Water Reliability for Tucson’s Future

Water Resources Research Center
March 9, 2015
**Water Reliability** means Tucson Water’s customers can count on...

- **Long-term planning and appropriate infrastructure and program investment**
- **Maximizing the use of all renewable water resources**
- **Clear and timely communication about our water and how to use and re-use it efficiently**
Transition to Renewable Supplies

- **Water Production for TW Service Area (Acre-Feet)**
- **Year**
  - 1940
  - 1950
  - 1960
  - 1970
  - 1980
  - 1990
  - 2000
  - 2010
  - 2013

- **Total Potable Water Use at 1989 Level**
- **Groundwater Use at 1944 Level**

**Water Sources**
- **Potable Production**
- **CAP Production**
- **TARP Production**
- **Reclaimed Water**
Potable Water Use - Projection to 2050 with Shortage

Volume (Acre-Feet)

Year

CAP Usage

Long Term Storage

Deficit?

GPCD = 127
Recycled Water Program

Focus

• Continue to invest in the Reclaimed Water System to maintain efficient service to existing and potential future customers

• Pursue full utilization of the City’s recycled water entitlement through indirect potable reuse (IPR) to diversify renewable supplies
Recycled Water Makes Sense

• Long Term Planning: Development of water supplies for the future

• Drought: Cutbacks in deliveries of CAP Water

• Community Investments:
  – $250 Million – Storage and Recovery of CAP Water
  – $600 Million – Wastewater Improvements
  – $25 Million – Purchase of CAP Allocation (FY15)

• Supports Economic Development
What Exactly Is Recycled Water?

- Reusing treated wastewater for beneficial purposes such as irrigation, industrial processing, replenishing groundwater basins, and purifying it for drinking water

- Tucson Water has been delivering recycled water, known as reclaimed water, for 30 years
Current Reclaimed Water Customer Base (percent of use by volume)

- **Golf Courses**: 35% - 8,549.10 AF
- **Parks**: 11% - 2,686.86 AF
- **Conservation Effluent Pool**: 30% - 7,327.80 AF
- **Schools**: 5% - 1,221.30 AF
- **Residential**: 3% - 732.78 AF
- **Commercial/Agriculture**: 1% - 244.26 AF
- **Available**: 15% - 3,663.90 AF

**Total Reuse in 2013**: 24,426 AF
Projections of Unutilized Recycled Water Resources

Tucson Water Effluent Entitlements (AFY)

- High Range
- Low Range

Year:
- 2010
- 2015
- 2020
- 2025
- 2030

Quantity:
- 0
- 10,000
- 20,000
- 30,000
Recycled Water: A New Vocabulary

• Recycling water for 30 Years as “Reclaimed Water”
  – Reclaimed Water- Treated wastewater with additional filtration. Not suitable for drinking
  – Potable reuse: Purification of treated wastewater for drinking water

• Direct Potable Reuse (DPR): Purified water goes directly into drinking water system

• Indirect Potable Reuse (IPR): Purified water goes through environmental buffer before introduction to drinking water system.
Is Recycled Water Safe to Drink?

Yes! Multiple barriers, or stages of treatment, would ensure that purified recycled water is safe for our customers.

– Conventional Wastewater Treatment – removes solid matters and other impurities.

– Soil Aquifer Treatment – a process where water is treated as it moves through the soil. A natural filtering and treatment process that removes pathogens, organic carbon, nutrients, and additional emerging contaminants.
Is Recycled Water Safe to Drink?

– Reverse Osmosis and Nanofiltration - mineral content is reduced and emerging contaminants are removed.

– Advanced Treatment – Ultraviolet/Hydrogen Peroxide Advanced Oxidation Process is used to disinfect and destroy remaining emerging contaminants and pathogens, leaving purified water.
Advanced Water Treatment Considerations

- Multiple barriers
- Pre-recharge and post-recovery treatment
- Soil aquifer treatment
- MF/UF, RO/NF
- GAC, UV-AOP
- Brine management
- National Water Research Institute oversight

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Pre-Recharge</th>
<th>Natural Treatment &amp; Storage</th>
<th>Post-Recovery</th>
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<tbody>
<tr>
<td>1</td>
<td>MF + NF + UV-AOP</td>
<td>Recharge</td>
<td>Disinfection</td>
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<tr>
<td>2</td>
<td>-</td>
<td>Recharge/SAT</td>
<td>SAT + NF + Disinfection</td>
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<tr>
<td>3</td>
<td>-</td>
<td>Recharge/SAT</td>
<td>SAT + NF + UV-AOP + Disinfection</td>
</tr>
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</table>
Recommended Advanced Water Treatment Concepts

Denitrified Reclaimed Water from Pima County

UV-Advanced Oxidation
  - Emerging Contaminants
  - Pathogens

Soil-Aquifer Treatment
  - Pathogens
  - Organic Carbon
  - Nutrients
  - Emerging Contaminants

Nano Filtration
  - Mineral content
  - Emerging Contaminants

Clearwell Res.

HU WTP

Blending / Distribution

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Clearwell Res.

HU WTP

Blending / Distribution
Recommended Recycled Water Program Concepts

Legend:
- WRFs
- Washes
- CAP canal
- Freeways
- Conveyance Route

Map showing locations such as North CAVSARP, CAVSARP, Tohono O'odham Nation, SAVSARP, Avra Valley WRF, Hayden Udall WTP, Ina Rd. WRF, and Roger Rd. WRF.
# Implementation Timeline

**Program Timeline**

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Master Plan Complete</th>
<th>Demonstration Facility Operating</th>
<th>Recycled Water Deliveries to Clearwater Blend</th>
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<tbody>
<tr>
<td>FY 2015</td>
<td></td>
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<td></td>
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<tr>
<td>FY 2016</td>
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<td>FY 2017</td>
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<td>FY 2020</td>
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<tr>
<td>FY 2021</td>
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<tr>
<td>FY 20XX</td>
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</tbody>
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### Public Outreach
- Continuous Outreach
  - Obtain City Manager’s Office, Mayor, & Councill support
  - Conduct surveys, focus groups, and monitor trending of support
  - Involve Independent Advisory Panel (IWRO) throughout implementation
  - Establish economic development, sustainability, communications
  - Continue Water Reliability communications
  - Achieve key stakeholder and broader community support

### Technical Investigations
- Conveyance Routes Studies
- Freeport-McMoRan Water Reuse Facility
- Two Water Treatment Plants
- Water Reuse Facility Feasibility Study
- Full-scale demonstration for FFIP
- Advanced Water Treatment Facility
- Strategic alliances and alternative revenue sources

### Pilot Testing & Demonstration
- Process Selection / Piloting
  - Pilot testing (design concepts & cost estimation)
  - Aquatec WRTD on-site pilot (TW projects)
  - Shorter-lead / PPR and OPR piloting
  - Smaller scale / multiple treatment trains
  - Full-scale water cycle demonstration opportunity

### Public Demonstration Project
- Permitting, design, construction, and O&M monitoring
- SHWR, PPR demonstration opportunity
- Fuller-scale / selected treatment train
- Potential for 2nd phase of full-scale PPR
- Ongoing public outreach and tours
- Opportunity for public to taste water

### All Funding Sources
- Water Reuse, Tailored Collaboration TC
- U.S. Bureau of Reclamation Title IX
- Regional collaboration potential

### Financial Plan
- CIP development / coordination
- Alternate revenue streams
- Alternative financing approaches
- Regional collaboration potential

### Permitting
- Permitting (2-3 years lead time)
  - Conveyance Rights of Way / Easements
  - Applicable Protections Permit (APP)
  - Underground Storage Facility Permit
  - License Permit

### Design & Construction
- Permitting (8-10 years lead time)
  - Conveyance Infrastructure
  - Rehabilitation and Retrofit Projects
  - Advanced Water Treatment Facility
  - Concrete Management/Recovery

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**City of Tucson**
Summary

• Long-term Planning with Sound Infrastructure Investment is Key to Tucson’s Water Future

• CAP M&I allocation unlikely to be shorted in the near-term

• The Long-Range Plan accounts for uncertainty regarding M&I shortage probability

• Recycled Water Program is integral to Tucson Water’s continuous planning for resource reliability
Water reuse is happening worldwide.

Questions?
Potable Water Use - Projection to 2050 with Shortage

Volume (Acre-Feet)

Year


GPCD = 145
GPCD = 130
GPCD = 120

LTS

CAP

City of Tucson

City of Tucson
Independent Advisory Panel Letter of Support

“It is the unanimous conclusion of the Panel that the efforts described in the Recycled Water Master Plan will be a landmark development in the acceptance and implementation of IPR and will contribute to the City of Tucson’s renewable water resources portfolio. The proposed new recycled water programs identified in the Recycled Water Master Plan will supplement existing sources and provide a greater degree of independence, thus improving the reliability and sustainability of existing water supplies.”
Tucson population continues to increase

Potable and reclaimed water use continues to decrease

Per Capita potable water use continues to decrease
Recycled Water Customer Survey
Completed in December 2013

<table>
<thead>
<tr>
<th>% of Tucson Water Customers Surveyed</th>
<th>Description</th>
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<tbody>
<tr>
<td>85%</td>
<td>Believe Tucson will need additional water supplies in the future</td>
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<tr>
<td>91%</td>
<td>Believe it is “very important” Tucson Water increase water recycling to meet long term needs</td>
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<tr>
<td>65%</td>
<td>Believe current technology can be used to further purify reclaimed water to make it pure and safe for drinking</td>
</tr>
<tr>
<td>33%</td>
<td>Are highly comfortable with Tucson Water purifying wastewater for future use as drinking water</td>
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</table>
Recycled Water Customer Survey Results (cont’d) water

The 67% that were not comfortable were asked: What measures would improve their comfort level?

<table>
<thead>
<tr>
<th>Likelihood to Increase Comfort Level for Potable Reuse*</th>
<th>Action to Increase Comfort Level for Potable Reuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>67%</td>
<td>Knowing that nationally recognized health and medical experts endorse the safety of the water</td>
</tr>
<tr>
<td>61%</td>
<td>Knowing that Tucson Water is the utility that will be producing and purifying the water</td>
</tr>
<tr>
<td>57%</td>
<td>Hearing about other communities that are already drinking purified water</td>
</tr>
<tr>
<td>66%</td>
<td>A tour of a facility to see how advanced technology is used to produce purified water</td>
</tr>
<tr>
<td>54%</td>
<td>Tasting the purified water</td>
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Comparison with other New Water Supply Projects

- City of Phoenix McCallum Valley Transfer Project
- EPWU Kay Bailey Hutchinson Desalination Plant
- EPWU Rio Bosque Potable Reuse Concept
- SWWA Groundwater Development Project
- City of Phoenix Agua Fria Linear Recharge Project
- Big Spring TX Potable Reuse
- EPWU Import from DelValley
- EPWU Phase 1 and 2 With Injection Wells
- RWMP North CAVSARP-4 (2030 Flows)
- RWMP North CAVSARP-3 (2030 Flows)
- LWMP North CAVSARP-4 (2020 Flows)
- LWMP North CAVSARP-3 (2020 Flows)
- SDCWA Carlsbad Desalination Project
- South Central Texas Seawater Desalination
- San Diego Recycled Water Study
- LWMP North CAVSARP-1 (2030 Flows)