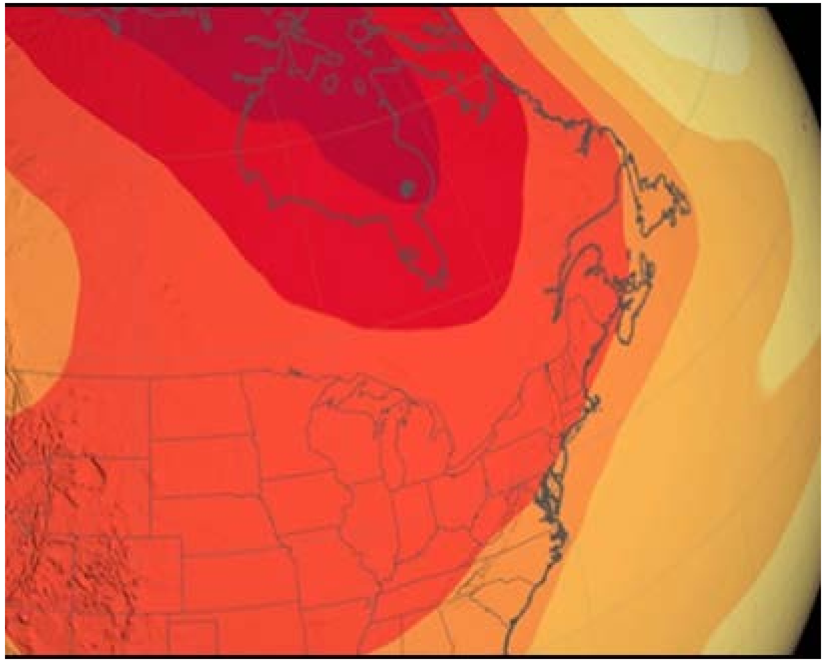
Guidance Framework Document for Arizona Potable Reuse

NWRI

Jeff Mosher
National Water Research Institute
jmosher@nwri-usa.org

Glendale, AZ
May 12, 2016



Potable Reuse Guidance Document Development by WateReuse AZ and AZ Water

- **Scope:**
  - Direct Potable Reuse
  - Indirect Potable Reuse: covered by existing regulations
- **Overall Goal:**
  - To provide permitting predictability for DPR projects
  - Focus on a quality end product, not necessarily on how you get there

ADEQ Reclaimed Water Rulemaking

- **Process to revise AZ rules on reuse of reclaimed water and gray water**
- **ADEQ last updated its reuse rules in 2001**
  - Expansion in reuse of treated wastewater
  - But research and technology have moved forward
  - New uses of reclaimed water have been proposed
- **ADEQ will rely on stakeholder involvement and expertise in developing the rule revisions**
- **ADEQ has held initial listening sessions in Phoenix Tucson**

https://www.azdeq.gov/environ/water/permits/reuserulemaking.html

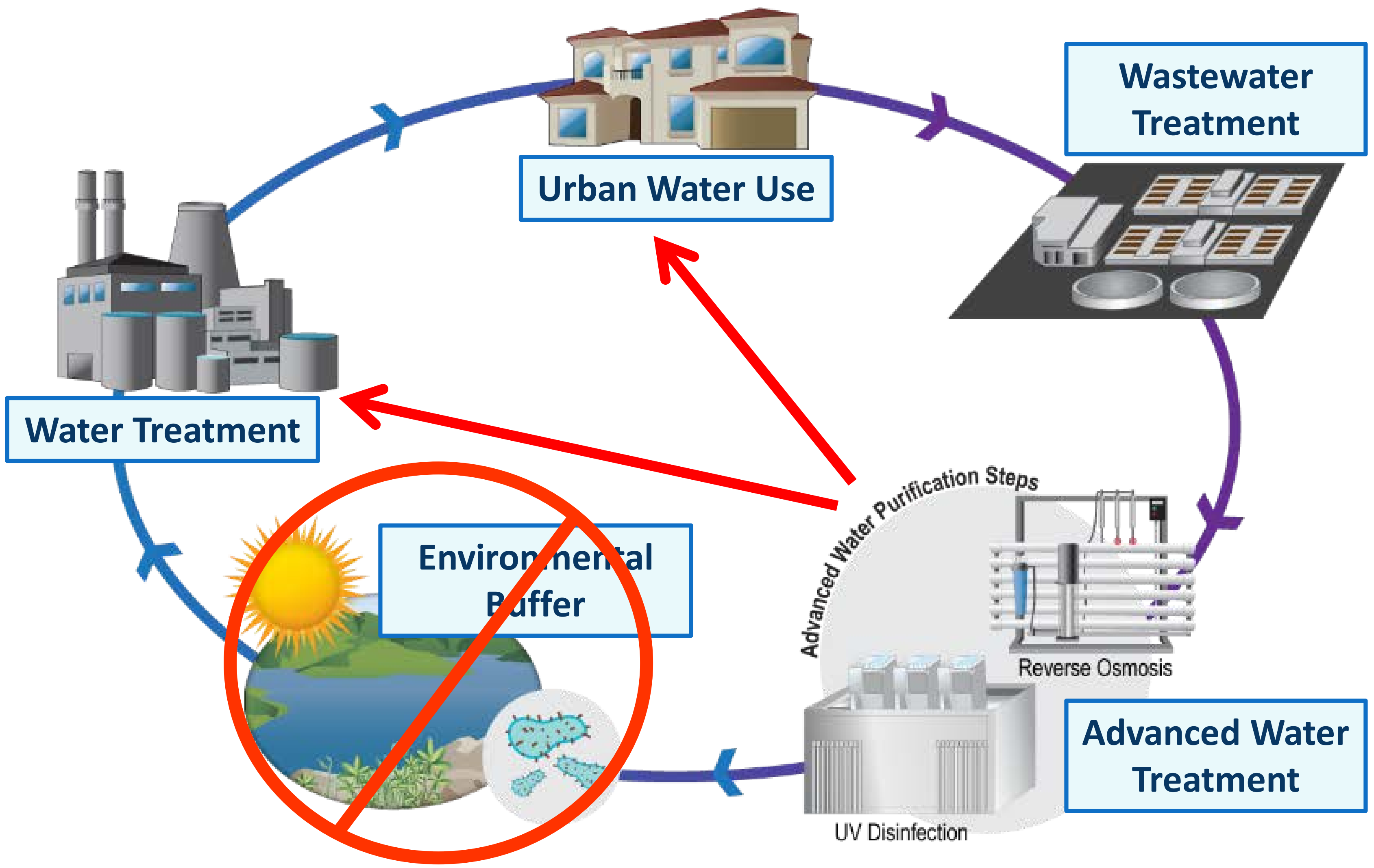
Approach to Develop "Potable Reuse" Guidance Document

1. **Workshop #1 (April 6-7)**
   - Obtain input/parameters/recommendations (topics)
2. **Workshop #2 (May 12)**
   - Review summary of topics and get input
3. **Develop annotated outline (NWRI)**
   - In process
4. **Develop draft report (NWRI) – May-July**
5. **Review of draft report (AZ) – July-August**
6. **Revised draft report (NWRI) – August**

Overview

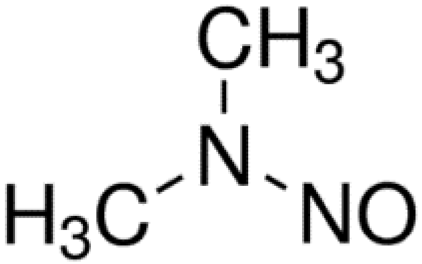
1. **Background on DPR**
2. **ADEQ Water Quality Division – Permits:**
    - Reclaimed Water Rulemaking
3. **ADEQ presentation on reuse (July 2015)**
4. **Sources of information on potable reuse**
5. **Review of topics**
6. **Scope of AZ <u>Potable Reuse</u> Guidance**
    - Input from participants
    - Topic by topic discussion
    - AZ “friendly”

Direct Potable Reuse



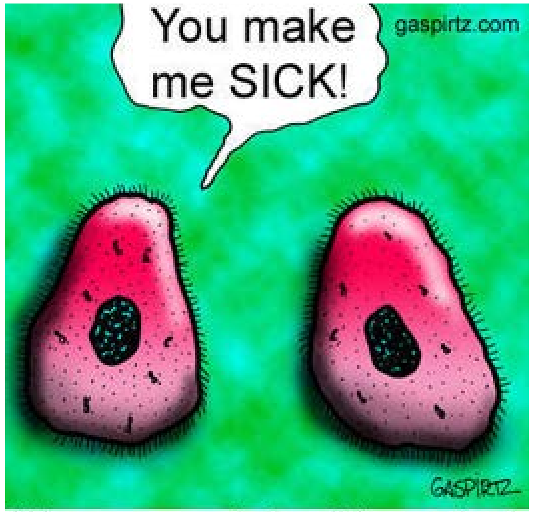
Potable Reuse Water Quality and Human Health Risks

- **Microbial risk (mostly acute)**
  - Virus
  - Protozoa
  - Pathogenic Bacteria



NDMA

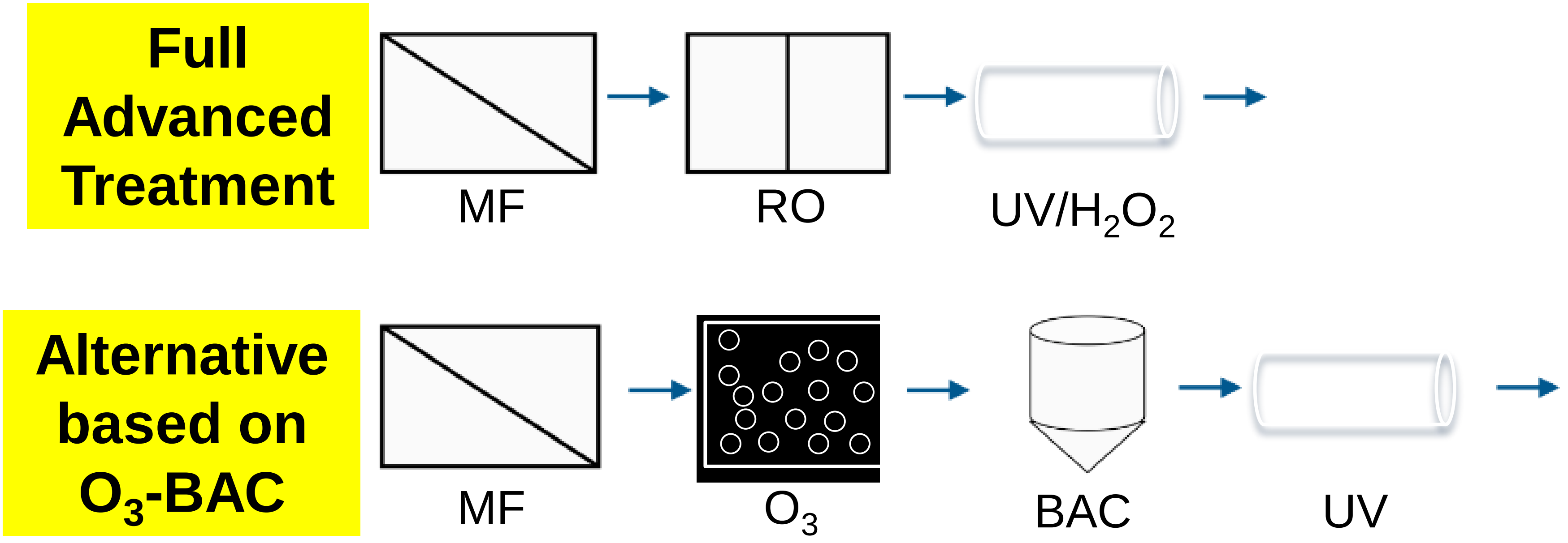
- **Chemical risk (mostly chronic)**
  - Natural and synthetic compounds
  - Regulated and **Unregulated**



When germ relationships go bad

- **Microbial and chemical risks exist with both conventional drinking water and IPR sources but differ in degree of source vulnerability**

Alternative Approach for Potable Reuse



Advantages of O_3-BAC

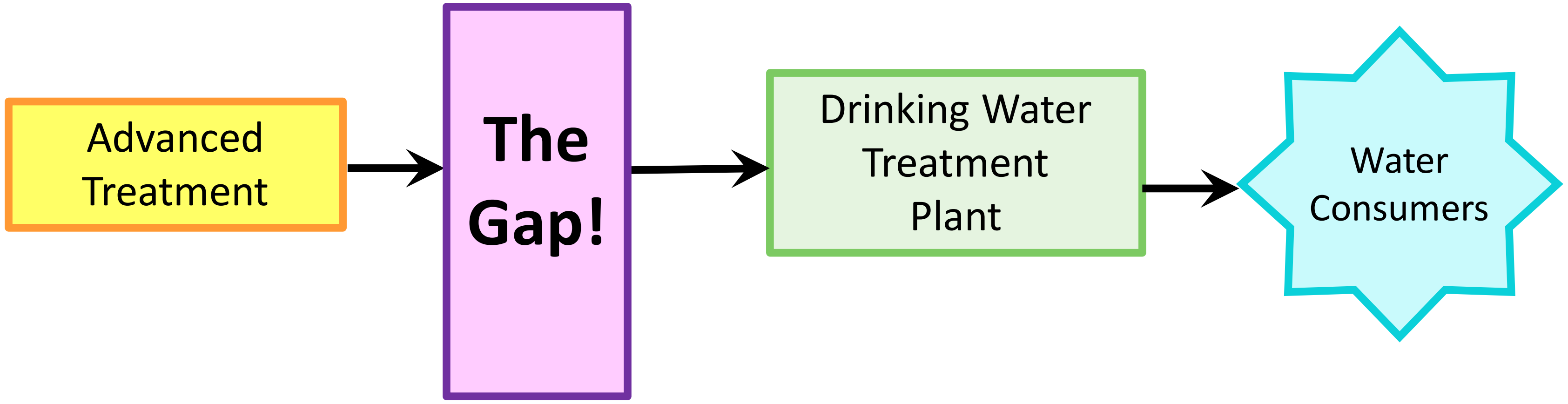
- Excellent CEC removal
- Eliminates RO concentrate
- Reduces capital and O&M costs

Disadvantages of O_3-BAC

- Disinfection byproducts
- No TDS reduction
- Higher product water TOC

Direct Potable Reuse

No environmental buffer!



Maintain <u>functionally</u> of environmental buffer (the "Gap"):

- Additional treatment
- Additional monitoring requirements

DPR – Key Questions

- **Treatment requirements**
  - Need for criteria for pathogen and chemical control
- **On-line monitoring**
  - Performance monitoring
- **Treatment technologies**
  - Defining reliability
- **Source control**
  - Managing the collection system
- **Operations and operators**
- **Response time** (respond to off-spec water)
- **Public acceptance**

Summary of Topics from July 2015 ADEQ Presentation (1)

- **Protect human health**
  - Emphasis on CECs
  - Use of water quality classes (A, B, etc.)
- **Direct reuse for human consumption is prohibited**
- **ADEQ supports stakeholder efforts to develop IPR/DPR criteria**
  - IPR criteria – may be adoptable as guidance w/o rule changes
  - DPR criteria – adoption by rule, concurrent with rescission of current DPR prohibition

Summary of Topics from July 2015 ADEQ Presentation (2)

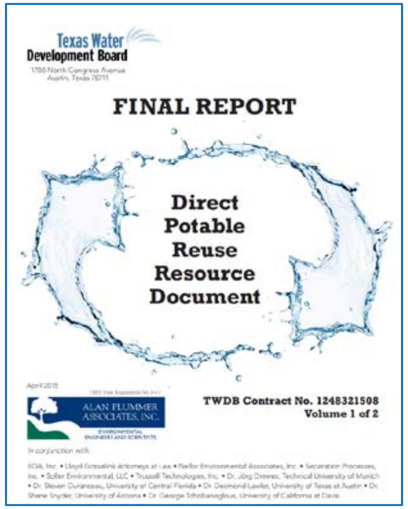
- **Revisions needed for AZ reclaimed regulatory:**
  - Reflect new technology, research, processes
  - Eliminate conflicts, clarify ambiguities
  - Simplify processes where possible
  - Add new end uses
- **CEC issues**
  - Covered by APEC
- **Concentrate (Brine) management**
  - Separate stakeholder process on deep well injection
- **Small systems (<1 mgd)**

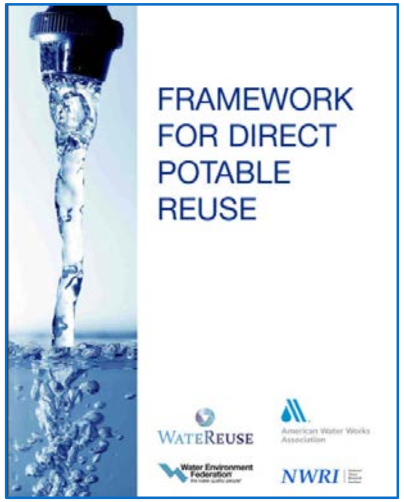
Potable Reuse Regulations: Sources of Information

- **California Regulations**
  - Groundwater replenishment (Final)
  - Surface Water Augmentation (Draft)

- **Texas Projects**
  - DPR projects
  - Texas Direct Potable Reuse Resource Document

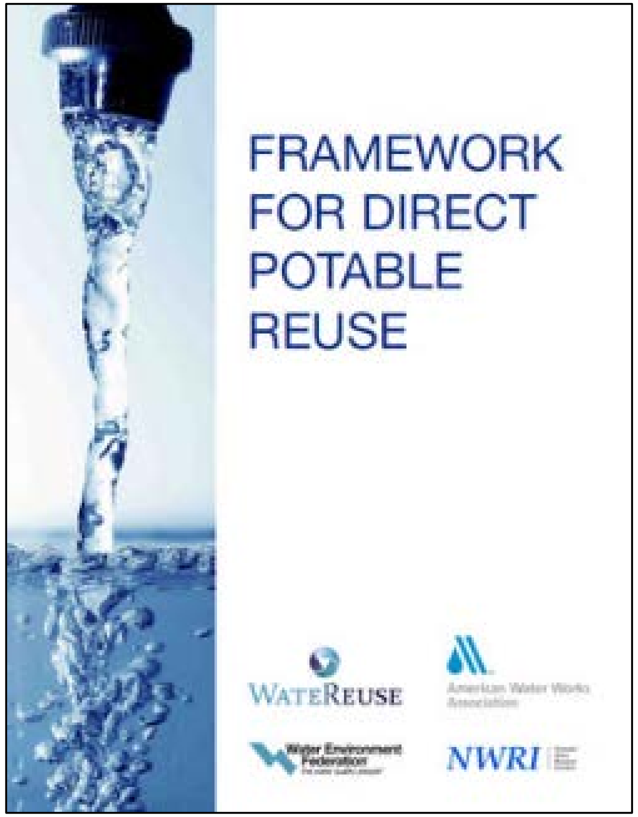
- **DPR Framework (WateReuse, 2015)**



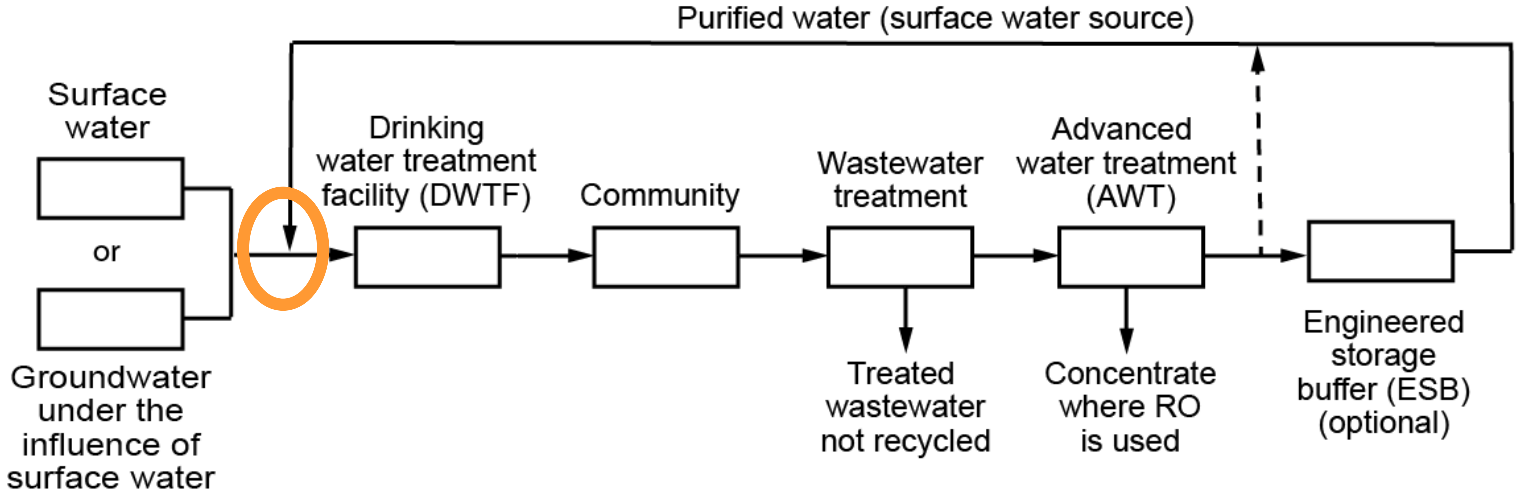


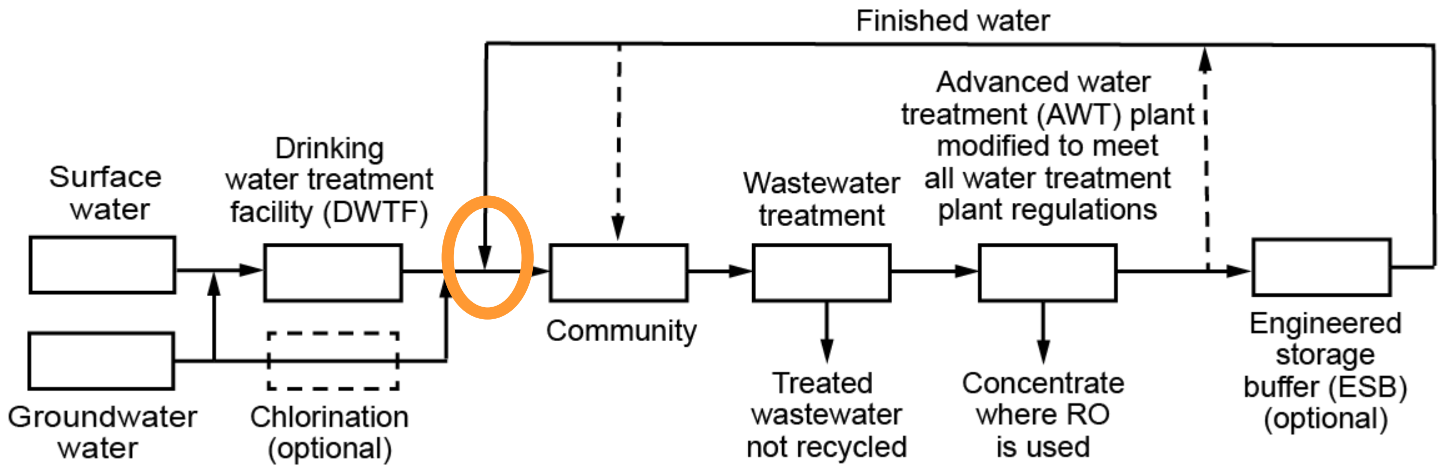
Publication:
"Framework for DPR"

- Published by WateReuse (2015)
- Sponsors: WateReuse, AWWA, and WEF
- Developed by an NWRI Expert Panel
- Available from www.watereuse.org

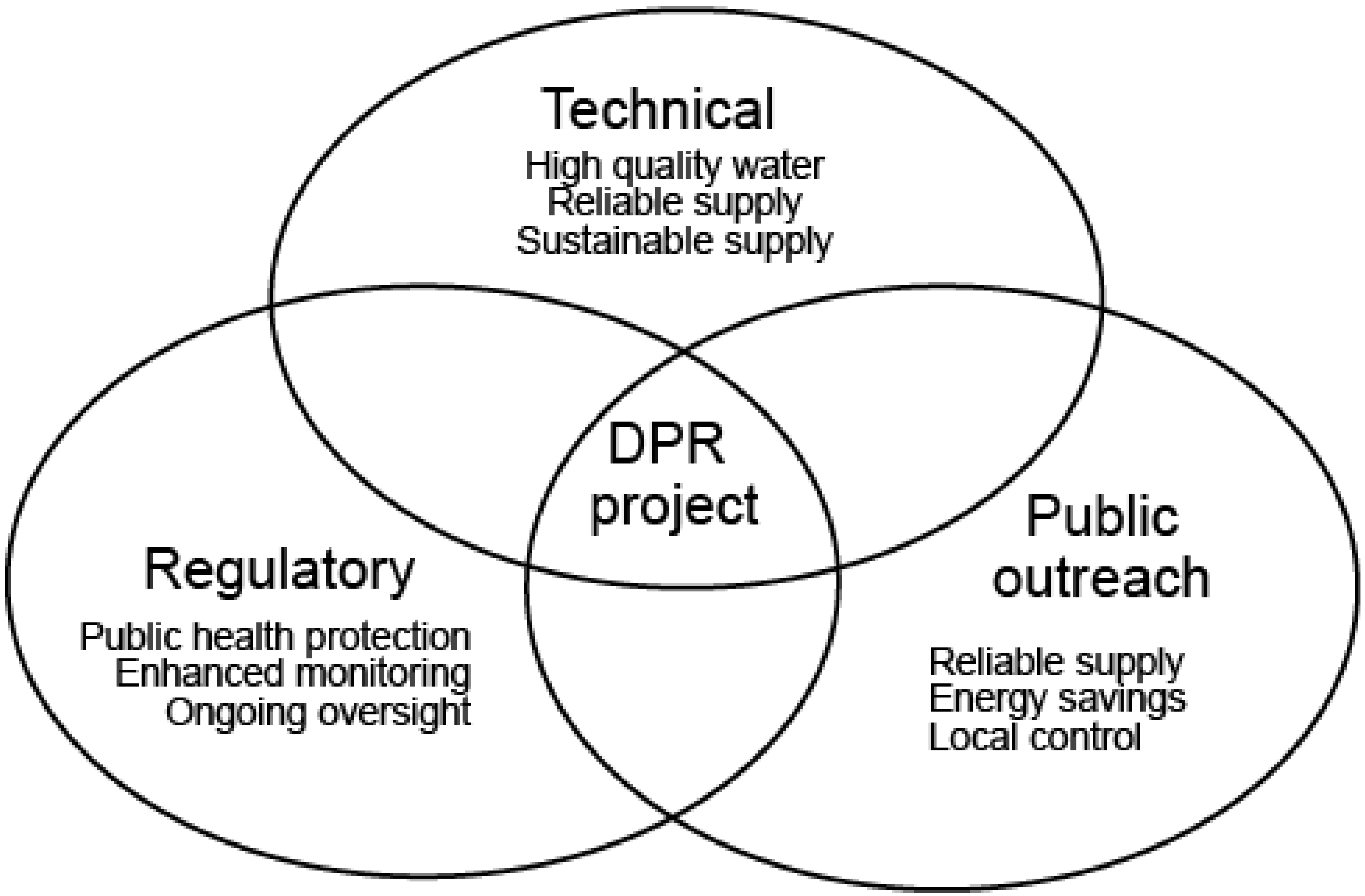


DPR Options

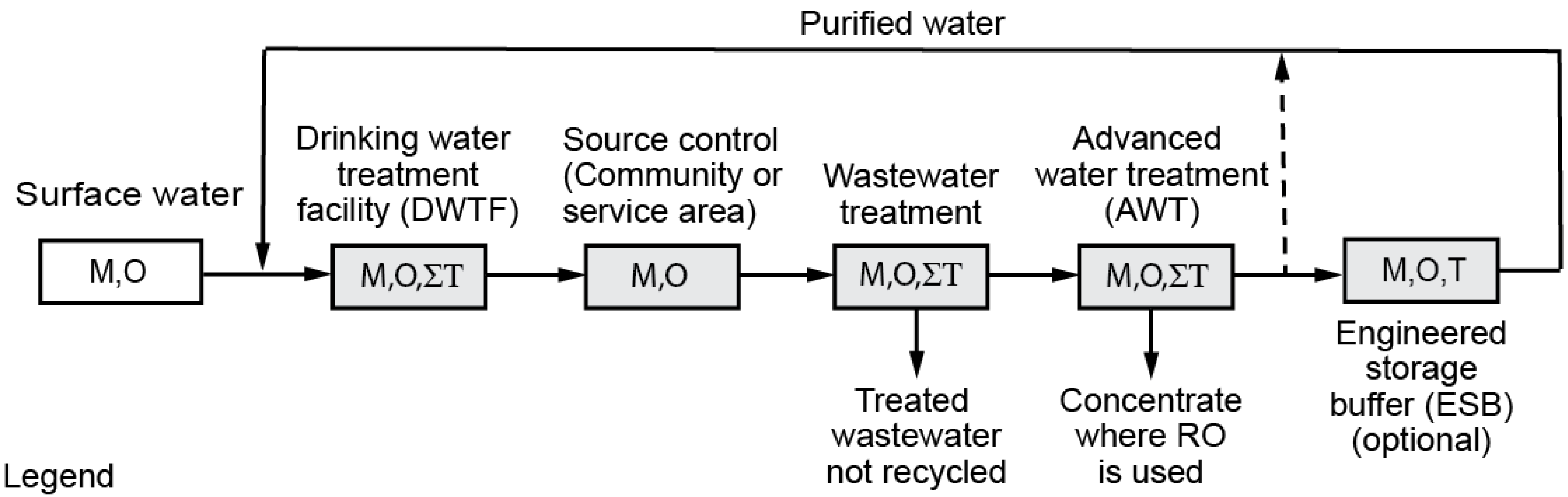

Purified water (surface water source)
Surface water
or
Groundwater under the influence of surface water
Drinking water treatment facility (DWTF)
Community
Wastewater treatment
Advanced water treatment (AWT)
Treated wastewater not recycled
Concentrate where RO is used
Engineered storage buffer (ESB) (optional)


Finished water
Surface water
Groundwater water
Drinking water treatment facility (DWTF)
Chlorination (optional)
Community
Wastewater treatment
Advanced water treatment (AWT) plant modified to meet all water treatment plant regulations
Treated wastewater not recycled
Concentrate where RO is used
Engineered storage buffer (ESB) (optional)

Key Components of a Potable Reuse Program



Technical, Operational, and Management barriers



Legend

M = Management barrier
O = Operational barrier
T = Technologial barrier
ΣT = Sum of multiple technical barriers

Types of Barriers

- **Technical barriers** (which also can be viewed as "physical" barriers) are the only barriers that can be credited with treatment performance, though management and operational barriers both can result in improved treatment and water quality.
- **Operational barriers** include operations and monitoring plans, failure and response plans, and operator training and certification.
- **Management barriers** are policy and maintenance plans key to the proper functioning and oversight of technical and operational barriers in DPR projects. Management barriers can be applied from the source of supply through the production of ATW. They also provide guidance for staff to make critical decisions (e.g., when to shut down the process if water quality data are questionable or treatment performance is compromised).

“Topics”

1. Scope of DPR Guidance Development
2. ADEQ Matrix
3. Summary of ADEQ Topics
4. Important Considerations
5. Potable Reuse Applications
6. Potential Regulatory Topics
7. Public Health Protection
8. Utility Collaboration
9. Source Control Program
10. Wastewater Treatment
11. Advanced Water Treatment
12. Typical Treatment Trains for Advanced Water Treatment
13. Pathogen Removal Values for Treatment Trains
14. Potential Water Quality Impacts of Blending Purified Water
15. Monitoring and Instrumentation Requirements
16. Long-Term Online and Calibration Monitoring
17. Facility Operation
18. Public Outreach
19. Schedule

1. Scope of Arizona DPR Guidance Development

- **Develop list of topics**
  - IPR projects
  - CA Regulations
  - Available guidance
- **Input from participants**
  - April 6-7, 2016 Workshop
  - May 12, 2016 Workshop
- **Topic -by-topic discussion**
- **AZ "friendly"**

2. ADEQ Matrix

- **To communicate ideas for the listening sessions and the web public, ADEQ created a Stakeholder Issues Matrix, with issues grouped into the following five categories:**
  - Conveyances/Infrastructure
  - Permitting
  - End Uses and Standards
  - Gray Water
  - Other (also miscellaneous)
- **Comment:** The Guidance Document will include a table or discussion that maps the following categories of Stakeholder Issues (as provided by ADEQ) in the context of DPR

3. Summary of ADEQ Topics (1)

- **Protect human health**
  - Emphasis on CECs
  - Use of water quality classes (A, B, etc.)
- **Direct reuse for human consumption is<u>prohibited</u>**
  - Guidance will state this statement should be rescinded completely.
- **ADEQ supports stakeholder efforts to develop IPR/DPR criteria**
  - DPR criteria – adoption by rule, concurrent with rescission of current DPR prohibition
- **Revisions needed for AZ reclaimed regulatory:**
  - Reflect new technology, research, processes
  - Eliminate conflicts, clarify ambiguities
  - Simplify processes where possible
  - Add new end uses
- **CEC issues**
  - Covered by Advisory Panel on Emerging Contaminants (APEC).
  - Other information available
- **Concentrate (Brine) management**
  - Separate stakeholder process on deep well injection
- **Small systems (<1 mgd)**

3. Summary of ADEQ Topics (2)

- **Small systems (<1 mgd)**
  - Include a discussion on technical, managerial, and financial (TMF) capacity.
  - A structure exists in Arizona that possibly can be modified to include DPR.
  - Note that DPR standards will be the same for large and small systems, but this process exists to help small systems determine and achieve TMF.
  - ADEQ already has a way to determine TMF.
  - The Water Infrastructure Finance Authority of Arizona (WIFA) is available to help small systems fund projects – it ensures small systems pay back loans on projects (through appropriate rate setting, etc.).
  - Address where off-spec water will be discharged.
    - For reuse in Arizona, methods are already required to dispose of wastewater.

4. Important Considerations

- **Consistency with current regulations**
- **Terms and definitions**
  - Include a terminology section.
  - Table of terminology – regulatory terminology and new terminology, as well as terms that “aren’t right.”
- **Multiple barrier approach (drinking water concept)**
  - Control of pathogens and chemicals
- **Need for dilution**
  - No
- **Technical, operational, and management barriers**
- **DPR:**
  - Lack of an environmental barrier
  - Failure response time
- **Regulations versus guidance (or permitting)**
  - Recommendations will be provided

Use of Reverse Osmosis

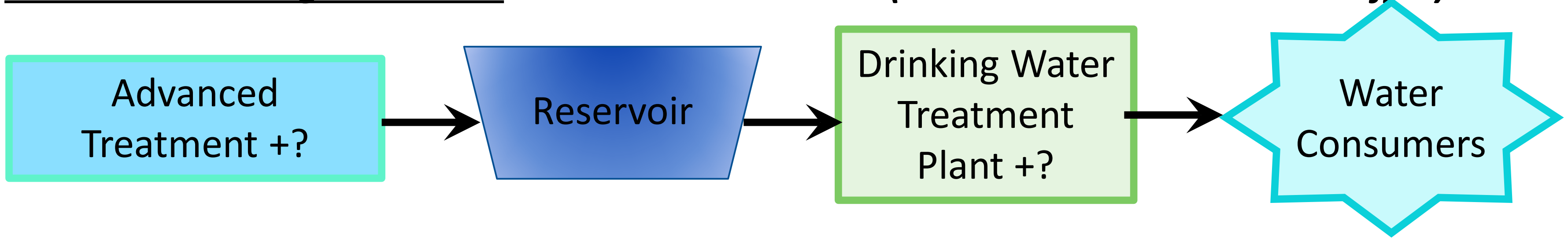
- **The driver for RO in Arizona is salinity (versus chemical constituents)**
  - Arizona may still need a salinity standard for DPR
  - Text will be needed to discuss salinity
    - It may be an issue (especially for small systems), so it should be addressed and/or studied.
    - For example, industrial users could have issues if total dissolved solids (TDS) gets too high.

5. Potable Reuse Applications

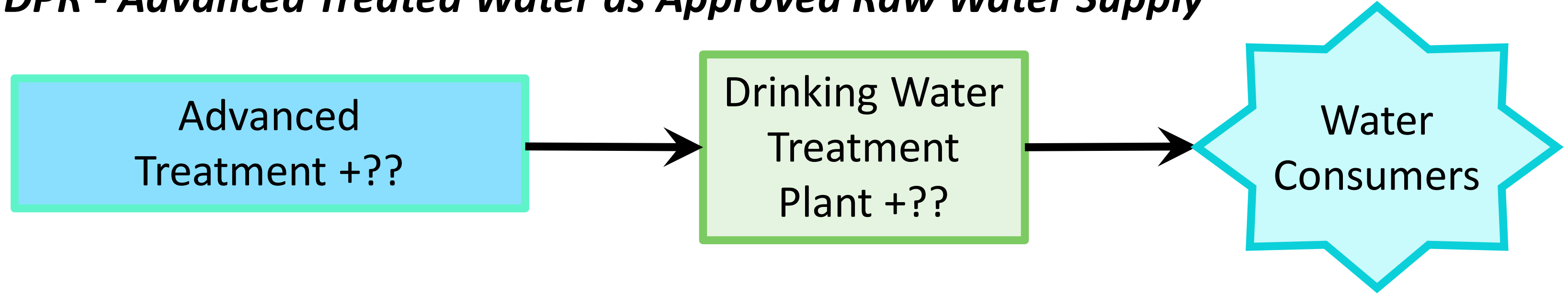
- **Surface Water Augmentation**
  - Reservoirs, lakes, and water conveyance structures.
    - See Arizona Administrative Code R18-9-601 (open water conveyance and pipeline conveyance).
- **Direct Potable Reuse**
  - With a surface water treatment plant
  - Without a surface water treatment plant

Potable Reuse Configurations:
Reduced Environmental Buffer and DPR

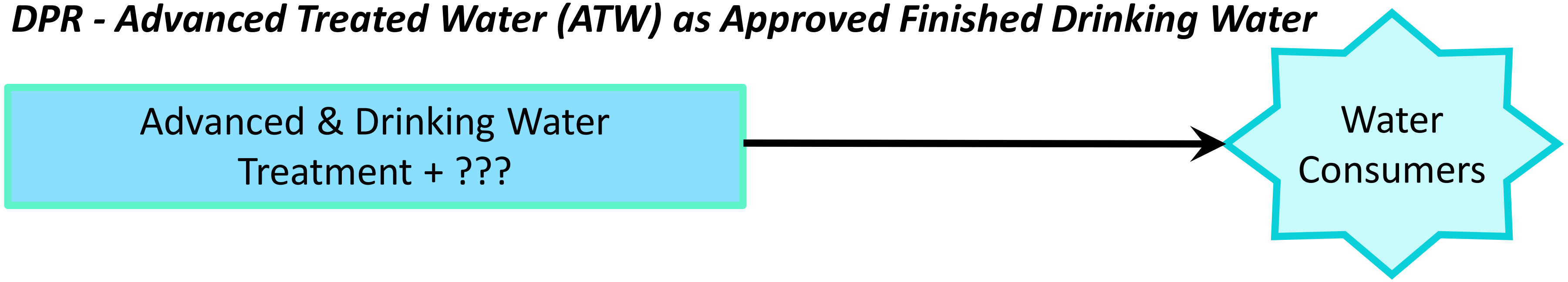
<u>Source Water Augmentation</u>? – Smaller Reservoir (Reduced Environmental Buffer)



DPR - Advanced Treated Water as Approved Raw Water Supply



DPR - Advanced Treated Water (ATW) as Approved Finished Drinking Water



6. Potential Regulatory Topics

- **Overall consideration: Public Health Protection**
  - Pathogen control
  - Chemical control
- **Source Control**
- **Wastewater Treatment**
- **Advanced Water Treatment**
- **Treated Water Management**
- **Monitoring and Instrumentation Requirements**
- **Residuals Management**
  - Including concentrate
- **Facility Operation**
  - Including operators

7. Public Health Protection

- **Water Quality Criteria**
  - Pathogen control
  - Chemical control
    - Unregulated chemicals control
- **Treatment performance**
  - Use of indictors and surrogates
  - **Indicator compound:** An individual chemical that can be used to measure the effectiveness of a process for a family or group of compounds in the treatment process of interest (e.g. TOC for RO)
  - **Surrogate:** A quantifiable parameter that can serve as a performance measure of treatment processes that relates to the removal of specific contaminants. Surrogate parameters provide a means of assessing water quality characteristics without conducting difficult trace contaminant analysis (e.g., UV absorbance)
- **Critical Control Points**
  - Demonstrates risk reduction

DPR Log-Reduction Values (WRRF 11-02)

Microbial Group	Criterion ($\log_{10}$ reduction)	Possible surrogates	Source used to develop criteria
Enteric virus	12	MS2 bacteriophage	SWTR (U.S. EPA, 1989a); CDPH (2011); NRC (2012); NRMMC–EPHC–NHMRC (2008)
Cryptosporidium spp.	10	Latex microspheres, AC Fine Dust, inactivated *Cryptosporidium* oocysts, aerobic spores	Interim ESWTR (U.S. EPA, 1998); LT2 ESWTR (U.S. EPA, 2006); CDPH (2011); NRC (2012); NRMMC–EPHC–NHMRC (2008)
Total coliform bacteria	9	NA[c]	Total Coliform Rule (U.S. EPA, 1989b); NRC (2012) risk assessment for salmonella

Texas DPR Regulations

- Although Texas does not have specific statewide regulations for DPR and permits such projects on a case-by-case basis, the Texas Commission on Environmental Quality has taken an approach similar to California regarding pathogens (TWDB, 2015).

- For example, for the Wichita Falls DPR project, the TCEQ requires 9-log reduction of virus, 8-log reduction of *Giardia* cysts, and 5.5-log reduction of *Cryptosporidium* oocysts based on an assessment of the quality of the secondary effluent and pertinent regulations.

- Chemical constituent limits are somewhat similar to those imposed by California for IPR projects and other limits/monitoring suggested in NWRI (2013).

Pathogen Control

- **Using the 12/10/10 (virus/Crypto/Giardia) approach provides clear parameters on allowing or assigning log removal credits**
  - 12/10/10 has been “validated” (WRRF 11-02 panel)
  - Include an “alternatives provision”
  - If you have high-quality wastewater, it results in less advanced treatment.
    - Include flexibility: May be able to demonstrate log removal credits with a membrane bioreactor (MBR)
- **Using the Texas approach places the burden on the“regulators” to review the project, characterize the wastewater, and approve the treatment process.**
  - Texas does not give credit to reverse osmosis (RO).
- **Important: Need process for assigning log removal “credits”**

Chemical Control (1)

- **Chemical control without RO: How can we control trace organics without using total organic carbon (TOC)?**
  - Source Control (1)
  - Monitoring (2)
    - MCLs, Critical control points (CCPs), point of compliance monitoring, verification monitoring, TOC?
    - Review data on constituents of emerging concern (CECs)
  - Peer review the approach (Shane Snyder, Jörg Drewes, and Paul Westerhoff)
  - Data collection: used to make the case on how much removal is needed
    - Arizona has “Narrative Standards.”
    - Arizona’s Best Available Demonstrated Control Technology (BADCT) includes approved technologies or a process to demonstrate treatment, get data on contaminants
  - BADCT: Have small group to discuss (George Maseeh, Shane Snyder, Paul Westerhoff)
    - Include BADCT expert or regulatory expert on the wastewater side for BADCT
  - Action item: NWRI to write a problem statement, Arizona to review, small group will address
    - Caution: The regulatory approach is only applied to wastewater.

Chemical Control (2)

- **What are the water quality goals (maximum contaminant levels [MCLs], trace organics, etc.)?**
  - Unregulated disinfection byproducts (DBPs)– some (i.e., halogenated compounds) have more toxic effects than CECs.
  - Nitrogen/nitrates:
    - DPR projects need to use A+ effluent that is nitrified/denitrified (NDN) (especially if RO is not used).
  - What is a pathway for B+ effluent?
    - For source water, a B+ effluent is the minimum to start with?
    - Will need to up the log removals if you allow a B+ effluent standard.

8. Utility Collaboration

- **Address inter-jurisdictional issues:**
  - Collaboration is needed.
  - Describe how different agencies will work together.
  - Inter-governmental agreement.

9. Source Control Program

- **Importance of source control program for potable reuse**
- **Build on Federal Pretreatment Standards**
- **Principal elements of a source control program**
  - List common elements – like “pharmaceutical take-back” programs.
  - Best management practices (BMPs).
  - Have minimum requirements for any system (small and large), regardless of jurisdictional issues and/or boundaries.
  - Mention local limits.
    - IMPORTANT: If they do not have local limits, they should do an inventory of commercial and industrial dischargers and report it to ADEQ.
- **Examples of constituents that go through advanced water treatment**
  - For example: 1,4-dioxane, NDMA, acetone
- **Realistic expectations are needed for a source control program**
  - But be meaningful from a public relations point-of-view.
- **Minimal source control for small systems?**

Source Control Program

- **Modify the pretreatment/source control program so it is suitable for DPR.**
- **Identify constituents in wastewater that may be difficult to remove or are precursors to disinfection byproduct formation (depending on the treatment technologies used).**
- **Information is needed on the sources and concentrations of selected constituents.**
- **Include commercial and industrial entities in the source control program.**
- **Develop a program to inform consumers of best practices for home waste disposal.**

10. Wastewater Treatment

- **What constitutes wastewater treatment?**
  - Wastewater should be B+ or A+ (NDN), unless full-stream RO is used for advanced water treatment.
  - Is there another treatment for nitrate besides RO?
- **Differences between different secondary treatment processes.**
- **Issues related to the use of conventional wastewater treatment in potable reuse applications.**
- **Benefits of using a higher quality effluent**
- **Arizona utilities will get credits starting with the wastewater process.**
  - Note there is a difference in pathogen credits using B+ vs. A+ effluent.
  - One credit given for B+ effluent and another credit given for A+ effluent for virus, *Giardia*, and *Cryptosporidium*.
    - There is probably existing data to support this concept
    - We are not setting values, just showing a method to do it

Measures to Improve Performance and Enhance Reliability of Existing WWTPs

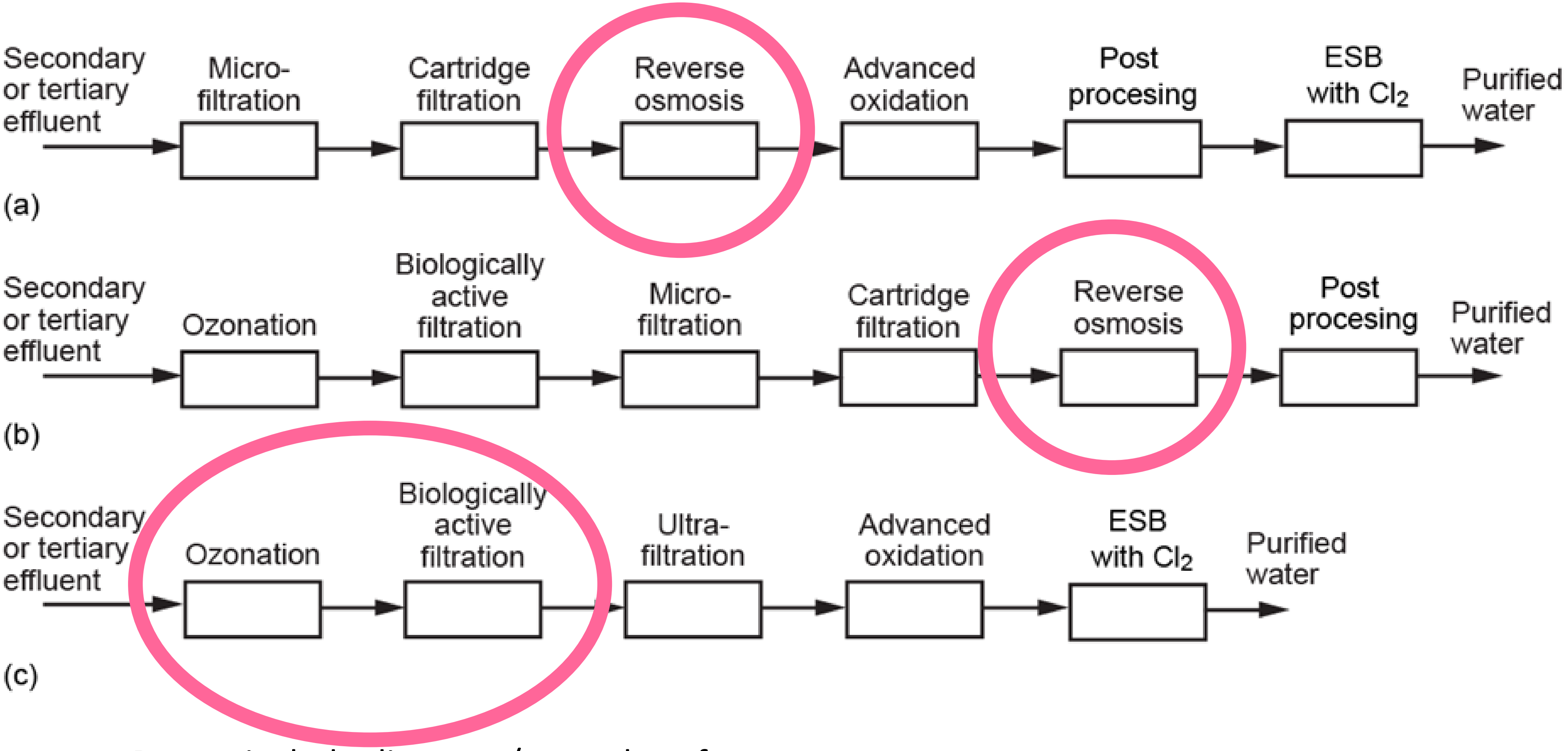
Measure	Value of each measure[a]
Enhanced screening process and possibly fine screening (2-6 mm)	Efficiency, reliability
Influent flow equalization	Efficiency, reliability
Elimination (or Equalization) of untreated return flows	Water quality, reliability
Operational mode for biological treatment process	Water quality, reliability
Effluent filtration and disinfection	Water quality, reliability
Improved process monitoring	Water quality, reliability

[a]*Efficiency* – the recommended improvement increases the overall cost efficiency of operation. *Water quality* – the recommended improvement increases the final potable water quality. *Reliability* – the recommended improvement

11. Advanced Water Treatment

- **The objectives of advanced water treatment**
  - Do not show flow diagrams of treatment trains
  - Include a table listing the types of technology available
  - Provide examples of credits given elsewhere
- **Examples of ~~treatment trains~~ processes for advanced water treatment**
  - Include a table that will list processes and what they remove
- **Performance levels for advanced treatment processes**
  - Include the determination of pathogen log reduction credits
- **Reliability of various treatment trains**
  - The California Expert Panel's report on "Reliability" will be available in June 2016
  - Will treatment processes address fluctuations in resiliency?
    - Respond to swings in microbial levels
    - 12/10/10 is protective of this scenario
- **Off-spec flows.**

12. Typical Treatment Trains for Advanced Water Treatment



Comment: Do not include diagrams/examples of treatment

Differences in Effluent Quality Between Advanced Water Treatment Processes

Constituent	Unit	Untreated wastewater	Range of effluent quality after indicated treatment: Conventional activated sludge with filtration	Activated sludge with O_3 BAF	Activated sludge with MF and RO	Activated sludge with MF, RO, and UV-AOP
Total suspended solids (TSS)	mg/L	130 - 389	2 - 8	1-2	≤1	≤1
Turbidity	NTU	80 – 150	1 - 10	≤1	≤0.1	≤0.1
Biochemical oxygen demand BOD)	mg/L	133 - 400	< 5 - 20	≤1	≤1	≤1
Chemical oxygen demand (COD)	mg/L	339 - 1016	30 - 70	≤10 - 30	≤2 - 10	≤2 - 10
Total organic carbon (TOC)	mg/L	109 - 328	15 - 30	2 - 5	0.1 - 1	0.1 - 1
Ammonia nitrogen	mg N/L	14 - 41	1 - 6	≤0.1	≤0.1	≤0.1
Nitrate nitrogen	mg N/L	0 - trace	5 - 30	5 - 30	≤1	≤1
Nitrite nitrogen	mg N/L	0 - trace	0 - trace	≤0.001	≤0.001	≤0.001
Total nitrogen	mg N/L	23 - 69	15 - 35	≤1	≤1	≤1
Total phosphorus	mg P/L	3.7 - 11	2 - 6	2 - 6	≤0.5	≤0.5
Volatile organic compounds (VOCs)	mg/L	<100 – >400	10 - 40	≤1	≤1	≤1
Iron and manganese	mg/L	1 – 2.5	1 - 1.4	≤ 0.3	≤ 0.1	≤ 0.1
Surfactants	mg/L	4 - 10	0.5 - 1.5	≤0.5	≤0.1	≤0.1
Totals dissolved solids (TDS)	mg/L	374 - 1121	374 - 1121	374 - 1121	≤5 - 40	≤5 - 40
Trace constituents[a]	mg/L	10 - 50	5 - 30	≤0.1	≤0.1	≤0.1
Total coliform	No./100 mL	10^6 – 10^{10}	10^3 - 10^5	350	<1	<1
Protozoan cysts and oocysts	No./100 mL	10^1 – 10^5	0 -10	≤0.002	≤0.002	≤0.002
Viruses	PFU/100 mL	10^1 – 10^4	10^1 - 10^3	≤0.03	≤0.03	≤0.03

13. Pathogen Removal Values for Treatment Trains

Process	Performance monitoring method	Log reduction		
		V	G	C
	Total, treatment train 1			
Primary and secondary treatment	No existing method	1	0.	1
MF	Twice daily pressure decay testing	0	4.0	4.0
RO	Online TOC	1.5	1.5	1.5
UV AOP	Intensity sensors	6	6	6
ESB with free Cl_2, CT = 900 mg•min/L	Online Cl_2	6	3	0
Total, treatment train 1		**13.5**	**14.5**	**11.5**
	Total, treatment train 2			
Primary and secondary treatment	No existing method	1	0.	1
Ozone (O_3), minimum CT = 1 mg•min/L	Online O_3[i]	5	3	0
BAF	None	0	0	0
MF	Daily pressure decay testing	0	4.0	4.0
RO	Online TOC	1.5	1.5	1.5
UV (no AOP)	Intensity sensors	6	6	6
Total, treatment train 2		**12.5**	**10.5**	**7.5**
	Total, treatment train 3			
Primary and secondary treatment	No existing method	1	0.	1
Ozone (O_3), minimum CT = 1 mg•min/L	Online O_3[i]	5	3	0
BAF	None	0	0	0
UF	Twice daily pressure decay testing	1	4	4
UV AOP	Intensity sensors	6	6	6
ESB with free Cl_2, CT = 900 mg•min/L	Online Cl_2	6	3	0
Total, treatment train 3		**18**	**16**	**10**

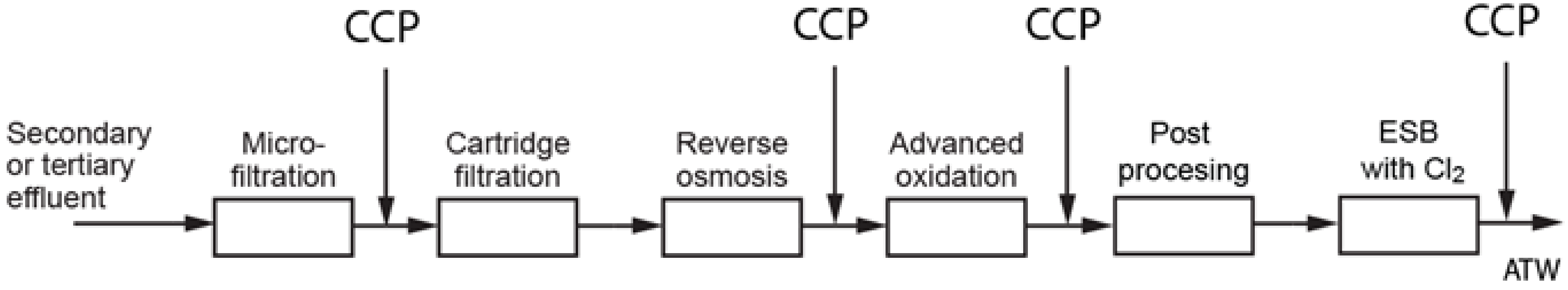
14. Potential Water Quality Impacts of Blending Purified Water

- **Organic material and nutrients**
- **Inorganics**
- **Trace level constituents (e.g., CECs, TOrCs)**
- **Disinfection stability and DBPs**
- **Temperature**
- **Aesthetics**
- **Pathogens**

15. Monitoring and Instrumentation Requirements

- **Strategies for process control and monitoring**
- **Pathogen credit allocation for various treatment processes**
- **Strategies for MCLs, Secondary MCLs, and CECs**
- **Pilot and/or demonstration – when would it be required?**
  - If no existing full-scale treatment system is in place, would piloting and/or demonstration be needed?
  - Would existing pilots be sufficient?
  - To start implementing DPR in Arizona, piloting will be required
    - Have some leeway so that proven processes
    - Can use a panel review process to validate piloting.
- **Start-up and commissioning**
- **Long-term performance monitoring**
- **CCPs:**
  - Best practices.
  - IMPORTANT: Arizona should not use the term “CCP” and instead use “control points.”

Critical Control Points



16. Long-Term Online and Calibration Monitoring (1)

Process	Test	Grab or online	Frequency of sampling during operation
Secondary Effluent	Turbidity	Both	Online (continuous) and grab (weekly)
	Ammonia, TSS and BOD	Grab	Weekly
UF	PDT	Offline Testing	Daily
	Turbidity	Both	Online (continuous) and grab (weekly)
RO	Influent and Effluent EC and TOC	Both	Online (continuous) and grab (weekly)
UV AOP	UV Sensors	Both	Online (continuous) and grab (weekly)
	Influent UVT	Both	Online (continuous) and grab (weekly)
	Influent and Effluent Chloramine	Both	Online (continuous) and grab (weekly)
ESB with free chlorination	Effluent Free Chlorination	Both	Online (continuous) and grab (weekly)

16. Long-Term Online and Calibration Monitoring (2)

- **Add nitrogen species**
- **CRITICAL: Add a column on "how to apply" – what are you looking for (e.g., microbial, CEC, nitrogen)?**
  - In California, at a process to get credit, you need to have monitoring.
- **Address baseline control monitoring of DPR**
  - Some items monitor for continuously – that do not drop off or gets reduced over time.
  - Demonstrate that you are meeting standards at alltime
- **Secondary treatment should be changed to "wastewater treatment effluent" to reflect B+ and A+ effluent**
- **Explain "chloramine" in the row on UV-AOP**
- **Rename "ESB" to "storage"**
  - Instead of "free chlorination," use "effluent free chlorine residual"

17. Facility Operation

- **Importance of facility operation to produce advanced treated water**
- **Facility startup and commissioning**
- **Operator requirements for potable reuse facilities**
  - Endorsement for advanced treatment.
    - Leave it open for either wastewater or drinking water operators– for advanced treated water going to a drinking water treatment facility.
    - The operator in charge should be drinking water certified– for finished water going to a distribution system.
  - What does Texas do for operators?
    - At Big Spring: Class B surface water/drinking water operator with Class C able to operate facility (that is, Big Spring used the drinking water route).

17. Facility Operation (2)

- **Operations, Monitoring, and Management Plan (OMMP):**
  - Should it be required?
    - In California, regulators approve it. In Arizona, it is submitted to the regulators
    - Include the communication plan between inter-jurisdictional agencies (this is necessary if there are multiple agencies involved in the DPR project).
  - There are existing examples.
    - AACP guidance – existing guidance by ADEQ on OMMP?

- **Response plan to off-spec water:**
  - Need to know the process to identify and address problems.
  - Addresses the time to react – use of automated systems.
  - A plan can be in the operations manual – it does not need to be a separate document.

- **Alternative source of water:**
  - In California, this is a requirement.
  - In Arizona, you have to have another source anyway – Emergency Plan.
    - There may situations in which, seasonally, you may not have an alternative source

18. Public Outreach

- **What constitutes public outreach?**
- **What are the challenges associated with potable reuse outreach?**
- **Development of a communication plan**
- **Examples of potable reuse outreach programs**

Public Outreach: Key Activities

Outreach Activity	Purpose
Provide a rationale for the need for DPR	Raise public confidence of the benefits and value of the DPR project to the community.
Identify public perception challenges to the DPR project	Use to assist in the development of strategies to alleviate these concerns and improve public perception.
Develop a DPR Communication Plan	Provide strategies to communicate about the DPR project to the public, elected officials, and others, with the goal of building public confidence in and support of the DPR project.
Develop and disseminate communications materials on the DPR project	Provide objective, accurate, and timely information to raise awareness of the DPR project and address public concerns.
Connect with outreach staff at other AWTFs	Gain practical information and lessons learned from the real-world experiences of other potable reuse public outreach efforts.
Prepare a participation program for source control	Engage industrial and commercial dischargers, as well as the public, on means to eliminate or control the discharge of constituents into wastewater that can impact the production of ATW.

19. Schedule

- **May 12 - Arizona Water Conference**
  - Audience input.
  - Develop a draft based on this input.
- **Present at the symposium on July 25, 2016**
  - 30-minute presentation in one session, with questions and answers.
- **A workshop in August 2016 dedicated to this effort**
  - Have a public draft– either release it earlier (like at the July symposium) and talk about it here, or release it at the August workshop.

Thank you for listening!

Jeff Mosher
National Water Research Institute
Fountain Valley, CA
jmosher@nwri-usa.org