Flagstaff Water Services DPR Feasibility and Outreach

July 23, 2018
Advanced Treatment Facility for Direct Potable Reuse

WHY NOW?

✓ Water Resources Master Plan
  • As Flagstaff plans for the future, new sources must be evaluated

✓ Rule Change
  • Prior to 2018, there was a prohibition on direct potable reuse
2017 Water Deliveries

GROUNDWATER
5,921 AF  58%

SURFACE WATER
1,766 AF  21%

RECLAIMED WATER
2,189 AF  21%

Water Conservation – decrease in GPCD ~40% since 1980s
Flagstaff Must Be Proactive to Obtain New Water Supplies

Projected Demand: 1.44% Growth Rate

Population ~106,000

Local Groundwater 9,913 AFY

~2034

14,840 AFY Designation

~2038

~8,150 AFY

Population ~150,000

- Renewable Portion of Local Groundwater
- Direct Delivered Reclaimed (Irrigation Use)
- Surface Water

New Water Supply

Red Gap Ranch and/or Local Potable Reuse
DPR is Just One Way to Provide Water for Future Generations

Direct Potable Reuse or Indirect Potable Reuse
Public Outreach Prior to Rule Change

- Pure Water Brew Challenge – Parallel with Rule Rewrite
- ADEQ Substantive Policy
  - April 27, 2017
  - Purpose was to provide a temporary interpretation of “direct reuse for human consumption” under current reclaim rules
  - Provides definition for “Advanced Water Treatment Facility”
- Advanced treatment reclaimed water permit
  - First and only in state
get a summary of status of DPR regs in other states
Robert McCandless, 6/8/2018
First Direct Potable Reuse mobile facility produced purified water in Tucson, Phoenix and Flagstaff to make beer!
States with Indirect Potable Reuse Rules
Status of DPR Rules in Other States

- **California**: Rule expected in 2018
- **North Carolina**: Senate Bill passed in 2017
- **Texas**: DPR approved on case by case basis (3 projects)
- **Washington**: Approved on case by case basis
- **Oklahoma**: In development
- **New Mexico**: Framework document only
- **Florida**: Investigating
Status of Arizona DPR Rules and Regulations

✓ 2017: ADEQ workgroups Reuse Rule Update and recommendations for advanced treatment rules
  • Recycled Water Quality Water Standards
  • Recycled Water Infrastructure and Technology

✓ January 1, 2018:
  • DPR Prohibition Rescinded,
  • Interim rule for advanced treatment pilot projects

✓ January 31, 2018: WateReuse AZ releases the “Framework for Direct Potable Reuse in Arizona” prepared by NWRI

✓ Final rule and guidance for advanced treatment under development
Regulatory Approach

Microbial Contaminant Control

- Texas Approach: Characterize treated WW like SDWA approach
- California Approach: 12-10-10 log removal starting from raw WW

Chemical Control

- Tier 1: Drinking Water MCLs
- Tier 2: Unregulated but of interest for public health
- Tier 3: Unregulated, used to monitor treatment performance
What’s unique about Arizona’s approach

- Recommending either California or Texas Approach to treatment performance requirements
- RO explicitly not required unless needed for salinity management
- Must demonstrate compliance with Class A+ quality at some point along process train
Review

- Flagstaff Needs Future Water Source to Maintain Growth
- Pure Water Brew Challenge – DPR is Possible and Safe
- Rule Rewrite – Prohibition Removed
- Future Rules for DPR with ADEQ – Arizona Approach
Flagstaff Water Services DPR
Feasibility and Outreach
Definition of Potable Reuse

Indirect Potable Reuse by Surface Water Augmentation

Indirect Potable Reuse by Groundwater Recharge

Source for base graphic: AWWA Potable Reuse 101
Definition of Potable Reuse

Direct Potable Reuse

Source: AWWA Potable Reuse 101
Study Objectives

✓ Basis of knowledge of community leader and key stakeholders
✓ Engineering feasibility (cost)
✓ Implementation actions and timeline
Stakeholder Interviews
Conducted by Katz and Associates May 2018

Groups Interviewed
- Az Segway and Pedal Tours/Flagstaff Sports Exchange
- City of Flagstaff Mayor
- City of Flagstaff, City Council
- City of Flagstaff Water Commission
- Coconino County District 1
- Coconino County Superior Court
- Economic Collaborative of Northern Arizona
- Friends of Flagstaff’s Future
- Friends of the Rio de Flag
- Greater Flagstaff Chamber of Commerce
- Northern Arizona Leadership Alliance
- Northern Arizona Association of Realtors

Topics Covered
- Opinion of Adequacy of Water Supplies
- Awareness of planning for new water supplies
- Awareness of recycled water use
- Potential use of recycled water as source for drinking water
- Trusted sources of information regarding water issues
Stakeholder Interviews

Awareness of recycled water use
- Very aware of current uses
- Concerned there is not enough supply to maintain current use and potable reuse
- Concerns over water quality and effects on human health and the environment

Potential use of recycled water as source for drinking water
- Questions about pharmaceuticals and endocrine disruptors
- Preference for indirect potable reuse due to public perceptions
- Cost and energy efficiency
- Needs to be presented to public in an easily understandable way
Advanced Treatment Goals

✓ Regulated under Safe Drinking Water Act
✓ Multiple Barrier Approach
✓ Microbial Contaminant Control
  • At least 12-log removal of viruses
  • At least 10 log removal of bacteria
  • At least 10 log removal of protozoa
✓ Chemical Control
  • EPA Drinking Water Standards
  • Pharmaceuticals, Personal Care Products, other trace chemicals (CECs)
  • Total dissolved solids

✓ Community decision on “How Clean is Clean?” Water Quality Goals
Treatment Options

Using Reverse Osmosis

- Class A+ Reclaimed Water
- Membrane Filtration
- pH Decreaser and Scale Inhibitor
- Reverse Osmosis
- RO concentrate to Disposal
- Chlorine
- UV / Advanced Oxidation
- pH Increase
- Chlorine
- Degassifier
- Re-stabilization
- Final Disinfection
- Finished Water Storage
- To Water Distribution System

Using Ozone-Biological Filter

- Class A+ Reclaimed Water
- Ozone Generator
- Ozone Contact Basin
- Biologically Active Filter
- Granular Activated Carbon (Optional)
- Membrane Filtration
- Peroxide
- Chlorine (for residual)
- UV/Advanced Oxidation
- Final Disinfection and Finished Water Storage
- To Water Distribution System
## Advanced Water Treatment Process Comparison

<table>
<thead>
<tr>
<th>RO Based Process</th>
<th>Ozone-BAF Based Process</th>
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</thead>
<tbody>
<tr>
<td>✓ Excellent removal of trace chemicals</td>
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</tr>
<tr>
<td>✓ Prevents disinfection by-product formation</td>
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</tr>
<tr>
<td>✓ Removes salt</td>
<td>✓ Does not remove salt</td>
</tr>
<tr>
<td>✓ Creates high salinity waste stream</td>
<td>✓ No high salinity waste stream</td>
</tr>
<tr>
<td>✓ Requires minerals to re-stabilize water</td>
<td>✓ No minerals to re-stabilize water</td>
</tr>
<tr>
<td>✓ Energy consumption 122 kw/mgd</td>
<td>✓ Energy consumption 67 kw/mgd</td>
</tr>
</tbody>
</table>
Wildcat Hill Conceptual Site Layout

Reverse Osmosis w/o Brine Disposal

Ozone-BAF
**RO Brine Disposal**

Pond sizes
- For 6 mgd: 15.3 acres
- For 10 mgd: 25.5 acres
- For 14 mgd: 35.7 acres
Cost Comparison

Total Project Capital Costs

- RO Option with Brine Disposal
  - Phase 1 (6 mgd): $40
  - Phase 2 (10 mgd): $138
  - Phase 3 (14 mgd): $66

- Ozone-BAF Option
  - Phase 1 (6 mgd): $22
  - Phase 2 (10 mgd): $36
  - Phase 3 (14 mgd): $87

Present Worth Cost of Water, $/acre-foot

- RO Option with Brine Disposal
  - 6 mgd: $1,530
  - 10 mgd: $1,040
  - 14 mgd: $960

- Ozone-BAF Option
  - 6 mgd: $710
  - 10 mgd: $710
  - 14 mgd: $650
Implementation Considerations

- Determine the Community’s Water Quality Goals “How Clean is Clean?”
- Water Quality Sampling and Monitoring
- Pilot/Demonstration Facility
- Source Control Survey
- Salinity Management Model
- Operator Training and Certification
- Funding and Financing
- Compare costs & availability to possible future water supply sources (e.g., Potable Reuse (IPR, DPR), Red Gap Ranch, Water Conservation, etc)
QUESTIONS?

it’s about connecting

Steve Camp, Regulatory Compliance Manager
City of Flagstaff

Robert McCandless, P.E., Project Manager
Brown and Caldwell