+ because nitrogen removal is also required under BADCT).
- For larger sewage treatment plants, disinfection is required so that no fecal coliform and *E. coli* bacteria are detected. If filtration is added to the treatment process to meet a turbidity limit of 2 NTU, the treated wastewater meets the Class A reclaimed water quality standard (actually Class A+ because nitrogen removal is also required under BADCT).

Because BADCT requires advanced treatment for new and expanding facilities, ADEQ was able to adopt the previously-described simplified general permit program for end users of the high-quality wastewater generated by this treatment. This regulatory scheme has boosted the reuse of reclaimed water, turning what was once a “waste” into a valuable renewable resource.

Recharge of Reclaimed Water

For artificial recharge of reclaimed water to underground water storage facilities, as defined by ADWR, ADEQ writes APPs to ensure that the underlying groundwater is protected. For such facilities, the regulatory responsibilities of ADWR include the provisions of the Underground Water Storage, Savings and Replenishment Act (Recharge Program).

Underground storage and recovery is a means of artificially storing water supplies, including CAP water, reclaimed water and other surface waters, so that they may be recovered for future use. Storage of water supplies, including reclaimed water, is an increasingly important tool in the management of Arizona’s water supplies, particularly in meeting the goals of the 1980 GMA. Storing water underground to ensure an adequate supply for the purpose of satisfying current and future needs is both a practical and cost-effective alternative to direct use of renewable supplies.

In 1986, the Arizona Legislature established the Underground Water Storage and Recovery program to allow persons with surplus supplies of water to store that water underground and recover it in another location in the same groundwater basin either in the same calendar year or at a later date. In 1994, the Legislature enacted the Underground Water Storage, Savings, and Replenishment Act, which further refined the recharge program.

A person who wishes to store, save, replenish, or recover water through the Recharge Program must apply for permits through ADWR. Depending on what the applicant intends to accomplish, different types of permits may be required.

An Underground Storage Facility (USF) Permit allows the permit holder to operate a facility that stores water in the aquifer. A Constructed USF Permit allows for water to be stored in an aquifer by using some type of constructed device, such as an injection well or percolation basin. A Managed USF Permit allows for water to be discharged to a naturally water-transmissive area such as a streambed that allows the water to percolate into the aquifer without the assistance of a constructed device.

A Groundwater Savings Facility (GSF) Permit allows renewable water supplies, owned by the water storer, to be delivered to a separate recipient who agrees to curtail groundwater pumping on a gallon-for-gallon basis, thus creating a groundwater savings.

A Water Storage Permit allows the permit holder to store water at a USF or GSF. In order to store water, the applicant must provide to the Department evidence of its legal right to the source water proposed for recharge. Water storage must occur at a permitted facility, as described above.

A Recovery Well Permit allows the permit holder to recover long-term storage credits or to recover stored water annually. Recovery can occur inside the area of impact of the stored water (the area where the water artificially recharged into the aquifer actually occurs) or outside the impact area of the stored water; however, recovery must occur in the same groundwater basin where the water was stored.

The Recharge Program provides incentives for storing reclaimed water. For storage of water supplies other than reclaimed water, ADWR includes a cut-to-the-aquifer of five percent. Storage of reclaimed does not include this cut-to-the-aquifer, unless the water is stored at a managed facility where the cut-to-the-aquifer is calculated at 50 percent.

More information on the Underground Storage and Program is available at the ADWR website, www.azwater.gov.

Assured Water Supply

ADWR's Assured and Adequate Water Supply (AAWS) Programs were created to address the problem of limited groundwater supplies in Arizona. The Assured Water Supply Program functions to protect and preserve limited groundwater supplies within Arizona's five AMAs. AMAs are those areas of the state where significant groundwater depletion has occurred in the past and include portions of Maricopa, Pinal, Pima, Santa Cruz and Yavapai County. A key element of the Assured Water Supply Program within the AMAs is the requirement for future development to reduce its reliance on mined groundwater supplies through utilization of renewable water supplies (CAP and surface water) or through the use of reclaimed water. The use of reclaimed water has become increasingly utilized for non-potable purposes in new developments (e.g., golf courses and other landscaping needs).

Outside the AMAs, the Adequate Water Supply Program, while not as protective as the Assured Water Supply Program, acts as a consumer advisory program, ensuring that potential real estate buyers are informed about any water supply limitations.

Gray water

Gray water reuse is regulated by ADEQ under rules for the direct use of reclaimed water, A.A.C. Title 18, Chapter 9, Article 7. As described earlier, this article also governs end user permits for the reuse of reclaimed water from a sewage treatment plant. Gray water is defined in statute as "wastewater that has been collected separately from a sewage flow and that originates from a clothes washer or a bathroom tub, shower or sink but that does not include wastewater from a kitchen sink, dishwasher or toilet [A.R.S. 49-201(18)].

Prior to 2001, gray water reuse was regulated through individual permits. This approach had proved ineffective because nearly all residential gray water users ignored the permitting requirement. In 2001, ADEQ replaced the individual permit requirement with a simple general permit for residential use of gray water [A.A.C. R18-9-711]. Under the general permit, a residential reuser of gray water is deemed permitted to use gray water as long as the person complies with 13 best management practices. No application or notification to ADEQ is required, and ADEQ does not issue any permit document. This approach, which emphasizes education, recognized the impediments created by the earlier "hard" permitting requirements that were ignored by nearly everyone. This new approach has been highly successful in adding gray water to the recycled water supply and has been copied by other states.

In the 2001 rule, ADEQ also established a general permit for more voluminous residential and non-residential uses of gray water up to 3000 gallons per day [A.A.C. R18-9-719]. This general permit requires submittal of design plans to and approval by ADEQ, and conformance with technical criteria in rule.

With respect to the residential gray water general permit allowed under A.A.C. R18-9-711, the ADEQ rule explicitly granted towns, cities, or counties the authority to further limit the use of gray water by rule or ordinance [A.A.C. R18-9-711(C)]. This authority was removed through legislation in 2006 [A.R.S. 49-204], which prohibited a town, city, or county from limiting the use of gray water in rule or ordinance, with one exception. In an initially designated Active Management Area that does not contain part of the CAP aqueduct but has a safe yield goal dependent on utilization of reclaimed water as part of an assured water supply determination (only the Prescott AMA satisfies this definition), towns, cities, or counties may limit the use of gray water by rule or ordinance as long as the volume of effluent available to meet assured water supply requirements is not reduced.

In 2006, the Legislature enacted legislation requiring ADWR to amend its assured water supply rules to provide for a reduction in water demand for an application for an assured water supply designation or certificate if a gray water reuse system will be installed that meets the requirements of rules adopted by ADEQ for gray water systems. The legislation provides that the rules shall allow for such a reduction in water demand for a certificate only if the land to which the certificate is sought qualifies as member land in the Central Arizona Groundwater Replenishment District (CAGRDR). The legislation defines gray water consistent with A.R.S. § 49-201(18). Although the current AAWS rules do not explicitly provide for the reuse of gray water to reduce demands, the ADWR has previously considered such rule language, but the rulemakings were delayed for unrelated reasons. Because the gray water reuse changes are mandated by statute, ADWR will allow for a reduction in water demand based on gray water reuse before the AAWS rules are amended to include such a requirement. As provided in the statute, the reduction will be allowed for an application for a certificate of assured water supply only if the land for which the certificate is sought qualifies as member land in the CAGRDR. ADWR draft rule language may provide guidance on the subject.

The ADWR draft gray water rule language included the following:

- *Two amendments to A.A.C. R12-15-704 to allow for a reduction in the estimated water demand for a subdivision enrolled as a member land in the CAGRDR if gray water reuse systems will be installed in the subdivision.*
 - *Language would be added to subsection (B) to require an applicant for a certificate of assured water supply to provide "sufficient information for the ADWR Director to determine the appropriate reduction in demand" if the subdivision is enrolled as a member land in the CAGRDR and the applicant proposes to install gray water reuse systems.*
 - *Language would be added to subsection (E) to provide that if the subdivision is enrolled in the CAGRDR and gray water reuse systems will be installed in the subdivision, the ADWR Director shall reduce the estimated water demand by a volume that is likely to be saved through the gray water reuse system.*
- *Two amendments to the rule regarding application for a designation of assured water supply to allow a reduction in the estimated water demand if the applicant will serve one or more customers that will use a gray water reuse system.*
 - *Subsection (A) would provide that an applicant for a designation of assured water supply that is seeking a reduction in the estimated water demand because one or more customers*

- will use a gray water reuse system must include in its application sufficient information to allow the director to determine the appropriate reduction in demand.*
- *Subsection (D) would provide that if the applicant demonstrates that it will serve one or more customers that will use a gray water reuse system, the ADWR director shall reduce the estimated water demand by the volume the director determines is likely to be saved through the gray water reuse system. Unlike an applicant for a certificate of assured water supply, it is not a requirement that the applicant show membership in the CAGR in order for demand to be reduced because of the gray water reuse system.*

Amendments to A.A.C. R12-15-714 (applications for designations of adequate water supply) would mirror the amendments to A.A.C. R12-15-710 relating to the use of gray water reuse systems and the ability of an applicant to reduce its estimated water demand by an appropriate volume of water that will likely be saved by the utilization of a gray water reuse system by one or more of the applicant's customers.

Finally, if the City of Tucson is any indication, ordinances to encourage gray water use, rather than limiting use, may become the trend. The City of Tucson adopted its gray water ordinance, effective June 1, 2010, requiring plans for all new single family homes and duplexes to include plumbing for future gray water distribution. The plans must show either a separate multiple pipe outlet or diverter valve and an outside "stub-out" installation on clothes washing machine hook-ups. The plans also must show a building drain or drains for lavatories, showers, and bathtubs, separate from all other plumbing fixtures. In other words, the Tucson ordinance prepares new single family homes and duplexes for easy use of gray water upon occupation by the new residents.

Rainwater Harvesting/Stormwater

Rainwater harvesting

Rainwater harvesting is the process by which rainwater is accumulated and stored after collection from the roofs of houses, buildings, other structures and specially prepared areas of ground. Most definitions of rainwater harvesting highlight the concepts of onsite or within-the-property capture, collection where rainwater falls before it can drain away, and use of the captured water for non-potable purposes.

ADEQ statutes and rules contain no definitions or citations relating to rainwater harvesting. Neither the Arizona Pollutant Discharge Elimination System (AZPDES) permit program nor the APP program require permits for this activity. As described more fully in the next section on stormwater, the AZPDES program regulates discharges to waters of the United States, which are essentially surface waters. The term "precipitation runoff" is used once in AZPDES rules governing permitting of discharges to surface waters [A.A.C. R18-9-A902(G)(7)]. This is in connection with an exclusion from permitting for mining and oil and gas operations if precipitation runoff is collected into a conveyance and prevented from coming into contact with "any overburden, raw material, intermediate products, finished product, byproduct, or waste product located on the site of the operations." Except in this extreme situation, which most practitioners would not regard as a rainwater harvesting activity anyway, the AZPDES program does not contemplate a requirement for permitting.

APP statutes and rules also contain no language that applies directly to rainwater harvesting. Statutory exemptions from APP permitting exist for "household and domestic activities" and "household gardening, lawn watering, lawn care, landscape maintenance and related activities" [A.R.S. 49-250(B)(1) and (B)(2), respectively]. ADEQ law is silent on similar non-household activities. An exemption from permitting

exists for “surface impoundments used solely to contain storm runoff, except for surface impoundments regulated by the federal clean water act” [A.R.S. 49-250(B)(10)]. Although it is doubtful this exemption was written with rainwater harvesting in mind as this practice is now understood, it would nevertheless apply to impoundments constructed to harvest locally-derived rainwater.

In summary, ADEQ statutes and rules do not address rainwater harvesting, using that terminology, and only vaguely address activities that might fall into the definition of rainwater harvesting as described in the first paragraph of this section. What can be said with certainty is that no ADEQ permit is required to practice rainwater harvesting in this context.

ADWR has no specific requirements for the use of rainwater harvesting, however the use of this practice is one possible BMP that can be used in the Modified Non-Per Capita Conservation Program (MNPCCP) by municipal water providers.

In contrast, the City of Tucson recently adopted a rainwater harvesting ordinance that may be the first of its type in the nation. Tucson’s ordinance requires water harvesting from new commercial buildings for landscape irrigation. According to the City of Tucson, integrating rainwater harvesting into new building construction adds minimal cost to a project while allowing a significant portion (50percent or more) of outdoor landscaping water needs to be met. Under the Tucson ordinance, facilities subject to the ordinance must meet 50percent of their landscape demand using harvested rainwater, prepare a site water harvesting plan and water budget, meter outdoor water use and use irrigation controls that respond to soil moisture conditions at the site. Facilities have three years to establish plants before the 50percent requirement must be met, and the requirement is waived during periods of drought. Both passive water harvesting systems (systems that passively infiltrate rainwater into soil or porous pavement for use by vegetation), and active systems (systems that store water in tanks for future distribution to beneficial uses) are addressed in the ordinance. The City cites other benefits of this program including stormwater pollution prevention, attenuation of peak runoff from hardscaped surfaces, and public education opportunities. Following Tucson’s lead, other Arizona communities have passed or are considering rainwater harvesting ordinances.

Stormwater

Stormwater discharges are regulated under the federal Clean Water Act through National Pollutant Discharge Elimination System (NPDES) permits. The purpose of these permits is to regulate impact of pollutant discharges to the nation’s surface waters. In Arizona, these permits are called AZPDES permits and are issued by ADEQ under a grant of primacy from the United States Environmental Protection Agency (EPA).

ADEQ has established both individual and general AZPDES permits. An individual permit is required for many point source discharges such as wastewater treatment plants and other “end-of-pipe” discharges. In this type of permit, the regulated facility must limit levels of pollutants in its discharge so as to meet technology-based and water quality-based effluent limits. Water quality-based limits are derived from Surface Water Quality Standards that are set for the designated uses of the watercourse into which the facility is discharging. These permits usually require regular monitoring and reporting of a suite of pollutants.

Stormwater discharges also are regulated as point sources under the Clean Water Act. According to the EPA, about 30 percent of known pollution to our nation's surface waters is attributable to stormwater runoff. Discharges from these sources are regulated under individual permits for large municipal storm sewer systems and general permits for other types of facilities. Although the permits for stormwater rely

heavily on implementation of best management practices to control pollutants, there is expanding emphasis within this program on routine water quality monitoring and compliance with Surface Water Quality Standards at outfalls. AZPDES stormwater permits are applicable to the following categories of facilities:

Large storm sewer systems. The Medium and Large Municipal Separate Storm Sewer System (Large MS4) Permit is an individual permit that authorizes stormwater discharges from concentrated development in large urban areas. Currently, eight permittees operate under Large MS4 permits: Phoenix, Glendale, Mesa, Scottsdale, Tempe, Tucson, Pima County, and the Arizona Department of Transportation (ADOT).

Small storm sewer systems. The Small Municipal Separate Storm Sewer Systems (Small MS4) General Permit authorizes discharges of stormwater from smaller urbanized areas. Based on EPA criteria for eligibility, 41 such areas in Arizona operate under this general permit in regard to their stormwater discharges. This list includes 28 cities and counties, but also involves some non-traditional MS4s comprised of eight college campuses, two military bases, Arizona Dept of Corrections, Arizona State Hospital, and two Veteran’s Administration medical centers.

Construction activities. The Construction General Permit (CGP) authorizes stormwater discharges from sites of construction-related activities where the discharges have a potential to enter waters of the United States or a storm drain system.

Industrial activities. The Multi-sector General Permit (MSGP) authorizes discharges of stormwater associated with industrial activities that are of a non-construction nature. A list of standard industrial classification (SIC) codes is available indicating which industries must obtain coverage under this general permit. Regardless of SIC code, MSGP coverage applies if the facility meets certain narrative criteria.

AZPDES stormwater permits are designed to reduce the discharge of pollutants into surface waters to the maximum extent practicable. Many best management practices used for stormwater utilize detention or retention. However, AZPDES stormwater provisions do not regulate the use of retained stormwater, nor do they address downstream appropriation of runoff for beneficial use.

An AZPDES individual permit is required for projects designed to beneficially use stormwater where it is mixed with reclaimed water, remediated water, or other types of water and the site of use is within a water of the United States. Such projects have been proposed for environmental restoration and multi-benefit enhancement purposes. For this type of project, the water quality standards and testing requirements of the different programs likely will conflict. This obstacle has constrained the design or hindered full development of such projects. AZPDES does provide for alternative approaches such as Net Ecological Benefit and lake management plans. More complete guidance on these alternative approaches would probably stimulate innovative ideas for multi-benefit projects.

Conservation

Arizona Department of Water Resources

Because of Arizona’s arid climate, the availability of secure water supplies has always been a blessing rather than a certainty. Though Arizona is in fact blessed with many sources of available water supplies, the reliability of those supplies has been highly dependent on annual variability. Not until the development of dams, storage reservoirs and delivery infrastructure was this variability “tamed”, albeit for as long as the climate allowed. Additional progress for accessing water, on a large scale, from below

the land surface has added to the reliability of water supplies in Arizona. However, Arizonans have long known that the water supply upon which it has become so reliant is finite and that the only way to stretch this finite supply is to efficiently utilize all sources of water.

The most significant step that Arizona has taken to address on-going water use efficiency was the adoption of the 1980 GMA. The state Legislature created the GMA to address groundwater depletion in the state's most populous areas and created ADWR to implement it. The goal of the GMA is twofold: 1) to control severe groundwater depletion, and 2) to provide the means for allocating Arizona's limited groundwater resources to most effectively meet the state's changing water needs. This effort to manage Arizona's groundwater resources was so progressive that in 1986 the GMA was named one of the ten most innovative programs in state and local government by the Ford Foundation and Harvard University. When granting the award, it was noted that no other state had attempted to manage its water resources so comprehensively. Accordingly, Arizona built consensus around its policy and then followed through to make it work in practice.

Groundwater basins where groundwater depletion is most severe are designated as AMAs. There are five AMAs – Phoenix, Pinal, Prescott, Santa Cruz and Tucson. These areas are subject to regulation pursuant to the GMA. Each AMA has a statutory management goal. In the Phoenix, Prescott, and Tucson AMAs, the primary management goal is to achieve safe yield by the year 2025. In the Pinal AMA, where the economy is primarily agricultural, the management goal is to preserve that economy for as long as feasible, while considering the need to preserve groundwater for future non-irrigation uses. Recognizing that the Santa Cruz AMA is currently at the safe-yield status, the management goal of the Santa Cruz AMA is to maintain safe yield and prevent local water tables from experiencing long-term decline. Each AMA carries out its programs in a manner consistent with these goals while considering and incorporating the unique character of each AMA and its water users. Another important component of the Code is the requirement for ADWR to develop and implement conservation requirements within AMAs for the agricultural, municipal and industrial water use sectors. The conservation requirements change in each subsequent management period⁵, generally requiring increasing water use efficiency in each management period for each of the water-using sectors. Management Plans, corresponding to each management period for the five AMAs contain specific water allocation formulas and conservation requirements for each sector.

ADWR Agricultural Conservation Requirements. Holders of an Irrigation Grandfathered Right (IGFR), a right to withdraw groundwater in an AMA on farmland of two or more acres for crops for human or animal consumption who withdraw water from a non-exempt well are subject to the Agricultural Conservation Program. The foundation of the program includes conservation requirements based on water duties and maximum annual groundwater allotments or through BMPs. A key component of the GMA prohibits the establishment of new IGFRs—eliminating new acres from being put into agricultural production.

ADWR Municipal Conservation Requirements. Under the Municipal Conservation Program, municipal water providers (cities, towns or private water companies) are required to meet conservation requirements based on reductions in total per capita use or through implementation of specific BMPs (see Appendix IV) identified for their service area characteristics. Additionally, municipal providers are required to limit the amount of lost and unaccounted for water in their delivery system. Private water companies regulated by the ACC located inside or outside of an AMA are also required to implement BMPs for their service area as identified by the ACC.

⁵ The first management period was 1980 through 1990; the second management period was 1990 through 2000; the third management period was 2000 through 2010; the fourth management period is 2010 through 2020; and the fifth management period is 2020 through 2025.

ADWR Industrial Conservation Requirements. Industrial water users who do not receive water from a municipal provider and have their own well (non-irrigation groundwater rights inside of AMAs) are subject to the Industrial Conservation Program. Conservation requirements are based on the best available technology for the end use and range, based on the permit or right type, from BMPs to specific groundwater allotments for water users such as turf facilities. Requirements for industrial water users are specific to the industry including mining and metallurgical processing, electric power facilities, sand and gravel facilities, dairies, feedlots, turf-related facilities (schools, parks, golf courses, and home owner association greenbelts) and other large landscape users.

Statewide Conservation Requirements. While specific conservation requirements are limited to the major water using sectors (agricultural, municipal and industrial) located within the AMAs, the statutes require all water providers to develop a water conservation plan to be submitted to ADWR and updated every five years. Significant water conservation efforts have been implemented across Arizona, many of which can be found by accessing the ADWR website. www.azwater.gov.

ADWR is not the only entity that requires conservation of water supplies in Arizona and is not the only reason why entities implement conservation in their communities. Water users who enter into sub-contracts for CAP water have requirements to develop and implement conservation measures. Many Indian communities in Arizona, who are not regulated under state requirements, voluntarily implement many of the provisions of the GMA for water use in their agricultural, industrial and municipal systems. Additionally, the ACC has developed their own requirements that increase water use efficiency for their regulated utilities described in more detail below.

Arizona Corporation Commission

For many years, the ACC has promoted the efficient use of groundwater and renewable surface water by instituting inclining block rates (also referred to as “tiered rates”) for all water companies that have filed rate cases since the late 1990s. Prior to that time, most water companies’ rates were set at a flat rate per 1,000 gallons with up to 5,000 gallons of water included as part of the monthly minimum charge. In fact, it was not uncommon for a water system to have declining block rates (i.e., the more water a customer used, the lower the cost per 1,000 gallons).

The most common form of rate design used by the ACC today is a 3-tiered rate for residential use. An example of this rate structure would be:

- Tier 1 - \$2.00 per 1,000 gallons for the first 3,000 gallons
- Tier 2 - \$4.00 per 1,000 gallons for the next 7,000 gallons
- Tier 3 - \$6.00 per 1,000 gallons for all usage over 10,000 gallons.

In addition, the monthly minimum is set at zero gallons, which means that a customer pays the minimum regardless of water use, plus the applicable rate for every gallon of water used above zero.

Assuming a customer uses 12,000 gallons in a month with the above rate design and a monthly minimum charge of \$20.00, the customer’s bill would be \$66.00 (\$20 minimum plus \$46 for commodity). A customer using half that amount (6,000 gallons) would have a bill of \$38.00 (\$20 minimum plus \$18 for commodity). As can be seen, the price for the commodity billed to the customer using 12,000 gallon per month is not twice that of the customer using 6,000 gallon per month, but more than 2.5 times. Likewise, a customer using 18,000 gallons would pay greater than 4.5 times more for the commodity portion than a customer using 6,000 gallons, rather than just 3 times more.

The 3-tiered rate design described above gives a customer control over his or her water bill by providing an incentive to use less water, since the cost increases significantly with each tier. The tiered rate structure does allow a customer who wishes to use more water to do so, but at an increasingly higher cost per unit of commodity, unlike flat or declining block rate structures.

There have been a few cases recently where the ACC has approved tiered rates with more than three tiers. The ACC has approved rate designs with as many as five tiers. With more tiers in an inclining block rate design, the customer has more control over his or her bill, but the tradeoff is that customers must be better informed by the water company as to exactly how this type rate design operates and affects them.

In the last couple of years the ACC also has been requiring water utilities that come before it to adopt and implement BMPs for water conservation. These BMPs are the same ones that the ADWR requires within the designated AMAs. The ACC has applied these BMPs both within and outside of the AMAs. The ACC typically has required a water utility to adopt more BMPs than the number required by ADWR.

The manner in which the ACC has allowed water systems to implement the BMPs is through the adoption of tariffs. These tariffs not only require the water systems to meet BMP requirements, but also require customers to abide by these BMPs in order to receive initial service and maintain service from the water system. An example of such a BMP tariff is a low water use landscaping tariff. Under this tariff, a water system would be required to provide new customers with information regarding low water use landscaping. The tariff could also impose a requirement that would allow only a percentage of the customer's landscaping to be turf. If after initiating service to a customer, the water system becomes aware that the customer's landscaping of turf has risen above the set percentage, the water system notifies the customer in writing that the customer has violated the terms of the tariff. The customer is given a reasonable amount of time to comply with the tariff. If the customer does not comply within the timeframe, the water system initiates a disconnection process per ACC rules.

In addition, in the last few years, the ACC has added a condition to a new Certificate of Convenience and Necessity (CC&N) or an extension of an existing CC&N for a water provider that prohibits the provider from selling groundwater for irrigation of golf courses or for other water intensive features such as ponds and fountains. This condition further promotes the ACC's policy of conserving groundwater.

Energy/Water Nexus

In recent years the term "energy/water nexus" has become very familiar to all in both the energy and water industries. The typical forms of energy production cannot exist without consumption of water and water cannot be treated or moved from point A to point B without consumption of some type of energy. To use a very simple example of this, a water-saving showerhead should also be considered an energy-saving device and an energy-saving light bulb should also be considered a water-saving device.

The ACC presently has an open docket to gather information on dry- versus wet-cooling for power plants. While dry-cooling or some form of hybrid-cooling could save significant quantities of water in the production of electricity, there are accompanying efficiency and cost tradeoffs that serve as disincentives to their use.

Furthermore, electric power plants located within AMAs are required by ADWR to implement the Industrial Conservation Requirements specific to their industry. Facilities that were in existence after 1984 (the first year in which the conservation requirements took effect) must comply with an annual average of 15 cycles of concentration (seven cycles of concentration for facilities constructed and operational in and prior to 1984), must blow down water on a continuous basis, and must divert the

maximum amount of water feasible to the cooling processes. In other words, water used to cool the power plant must be re-circulated through the cooling tower so that only one-fifteenth (or one-seventh, if applicable) of its original volume is left, the rest being lost as steam. At the same time, there must be continuous removal of the water to control salt buildup and minimize corrosion and scaling. To incentivize use of reclaimed water, the cycles of concentration do not apply to any facility for the first 12 consecutive months in which 50 percent or more of the water supplied to the cooling towers is reclaimed water.

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CHAPTER 3 – Current Status and Potential Opportunities to Advance Water Sustainability in Arizona

Reclaimed water

As a percentage of the total Arizona water supply, reliance on reclaimed water resources has grown. Current estimates of use of reclaimed water in Arizona for an allowed beneficial purpose total over three percent of statewide water use based on information reported to ADWR. Additional volumes of reclaimed water are artificially recharged for use in later years. The use of reclaimed water is greater in the Active Management Areas, accounting for over six percent of total AMA water use, where groundwater use restrictions, incentives for the use of renewable water supplies and the availability and investments in infrastructure have moved water users toward non-groundwater supplies, including reclaimed water for non-potable uses.

In Arizona, ADEQ is the primary agency regulating production and use of reclaimed water, with ADWR maintaining authorities over recharge of reclaimed water, long-range water supply planning and water conservation requirements that depend on reclaimed water. ADEQ has a broad regulatory program for reclaimed water encompassing permitting, water quality standards, allowable end uses, and BADCT for sewage treatment plants. This regulatory framework ensures that most reclaimed water now generated for reuse is of high quality, nearly meeting EPA Drinking Water Standards (although ADEQ rule prohibits direct reuse for drinking). ADEQ's regulatory program thus assists in meeting the State's water supply and conservation goals while protecting public health and the environment.

ADEQ's program creates an incentive to construct modern, high-performance tertiary sewage treatment facilities in accordance with the BADCT requirements. This incentive results because the BADCT requirements are offset by an uncomplicated, yet protective, regulatory framework for reclaimed water, which relies largely on simple end user permits. This overall regulatory approach, within which treatment plant and reclaimed water permitting requirements dovetail, also has created appealing collateral environmental benefits. For wastewater discharges that are not otherwise reused, pollutant loading to waters of the United States under NPDES permits is reduced. Natural and constructed wetlands become more sustainable through greater availability of high-quality treated wastewater. Increased reuse results in a reduced probability of activation of state- and federally-mandated contingency plans by public drinking water systems (PWS) burdened by inherently scarce supplies or during drought. Finally, the high level of treatment now required under BADCT and to meet Class A+ reclaimed water standards results in substantially decreased levels of emerging contaminants in wastewater, including pharmaceuticals and personal care products (PPCP), compared to older lower-performance facilities.

Proof of the effectiveness of Arizona's regulatory program for reuse of reclaimed water is found in the fact that 59 percent of wastewater treatment plants in the state now distribute reclaimed water for reuse, 181 of the 309 permitted facilities. Reuse occurs in every county (see table below). Notable are the large percentage of plants authorized for reuse in counties comprising the most populous AMAs: Maricopa (78%), Pima (74%), and Pinal (71%). Even counties located outside of AMAs have significant percentages of sewage treatment plants authorized for reuse, for example, Coconino County (63%), Cochise County (53%), and Mohave County (36%).

Table 1: Arizona Wastewater Treatment Plants Authorized to Reuse

County	No. of Permitted Plants	No. Authorized to Reuse	Percentage Authorized to Reuse
Apache	7	3	43
Cochise	15	8	53
Coconino	27	17	63
Gila	10	3	30
Graham	5	4	80
Greenlee	2	1	50
La Paz	6	2	33
Maricopa	64	50	78
Mohave	33	12	36
Navajo	14	7	50
Pima	19	14	74
Pinal	45	32	71
Santa Cruz	6	1	17
Yavapai	33	19	58
Yuma	23	8	35
All Counties	309	181	59

The number of sewage treatment plants producing high quality wastewater is significant, too, as Table 2, below, shows. One-quarter of the plants in Arizona now produce Class A+ or A wastewater, that is, wastewater that has been treated to an essentially pathogen free level. Thirty-nine percent of the plants in the state produce wastewater in “plus” classifications, which is water that has undergone treatment to remove excess nitrogen. The treatment processes to remove nitrogen also have the additional benefit of increased PPCP removal.

Table 2: Classification of Wastewater Treatment Plants for Reuse

Classification of Plant for Reclaimed Water Reuse	No. of Plants	Percentage of Total Plants in Arizona	Percentage Among Plants Authorized for Reuse
A+	74	24	41
A	7	2	4
B+	46	15	25
B	32	10	18
C	22	7	12
Totals	181	59	100

On the user side, ADEQ has issued 389 end use permits to date for the reuse of reclaimed water. The vast majority of the permits, 72 percent, are for reuse of Class A+ reclaimed water, with the remaining permits for the older sub-Class A+ treatment facilities still in operation. More than 40 end use permits have been issued to reclaimed water agents, accounting for hundreds of additional end users.

In summary, Arizona’s reclaimed water program has resulted in construction and upgrading of scores of high-performance sewage treatment plants in Arizona so that safe supplies of reclaimed water are available for reuse. Reclaimed water is distributed for a myriad of uses to many hundreds of end users. Reclaimed water distribution systems have been built, some with over 100 miles of distribution mains, to supply recharge facilities throughout the state; irrigation of a significant number of Arizona’s golf

courses; outside landscape and turf irrigation service to hundreds of residences; irrigation of many parks and schoolyards; and critical supplies for agricultural, industrial and power generation needs. Ultimately, this investment in infrastructure has extended Arizona's water supply and contributed to long-term water sustainability.

Although much reclaimed water is already used in Arizona as the tables show, significant potential still exists. Even though a large number of plants are classified and authorized to supply reclaimed water, not all that capacity is being used, and in some cases, reuse has not yet started. As the first table shows, considerable opportunity for reuse still exists outside the AMAs. Both inside and outside the AMAs, a historical limiting factor has been that reclaimed water is usually produced at the lowest, downstream edge of a community, making it costly, particularly in retrofit situations, to convey it to high value reusers within the community. For this reason, opportunity exists for developing incentives or for better matching the availability of reclaimed water with potential uses. For example, it might be possible to locate solar thermal electrical generation plants adjacent to wastewater treatment plants where reclaimed water is not being fully utilized. Also, communities are investigating decentralized wastewater treatment options, where smaller high-performance, odor free plants are located within the communities, allowing a variety of high-value uses with lower infrastructure costs. When planning for reuse, diurnal and seasonal variations in effluent production and variations in the end use demand must be taken into account. As indicated in the recommendations of Working Groups, many other opportunities for fuller use of reclaimed water exist.

Gray water

Prior to 2001, ADEQ required applications from and issuance of individual permits to any person wishing to legally use gray water for residential use. The requirements were so onerous that ADEQ had issued only two known permits for such use. During the stakeholder process in 2002 to update the rule at that time, a major study of gray water use in the greater Tucson area was completed by the Water Conservation Alliance of Southern Arizona (Water CASA). The Water CASA surveyed a large number of Pima County residents with a detailed questionnaire (just under 2000 survey forms mailed out with some 600 usable responses returned). The study garnered a wealth of information about the extent and use of gray water in Pima County.

Of immediate interest at that time was the result that 13 percent of occupied single-family residences and manufactured homes did some type of gray water reuse. This corresponded roughly to between 20,000 and 30,000 residences in Pima County and 50,000 to 80,000 persons. Extrapolating to the rest of the state, it was clear that citizens in well over 100,000 residences in Arizona already reused gray water in some way, ignoring the legal requirement for obtaining a permit. It also was clear that a "hard" permitting approach would never work, either aimed at existing "illegal" reusers or at persons wishing to begin using gray water. The survey results strongly supported ADEQ's best management practice approach to residential gray water use as embodied in the current rule.

The Water CASA study found that the largest source of gray water, by far, was clothes washing machines, accounting for 66 percent of all gray water sources. Bathroom tubs and showers accounted for another 15 percent. The study also found that irrigation of shade or ornamental trees accounted for 32 percent of reported uses, followed by shrub irrigation at 19 percent, and grass irrigation at 14 percent. Many gray water reusers appeared to have simply directed clothes washing machine drainage water to vegetation with a hose.

The study suggested that the following factors may increase the likelihood of gray water reuse:

- older homes

- lower value homes
- manufactured housing
- lower income levels
- septic tanks

The study concluded that residents of manufactured homes may be particularly likely to reuse gray water because of the easier access to wastewater plumbing, and that septic tank preservation probably was a significant factor motivating much gray water reuse.

Even though the Water CASA study is 10 years old and was limited to the greater Tucson area, it probably represents the current situation on a statewide basis with considerable accuracy. In communities like Tucson, where gray water use is encouraged and an ordinance became effective in 2010 requiring all new residences to be built with gray water capabilities, a new survey might show some increased gray water reuse since 2000. The Tucson ordinance likely represents a model for all of Arizona in increasing the use of gray water and thus reducing potable supply demand.

Rainwater Harvesting/Stormwater

Rainwater harvesting has long been practiced in Arizona on a small-scale basis mostly by individual homeowners. Harvesting rainwater for landscape watering allows homeowners to conserve potable water supplies and to reduce their water bills. There are no requirements for rainwater harvesting on individual residential lots and the practice is largely unregulated but highly encouraged by local water conservation groups. Because of Arizona's arid climate, the volume of rainwater available for harvesting may be a limiting factor, but still may provide a lower cost alternative to potable water supplies.

Implementation of large-scale rainwater harvesting and stormwater control projects is also possible. For example, at the University of Arizona has developed a project on its campus that provides multiple benefits. Landscaping is being maintained with harvested rather than potable water, and some troublesome areas of flooding following rains have been mitigated.

The ADEQ headquarters in Phoenix is an example of harvesting a non-traditional source of water. This LEED Silver certified office building has drastically reduced its landscape irrigation water needs through use of xerophytic plants and harvesting and reuse of cooling tower blowdown from heating, venting and air conditioning. Similar opportunities exist in other commercial, institutional, and educational settings.

Opportunity also exists, enhanced once a number of obstacles identified in the recommendations are removed, for developing multi-source, multi-purpose projects that might combine harvested rainwater, captured stormwater, reclaimed water, remediated water and other types of water. One example of a project along these lines is the Kino Environmental Restoration Project (KERP) in Tucson. This project, which combines captured stormwater and reclaimed water, turned what was essentially a 50-acre unattractive stormwater retention basin into 141 acres of riparian and open water wetlands, grassland, mesquite bosque, marsh and upland vegetation with surrounding recreational paths. The facility still serves its fundamental stormwater control purpose while providing a popular environmental amenity for use by its citizens. Other such opportunities can be envisioned across the state if recommendations of this Blue Ribbon Panel are implemented.

Conservation

Water is an essential resource in our lives and economy. Using water more efficiently is a responsibility of all Arizonans and a critical element in Arizona's long-range plan for securing sufficient water supplies.

By supporting a "culture of conservation" in Arizona, ADWR is helping citizens, businesses and communities become better water stewards. Within the AMAs, municipal water providers are required to comply with either a gallons per capita per day (GPCD) requirement or to implement BMPs that reflect the water use characteristics of their service area. Under the GPCD program, water providers are given a numeric target for each management plan and are expected to implement conservation measures aimed at reducing per capita use. ADWR does not require specific conservation measures under this program but allows the water provider to identify the appropriate measures for their community.

The Modified Non-Per Capita Conservation Program (MNPCCP) was developed in conjunction with stakeholders from all AMAs. The MNPCCP became effective in May 2008 and is described in the Second Modification to Chapter 5 of the Third Management Plan (ADWR, 2008). Participation in the program is required for all large municipal water providers that do not have a Designation of Assured Water Supply (DAWS) and that are not regulated as a large untreated water provider or an institutional provider. Participation in the program is optional for large municipal providers that have a DAWS. DAWS providers that do not opt for MNPCCP are regulated by the GPCD program. A large municipal provider is a city, town or private water company that serves more than 250 acre-feet of water per year. To date, 55 out of 76 large municipal providers in the five AMAs are regulated under the program. The MNPCCP requires participating providers to implement BMPs that yield greater water use efficiency in their service areas. A water provider regulated under the program must implement a required basic public education program and choose one or more additional BMPs based on its size as defined by its combined total of residential and non-residential water service connections:

- Tier 1 – up to 5,000 service area connections: one additional BMP
- Tier 2 – 5,001 - 30,000 service area connections: five additional BMPs
- Tier 3 – more than 30,000 service area connections: ten additional BMPs

The 53 BMPs described in the program are divided into seven categories (see Attachment IV for complete list of BMPs):

1. Public Awareness
2. Education and Training
3. Outreach Services
4. Physical System Evaluation and Improvements
5. Ordinances, Conditions of Service, Tariffs
6. Rebates/Incentives
7. Research/Innovation

Encouraging water-wise agricultural practices is also consistent with the goal of the AMAs. Many agricultural water users in the AMAs have been pro-active in implementing on-the-ground conservation measures such as land leveling, ditch lining, sprinkler systems, and drip irrigation systems. ADWR regulates agricultural water use through its Agricultural Conservation Programs detailed in the AMA Management Plans. The Agricultural Conservation Program contains three conservation programs for IGFR owners: 1) the Base Program, 2) the Historic Cropping Program, and 3) the BMP Program. For the third management plan period Base Agricultural Program, ADWR calculated the maximum annual groundwater allotment for each IGFR by dividing the total irrigation requirement per acre of the crops historically grown between 1975 and 1980 on a farm unit by an irrigation efficiency of 80 percent. Lower irrigation efficiencies may be used for a farm unit or portion of a farm unit determined by ADWR to have limiting soils or excessive slopes and for a farm unit where orchard crops were historically grown and continue to be grown. Alternatively, the owner of the IGFR may opt to enroll in one of the two alternative conservation programs if certain requirements are met. The BMP program is the only alternative program that has been utilized by farmers in the AMAs. Of the 4,012 active IGFRs (representing a total of 477,411 acres) in the AMAs, 148 right holders (37,195 acres) participate in the

BMP program. The remaining IGFR holders continue to be regulated under the Base Agricultural Program.

ADWR also has consistently provided conservation assistance funds to reduce agricultural water use in the AMAs. One important example is the Irrigation Management Service (IMS) in the Pinal AMA and Water Conservation Management Program (WCMP) in the Phoenix AMA. The IMS and WCMP are cooperative programs with local Natural Resources Conservation Districts, the U.S. Natural Resources Conservation Service, ADWR, and more recently the U.S. Bureau of Reclamation. The programs provide irrigation scheduling, application rate information and water management education services to numerous farmers. In addition, programs such as the AMA Crop Survey help identify the impacts of agriculture in the AMAs, and help assess the effects of crop markets on water use. This tool has been used in the past by ADWR hydrologists and water resource specialists, in consultation with Irrigation Districts, and provides a relatively inexpensive way to assess water use and conservation potential in the AMAs. The Crop Survey also could be used as an educational and outreach tool to demonstrate the contribution of agriculture to the local economy.

Industrial conservation is also a key component of the regulatory conservation program in the AMAs. This program is aimed at industrial water users who have their own well and do not receive water from a municipal water provider. Conservation measures employed by industrial facilities are either allotment-based dependent on number of acres or animals or rely on the use of industry-specific BMPs. There are several industrial sub-sectors included in this program. Table 3 below identifies the types and numbers of industrial facilities regulated within the AMAs.

Table 3: Regulated Industrial Facilities in AMAs

User Category	Facilities
Large Scale Metal Mines	7
Turf-Related Facilities	281
Sand and Gravel Facilities	85
Other Industrial	743
Large-Scale Power Plants	12
Dairies	107
Total	1,235

Outside of the AMAs, water efficiency decisions are made by individual water users and communities. ADWR requires all water providers statewide to develop and submit a water conservation plan every five years. This is part of ADWR’s effort to develop a culture of conservation throughout Arizona. ADWR has provided assistance to communities developing conservation programs outside of AMAs by hosting a website that provides the most up to date conservation technologies available for all water users: [<http://www.azwater.gov/AzDWR/StatewidePlanning/Conservation2/default.htm>]. The website includes “how to” fact sheets and information on successful implementation of these measures in Arizona and other parts of the United States.

Arizona communities and water users have long been implementing conservation programs to stretch our limited water supplies. Opportunities exist in providing the non-AMA communities with the tools and experiences of the AMA communities in developing strong conservation programs to enhance what has already been implemented. Sharing information on programs that have been successfully implemented in Arizona allows communities to better address their unique water supply limitations.

Water/Energy Nexus

Water and energy are interdependent. It takes water to produce energy. Water is needed most evidently to produce steam to drive the electric generators, but more visibly and in greater volume for cooling the steam to convert it back to liquid. The primary forms of electrical generation in Arizona are still thermal processes that require large volumes of water: coal, natural gas and nuclear. The demand for water at these facilities varies significantly with nuclear being the most water dependent, needing about 785 gallons to generate a megawatt hour of power, followed by coal at 510 gallons per megawatt hour and natural gas at 415 gallons per megawatt hour (Pasqualetti and Kelly, 2008). Currently, Arizona power facilities account for approximately 45 percent of the total industrial water use in the state.

Conversely, significant amounts of energy are required to produce water. Energy is needed to extract water from wells or to divert from rivers. The Central Arizona Project, which pumps water from Lake Havasu on the Colorado River into an aqueduct supplying the Phoenix and Tucson metropolitan areas, is the largest single energy user in Arizona. Conveying that water further to homes, farms and other uses requires varying amounts of energy depending on the terrain and location and types of end uses. Water treatment facilities require energy for producing safe drinking water and to move it to end uses. Energy is used in our homes and places of work to heat water, another significant energy requirement. A study by the Salt River Project, which was summarized for the Panel at the March 2010 meeting, found that more than 80 percent of the electricity use for potable water supplies is attributable to residential water heating (see Figure 2):

Electricity Embedded in the Water Use Cycle

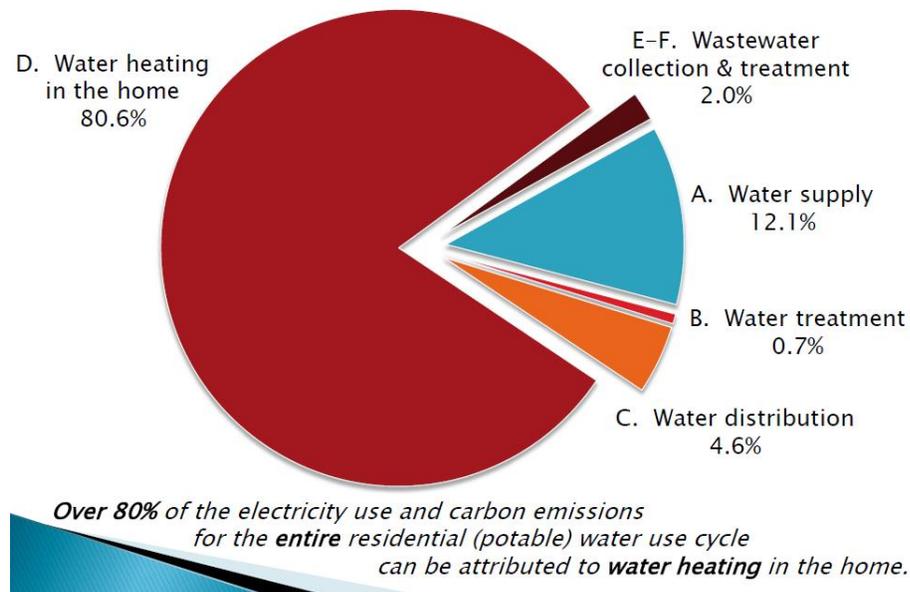


Figure 2: Electricity Embedded in Water

From the presentation, "The Electricity Embedded in Water: Two Sides of the Same Coin,.." Salt River Project, accessed at <http://www.azwater.gov/azdwr/waterManagement/documents/EmbeddedElectricityBlueRibbonCommittee030510.pdf>.

Once the water is used, energy is required to convey wastewater to treatment facilities and, most significantly, for the treatment processes. For many communities, the cost of treating wastewater is the single biggest component of their power bill. If the reclaimed water is reused, electricity is again needed to pump the water to end uses.

The use of solar energy has been explored and continues to be studied because of the great availability of sunshine in Arizona. While solar energy produces significantly less carbon emissions than conventional energy production techniques, the type of cooling for solar energy can have impacts on water supplies. Wet cooling is the lowest cost alternative for solar energy production, requiring less land area and producing the highest net generation, but it uses the most water. It is estimated that wet-cooled thermal solar facilities can use from 700 to 1000 gallons per megawatt hour. Dry cooling is an alternative to wet cooling. Dry cooling can use very little water (estimated at below 100 gallons per megawatt hour, however it requires more land area to compensate for lower power production and it works better in cool, humid climates. This is a significant disadvantage in Arizona. Hybrid wet/dry cooling is an alternative solution that is being studied that may be able to accentuate the advantages of both dry and wet cooling while minimizing the disadvantages.

Because water and energy are so interrelated, conservation of one conserves the other. Opportunities exist in educating Arizonans on this interdependency and promoting simultaneous conservation of water and energy. As Arizona explores renewable energies such as solar power, investigating the practical application of wet, dry or hybrid cooling facilities will enhance the goal of Arizona to be water and energy efficient. Identifying alternative cooling water sources by linking impaired waters to the appropriate uses and conserving higher quality waters for potable uses will also stretch the available water supplies. And finally, encouraging water and energy planners to collaborate on plant locations and water supply availability will better ensure that appropriate water sources are used at the lowest cost to the facility and ultimately energy consumers.

References

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CHAPTER 4 –Recommendations of the Blue Ribbon Panel on Water Sustainability

This chapter presents the final recommendations of the Panel. Some of these recommendations may require modifications to rules and policies. Most of the recommendations advocate action outside of the Panel process, including further research and public awareness/education campaigns or processes. The process used to get to the recommendation phase included development and prioritization of issues identified by the Working Groups. The Working Groups identified over 40 issues for consideration by the Panel (see Appendix II), which were then prioritized and reduced to 26 issues (see Appendix III). Next, the Panel directed the Working Groups to develop White Paper analyses and proposed recommendations for the 26 issues. The full text of these White Papers can be found in Appendix V. The Panel has reviewed the recommendations and by general consensus, adopted the recommendations within this chapter. A summary of the Issues and Recommendations is included in Appendix VI. Panel members with significant concerns about a recommendation were invited to file minority reports. No minority reports have been submitted to the Panel.

The Blue Ribbon Panel recommends no new regulatory programs or major reconstruction of existing programs. Instead, the Panel's recommendations include improvements to Arizona's existing toolbox of water management, education, and research capabilities. In the Panel's opinion, the current programs administered by ADWR, ADEQ, and the ACC constitute an exceptional framework within which water sustainability can be pursued and improvements to that framework will move Arizona further toward a secure water supply future. The issues and recommendations that were approved by the Panel were combined and categorized into five categories: 1) Education/Outreach; 2) Standards; 3) Information Development and Research Agenda; 4) Regulatory Improvements; and 5) Incentives.

A. EDUCATION/OUTREACH

Water issues are inherently complex, and the long-term sustainability of water supplies in Arizona and the role of reclaimed water in the water supply portfolio is no exception. Discussions in the working groups identified a general lack of understanding and miscommunication affecting public awareness regarding the relationship among water availability, water resource management, water quality, economic development, environmental needs and quality of life.

To further exacerbate the issue of miscommunication, definitions for reclaimed water and associated terminology vary among entities statewide. The professional water community uses technological terms and the bulk of the communication regarding reclaimed water comes from the professional water community. Conflicting definitions, complex terminology and negative campaigns (inherited from other states) foster public mistrust, misinformation and confusion.

Additionally, a lack of awareness of the availability of water reuse and water resource-related information (including technologies and financial information) continues to surface in numerous forums as a critical issue for water conservation, water reuse and water management efforts. Because Arizona has limited water resources, it is clear that a well-informed public is necessary to move Arizona forward with planning and financing the infrastructure and programs needed to achieve sustainability.

Education/Outreach issues identified in this category emphasize the need for coordinated information to be disseminated to the general public as well as community and business leaders in order to encourage efficient use of our water supplies and to improve public confidence in the use of reclaimed water. The Panel recommends the development of a coalition to formulate positive and easily understandable terminology as a means to improve public perceptions. The Panel also recommends the creation of an information portal to centralize the information necessary to develop a common understanding of Arizona's water supplies and conduct a coordinated education campaign aimed at improving the public's understanding and confidence in use of reclaimed water.

A.1. INCREASING PUBLIC AWARENESS

Issue {White Papers #17 #18, #20, #5, #6, #3}

The Panel believes there is a need for consistent use of common and positive terminology to convey effective messages about water sustainability. Additionally, there is a need for better public understanding of and confidence in the overall water picture and the role of reclaimed water in the water cycle. Support for programs that protect and enhance the sustainability of Arizona water supplies through a firmly-grounded and fact-based awareness of the relationship of water availability, conservation, the economy, the environment and desired quality of life is necessary. In order to establish the role of water efficiency and demand curtailment programs in addressing growth and drought, the relationship of water resource availability and development costs must be incorporated in water resource planning at all levels of government and private enterprise.

Recommendations

1. ADWR and ADEQ should create a coalition to engage industry experts and enlist professional assistance to translate industry terminology into an acceptable lexicon for statewide use. Water professionals should be educated on the use of the new terminology and the benefit to their industry for employing the terminology. The coalition should also focus on a unified message about the importance and appropriate uses of reclaimed water as part of Arizona's water portfolio and a plan to continuously and widely (at the state, county, and local levels) disseminate the message. Coalition members could include representatives from state, county and local jurisdictions, agricultural experts, industry experts, Arizona Universities, University of Arizona (U of A) Cooperative Extension, the AMAs, the Water Resources Research Center, the AZ Water Association, the Arizona section of the WaterReuse Association, interested members of the public and other parties (state, county, local). The coalition should be commissioned to formulate a strong, positive message that can be utilized on the state, county, and local level and that is appropriate to a variety of audience segments (agriculture, commercial, municipal, and consumer for example). ADWR and ADEQ should seek outside voluntary funding from federal, state, local and private institutions for to manage and administer the coalition, to acquire professional assistance, and to undertake a public awareness campaign. Information from the coalition should be reported regularly, using state and local jurisdiction websites and the media as well as encouraging stakeholder groups to keep their members informed.
2. ADWR should create a state-hosted, and easily accessible, information portal (with links to ADEQ, ACC, Universities and other relevant information) with researched-based information on water pricing, water supply, water quality, water management, and water conservation and efficiency programs (including reuse and water efficient technologies), and water harvesting. The portal should also include available information regarding education, training, rebates and ordinances as well as a section on funding options with links to possible organizations that could provide funding and case studies showing solutions to various reuse programs. Emphasis should be placed on detailed information regarding actual practices that have been analyzed for benefits and costs so that a provider or a district staff member can assess the information and make a tangible determination of the plausibility of the information for their own entity. To improve the information available through the portal, ADWR, ADEQ and ACC should improve the collection and dissemination of information about water supplies and demand and should promote electronic, real-time information sharing and discussion through on-line forums, e-mail groups, etc. This information should be promoted to all stakeholders, including water resource planners, industry and trade groups, agricultural interests, economic development staff, and business prospects. It could be utilized to educate economic development leaders, industry, and trade association groups (state, regional, and local) regarding the impact of new business and water demand upon one another.
3. A more robust approach, or a second-tier of the web-based portal, could be modeled after the U of A Cooperative Extension Service, where staff would be available to provide direct assistance ranging

from reconnaissance level feasibility assessment to helping with applications for funding. Staff would apply a common evaluation framework to the unique circumstances of the individual, business or community seeking assistance.

4. Public and private water and/or wastewater agencies should be encouraged to evaluate their ability to implement a reuse program within the next two years and to submit this evaluation to ADWR and ADEQ. Those entities that make the greatest efforts should be rewarded through public recognition of their efforts.
5. ADWR should develop, in cooperation with ADEQ, ACC, Universities and stakeholders, a series of out-of-session legislative meetings with stakeholders and legislators to discuss various aspects of water sources and the programs that protect and enhance water sustainability.
6. ADWR should expand the existing statewide awareness campaign to help encourage a culture of conservation that would make the public more receptive to local efforts. This campaign could ensure consistency of message, the greatest visibility, and the most efficient use of resources. This campaign should generate the umbrella awareness of the need for conservation as efficiently as possible, priming the public for more specific messages and allowing more funding on a local level to be concentrated on delivering targeted information to customers.
7. ADWR and ADEQ should request the Governor to proclaim an auspicious date as Water Reuse day for Arizona. The Agencies should also engage with academics, local celebrities, and business partners as official spokespeople for reclaimed water and should conduct an outreach campaign to potential users of reclaimed water.
8. Arizona should continue to rely on the combined expertise of Arizona's water managers in conjunction with the resources of the three universities as a means of expanding collaboration to support water resources management and technology development in real-world applications. The Universities serve as the hub of research, community assistance and analytical support to ensure clean and sustainable water resources and opportunities should be explored for strengthening links with Arizona's water managers.

A.2. PHARMACEUTICALS & PCPS

Issue {White Paper #16}

Many man-made compounds have made our lives safer, healthier and more convenient. However when released into the environment, even in trace concentrations, some of these substances may cause water quality, health and safety concerns. Their presence can also result in a public perception that use of reclaimed or recycled water is not safe. Because of the many compounds in use today and because we have a better understanding of their potential to impact human health and the environment, the process of setting water quality standards and regulations has grown increasingly important and complex. The Panel believes there is a need for the public, community leaders, water treatment professionals, businesses and industry to understand and be aware of water quality issues and how their actions, may impede the use of reclaimed water.

Recommendations

By focusing an effort on coordinated education and outreach, funding and legislative attention in the area of PPCPs, the Panel believes that the following recommendations can increase public awareness and confidence in the use of reclaimed or recycled water.

1. Education and Outreach
 - Work with national and other statewide programs to develop a consistent program nomenclature. For example, entities have different names for pharmacy take-back programs including Unwanted Medicine Return Program, Dispose-A-Med, No Drugs Down the Drain
 - Expand pharmaceutical take-back programs: participate at the state and national level in efforts to facilitate programs and offer them at no cost to the public
 - Urge ADEQ to implement a non-regulatory outreach/education/facilitation approach, that cuts through some of the barriers

- Be proactive with the media
 - Media outreach should include:
 - Linkage between water supplies and water quality
 - Description of how contaminants are regulated
 - Consistent messages regarding safety of reclaimed water for its intended uses
 - What the public can do to protect clean and safe water
 - Use experts, universities, professional industry organizations, subject matter experts, law enforcement and social media to educate the public on water quality issues
2. Funding
- Fund a statewide education and outreach campaign
 - Implement incentive programs for pharmacy and health departments
 - Fund drug take-back programs. Some programs charge a fee and others require proof of residency. These requirements are impediments to successful programs and discourage the public from using them.
 - Support funding for research in the following areas:
 - Evaluate the effects of trace organics in stream systems receiving wastewater
 - Evaluate the fate of trace organics in wastewater effluent discharge to surface water or infiltrated for groundwater replenishment
 - Explore the linkages, if any, between residual trace organic compounds in wastewater effluent and human health effects
 - Evaluate the environmental fate of PPCPs in Arizona settings where effluent is used for reuse, recharge, and environmental enhancement
 - See also Issue C.2 in this chapter for discussion of a strategic research plan related to emerging contaminants.
3. Legislation
- State laws specify the information that must be provided in prescriptions. One strategy is to advocate for an amendment to state law ARS 36, Chapters 27 and 28 to require pharmacies to post information about how to dispose of medications and personal care products and where to find take-back programs.
 - Legislation to support proper disposal of pharmaceuticals and personal care products should be administered by the Arizona Department of Health Services (ADHS) and the Arizona State Board of Pharmacy.

B. STANDARDS

Issues in this category are focused on the need for new or improved standards or related regulations and permit requirements to assist water users to increase their ability to utilize reclaimed water or other types of recycled water. Recommendations focus on matching recycled water supplies with appropriate end uses and removing uncertainties by coordinating regulations and planning efforts. Specific recommendations are proposed for developing standards for reclaimed water distribution system operations and design and for facilitating approval for projects aimed at coupling advanced treated reclaimed water with potable water sources, such as an aquifer.

B.1. MATCHING ALTERNATIVE WATER SUPPLIES TO APPROPRIATE END USES

Issue *{White Paper #12}*

Some recycled water supplies such as reclaimed water, remediated water, and brackish groundwater may not be utilized to the fullest extent throughout Arizona. Recognizing that not all recycled waters are appropriate for all classes of user, the Panel believes that efforts should be made to manage water supplies to optimize the matching of water quality to intended uses.

Recommendations

Recognizing that a “one size fits all” policy with respect to the use of lower quality water is unlikely to represent the best approach for Arizona, uniform model standards can be developed and may be useful; however, they must take into account site-specific conditions or provide for exceptions. To develop a comprehensive approach to matching water supplies to appropriate uses the Panel makes the following recommendations:

1. ADEQ, ADWR and the ACC should initiate a stakeholder’s process to review and amend regulations as necessary that will improve, enhance or encourage use, storage and exchange of lower quality water supplies. A focus should be made to encourage agricultural water users to use reclaimed or remediated water, where appropriate. Recognizing that funding for improvements to infrastructure is needed; changes or amendments may be needed to policies and regulations that impede utility providers and governing agencies from pursuing alternate water sources and exchanges.
2. ADWR should evaluate the potential for incentives that encourage use of lower quality water supplies (see also the Incentives section at the end of this chapter).
3. Public and private water utilities should be encouraged to invest in treatment technology research aimed at improving efficiency, cost reduction and quality improvement.
4. ADEQ, ADWR and the ACC should encourage research in water reuse. It may be less costly and alleviate concerns about possible emerging contaminants in reclaimed water to use this water for non-potable (agricultural or industrial) purposes.

B.2. DEVELOPING COMPREHENSIVE RECLAIMED WATER INFRASTRUCTURE STANDARDS

Issue *{White Paper #21}*

ADEQ statutes and rules provide a framework for the reuse of reclaimed water in Arizona. In 2001, ADEQ adopted in rule a relatively limited set of technical criteria for the design and construction of reclaimed water distribution systems, including criteria for both pipeline conveyances and open water conveyances. These criteria apply to conveyances transporting reclaimed water from the treatment plant to “the point of land application or end use.” Retrofit situations are not addressed, including conversions of drinking water system piping to reclaimed water use or vice versa. Other significant issues not addressed include cross connection control, meters and other appurtenances, augmentation of the system with other sources of water, and infrastructure abandonment. For reclaimed water infrastructure and distribution at the end use or “onsite,” i.e., following delivery of the reclaimed water from the conveyance to the end use (typically viewed as downstream of the reclaimed water meter), ADEQ rules provide very

few technical criteria as part of end use permits. Lack of comprehensive, standardized technical criteria at the State level is seen by many as a key impediment to increasing the reuse of reclaimed water and decreasing the cost of reclaimed water infrastructure. It also has spawned multiple standards-generating efforts at local levels that some regard as duplicative.

Recommendations

The Panel recommends compiling a matrix of state, regional and local specifications and infrastructure standards to identify similarities, inconsistencies, and gaps and develop recommendations on a suite of standards that will provide a common foundation of safety and good engineering practices for reclaimed water distribution systems. The Panel believes that this would reduce uncertainties over appropriate standards, reduce costs due to uncertainties, and would be further protective of public health and safety.

To facilitate the development of the matrix the Panel recommends ADEQ establish a Reclaimed Water Infrastructure Advisory Panel of state, county, local, and private experts. The Advisory Panel would review and enhance the matrix of State, regional and local infrastructure specifications and standards developed by the Blue Ribbon Panel Infrastructure/Retrofit Working Group. Based on the matrix, the Advisory Panel would review and make recommendations regarding minimum design and construction criteria appropriate for statewide use and local conditions, while balancing the need for communities and utilities to maintain the ability to adopt local standards to enable an increased use of reclaimed water. The Advisory Panel would devise processes for timely updating of standards and for ensuring that local conditions can be accommodated. The Advisory Panel would recommend whether specifications and standards should be adopted as ADEQ rule, or embodied in a guidance manual of best management practices, or accomplished as a combination of the two. The Advisory Panel would consider and recommend an appropriate administrative mechanism to ensure that the infrastructure specifications and standards are used throughout the state with minimum additional administrative burden and cost.

Due to time limitations, Working Group members were not able to complete a full analysis of Priority Issue #24, which called for developing a menu of BMPs for operation and maintenance of reclaimed water systems. Working Group members had agreed, however, that a menu of operation and maintenance BMPs would be valuable to owners/operators of reclaimed water systems and would provide a baseline for consistent operation state-wide. Since development of a menu of BMPs easily could be incorporated into the work of the Reclaimed Water Infrastructure Advisory Panel, it is recommended that the Advisory Panel consider adding this task to its program of work.

B.3. FACILITATING INDIRECT POTABLE REUSE

Issue *{White Paper #10}*

The Panel believes that there is a need to develop definitions and guidance for Indirect Potable Reuse (IPR) to clarify and facilitate drinking water source approval and local and state agency permitting requirements. IPR is defined as the injection of advanced treated reclaimed water into the saturated zone of a potable source water aquifer. Fundamentally, IPR is the intentional close coupling of advanced treated reclaimed water with a potable water source (i.e., aquifers). It is believed that IPR guidance would facilitate a standardized and efficient approach to design, permitting and operation of such projects. The intent for a unified IPR policy is to maximize the efficient use of secured water supplies for future growth and to augment surface and groundwater supplies during system outages or drought.

Currently, APP program administered by ADEQ allows for the recharge of aquifers with reclaimed water. However, the regulatory requirements for obtaining a New Source Approval to allow the recovery of groundwater augmented by reclaimed water to be connected to a Public Water System are indeterminate at this time. Without an adequate regulatory framework for New Source Approval for IPR projects such

investments cannot be made, thereby inhibiting the full utilization of reclaimed water supplies. It has therefore been suggested that IPR regulations be established to address water quality standards (regulated and unregulated constituents), differing hydrogeological circumstances of recharge and recovery, and multiple/engineered barriers of protection necessary to obtain a New Source Approval.

For the current State and County permit programs there are multiple layers of overlap and confusion related to the design, construction and operations of the facilities (e.g., implementation of new technologies to prevent operational injection clogging), hydrogeologic characterization of the area (e.g., address A.A.C. R18-5-502 and R12-15-818, both having a “100-foot separation rule”), monitor well design and location, water quality sampling/reporting requirements, water quality impacts (i.e., obtaining New Source Approval for IPR programs), groundwater level impacts, technical and financial capabilities of the applicant, and land ownership and land zoning issues. Permitting of such a facility could be most effectively addressed by all agencies cooperating and accepting a single, unified, and well defined review and approval framework which covers all issues of concern without duplication and inconsistencies.

Recommendations

IPR uses the latest technology to indirectly store and recover reclaimed water for supplementing potable water supplies. The Panel believes that the current regulatory framework of multiple agency rules and regulations should be streamlined for IPR projects by the following recommendations:

1. Create an IPR Multi-Agency Steering Committee. The Steering Committee shall be comprised of the Directors or their designees of ADEQ, ADWR, and County agencies. The Steering Committee’s mission is to further advance IPR’s use by streamlining agency reviews, incorporating new technologies, and directing the IPR Advisory Panel. The Steering Committee’s first priority should be the development of a state-wide unified policy on IPR. The policy should define the objectives of IPR; clarify how recharged reclaimed water can be source water acceptable for potable purposes; and define the process for issuing New Source Approvals for IPR facilities.
2. Create an IPR Advisory Panel to focus on the effectiveness and implementation of new technologies and field studies (e.g., tracer studies).
 - a. The advisory panel should report to the IPR Multi-Agency Steering Committee.
 - b. The advisory panel should include technical agency representatives, researchers, practitioners, and a citizen representative.
 - c. The advisory panel could address streamlining current and future multi-agency rules, technical issues, and public concerns as they arise.
 - d. Convene a citizens/industrial panel to determine if there is public acceptance for IPR and work with the regulatory agencies in identifying potential regulatory controls to be implemented.
3. ADEQ should open up the public rule making process and develop the regulatory framework for IPR.
4. Implement the above recommendations in a manner that has no detrimental effect on USF projects or APP discharges of reclaimed water that are already permitted and functioning.

B.4. OPERATOR CERTIFICATION FOR RECLAIMED WATER DISTRIBUTION SYSTEMS

Issue *{White Paper #15}*

A.A.C. R18-5-101 through 116 provides rules for classifications of water and wastewater facilities and certification of operators. The level of training and certification required depends upon the classification of water and wastewater facilities, based mainly upon their complexity and population served. However, this code does not include reclaimed water distribution systems operated by utilities. The Panel believes that without a state-recognized and approved training and certification program for operation of reclaimed water distribution systems, there is a risk to the entire water reuse industry in Arizona should there be an operator error in any one system that leads or directly contributes to harm or perception of harm to public health or the environment. Legal or press media scrutiny of such an error could result in public distrust

and fear that operators of reclaimed water distribution systems are not qualified to do so (even though they very well may be).

Recommendations

The Panel recommends that ADEQ facilitate the development of a reclaimed water distribution system operator training program and associated certification. The “certification” would actually be a reclaimed water operator “rider” that would be added to existing certifications that may be required for a utility. It is proposed that the AZ Water Association and WateReuse Arizona work together to develop and administer the program as a best practice, and refine the program over a year or two until it can be adopted into code by the State and be managed by ADEQ. As part of a future rule modification to include the reclaimed water operator rider program, it should be made a requirement that each reclaimed water utility designate an operator in direct responsible charge and that the operator in direct responsible charge must possess the reclaimed water operator rider. The program development and refinement process should include the ADEQ Operator Certification Committee. The white paper analysis on Priority Issue #15 (in Appendix V) provides the outline for a suggested training program.

It is proposed that this be an optional program jointly developed and administered by the AZ Water Association and WateReuse Arizona. Once the program is developed and implemented, modifications can be made as deemed necessary and appropriate over a 12 to 24 month period of time. Ultimately, it is suggested that the program be administered by ADEQ as part of the existing operator certification program, which would require a modification to the existing rule. Incorporating the reclaimed water distribution system operator certification program into rule is consistent with what is currently in place for water and wastewater operator certifications, formalizes the responsibilities of a reclaimed water distribution system operator within a legal framework, and facilitates the designation of an ‘operator in direct responsible charge’ by utilities.

B.5. WATER/ENERGY STANDARDS

Issue *{White Paper #7}*

Water utilities need electricity to support the treatment, distribution, collection, and reclamation of water. Electric utilities need water for power plant cooling purposes. While a linkage between water and electric service provision is evident, at the present time in Arizona and , in some cases, water service providers develop long range forecasts and plans without significant regard for electric service issues, and electric service providers develop long range forecasts and plans without significant regard for water service issues. One example of existing water - electric collaboration occurs under the general provisions of Arizona's Power Plant and Transmission Line Siting statute (A.R.S. § 40-360-06), where water resource impacts are addressed during the siting process.

Recommendations

Acknowledging that independent conservation efforts are being advanced within the water and electric service provision areas, more collaborative planning aimed at saving both water and electricity can be conducted. For a future in which water and electric service provision may be constrained, the Panel makes the following recommendations to facilitate collaboration between water and energy planners to ensure the most efficient use of water and energy:

1. As an initial step toward supporting increased collaboration between water and electric service providers, the ACC, ADWR, and ADEQ should facilitate a workshop aimed at promoting discussion among stakeholders regarding coordinated utility planning activities. Arizona’s electric and water industry regulatory agencies could take the lead in developing and moderating the proposed workshop. Participation in the forum or workshop would be voluntary; however results of the workshop may include best practice recommendations and/or the identification of guiding principles.

2. While the Panel recognizes some collaboration that occurs under the general provisions of Arizona's Power Plant and Transmission Line Siting statute (A.R.S. § 40-360-06), as identified above, collaboration may be increased by amending the statute for the sole purpose of specifying that the water resource impacts of a proposed generation facility should be considered in issuing a Certificate of Environmental Compatibility. The ACC should take the lead in this effort.

B.6. PERMITTING INCONSISTENCIES

Issue {White Paper #9}

The Panel believes that there may be inconsistencies between the AZPDES Permit Program, Surface Water Quality Standards, Reclaimed Water Quality Standards and Aquifer Protection Permits. It is unclear if there are significant inconsistencies between these programs that are an impediment to reclaimed water use. However, there is a perception that redundancies exist in permit reporting requirements causing frustration and unnecessary expenditures of resources on the part of the permittees. This uncertainty illustrates that there is a need for a greater understanding of the programs by the regulated community. What is allowed by one program may be inadvertently prohibited by another. The regulatory maze may be a disincentive, especially for small providers.

Recommendations

The Panel recommends that ADEQ lead an effort, in cooperation with ADWR, ACC and stakeholders to identify any inconsistencies or conflicts among the different agency programs (embodied in statutes, rules or policies). Reconciling inconsistency should have the impact of removing impediments to reuse and recharge where what is allowed by one program may currently be inadvertently blocked by another. To facilitate this review, the Panel recommends the development of a flowchart to identify what each program covers and where one program ends and the next program starts. Development of this matrix should be an effort of ADEQ, ADWR, ACC, and stakeholders. The regulating agencies should follow through on the results of the matrix to amend rules as necessary to resolve conflicts.

The Panel recognizes that this could easily turn into a big project at a time when agencies have scarce resources and further recommends that the agencies consider contracting with a third party to facilitate the process.

C. INFORMATION DEVELOPMENT & RESEARCH AGENDA

Accurate information is one of the most important elements of water sustainability. Good data promotes a common understanding of Arizona's water supplies. Development of rational regulations and standards that encourage reuse while protecting public health and safety, and increased public confidence in the use of reclaimed water, remediated water, gray water and stormwater also rely on timely and accurate data. Issues in this section focus on the need for accurate information regarding the amount of reclaimed water available in Arizona, a better understanding of the relationship of water and energy and streamlined coordination of data collection among the state's water agencies and water users. This section also contains recommendation to research technologies that can improve water and energy efficiency. In addition, a strategic research plan is proposed to alleviate barriers and water quality concerns, as well as to provide incentives, for best management practices related to stormwater and rainwater harvesting.

C.1. COORDINATING & STREAMLINING DATA SUBMISSION

Issue *{White Paper #4}*

Permit data submission by reclaimed water permittees is commonly done manually and is a time consuming process that typically involves more than one permit or application. Sometimes data has already been submitted for a report to an agency and it is required again for another agency or report. Paper reporting causes an inefficient submittal process. Good reuse and water management policies require current and accurate information. Some agencies/utilities may shy away from implementing a reuse program due to the real and perceived additional administrative requirements and costs to implement such a program. The Panel believes that streamlining data submission using current technology would reduce the administrative burden and improve data quality for regulatory agencies, permittees and public.

Recommendations

The Panel recommends that ADEQ and ADWR initiate a process to review and revise permit and non-permit data submittal requirements for necessary frequency, consistency, and the applicability of monitoring requirements. Data should be submitted electronically to avoid inefficient data submittal and the agencies should develop a standard for an electronic data management system that would be common and available to all regulators, permittees, contractors and the public. The agencies should utilize a stakeholder participation process to develop the system utilizing the expertise of information technology (IT) professionals, the expertise and capabilities developed by the regulated community to electronically report and manage data and to allow for electronic signatures. Regulators could work together with an IT firm to develop a common database that meets their needs as well as the needs of the permittees and public. The development of the data management system could be administered through an Intergovernmental Agreement between the regulatory agencies that require the data. The cost of developing the data management system should be shared by agencies that need the data.

The Panel also recommends that the ACC utilize common data from ADEQ and ADWR database to support application processes such as environmental quality compliance, water use data and wastewater flows.

After development of the system, the Panel recommends that ADEQ conduct outreach to ADHS certified laboratories to develop standardized electronic data submittals.

C.2. PROMOTE RESEARCH ON HUMAN HEALTH EFFECTS

Issue {White Paper #13}

The ability to measure extremely small levels of contaminants in water and recent media attention has increased the concern about emerging contaminants. There currently are no water quality standards and limited human health effect studies for many of these constituents. This situation has raised concern of whether or not the health of the population is threatened by the presence of these compounds. In response, limited research has been conducted by various groups, suggesting that additional coordinated research is needed. Doubt about public health impacts may impede the use of reclaimed water, and it elicits further concern regarding future possibilities for direct potable reuse of reclaimed water. The Panel believes that a strategic research plan is needed that supports new direction in policy and rule development in emerging contaminants, direct potable and full body contact reuse.

Recommendations

The Panel supports research on human health impacts in a traditional reuse setting (e.g. turf irrigation), separate from research into impacts on potable water and traditional in-stream discharge. This includes examination of exposure and risks associated with emerging contaminants (e.g. pharmaceutically active compounds, endocrine disruptors, personal care products) as well as from pathogens (e.g. protozoa). This information could be used to evaluate and possibly improve existing monitoring requirements and water quality standards. To implement this research the Panel recommends the following:

1. Arizona, California, Texas, Colorado, and Florida are national leaders in developing water reuse programs. These states could form a coalition, along with the WaterReuse Association, WaterReuse Research Foundation, EPA and other state and national institutions to develop a strategic research plan to answer questions regarding the development of new and expanded uses of reclaimed water and gray water. ADEQ should contact the WaterReuse Research Foundation and present them with a proposal to take the lead in bringing the states and EPA together to formulate a strategic research plan that addresses the issues described here.
2. ADEQ should convene a group of stakeholders to engage in a process that could eventually develop standards for emerging contaminants, direct potable reuse, and full body contact. This process would include identifying standards and monitoring requirements driven by the type of end use, (such as for drinking water, i.e. adopting drinking water standards), and would include associated health effects research and the development of indicator parameters appropriate to the end use. These standards should be technology based, employ a suite of treatments such as Granular Activated Carbon (GAC), high ozone, Reverse Osmosis (RO), etc., to address the broad spectrum of potential contaminants.

C.3. WATER/ENERGY NEXUS

Issue {White Papers #2, #22, #25}

Population projections continue to predict strong, long-term growth in Arizona. Water and energy needs are critical elements to consider when planning for growth. A better understanding is needed of the evolving relationship between future water and energy demands. Growing needs for water and energy are going to require a balancing of competing demands, and knowing how those needs change is essential.

Using less water requires less energy, which results in even more water savings at the power plant (as well as fewer carbon emissions). Therefore, pursuing water-energy nexus efficiency opportunities, evaluation of technologic feasibility thresholds, operational consequences, water and electric cost impacts, as well as site-specific considerations is necessary. In the electric business arena, some renewable resources (wind and solar photovoltaic) offer water use advantages. Consideration of dry cooling, or hybrid (wet and dry) cooling is one method of pursuing efficiency in the water-energy nexus.

However, to date, no dry or hybrid cooling systems have been built in Arizona due to actual or perceived impediments including, but not limited to, loss of generation capacity during the hottest months of the year (when power needs are at their highest), large land requirements to make up for losses in generating efficiencies, and the added capital costs for construction and the cost to produce power resulting in increased costs to ratepayers.

Additional efficiency improvements exist in the juncture of the water/energy nexus, presenting opportunities for joint ventures in technology transfer that will take advantage of economies of scale in both areas. Consumer oriented products that improve efficiency do not impede reuse or recycling per se, but a failure to optimize the use of water and energy saving technologies is an impediment to water and energy sustainability. In order to increase the availability of efficient fixtures, appliances, and technologies, there needs to be additional research and development for these water and energy saving items. Cooperation between the government, water providers, and industry is necessary to achieve this. These partnerships are critical to achieving water and energy savings, communicating the benefits of these technologies, and expediting the acceptance and adoption of them.

In addition to the water/energy nexus, additional efficiency improvements can be developed for all types of end uses. Information and research on the latest available technologies will assist water users in developing conservation measures that can address the unique characteristics of their communities and water use patterns.

The Panel believes that to address these issues there is a need for Arizona-specific information about how much water is embedded in energy production and how much energy is embedded in water production. Furthermore, the Panel agrees that Arizona must look at opportunities for efficiency in water use and the water and energy nexus including water-less solar facilities and dry cooling towers and increasing the availability of efficient fixtures, appliances, and technologies.

Recommendations

To gain a better understanding of the energy needs of producing water and the water needs of energy production, as well as providing continuous updated information on appropriate cooling technologies to promote water-efficient energy production, the Panel recommends the following:

1. ADWR and the ACC should cooperatively facilitate an Arizona-specific study that identifies the amount of water in energy and the amount of energy in water and an evaluation of the technologic feasibility, operational consequences, water use impacts and electric cost impacts of dry / hybrid cooling systems. (This may be more than one study, i.e. the cooling technology study may be performed separately with the higher level synopsis included in an overall report).
2. Legislation would not be needed to perform such a study. However, while oversight would come from ADWR and the ACC, adequate funding would need to be secured and could come in the form of grants or from the electric and water utilities within Arizona. The study should include support and feedback from a stakeholder group so that a thorough understanding of benefits and drawbacks are well understood prior to adoption of a new rule or policy. Uniform standards can be developed as a result of this study however it should be recognized that a “one size fits all” policy with respect to the use of dry or hybrid cooling is unlikely to represent the best approach for Arizona and must take into account site-specific conditions or provide for exceptions. Additional studies should be initiated to analyze the cost of FERC licensing that may be prohibitive to development of low-head hydro generation. The State should support evaluation of impediments to small (1.5 MW) low-head hydro generation in existing conduits resulting from FERC regulation.
3. ADWR should create a State-hosted information clearinghouse to store data (this could be done in conjunction with the information portal proposed on page in the Education/Outreach section of this chapter, Issue A.1, Recommendation 2). If creation of a State-hosted information clearinghouse is

infeasible due to the current state of the Arizona budget, then ADWR should look for other possible partners such as the State universities to house the data. Stakeholder input should be used to streamline the data-gathering process, using data already being reported to governmental agencies when possible. Once this is accomplished, the agency should work toward staffing of analytical support within a State agency as future budgets allow to provide feedback of current experiences and technologies.

4. ADWR and the ACC should support regional and national research that will encourage the development of innovative and groundbreaking products that will increase water use efficiency for all types of end uses and energy efficiency. The agencies should encourage federal funding for these research areas. It is important to note that research should not be limited solely to efficiency technology, but should also include a broad array of scientific studies. For example, plant research leading to the development of salt-tolerant varieties appropriate for reclaimed water use would prove fruitful, as would research on salt mitigation and reduction. The State should provide leadership for partnering in and supporting federal efforts. Individual jurisdictions could provide incentives for use of technology as their abilities and interests dictate.

C.4. RAINWATER HARVESTING & STORMWATER RESEARCH

Issue *{White Paper #26}*

Utilization of stormwater and rainwater at the regional, community and individual property owner levels is fairly new in the scheme of development. There is an opportunity for creative thinking that is technically oriented and based on sound engineering practices to be adopted in current regulations or guidance documents and made available for use. The Panel believes that further research is needed regarding regulatory barriers, cost and benefits, quality issues and avenues for increasing utilization of stormwater and rainwater at the regional, community and homeowner/property owner level. Additionally, the Panel believes that there is a need to provide incentives for emphasizing water harvesting as a preferred BMP for stormwater management.

Recommendations

The Panel recommends that ADWR approach the Arizona Floodplain Management Association or the National Association of Floodplain and Stormwater Management Agencies to “champion” the development of a strategic research plan to identify regulatory barriers, costs and benefits, quality issues and avenues for increasing utilization of stormwater and rainwater at the regional, community and individual property owner level. It is further recommended that a dialog be established with organizations such as the American Rainwater Catchment Systems Association and stakeholders to determine the extent of current research available and what research would be helpful in promoting more use of stormwater and rainwater.

Examples of questions that research should address include:

How much unused stormwater and rainwater can be reused?

What are the best uses for stormwater and rainwater?

What rules are currently in place that impede development of new applications for reuse in the areas of stormwater and rainwater?

Is technology available that is not being utilized? Why not?

What are the cost barriers to more reuse of stormwater and rainwater and how can they be reduced?

The significant efforts and progress made by Australia and Tucson in this area should be reviewed by ADWR for possible implementation statewide in Arizona.

D. REGULATORY IMPROVEMENTS

While regulations are aimed at protecting public health and safety and providing consistent application of statutes, there are concerns that some regulations inhibit the increased utilization of reclaimed water, remediated water, gray water and stormwater. Practical interpretation and implementation of rules by regulatory agencies is needed to promote increased utilization of these alternative water supplies. The issues in this category identify some of these limitations and make recommendations for improving consistency and coordination among the regulatory agencies and various regulatory programs.

D.1. ENCOURAGE THE USE OF ALTERNATIVE WATER SUPPLIES

Issue *{White Paper #8}*

Although traditional sources of water are becoming fully utilized in Arizona, potential applications of reclaimed water, reuse of gray water, stormwater and remediated water exist and are not being fully realized. Reasons include cost, effort, and current rules that should be amended as needed to keep up with current technology. Remediated water cannot currently be comingled with reclaimed water under a reclaimed water general permit; an individual permit must be processed by the ADEQ. Beneficial use of rainwater harvesting and stormwater management is not fully developed. Backflow and cross connection prevention to protect public drinking water systems and reuse sites from contamination is important to maintain public support for use of reclaimed water, gray water and other alternate water sources. The public needs assurance that health concerns regarding protection of drinking water supplies are adequately addressed, or they may oppose alternative water sources. Greater public education and outreach is needed regarding rainwater harvesting and stormwater opportunities.

The Panel believes that policy and rule changes are needed to encourage use of new water sources (reclaimed water, gray water, rainwater, stormwater and remediated water).

Recommendations

To encourage use of new water sources, the Panel recommends the following:

1. ADEQ and ADWR should review the rules that address comingling of remediated and reclaimed waters using a stakeholder process to identify changes. ADEQ rule in conjunction with ADWR policy needs to clearly address comingling of remediated waters with reclaimed water. ADEQ should review the rules to evaluate circumstances whereby a General Permit may be considered for comingling of remediated water and reclaimed water.
2. ADEQ's Stormwater BMPs need to encourage "green" infrastructure development such as rainwater harvesting and reclaimed water use, preservation of riparian corridors and groundwater recharge. Local agencies should be encouraged to adopt applicable BMPs and educational programs that promote "green" infrastructure development.
3. ADEQ should add an additional provision to the reclaimed water conveyance rules that refer to backflow requirements in A.A.C. R18-4-215 (ADEQ drinking water rule governing backflow provisions). Water providers would be responsible for enforcing backflow requirements.
4. ADEQ should amend R18-4-215 to specifically identify reclaimed water as an alternate water supply that would necessitate protection of the potable water service.
5. ADEQ should consider incorporating cross connection control requirements into rules administered by ADEQ.

D.2. ELIMINATE DUPLICATE REGULATIONS & FEES

Issue *{White Paper #1}*

A concern exists among stakeholders that definitions of terms in rules and statutes are inconsistent. After much general discussion at the working group level, the Panel chose not to recommend changing any of

the definitions. Instead the Panel recommends practical interpretation and implementation of rules by the regulatory agencies on a case-by-case basis that will promote increased utilization of reclaimed water.

One example of duplication has been identified in Maricopa County where the county is taking an active role in permitting reuse sites in a manner similar to ADEQ, although ADEQ has not delegated its reclaimed water program to any county. While Maricopa County believes it is providing additional service, duplication of requirements creates additional work, inefficient work flow and increased transactional costs for regulatory agencies, reclaimed water providers and end users that are operating with scarce resources. The issue causes confusion for the permittee regarding reporting requirements and possible liability regarding enforcement responsibilities for the regulatory agency. Furthermore, confusion regarding reuse authority creates negative public perception about the safety of reclaimed water.

Recommendations

The Panel believes that jurisdictional/duplication issues that exist between ADEQ, ADWR, ACC, counties should be identified and addressed. To address this issue, terms should be standardized; reporting requirements and fees should be examined for duplication among entities.

1. The ACC, ADEQ, ADWR and counties should review statutes for inconsistencies in definitions and duplication of fees.
2. ADEQ should review rules that apply to reclaimed water users for inconsistencies in definitions and duplication of fees.
3. ADEQ should initiate corrective action through their rulemaking process to fix the inconsistencies in A.A.C. R18-9 and R18-11 where references are made to the wrong location in A.R.S. 49-201 for the definitions of “Reclaimed water” and “On-site wastewater treatment facility.”
4. ADEQ should determine if counties are duplicating programs and charging fees for programs that are also being conducted by the State. Specifically, Maricopa County should consider amending its Health Code to be consistent with ADEQ Rules for permitted uses of reclaimed water to avoid confusion and facilitate the use of reclaimed water.

D.3. UPDATE RECLAIMED WATER QUALITY STANDARDS

Issue *{White Paper #11}*

The Panel believes that Title 18, Chapter 11, Article 3 Reclaimed Water Quality Standards should be reviewed and updated to take into account the experience and knowledge learned from reclaimed water use in Arizona. Cumbersome permitting processes may cause potential uses to be avoided. Specific standards to be addressed include:

- New candidates for general permits
- Type 3 gray water system design standards
- New gray water uses
- Definitions, amendments and signage requirements
- Review of outstanding issues
- Coliform monitoring issues (e.g. e-coli v. fecal coliform)
- Gray water usage limitations (quantity)
- Accommodate de minimus uses of alternate water sources
- Type 3 gray water system design standards review

Recommendations

The Panel specifically recommends that ADEQ take the following actions:

1. Develop a new general permit for commercial and municipal gray water users;

2. Revise standards for Type 3 gray water systems (R18-9-719);
3. Redefine permissive uses of gray water (R18-9-711. A.3);
4. Possible revisions to R18-9-101 (definitions) and R18-9-704 (signage);
5. Revise the fecal coliform rule (R18-11-303-307) so E coli may be used as the indicator organism for pathogen removal similar to the BADCT rule (R18-9-B204) and revise the coliform monitoring frequency requirement for Class A+, A, B+, and B reclaimed water in R18-11-303 to R18-11-306 to match the BADCT frequency in R18-9-B204;
6. Revise gray water permits to address size of application area and type of water demand (R18-9-711); and
7. Address de minimus uses under gray water permit requirements.

D.4. ESTABLISH RATEMAKING GUIDELINES

Issue {White Paper #23}

Public service corporations that provide water, wastewater and reclaimed water service regulated by the ACC lack the financial and ratemaking incentives, regulatory certainty and regulatory programs necessary to 1) facilitate and promote the implementation of demand side management and conservation programs; 2) acquire and deploy renewable (sustainable) supplies; 3) plan and construct infrastructure on a regional scale, all of which are necessary to promote sustainability; and 4) invest in large-scale regionally planned facilities or the acquisition of future renewable resources due, in part, to the regulatory concept of used and useful which generally holds that investment in facilities cannot be considered for recovery in rates until it is deemed to be providing service to current customers.

Recommendations

The Panel suggests that the ACC establish financial and rate-making guidelines for the ACC regulated water utilities that mirror the programs currently in effect for power utilities. Specifically, the Panel recommends that the ACC consider the following:

1. Establishment of a demand side management (DSM) and conservation program framework through a stakeholder or workshop process at the ACC with establishment of rules that include cost recovery method established for all future utility rate cases as part of rate case application;
2. Establish and promote effective revenue decoupling⁶ to remove revenue impediments to achievement of use reductions through stakeholder or workshop process at the ACC with establishment of rules that establish appropriate decoupling mechanisms;
3. Establish a consistent policy that promotes acquisition of renewable supplies in advance of supply needs. Establish appropriate funding mechanisms, needed to acquire such supplies and modify the “used and useful” standard or determine by ACC policy or rule that demonstration of sustainable and/or renewable supplies to offset current use of non-sustainable supplies is good public policy and is deemed to be “used and useful” for those supplies;
4. Establish by rule, a process where rate recovery of large capital-intensive infrastructure can begin before these facilities are placed in service. Allowing recovery as construction is on-going with step increases will provide utilities with a funding mechanism and help shield rate payers from rate shock;
5. Through stakeholder workshop process with the ACC, develop alternative funding methodologies that can provide funding for regionally-scaled reclaimed and renewable water facilities;
6. Insure that no existing policies, rules, legislation, or guidance, unnecessarily interfere with or make more difficult the potential to use private funding options for larger capital intensive projects;

⁶ Revenue decoupling is generally defined as a ratemaking mechanism designed to eliminate or reduce the dependence of a utility’s revenues on sales. It is adopted with the intent of removing the disincentive a utility has to administer and promote customer efforts to reduce water consumption and demand.

7. Partner with large water users to fund reclaimed water facilities and distribution systems; and
8. Seek private sector funding for large-scale water infrastructure projects, where appropriate.

D.5. ADDRESS UNIQUE SITUATIONS IN RECHARGE, REUSE AND AZPDES PERMITS

Issue *{White Paper #14}*

The Panel finds that Recharge, Reuse and AZPDES permits do not adequately address unique situations. The permit process may prohibit the use of reclaimed water for an environmental benefit because it is based on rigid standards that make the environmental use infeasible due to treatment costs. Regulation and permitting could better facilitate multiple benefits which recognize unique situations. Individual permits are expensive and time consuming. More General AZPDES Permits may be an incentive to use reclaimed water on sites that could benefit from the use of reclaimed water. This could allow improved compatibility with reuse permits. Rules are narrowly interpreted, resulting in policies that may impede utilization of reclaimed water. Whole Effluent Toxicity (WET) testing may be inappropriate for permitting some environmental restoration and multi-benefit projects, which are significant future uses of reclaimed water.

Recommendations

To allow for more flexibility so that reclaimed water use opportunities can be taken advantage of, and recognizing that EPA approval may be required in some cases, the Panel recommends that ADEQ implement the following modifications:

1. AZPDES general permits should be more widely offered for riparian areas, urban lakes, wetlands. There is a general APP (R18-9-D305) for wetlands discharge of A+ reclaimed water to natural wetlands, waters of the U.S., waters of the State, and riparian areas. ADEQ and stakeholders should develop a similar AZPDES general permit, if appropriate.
2. ADEQ should improve the interface between its various permitting program requirements where reclaimed water is incorporated as a resource to support a public project that involves overlapping programs with equally beneficial goals such as reuse, recharge of multiple water sources, stormwater management, stormwater harvesting, public amenities, wildlife benefits, etc.
3. To accommodate use of reclaimed water for environmental purposes (habitat restoration, riparian preservation, environmental and ecosystem enhancement projects, etc.) flexibility should be added to ADEQ's standards and permitting for surface water and reuse programs. Stakeholders and ADEQ should consider adopting one or more of the options or approaches included in White Paper on Priority Issue # 14 (Appendix V) in order to better facilitate environmental enhancement with reclaimed water.
4. ADEQ should develop a flexible approach that only applies WET in settings where aquatic wildlife impacts are likely. There should be additional research into alternative appropriate protections for AZPDES discharge in upland/ephemeral settings that are distinct from wet-water environments. In these settings, criteria for impact on terrestrial wildlife could be developed and applied.
5. Expand the application and provide guidance on implementation of Net Ecological Benefit (NEB) in individual AZPDES permits.

E. INCENTIVES

Improvements in regulations and standards may not fully facilitate the increased use of reclaimed water. However, incentives will provide additional benefits in moving Arizona closer to water sustainability.

E.1. DEVELOP, EXPAND AND PROMOTE TAX CREDITS FOR USE OF ALTERNATIVE WATER SUPPLIES

Issue *{White Paper #19}*

Currently, Arizona statute provides for a tax credit incentive for water conservation systems (A.R.S. §43-1090-01). The statute defines water conservation systems as systems capable of storing rainwater or gray water for reuse on a residential property. However, the tax credit will expire in tax year 2011. Less than half of the available tax credits were used during 2009 which could indicate that the availability of the tax credit is not widely known. Developers and rural property owners may not want to pursue gray water system installations or may not be encouraged to implement rainwater harvesting if the tax credit incentive expires and/or they are not aware of it due to the lack of publicity.

Adoption of A.R.S §49-204 removed the ability of some local governments to control gray water systems that was previously allowed by rule R18-9-711.C. The Statute states a city, town or county may not limit the use of gray water unless it is located in an initial Active Management Area, has a groundwater goal of safe yield, the area does not contain part of the CAP aqueduct and the effluent has been included in an assured water supply that permits towns, cities or counties to limit gray water systems. This means that water providers in some areas, where these conditions do not apply, cannot prohibit gray water systems, even if they have contractual commitments to reclaimed water customers. Local control of gray water outside these areas was allowed by rule before adoption of A.R.S §49-204. The price of water competes with the price of reclaimed water. A customer is likely to select the type of water that is most economically feasible for their project. The best use of reclaimed water could be aquifer recharge, industrial use or other types of large scale use in lieu of permitting gray water systems that might reduce the availability of reclaimed water to meet these uses. In this case it may be in the community's best interest to prohibit gray water systems so they are able to receive the return flow as wastewater.

The Panel believes that the current statutes have created jurisdictional issues with regards to control of gray water systems and because there are currently only limited financial and regulatory incentives for using reclaimed water, there is a need to provide incentives (or continue current incentives) for continued/expanded use of alternative sources of supply.

Recommendations

To provide the needed incentives to continue and/or expand the use of alternative water supplies, the Panel recommends the following:

1. A.R.S. §43-1090-01 should be extended by the Legislature and an effort should be made to publicize that it is available for tax credits (using the information portal recommended under Education/Outreach). ADWR and ADEQ should cooperate on facilitating this amendment. Administration of the tax credit would be the responsibility of the Arizona Department of Revenue.
2. A bill that expands the tax credit for reclaimed water infrastructure capital investment should be created. ADEQ and ADWR should assemble a work group tasked with considering how such a bill would look and try to find a sponsor for the bill.
3. A.R.S. §49-204 should be amended by the Legislature to allow for local control of gray water systems. ADEQ should take the lead on facilitating this amendment. Administration of the tax credit would be the responsibility of the Arizona Department of Revenue. Local governments would have clear authority to administer whether gray water systems are permitted or not by local ordinance.

4. ADWR should consider other policy changes that would provide incentives to encourage converting existing water uses to using alternative water supplies (see recommendations under Issue B.1 of this chapter).

Appendix I – Working Group Membership

A. PUBLIC PERCEPTION/ACCEPTANCE WORKING GROUP MEMBERS

NAME	AFFILIATION	NAME	AFFILIATION
Kathleen Chavez - Chair	Pima County Regional Wastewater Reclamation	Karen Dotson – Co-Chair	Tucson Water
Angela Lucci	City of Surprise	Ken Kroski	City of Phoenix Water Services Department
Anne Campbell		Kerry Schwartz	Arizona Project WET
Barbara A Glaus	Water Services Department	Kim Eberenz	Global Water
Barry G Carroll	Nalco Company	Leeann Spahos	City of Peoria
Brian Quill	Town of Gilbert	Leslie Hoy	
Carmelle Rodriguez	Global Water	Lynn Fisher	Bureau of Reclamation
Carol Erwin	Bureau of Reclamation	Madeline Kiser	
Cassie Martin	City of Surprise	Malene Binnion	
Channah Rock, Ph.D	University of Arizona	Marc Campbell	Salt River Project
Dale Lieb	Maricopa County	Mark Titus (Alternate)	Tucson Water
David Lelsz	ADEQ	Mary Alexander	DMB Associates
Debra Colodner	Arizona Sonora Desert Museum	Michael J. Fink	Environmental Resources Branch
Doug Toy	City of Chandler	Molly Greene	SRP
Ed Borromeo	Global Water	Patricia Cox	Bureau of Reclamation
Elizabeth Archuleta	Coconino County Board of Supervisors	Patricia Jordan	Town of Gilbert
Graham Symmonds	Global Water	Robert Wagner	Yavapai Regional Capital, Inc.
Jason Baran	AMWUA	Sam Sanchez	Nalco Company
Jo Cook	Arizona Municipal Water Users Association	Sofia Grigera	U of A
John Kmiec	Tucson Water	Steve Meltzer	Yavapai Regional Capital, Inc.
John Sellers	Yavapai Regional Capital, Inc.	Susanna Eden	
John Zambrano		Tom Poulson	U.S. Bureau of Reclamation
Kathy Rall	Town of Gilbert	Trevor Hill	Global Water
		Victoria Welch	City of Phoenix

B. REGULATIONS AND PERMITTING

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Angela Lucci	City of Surprise	Kimberlee Mulhern	Fort Huachuca
Asif Majeed	ADEQ	Leisha Williams	City of Peoria
Barry Rinehart	Central Arizona Project	Lisa Williams	ADWR
Bill Petrouson	Pima County	Marc Campbell	Salt River Project
Bob Frisby	Beaver Dam Water Company	Marcy Mullens	ADEQ
Byron McMillan	Pima County	Margaret LaBianca	Bryan Cave, LLP
Carie Wilson	City of Scottsdale	Mark Holmes	City of Mesa
Channah Rock	University of Arizona	Michele Robertson	ADEQ
Christine Nunez	City of Surprise	Michele Van Quathem	Ryley Carlock & Applewhite
Claire Zucker	Pima Assoc. of Governments	Michelle Wilson	City of Glendale
Chuck Graf	ADEQ	Mike Palermo	Ocotillo Management Association
Dale Bodiya	Maricopa County	Molly Green	Salt River Project
Dan Blackson	City of Surprise	Patty Jordan	Town of Gilbert
Dan Stanton	City of Tucson	Paul Miller	Water Masters
David Iwanski	City of Goodyear	Randy Gottler	City of Phoenix
David McNeil	City of Tempe	Richard Bartholomew	Bartholomew Engineering

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Eric Kaupanger	Maricopa County	Robert Hollander	Alan Plummer Associates
Gregg Elliott	Salt River Project	Robert Wagner	Yavapai Regional Capital, Inc.
Harlan Agnew	Pima County	Ron Fleming	Global Water
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Jennifer Hetherington	City of Mesa	Stephen Rot	City of Glendale
Jerald Postema	City of Goodyear	Steve Pawlowski	Sierra Club
Jeremy Mikus	City of Tempe	Susan Armijo	Global Water
Jim DuBois	Pima County	Susanna Eden	Water Resources Research Center
John Hetrick	Salt River Project	Suzanne Grendahl	City of Scottsdale
John Kmiec	City of Tucson	Teresa Valentine	Valentine Environmental Engineers
John Kolman	Maricopa County	Tim Walls	Rural Water Association of Arizona
John Sellers	Yavapai Regional Capital, Inc.	V.C. Danos	Arizona Municipal Water Users
Kathy Rall	Town of Gilbert	Wade Nobel	Nobel Law Offices
Kevin Chadwick	Maricopa County	Wally Wilson	City of Tucson

C. INFRASTRUCTURE/RETROFIT WORKING GROUP MEMBERS

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Chris Hassert	City of Scottsdale	Kathy Rall	Town of Gilbert
Chris Ward	Avera Water Co-op	Kevin Chadwick	Maricopa County
Chuck Graf	ADEQ	Kim Neill	City of Chandler
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Dale Lieb	Maricopa County	Maurice Tatlow	City of Scottsdale
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D. CONSERVATION/RECYCLING/EFFICIENCY/ENERGY NEXUS WORKING GROUP

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David Berry	Western Resource Advocates	Molly Greene	Salt River Project
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David Iwanski	City of Goodyear	Nancy Freeman	
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Joetta Miller	City of Glendale	Stan Snitzer	Maricopa Co. Stormwater Quality Program
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E. ECONOMIC/FUNDING WORKING GROUP MEMBERS

NAME	AFFILIATION	NAME	AFFILIATION
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Cecilio Flores	Tucson Water	Kevin Chadwick	Maricopa County
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Diana St. John	Pima County Regional Wastewater	Patricia Eisenberg	City of Tucson

APPENDICES
DRAFT FINAL REPORT – BRP (2) – 11/17/2010

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	Reclamation Department		
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Janeen Rohovit	Salt River Project	Tony Mardam	HDR
		Wendy LeStarge	Arizona Department of Environmental Quality

Appendix II – Working Group Issues

<i>Public Perceptions/Acceptance Working Group</i>	
	The need for consistency in the use of common and positive terminology to convey effective messages about water sustainability (PPA)
	The need for a better public understanding of the overall water picture and the role of reclaimed water in the water cycle (PPA)
	The need for the public, community leaders, water treatment professionals, businesses and industry to understand and be aware of water quality issues and how their actions, including disposal of pharmaceuticals and personal care products, can influence water quality (PPA)
	The need to create and expand public confidence that reclaimed water is safe for reuse through an understanding of how the water is treated and the types of potential uses for reclaimed water (PPA)
	The need to build a constituency for increased use and acceptance of reclaimed and recycled waters for beneficial purposes through education, outreach and other strategies (PPA)
<i>Conservation/Recycling/ Efficiency/Energy Nexus Working Group</i>	
	Guiding Principles - Recommendations must reflect that each area of the state has unique circumstances (CREEN)
	Guiding Principles - There is need for better awareness and education campaigns that target groups such as the public, decision makers and policy makers in all areas of discussion (CREEN)
	Guiding Principles - There is a need for improved data, research and better definition of terms in all areas of discussion (CREEN)
	Guiding Principles - Efforts should be made to manage water supplies to optimize the matching of water quality to intended uses (CREEN)
	Guiding Principles - The cost and benefits of all recommendations must be considered (CREEN)
	Stormwater Management - Further research is needed regarding regulatory barriers, costs and benefits, quality issues and avenues for increasing utilization of stormwater and rainwater at the regional, community and homeowner/property owner level. (CREEN)
	Stormwater Management - Identify what is needed to further encourage use of stormwater (CREEN)
	Water Energy Nexus - Ways to facilitate collaboration between water and energy planners should be developed to ensure the most efficient use of water and energy
	Water Energy Nexus - Arizona-specific information is needed about how much water is embedded in energy and how much energy is embedded in water (CREEN)
	Conservation - Water resource availability and associated development costs establish the role of water efficiency and demand curtailment programs in addressing growth and drought. This interrelationship must be incorporated in water resource planning at all levels (CREEN)
	Conservation - It is important to consider a continuing role for research and incentives which will transition worthy technologies into mainstream markets (CREEN)
	Conservation - To develop support for programs that protect and enhance sustainability of Arizona water supplies, a firmly-grounded and fact-based awareness of the relationship of water availability, conservation, the economy, the environment and desired quality of life among the public, business community and governmental leaders is necessary (CREEN)

Infrastructure/Retrofit	
	Compile a matrix of State, regional, and local specifications and infrastructure standards and use it to identify similarities, inconsistencies, and gaps. Use the matrix to develop recommendations to the BRP on a suite of standards that will provide a common foundation of safety and good engineering practice for reclaimed water distribution systems (IR)
	Compile a matrix of O&M best management practices (BMPs) that are applicable to reclaimed water distribution. Use the matrix to develop recommendations to the BRP on a menu of BMPs appropriate for use in Arizona (IR)
	Develop definitions and guidance for Indirect Potable Reuse (IPR) in aquifers in association with drinking water source approval and local and state agency permitting requirements to facilitate a standardized and efficient approach to design, permitting, and operation of such projects (IR)
	Coordinate with the Regulations/Permitting Working Group to analyze an array of approaches needed to implement the recommendations of Issues 1, 2, and 3 above in a manner that will eliminate current impediments (IR)
	Identify issues and develop approaches to operator training/certification for reclaimed water utility distribution systems to ensure consistent and safe management of this resource and its associated infrastructure. Based upon the analysis, develop recommendations on operator certification for the BRP (IR)
Regulations/Permitting	
	Data collection needs to be streamlined to reduce the administrative burden on reclaimed water providers. ADEQ and ADWR should initiate a review process of data collection requirements, monitoring requirements, and reporting requirements for permit and non-permit information. <ul style="list-style-type: none"> • Data should be collected in an efficient manner, avoid redundancies, where possible and reflect a comprehensive picture of reclaimed water use • Permit requirements should be reviewed for frequency, consistency, and applicability of monitoring • Consider the expertise/capabilities developed by the regulated community to electronically report and manage data; and accept electronic signatures (RP)
	Recharge, Reuse, and AZPDES permits do not adequately address unique situations. More flexibility is needed so that reclaimed water use opportunities can be taken advantage of. <ul style="list-style-type: none"> • De-chlorination requirements for riparian and recharge projects should be case by case • Lake management plans could substitute for narrative nutrient standards • Permits need to be consistent (APP BADCT/Reclaimed Water Quality Standards) • General permits should be more widely offered (RP)
	Policy and rule changes are needed to encourage use of new water sources (reclaimed water, gray water, rainwater, stormwater, and remediated water). <ul style="list-style-type: none"> • ADWR policy should clearly address comingling of remediated waters with reclaimed water • BMPs need to encourage “green” infrastructure development such as rainwater harvesting • Aquifer Protection Permit and Reclaimed Water Permit Rules should emphasize protection of public drinking water sources from contamination to maintain public support for use of reclaimed water, gray water and other alternate water sources (RP)
	Jurisdictional/duplication issues exist between ADEQ, ADWR, ACC, counties, and other entities. <ul style="list-style-type: none"> • Terms should be standardized • Reporting requirements should be examined for duplication

	<ul style="list-style-type: none"> • Fees should be examined for duplication between entities (RP)
	<p>Education and outreach need to be stronger components of regulatory programs. Regulations need to encompass these issues so the public better understands the benefits and safety of the use of alternate sources of water supply.</p> <ul style="list-style-type: none"> • Design guidelines are needed for persons considering and installing gray water systems • Reclaimed water use can offset and help conserve potable water sources (RP)
	<p>A strategic research plan is needed that supports new directions in policy and rule development (emerging contaminants, direct potable and full body contact reuse).</p> <ul style="list-style-type: none"> • Direct potable reuse • Research efforts coordinated similar to those under the prior Arizona Water Institute • Technology based standards development process • Human health impacts for existing, traditional reuse applications • Human health impacts of PCPs in gray water (RP)
	<p>Title 18, Chapter 11, Article 3 Reclaimed Water Quality Standards need review and updating to take into account experience and knowledge learned from reclaimed water use in Arizona.</p> <ul style="list-style-type: none"> • New candidates for general permits • Type 3 gray water system design standards based on on-site treatment • New gray water uses • Definitions, amendments, signage requirements • Review of outstanding issues • Coliform monitoring issue (e.g. E. coli vs fecal coliforms) • Gray water usage limitations (quantity) • Accommodate de minimus uses of alternate water sources • Type 3 gray water system design standards review (RP)
	<p>Current state statutes have created a jurisdictional issue with regards to control of gray water systems and need to provide incentives for continued/expanded use of alternate sources of water supply.</p> <ul style="list-style-type: none"> • Tax credits for gray water systems • Provide financial and regulatory incentives for conversions • Local control of gray water systems (RP)
	<p>Items identified that should remain on the radar for future consideration, but currently work well.</p> <ul style="list-style-type: none"> • Enhance education efforts to promote reuse that currently already have standards and framework in place by statute and rule • Local control of salinity requirements • Local control of water softeners • The definition of effluent (RP)
	<p>Interactions and inconsistencies between the AZPDES Permit Program, Surface Water Quality Standards, Reclaimed Water Quality Standards and Aquifer Protection Permits need to be resolved.</p> <ul style="list-style-type: none"> • A flowchart/matrix will assist in clarification. This should have the impact of removing impediments to reuse and recharge where what is allowed by one program might be inadvertently blocked by another. The flowchart should identify what each program covers and where one program ends and the next program starts. The working group believes it is beyond their scope to develop this matrix and it should be an effort of ADEQ (RP)
<i>Economic/Financing</i>	
	<p>Provide technical support and a Clearinghouse for assistance to Arizona communities. (EF)</p>
	<p>Establish financial and rate-making guidelines for the ACC regulated water utilities that mirror the programs currently in effect for the power utilities. (EF)</p>

APPENDICES

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	Continue and expand WIFA grant and loan programs targeted to Green Infrastructure such as aquifer recharge, and stormwater capture/rainwater harvesting. (EF)
	Incentivize Green Infrastructure by introducing simplified ADWR and ADEQ regulatory and permitting programs which save time and effort for smaller communities. (EF)
	Refine Arizona policies and regulations governing the accrual of groundwater credits to provide incentives for conversion to reclaimed water from groundwater pumping for groundwater turf users proximate to reclaimed lines. (EF)
	Provide incentives for emphasizing water harvesting as a preferred Best Management Practice (BMP) for stormwater management. (EF)
	Make changes to state statutes to grant full recharge credit to the Secretary of the Interior for effluent used to sustain the flows in riparian corridors. (EF)
	Look at opportunities for efficiency in the water and energy nexus including water-less solar facilities and dry cooling towers (EF)
	Gray water incentives should be provided to the commercial and municipal sector. (EF)

Appendix III – BRP Priority Issues
BRP ISSUE PRIORITIZATION
DRAFT Recommendation Approach
October 29, 2010

EDUCATION/OUTREACH

- *(Priority Issue #17)* Need for consistency in the use of common and positive terminology to convey effective messages about water sustainability;
- *(Priority Issue #20)* Need for better public understanding of the overall water picture and the role of reclaimed water in the water cycle;
- *(Priority Issue #16)* Need for the public, community leaders, water treatment professionals, businesses and industry to understand and be aware of water quality issues and how their actions including disposal of pharmaceuticals and personal care products can influence water quality;
- *(Priority Issue #5)* Need to create and expand public confidence that reclaimed water is safe for reuse through an understanding of how the water is treated and the types of potential uses for reclaimed water and the need to build a constituency for increased use and acceptance of reclaimed and recycled waters for beneficial purposes through education, outreach and other strategies;
- *(Priority Issue #6)* To develop support for programs that protect and enhance sustainability of Arizona water supplies; a firmly-grounded and fact-based awareness of the relationship of water availability, conservation, the economy, the environment and desired quality of life among the public, business community and government leaders is necessary;
- *(Priority Issue #3)* Water resource availability and associated development costs establish the role of water efficiency and demand curtailment programs in addressing growth and drought. This interrelationship must be incorporated in water resource planning at all levels.

STANDARDS

- *(Priority Issue #12)* Efforts should be made to manage water supplies to optimize the matching of water quality to intended uses (Can also be a part of regulatory rationalization and education/outreach);
- *(Priority Issue #21)* Compile a matrix of state, regional and local specifications and infrastructure standards and use it to identify similarities, inconsistencies and gaps. Use the matrix to develop recommendations on a suite of standards that will provide a common foundation of safety and good engineering practice for reclaimed water distribution systems;
- *(Priority Issue #24)* Compile a matrix of O&M best management practices (BMPs) that are applicable to reclaimed water distribution. Use the matrix to develop recommendations to the BRP on a menu of BMPs appropriate for use in Arizona;
- *(Priority Issue #10)* Develop definitions and guidance for Indirect Potable Reuse (IPR) in aquifers in association with drinking water source approval and local and state agency permitting requirements to facilitate a standardized and efficient approach to design, permitting and operation of such projects;
- *(Priority Issue #15)* Identify issues and develop approaches to operator training/certification for reclaimed water utility distribution systems to ensure consistent and safe management of this resource and its associated infrastructure. Based upon the analysis, develop recommendations on operator certifications for the BRP;
- *(Priority Issue #7)* Facilitate collaboration between water and energy planners should be developed to ensure the most efficient use of water and energy;

- *(Priority Issue #9)* Interactions and inconsistencies between the AZPDES Permit Program, Surface Water Quality Standards, Reclaimed Water Quality Standards and Aquifer Protection Permits need to be resolved.
 - A flowchart/matrix will assist in clarification. This should have the impact of removing impediments to reuse and recharge where what is allowed by one program might be inadvertently blocked by another. The flowchart should identify what each program covers and where one program ends and the next program starts. The working group believes it is beyond their scope to develop this matrix and it should be an effort of ADEQ.

INFORMATION DEVELOPMENT & RESEARCH AGENDA

- *(Priority Issue #4)* Data collection needs to be streamlined to reduce the administrative burden on reclaimed water providers. ADEQ and ADWR should initiate a review process of data collection requirements, monitoring requirements and reporting requirements for permit and non-permit information.
 - Data should be collected in an efficient manner, avoid redundancies where possible and reflect a comprehensive picture of reclaimed water use;
 - Permit requirements should be reviewed for frequency, consistency and applicability of monitoring;
 - Consider the expertise/capabilities developed by the regulated community to electronically report and manage data; and accept electronic signatures.
- *(Priority Issue #13)* A strategic research plan is needed that supports new direction in policy and rule development (emerging contaminants, direct potable and full body contact reuse)
 - Direct potable use;
 - Research efforts coordinated similar to those under the prior Arizona Water Institute;
 - Technology based standards development process;
 - Human health impacts for existing, traditional reuse applications;
 - Human health impacts of PCPs in gray water.
- *(Priority Issue #2)* Arizona-specific information is needed about how much water is embedded in energy and how much energy is embedded in water;
- *(Priority Issue #25)* Look at opportunities for efficiency in the water and energy nexus including water-less solar facilities and dry cooling towers;
- *(Priority Issue #22)* It is important to consider a continuing role for research and incentives which will transition worthy technologies into mainstream markets.
- *(Priority Issue #26)* Further research is needed regarding regulatory barriers, cost and benefits, quality issues and avenues for increasing utilization of stormwater and rainwater at the regional, community and homeowner/property owner level. Provide incentives for emphasizing water harvesting as a preferred Best Management Practice (BMP) for stormwater management.

“REGULATORY RATIONALIZATION”

- *(Priority Issue #8)* Policy and rule changes are needed to encourage use of new water sources (reclaimed water, gray water, rainwater, Stormwater and remediated water). (Can also be under Incentives)
 - ADWR policy should clearly address commingling of remediated waters with reclaimed water;
 - BMPs need to encourage “green” infrastructure development such as rainwater harvesting;
 - Aquifer Protection Permit and Reclaimed Water Permit Rules should emphasize protection of public drinking water sources from contamination to maintain public

- support for use of reclaimed water, gray water and other alternative water sources (Can also be part of Education/Outreach)
- Refine Arizona policies and regulations governing the accrual of groundwater credits to provide incentives for conversion to reclaimed water from groundwater pumping for groundwater turf and irrigation users – proximate to reclaimed lines;
- *(Priority Issue #1)* Jurisdictional/duplication issues exist between ADEQ, ADWR, ACC, counties and other entities –terms should be standardized, reporting requirements should be examined for duplication and fees should be examined for supplication between entities;
- *(Priority Issue #11)* Title 18, Chapter 11, Article 3 Reclaimed Water Quality Standards need review and updating to take into account experience and knowledge learned from reclaimed water use in AZ (Can also be under Standards):
 - New candidates for general permits
 - Type 3 gray water system design standards
 - New gray water uses
 - Definitions, amendments and signage requirements
 - Review of outstanding issues
 - Coliform monitoring issues (e.g. e-coli v. fecal coliform)
 - Gray water usage limitations (quantity)
 - Accommodate de minimus uses of alternate water sources
 - Type 3 gray water system design standards review
- *(Priority Issue #23)* Establish financial and rate-making guidelines for the ACC regulated water utilities (and public utilities) that mirror the programs currently in effect for power utilities;
- *(Priority Issue #14)* Recharge, Reuse and AZPDES permits do not adequately address unique situations. More flexibility is needed so that reclaimed water use opportunities can be taken advantage of.
 - De-Chlorination requirements for riparian and recharge projects should be case-by-case;
 - Lake management plans should substitute for narrative nutrient standards;
 - Permits need to be consistent (APP BADCT/Reclaimed Water Quality Standards)
 - General Permits should be more widely offered.

INCENTIVES

- *(Priority Issue #19)* Current state statutes have created a jurisdictional issue with regards to control of gray water systems and need to provide incentives for continued/expanded use of alternative sources of water supply:
 - Tax credits for gray water systems;
 - Provide financial and regulatory incentives for conversions;
 - Local control of gray water systems.
- *(Priority Issue #18)* Provide technical support and serve as a clearinghouse for AZ communities in determining needs for water resource requirements relative to reclaimed water and to provide assistance with eligibility for grants and financial assistance and continue and expand WIFA grant and loan programs targeted to Green Infrastructure such as aquifer recharge and stormwater capture/rainwater harvesting.

Appendix IV – MNPPCP BMPs

Category 1: Public Awareness/Public Relations

- 1.1 Local and/or regional messaging program
- 1.2 Special events/programs and community presentations
- 1.3 Market surveys to identify information needs/assess success of messages

Category 2: Conservation Education and Training

- 2.1 Adult education and training programs
- 2.2 Youth conservation education program
- 2.3 New homeowner landscape information
- 2.4 Xeriscape demonstration garden
- 2.5 Distribution plan for water conservation materials

Category 3: Outreach Services

- 3.1 Residential audit program
- 3.2 Landscape consultations (residential and/or non-residential)
- 3.3 Water budgeting program (non-residential)
- 3.4 Residential interior retrofit programs
- 3.5 Non-residential interior retrofit programs
- 3.6 Customer high water use inquiry resolution
- 3.7 Customer high water use notification
- 3.8 Water waste investigations and information

Category 4: Physical System Evaluation and Improvement

- 4.1 Leak detection program
- 4.2 Meter repair and/or replacement program
- 4.3 Comprehensive water system audit program

Category 5: Ordinances / Conditions of Service / Tariffs

- 5.1 Low water use landscaping requirements for residential, multi-family, non-residential and/or common areas
- 5.2 Water tampering/water waste ordinances
- 5.3 Plumbing code requirements if more restrictive than the 1990 Uniform Plumbing Code
- 5.4 Limitations on water features and/or water intensive landscaping and turf
- 5.5 Ordinance for model home landscapes in new residential developments
- 5.6 Required on-site gray water/water harvesting features at residences and/or businesses
- 5.7 Requirements for car wash water recycling
- 5.8 Landscape watering restrictions (time of day, etc.)
- 5.9 Requirements for hot water recirculation devices for residential, multi-family and or non residential sectors
- 5.10 Retrofit on resale
- 5.11 Landscape water-use efficiency standards for non-residential users
- 5.12 Conservation tariff (private water companies)
- 5.13 Water use plan for new large non-residential users

Category 6: Rebates/Incentives

- 6.1 Toilet rebate (residential and/or multifamily homes)
- 6.2 High efficiency flush toilet rebate (residential and/or multifamily homes)
- 6.3 Toilet replacement (residential and/or multifamily homes)
- 6.4 Indoor water fixture replacement/rebate/incentive (residential and/or multifamily homes)
- 6.5 Hot water recirculating system or instant hot water system rebate (residential, multifamily, or nonresidential)
- 6.6 Water efficient appliances rebate/incentive
- 6.7 Gray water retrofit/rebate/incentive
- 6.8 Water harvesting retrofit/rebate/incentive
- 6.9 Landscape conversion rebate/incentive
- 6.10 Xeriscape installation rebate in new landscapes
- 6.11 Commercial and industrial program, e.g. audits, incentives, rebates, etc.
- 6.12 Large landscape conservation program (non-residential)
- 6.13 No/low interest loans for implementing water conservation measures (non-residential)

Category 7: Research/Innovation Program

- 7.1 Implement an emerging technology
- 7.2 Initiate or support applied research to enhance decision making
- 7.3 Evaluate new and emerging technologies and practices
- 7.4 Conduct quantitative analysis of a conservation measure (for water savings results)
- 7.5 Implement smart irrigation technology
- 7.6 Develop industry partnerships to save water
- 7.7 Support the development of new technologies and products
- 7.8 Pilot a new initiative, project or program

Appendix V – Working Group White Paper Analyses

Pending

Appendix VI – Summary of Recommendations

ISSUE	RECOMMENDATIONS
A. EDUCATION/OUTREACH	
<p>A.1 – Increasing Public Awareness (<i>page 27</i>)</p>	<ul style="list-style-type: none"> - Create a coalition to engage industry experts and enlist professional assistance to translate industry terminology into an acceptable lexicon for statewide use; - Create a state-hosted information portal on water pricing, water supply, water quality, water management, and water conservation and efficiency programs (including reuse and water efficient technologies), water harvesting, and education/technology information. Improve the collection and dissemination of information about water supplies and demand and promote electronic, real-time information sharing and discussion through on-line forums, e-mail groups, etc; - Encourage public and private water and/or wastewater agencies should to evaluate their ability to implement a reuse program within the next two years; - Develop a series of out-of-session legislative meetings to discuss various aspects of water sources and the programs that protect and enhance water sustainability; - Expand the existing statewide awareness campaign to help encourage a culture of conservation; - Request the Governor to proclaim a Water Reuse day for Arizona; - Continue to rely on the combined expertise of Arizona's water managers in conjunction with the resources of the three universities as a means of expanding collaboration to support water resources management and technology development in real-world applications
<p>A.2 – Pharmaceuticals & PCPs (<i>page 28</i>)</p>	<ul style="list-style-type: none"> - Expand pharmaceutical take-back programs, develop a consistent program nomenclature, and expand media outreach; - Fund a statewide education and outreach campaign, drug take-back programs, and research on the effects of trace organics in stream systems receiving wastewater, the fate of trace organics in wastewater effluent discharge to surface water or infiltrated for

ISSUE	RECOMMENDATIONS
	<p>groundwater replenishment, the linkages, if any, between residual trace organic compounds in wastewater effluent and human health effects, and the environmental fate of PPCPs in Arizona settings where effluent is used for reuse, recharge, and environmental enhancement;</p> <ul style="list-style-type: none"> - Amend state statutes to require pharmacies to post information about how to dispose of medications and PCPs and where to find take-back programs.
B. STANDARDS	
<p>B.1 – Matching Alternative Water Supplies to Appropriate End Uses <i>(page 30)</i></p>	<ul style="list-style-type: none"> - Initiate a stakeholder process to review and amend regulations as necessary that will improve, enhance or encourage use, storage and exchange of recycled water supplies; - Evaluate the potential for incentives that encourage use of lower quality water supplies; - Encourage public and private water utilities to invest in treatment technology research aimed at improving efficiency, cost reduction and quality improvement; - Encourage research in water reuse.
<p>B.2 – Developing Comprehensive Reclaimed Water Infrastructure Standards <i>(page 30)</i></p>	<ul style="list-style-type: none"> - Compile a matrix of state, regional and local specifications and infrastructure standards to identify similarities, inconsistencies, and gaps and develop recommendations on a suite of standards that will provide a common foundation of safety and good engineering practices for reclaimed water distribution systems - establish a Reclaimed Water Infrastructure Advisory Panel of state, county, local, and private experts to facilitate development of the matrix.
<p>B.3 – Facilitating Indirect Potable Reuse <i>(page 31)</i></p>	<ul style="list-style-type: none"> - Create an IPR Multi-Agency Steering Committee to further advance IPR’s use by streamlining agency reviews, incorporating new technologies, and directing the IPR Advisory Panel. The Steering Committee’s first priority should be the development of a state-wide unified policy on IPR; - Create an IPR Advisory Panel to focus on the effectiveness and implementation of new technologies and field studies.

ISSUE	RECOMMENDATIONS
B.4 – Operator Certification for Reclaimed Water Distribution Systems (page 32)	<ul style="list-style-type: none"> - Develop a reclaimed water distribution system operator training program and associated certification
B.5 – Water/Energy Standards (page 33)	<ul style="list-style-type: none"> - Facilitate a voluntary workshop aimed at promoting discussion among stakeholders regarding coordinated water and energy utility planning activities - the workshop may include best practice recommendations and/or the identification of guiding principles; - Amend A.R.S. § 40-360-06 to specify that the water resource impacts of a proposed generation facility should be considered in issuing a Certificate of Environmental Compatibility.
B.6 – Permitting Inconsistencies (page 34)	<ul style="list-style-type: none"> - Convene a stakeholder process to identify inconsistencies or conflicts among the different agency (ADWR, ADEQ and ACC) programs (embodied in statutes, rules or policies). To facilitate this review, develop a flowchart to identify what each program covers and where one program ends and the next program starts
C. INFORMATION DEVELOPMENT & RESEARCH AGENDA	
C.1 – Coordinating & Streamlining Data Submission (page 35)	<ul style="list-style-type: none"> - ADEQ and ADWR initiate a stakeholder process to review and revise permit and non-permit data submittal requirements for necessary frequency, consistency, the applicability of monitoring requirements, develop a common database and develop electronic data submittal procedures; - The ACC should utilize common data from the ADEQ and ADWR database to support application processes such as environmental quality compliance, water use data and wastewater flows; - ADEQ conduct outreach to ADHS certified laboratories to develop standardized electronic data submittals.
C.2 – Promote research on Human Health Effects (page 36)	<ul style="list-style-type: none"> - Form a coalition between Arizona, California, Texas, Colorado, and Florida (national leaders in developing water reuse programs) along with the WaterReuse Association, WaterReuse Research Foundation, EPA and other state and national institutions to develop a strategic research plan to answer questions regarding the development of new and expanded uses of reclaimed water and gray water;

ISSUE	RECOMMENDATIONS
	<ul style="list-style-type: none"> - Convene a group of stakeholders to engage in a process that could eventually develop standards for emerging contaminants, direct potable reuse, and full body contact.
<p>C.3 – Water/Energy Nexus <i>(page 36)</i></p>	<ul style="list-style-type: none"> - Facilitate an Arizona-specific study to identify the amount of water in energy and the amount of energy in water and an evaluation of the technologic feasibility, operational consequences, water use impacts and electric cost impacts of dry / hybrid cooling systems; - Create a State-hosted information clearinghouse to store water/energy nexus data ; - Support regional and national research that will encourage the development of innovative and groundbreaking products that will increase water use efficiency for all types of end uses and energy efficiency.
<p>C.4 – Rainwater Harvesting & Stormwater Research <i>(page 38)</i></p>	<ul style="list-style-type: none"> - Approach the Arizona Floodplain Management Association or the National Association of Floodplain and Stormwater Management Agencies to “champion” the development of a strategic research plan to identify regulatory barriers, costs and benefits, quality issues and avenues for increasing utilization of stormwater and rainwater at the regional, community and individual property owner level.
D. REGULATORY IMPROVEMENTS	
<p>D.1 – Encourage the Use of Alternative Water Supplies <i>(page 39)</i></p>	<ul style="list-style-type: none"> - Review the rules that address comingling of remediated and reclaimed waters , modify agency rules and/or policies to clearly address comingling of remediated waters with reclaimed water and review rules to evaluate circumstances whereby a General Permit may be considered for comingling of remediated water and reclaimed water; - Stormwater BMPs need to encourage “green” infrastructure development such as rainwater harvesting and reclaimed water use, preservation of riparian corridors and groundwater recharge. Local agencies should be encouraged to adopt applicable BMPs and educational programs that promote “green” infrastructure development;

ISSUE	RECOMMENDATIONS
	<ul style="list-style-type: none"> - Add an additional provision to the reclaimed water conveyance rules to refer to backflow requirements; - Amend R18-4-215 to specifically identify reclaimed water as an alternate water supply that would necessitate protection of the potable water service; - Consider incorporating cross connection control requirements into rules administered by ADEQ.
<p>D.2 – Eliminate Duplicate Regulations & Fees <i>(page 39)</i></p>	<ul style="list-style-type: none"> - Review state and county statutes for inconsistencies in definitions and duplication of fees; - Review rules that apply to reclaimed water users for inconsistencies in definitions and duplication of fees. - Initiate corrective action through the rulemaking process to fix the inconsistencies in A.A.C. R18-9 and R18-11 where references are made to the wrong location in A.R.S. 49-201 for the definitions of “Reclaimed water” and “On-site wastewater treatment facility.”; - Determine if counties are duplicating programs and charging fees for programs that are also being conducted by the State - specifically, Maricopa County should consider amending its Health Code to be consistent with state rules for permitted uses of reclaimed water.
<p>D.3 – Update Reclaimed Water Quality Standards <i>(page 40)</i></p>	<p>ADEQ should consider the following actions:</p> <ol style="list-style-type: none"> 1. Develop a new general permit for commercial and municipal gray water users; 2. Revise standards for Type 3 gray water systems (R18-9-719); 3. Redefine permissive uses of gray water (R18-9-711. A.3); 4. Possible revisions to R18-9-101 (definitions) and R18-9-704 (signage); 5. Revise the fecal coliform rule (R18-11-303-307) so E coli may be used as the indicator organism for pathogen removal similar to the BADCT rule (R18-9-B204) and revise the coliform monitoring frequency requirement for Class A+, A, B+, and B reclaimed water in R18-11-303 to R18-11-306 to match the BADCT frequency in R18-9-B204;

ISSUE	RECOMMENDATIONS
	<ol style="list-style-type: none"> 6. Revise gray water permits to address size of application area and type of water demand (R18-9-711); and 7. Address de minimus uses under gray water permit requirements.
<p>D.4 – Establish Ratemaking Guidelines (<i>page 41</i>)</p>	<p>The ACC should consider the following:</p> <ol style="list-style-type: none"> 1. Establishment of a demand side management (DSM) and conservation program framework with establishment of rules that include cost recovery method established for all future utility rate cases as part of rate case application; 2. Establish and promote effective revenue decoupling to remove revenue impediments to achievement of use reductions with establishment of rules that establish appropriate decoupling mechanisms; 3. Establish a consistent policy that promotes acquisition of renewable supplies in advance of supply needs. Establish appropriate funding mechanisms, needed to acquire such supplies and modify the “used and useful” standard or determine by ACC policy or rule that demonstration of sustainable and/or renewable supplies to offset current use of non-sustainable supplies is good public policy and is deemed to be “used and useful” for those supplies; 4. Establish by rule, a process where rate recovery of large capital-intensive infrastructure can begin before these facilities are placed in service; 5. Through stakeholder workshop process with the ACC, develop alternative funding methodologies that can provide funding for regionally-scaled reclaimed and renewable water facilities; 6. Insure that no existing policies, rules, legislation, or guidance, unnecessarily interfere with or make more difficult the potential to use private funding options for larger capital intensive projects; 7. Partner with large water users to fund reclaimed water facilities and distribution systems; and

ISSUE	RECOMMENDATIONS
	<p>8. Seek private sector funding for large-scale water infrastructure projects, where appropriate.</p>
<p>D.5 – Address Unique Situations in Recharge, Reuse and AZPDES Permits (page 42)</p>	<ul style="list-style-type: none"> - AZPDES general permits should be more widely offered for riparian areas, urban lakes, wetlands; - Improve the interface between its various permitting program requirements where reclaimed water is incorporated as a resource to support a public project that involves overlapping programs with equally beneficial goals such as reuse, recharge of multiple water sources, stormwater management, stormwater harvesting, public amenities, wildlife benefits, etc. - Add flexibility to ADEQ’s standards and permitting for surface water and reuse programs to accommodate use of reclaimed water for environmental purposes; - Develop a flexible approach that only applies WET in settings where aquatic wildlife impacts are likely. There should be additional research into alternative appropriate protections for AZPDES discharge in upland/ephemeral settings that are distinct from wet-water environments. In these settings, criteria for impact on terrestrial wildlife could be developed and applied. - Expand the application and provide guidance on implementation of Net Ecological Benefit (NEB) in individual AZPDES permits.
<p>E. INCENTIVES</p>	
<p>E.1 – Develop, Expand and Promote Tax Credits for Use of Alternative Water Supplies (page 43)</p>	<ul style="list-style-type: none"> - Extend the tax incentive in A.R.S. §43-1090-01 and publicize that it is available for tax credits (using the information portal recommended under Education/Outreach); - Expand the tax credit for reclaimed water infrastructure capital investment through legislation; - Amend A.R.S. §49-204 to allow for local control of gray water systems; - Consider other policy changes that would provide incentives to encourage converting existing water uses to using alternative water supplies.

