

Water Reuse Task Force



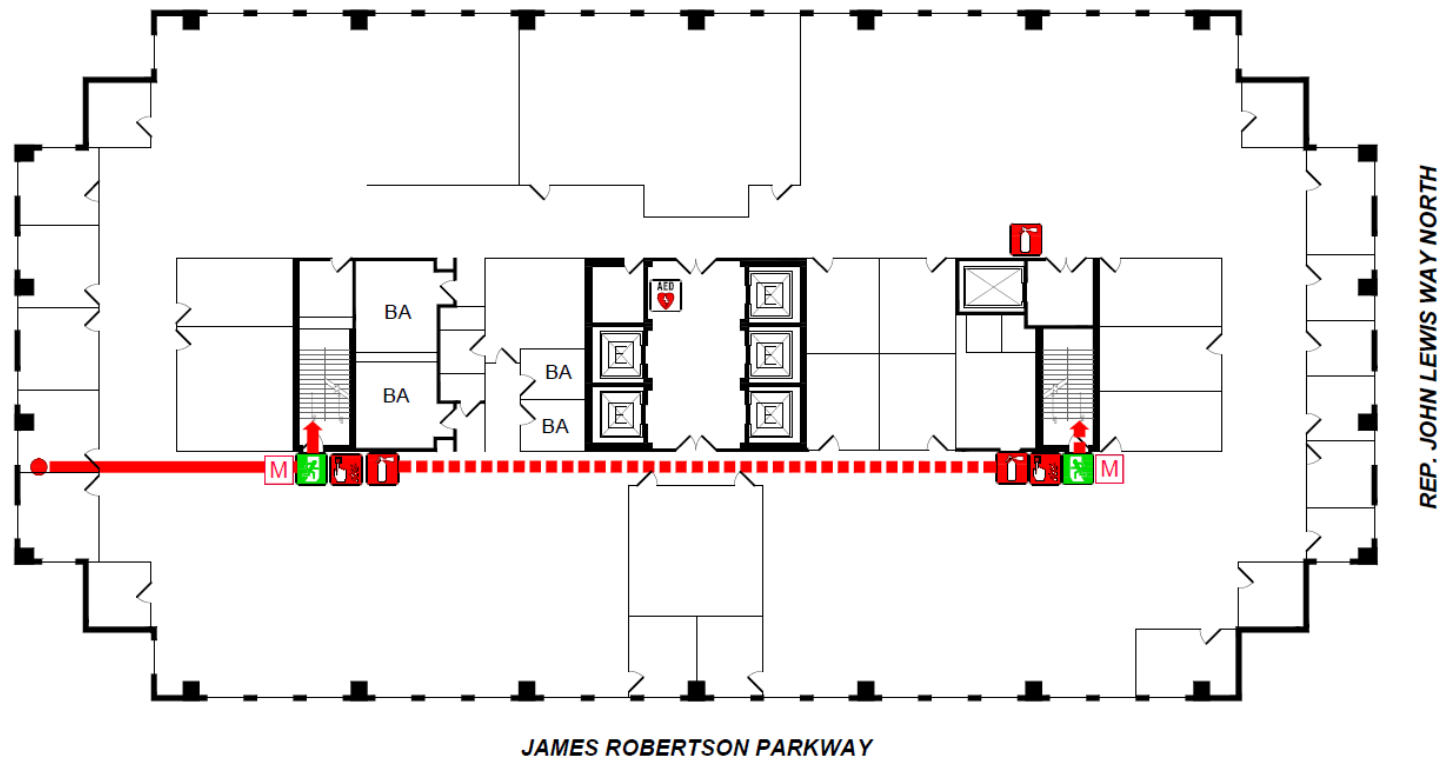
Task Force Meeting No. 2
April 30, 2025

Welcome and Meeting Overview

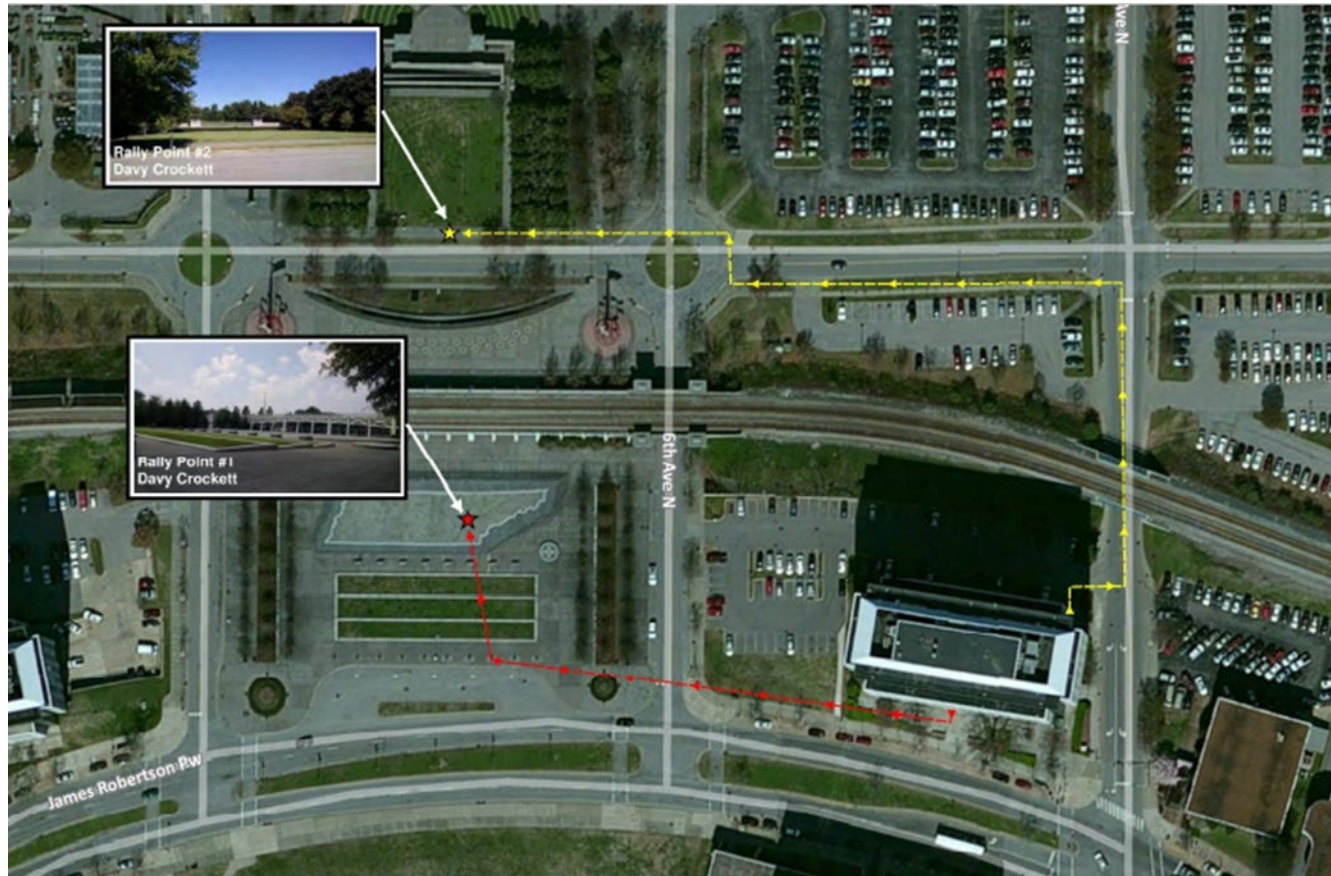
- Welcome to the second Water Reuse Task Force meeting!
- One-day hybrid event
- Sharing expertise and asking questions
- One group throughout
- This meeting will be recorded for notetaking purposes



Davy Crockett Emergency Exits

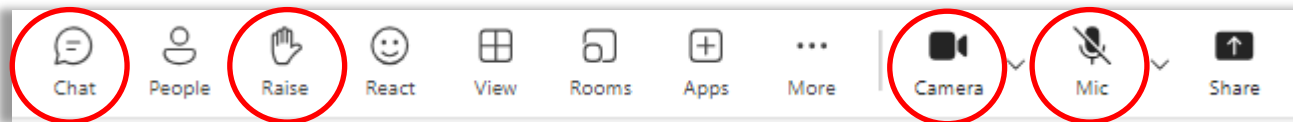


Rally Points



Virtual Participation Best Practices

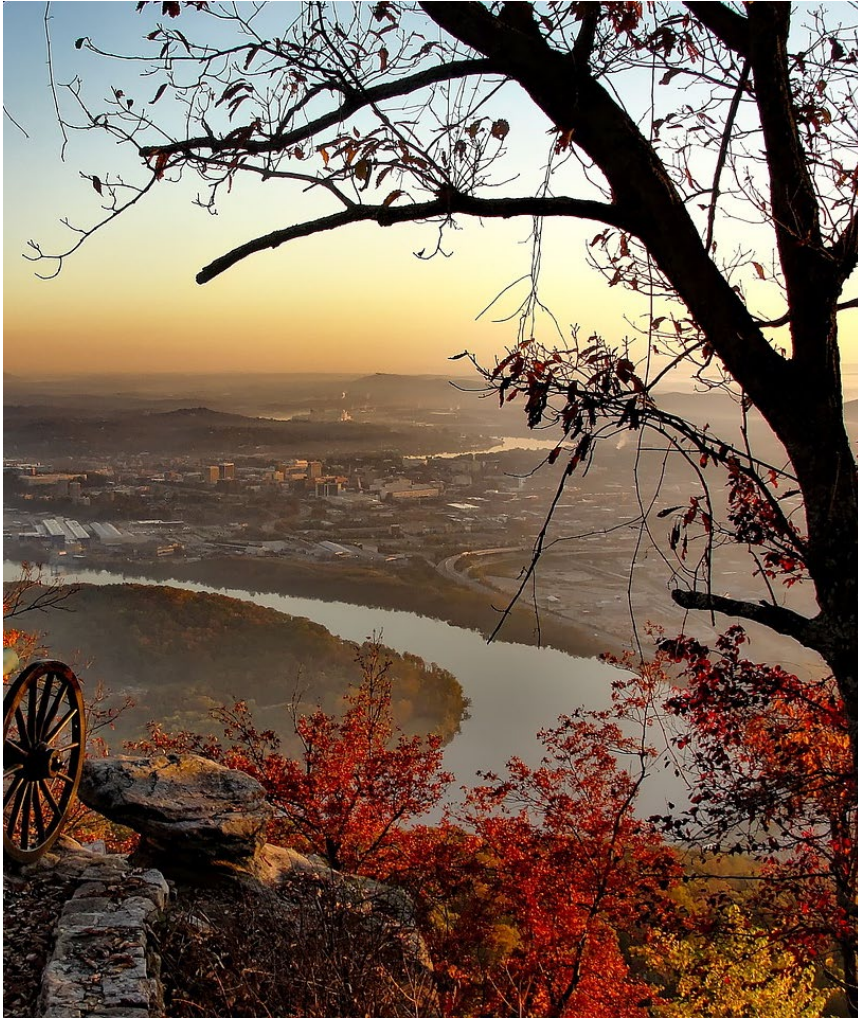
- Mute your mic when not speaking.
- Use “raise hand” button to indicate you would like to speak.
- Use the “chat” function to share a comment, information, or question.
- Turn on your camera when speaking if you are willing and able to do so.
- In the room: Raise your hand or name tent to indicate you’d like to speak



Basic Meeting Ground Rules

- One person speaks at a time
- No personal or institutional attacks
- Be concise
- Express your own views rather than speaking for others
- Stay on track with the agenda
- Identify areas of common ground where possible
- Each person reserves the right to disagree with any proposal and, where appropriate, assumes a responsibility to offer an alternative proposal
- Workgroup lead will present followed by questions

Morning Agenda



- **Check-in & Networking**
(8:30 – 9:00am)
- **Welcome and Overview**
(9:00 – 9:30am)
- **Regulatory Framework Focus**
(9:30 – 10:30am)
- **BREAK** (10:30 – 10:45am)
- **Outreach/Comms Focus**
(10:45 – 11:45am)
- **LUNCH** (11:45am – 12:30pm)

Afternoon Agenda

- **Source Water Nexus Focus**
(12:30 – 1:30pm)
- **BREAK** (1:30 – 1:45pm)
- **Advanced Treatment Focus**
(1:45 – 2:45pm)
- **BREAK** (2:45 – 3:00pm)
- **Operations Focus**
(3:00 – 4:00pm)
- **Discussion / Wrap Up**
(4:00 – 4:30pm)



Task Force – Workgroup Structure



Primary Workgroup Affiliation

Color coded name tents indicate primary workgroup participation

Blue: Regulatory Framework

Red: Communications and Outreach

Green: Source Water Nexus

Purple: Advanced Water Treatment

Orange: Operations

Note that you are welcome to join ANY workgroup meetings

Big Picture Objective

Evaluate and compile information for a regulatory framework to enable potable reuse in Tennessee

- Leverage expertise and work collaboratively
- Evaluate adopted and draft rules from other states
- Compile information that may contribute to the potential future draft rule by summer 2026



Task Force – Approach, Structure and Function

Water Reuse Task Force



Workgroup Leads

Angela Jones - Regulatory Framework

Emily Leaonard - Communications and Outreach

Matthew Tipton - Source Water Nexus

Cindy Wheeler - Advanced Water Treatment

Erich Webber - Operations

ERG Team

- Bobby Jacobsen
- Emily Isaacs
- Kellie DuBay
- Adriane Garnreiter
- Elaine Whetstine

New Workgroup members

- Advanced Water Treatment
Eva Steinle-Darling (Carollo)
Karthik Kumarasamy (CDM Smith)
- Source Water Nexus
Austa Parker (Jacobs)
- Operations
Nick Tatum (Water Authority of Dickson County)
- Communications and Outreach
Peter Murray (TDEC)

Meeting Objectives

- Review Task Force goals and function
- Provide workgroup status updates
- Provide opportunity for workgroup members to
 - Give feedback
 - Identify areas of overlap
 - Identify needed coordination
- Reveal items the workgroups have not yet considered
- Continue to get to know Task Force members
- Serve as a checkpoint and re-energizing forum

Disclaimer

- Collaborative potable reuse program development process
- TDEC will lead the development of any future rules or revisions to related rules or policies
- Information in the work group presentations may not fully align
- These slides capture observations and opinions of members shared during workgroup meetings
- The views expressed do not necessarily represent the views of TDEC

Existing Direct Potable Reuse Rules

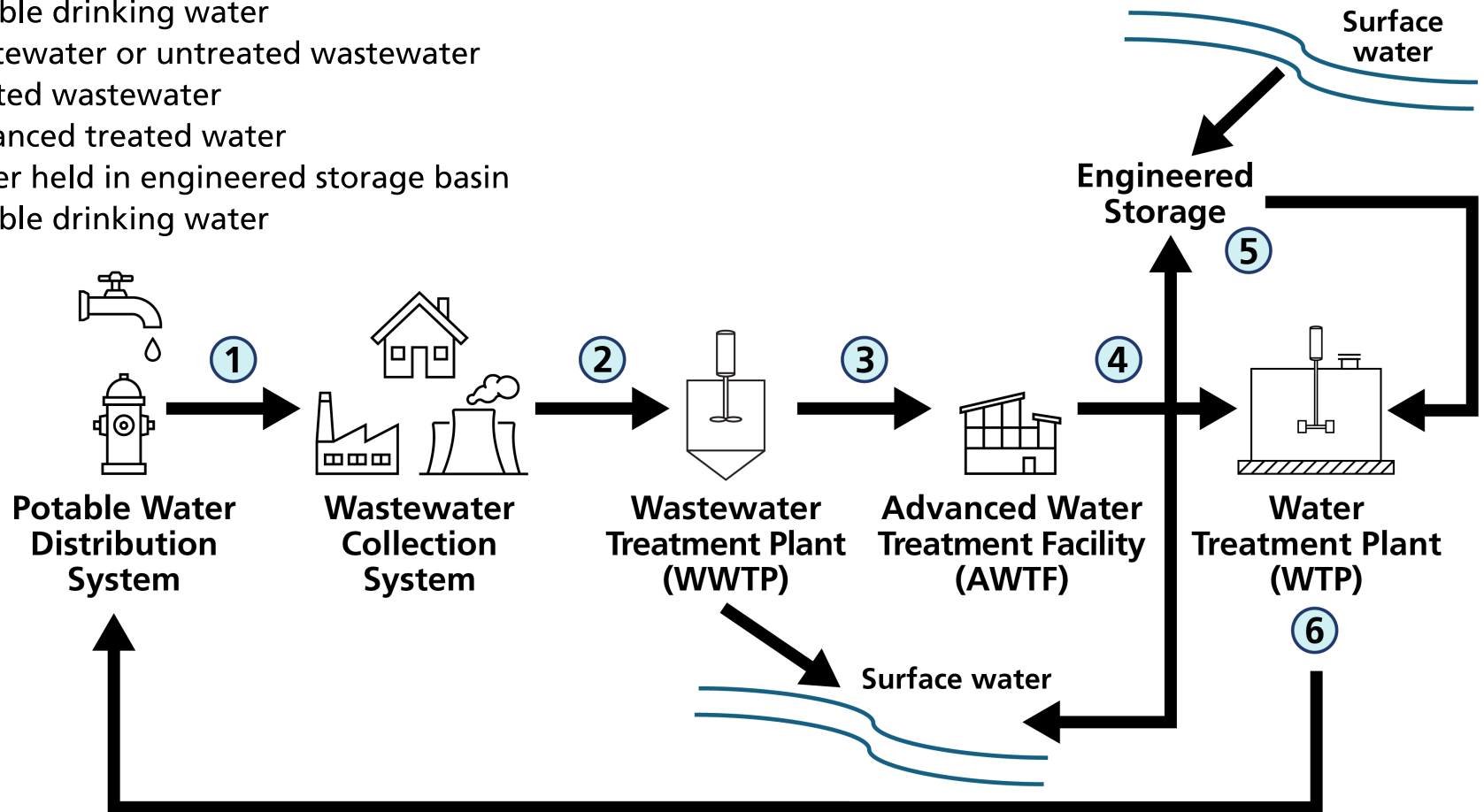
- Colorado – 1/14/2023 (final rule published)
- California – 10/1/2024 (rule effective date)
- Florida – 12/13/2024 (rule approved)
- Arizona – 3/5/2025 (rule effective date)



Potential Scope of Potable Reuse in TN

Process Streams:

- ① Potable drinking water
- ② Wastewater or untreated wastewater
- ③ Treated wastewater
- ④ Advanced treated water
- ⑤ Water held in engineered storage basin
- ⑥ Potable drinking water





Workgroup 1 Focus: Regulatory Framework

Meeting Topics

Workgroup has met five times to date and discussed the following topics:

- Potable reuse definitions
- Scope of potable reuse in TN
- Existing relevant TN rules
- Potable reuse permitting / approval process
- Pilot testing requirements



Definitions

Task Force Working Definitions for Potable Reuse

- Development process
 - Workgroup compiled existing definitions from key sources (e.g., U.S. EPA, WaterReuse Association, regulations in TN and other states)
 - TDEC Facilitation Committee reviewed to identify which aligned with the State's current thoughts
 - Workgroup reviewed and provided working definitions



Task Force Working Definitions

Water Reuse

- The use of treated wastewater (reclaimed water) for a beneficial purpose

Task Force Working Definitions

Reclaimed Water

- Treated effluent from a wastewater treatment system, which as a result of treatment, is suitable for a beneficial purpose

Task Force Working Definitions

Advanced Treated Water

- Water produced from an advanced water treatment facility (AWTF) suitable for direct and indirect potable reuse applications

Task Force Working Definitions

Direct Potable Reuse (DPR)

- The introduction of advanced treated water (with or without retention in an engineered storage buffer) directly into a drinking water treatment plant

Task Force Working Definitions

Engineered Storage Buffer

- A storage facility used to provide retention time – before advanced treated water is introduced into the water treatment plant or distribution system – to conduct testing to evaluate water quality and hold or divert the water in the event that it does not meet specifications; it may also be used to store water to ensure an adequate water supply or allow for blending with surface water

Task Force Working Definitions

De Facto Reuse

- The downstream use of surface water as a source of drinking water that is subject to upstream wastewater discharges, although the water supply has not been permitted as a water reuse project



Scope of Reuse

Scope of Potable Reuse in Tennessee

- Tennessee has non-potable water reuse regulations for applications such as landscape irrigation, toilet flushing, and industrial use
- Task Force is exploring potable water reuse for human consumption
- Out of scope
 - De facto reuse
 - Agricultural reuse for foods crops
- Potential future potable reuse rule would not enable “direct to distribution” DPR approach



Existing Rules

Evaluating Existing Relevant TN Rules

- Rules reviewed to date
 - Non-Potable Water Reuse (0400-40-06-.10)
 - Public Water Systems (0400-45-01)
 - Individual NPDES Permits (0400-40-05)
- Evaluation process
 - Reviewed existing TN regulations
 - Explored other state regulations (adopted and draft) to understand what changes to existing rules were necessary in other states and become more familiar with the language used
 - Discussed applicability to TN



Image source: [EPA, 2025](#).



Image source: [Ohio EPA, n.d.](#)

Evaluation:

TN's Non-Potable Water Reuse Rules

- The workgroup identified a few items under definitions that may need to be revised, including:
 - Update definition for “potable reuse of reclaimed wastewater”
 - Change “reclaimed wastewater” to “reclaimed water”
 - Add definition for “advanced treated water”
- Given that the non-potable rule was specifically written to not cover potable reuse, nothing in the rule applies to the current effort
- The workgroup did not identify any conflicts

Evaluation:

TN's Public Water Systems Rules

- Reviewed CO's regulatory approach to enable potable reuse
 - Modifications to CO's Primary Drinking Water Standards (Reg. 11)
 - Direct Potable Reuse Rule is found in Section 11.14
 - The State also issued two policies to support the DPR Rule
 - Direct Potable Reuse Policy
 - Enhanced Source Water Control Program Policy

Evaluation:

TN's Public Water Systems Rules

- Potential modifications to enable reuse in TN
 - Purpose: Add language about disproportionately impacted communities in coordination with Communications and Outreach workgroup
 - Definitions: Potential minor amendments using CO definitions and task force working definitions as a guide
 - Public Notification: Update appendices with violations and standard health effects language

Evaluation:

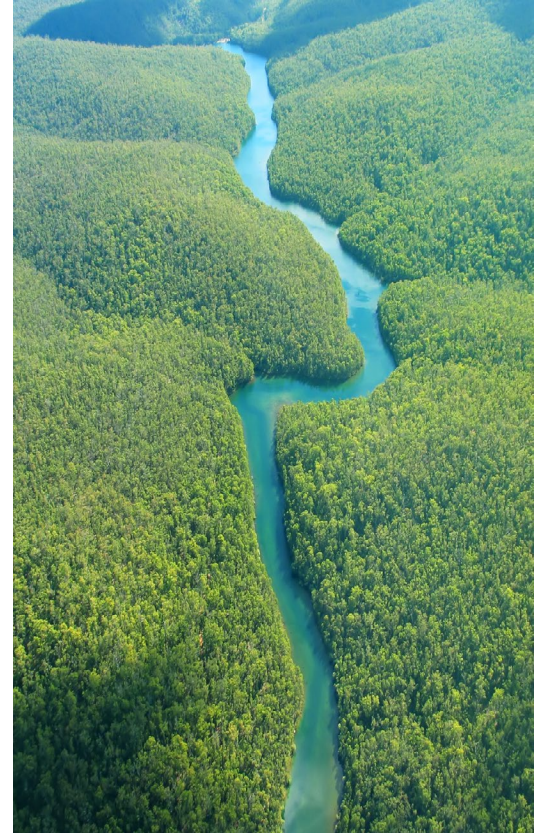
TN's Public Water Systems Rules

- Consumer Confidence Reports (CCR): Add in potable reuse language
- Drinking Water Source Protection: Add language to reflect wastewater as a source

Evaluation:

TN's Individual NPDES Permits Rules

- Reviewed AZ, CO, and FL approaches
 - No amendments identified
- Potential modifications to enable reuse in TN
 - Update to indicate that potable reuse is authorized under new Potable Reuse Rule
 - Evaluate whether additional definitions are needed (e.g., advanced water treatment)



Potential Home for Potable Reuse Rules

Tennessee Secretary of State Official Compilation of Rules and Regulations

[All Effective Rules and Regulations](#) > [0400](#) > [0400-45](#)

Rules of the Tennessee Department of Environment and Conservation

Division of Water Resources (Drinking Water Supply)	
Chapter	Description
0400-45-01	Public Water Systems (Transferred from 1200-05-01 which was repealed)
0400-45-02 through 0400-45-03	Reserved
0400-45-04	Regulations Governing the "Waterworks Construction Loan Act" (Transferred from 1200-05-04)
0400-45-05	Reserved
0400-45-06	Underground Injection Control (Transferred from 1200-04-06)

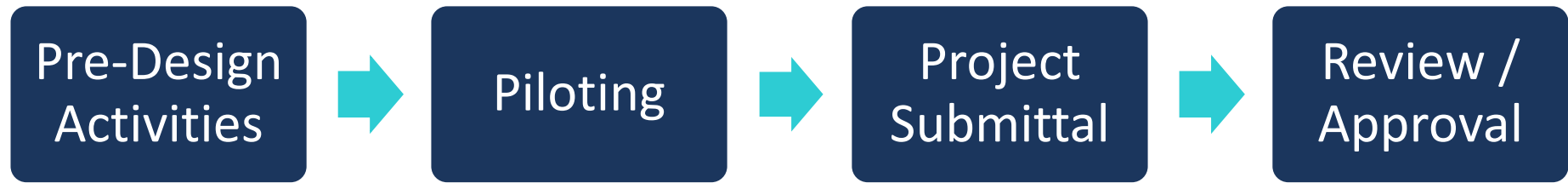


Permitting/ Approval

Potential Approach for Potable Reuse Permitting / Approval

- Reviewed AZ, CO, FL, and CA approaches; some issue a potable reuse permit, some review and approve
- Explored key aspects of approval process
 - Joint agreement
 - Pre-application activities
 - Submittal requirements
- Exploring feasibility of coordinated permitting approach
 - NPDES permit to authorize surface water discharge from advanced treatment
 - State Operating Permit (SOP) for non-discharging systems to authorize potable reuse

Potable Reuse Permitting / Approval Process



Aspects Discussed for Potable Reuse Approval Process

- Pre-design activities
 - Initial meeting with TDEC
 - Demonstration of technical, managerial, and financial (TMF) capacity
 - Joint agreement for pilot activities
 - Initial source water characterization (ISWC) plan and report
 - Initial source water monitoring at all WWTPs delivering treated wastewater to a proposed AWTF
 - Communications Plan
- Piloting
 - Pilot study plan
 - Pilot study and report

Aspects Discussed for Potable Reuse Approval Process

- Project submittal requirements
 - Administrative information (e.g., names of all partners)
 - Copy of joint agreements
 - Updated financial assessment
 - Public communications plan
 - Pilot study results
 - Source water monitoring results
 - Enhanced source water control plan

Aspects Discussed for Potable Reuse Approval Process

- Project submittal requirements (continued)
 - Engineering report, plans, and specifications
 - Off-spec water disposal
 - Non-potable reuse system description
 - Monitoring plan (i.e., pathogen and chemical action levels)
 - Full-scale verification plan
 - Operations plan



Pilot Testing

Pilot

- Demonstration pilot
 - Scaled down version of the treatment processes
- Full scale pilot
 - Full scale facility prior to approved regulations
 - Full scale facility during first year of operation, prior to connection to water treatment plant

Pilot Discussion

- Reviewed AZ, CO, and FL approaches
- Pre-application piloting
 - Year-long pilot at demonstration scale
 - Pretreatment program may not be required for pilot but likely would be for full-scale
- Example pilot plan requirements
 - Pilot study objectives
 - Design for each treatment component
 - Monitoring plan and parameters
 - Sampling protocols
 - Explanation of the pilot train's representation of the scale / performance of full-scale AWTF

Pilot Discussion

- Pilot monitoring / sampling requirements
 - At a minimum, identify what is to be sampled at what frequency
 - Address Contaminants of Emerging Concern (CECs)
 - Spike testing to prove treatment efficacy
 - Period of steady-state operation
 - Advanced Treatment Workgroup to further evaluate

Pilot Discussion

- Reporting requirements
 - Would likely only ask for final report; do not anticipate needing intermediate reporting
 - Best practice for TDEC to periodically meet and be in communication with pilot community



TDEC Policy

- Tennessee Code Annotated § 4-5-102(10) defines policy:
- “Policy” means any statement, document, or guideline prepared or issued by any agency pursuant to its delegated authority that merely defines or explains the meaning of a statute or a rule.
- “Policy” also means any statement, document, or guideline concerning only internal management of state government that does not affect private rights, privileges, or procedures available to the public.
- “Internal management” means the administration of an agency’s internal operations for the purposes of facilitating operational effectiveness and efficiency.

Next Steps

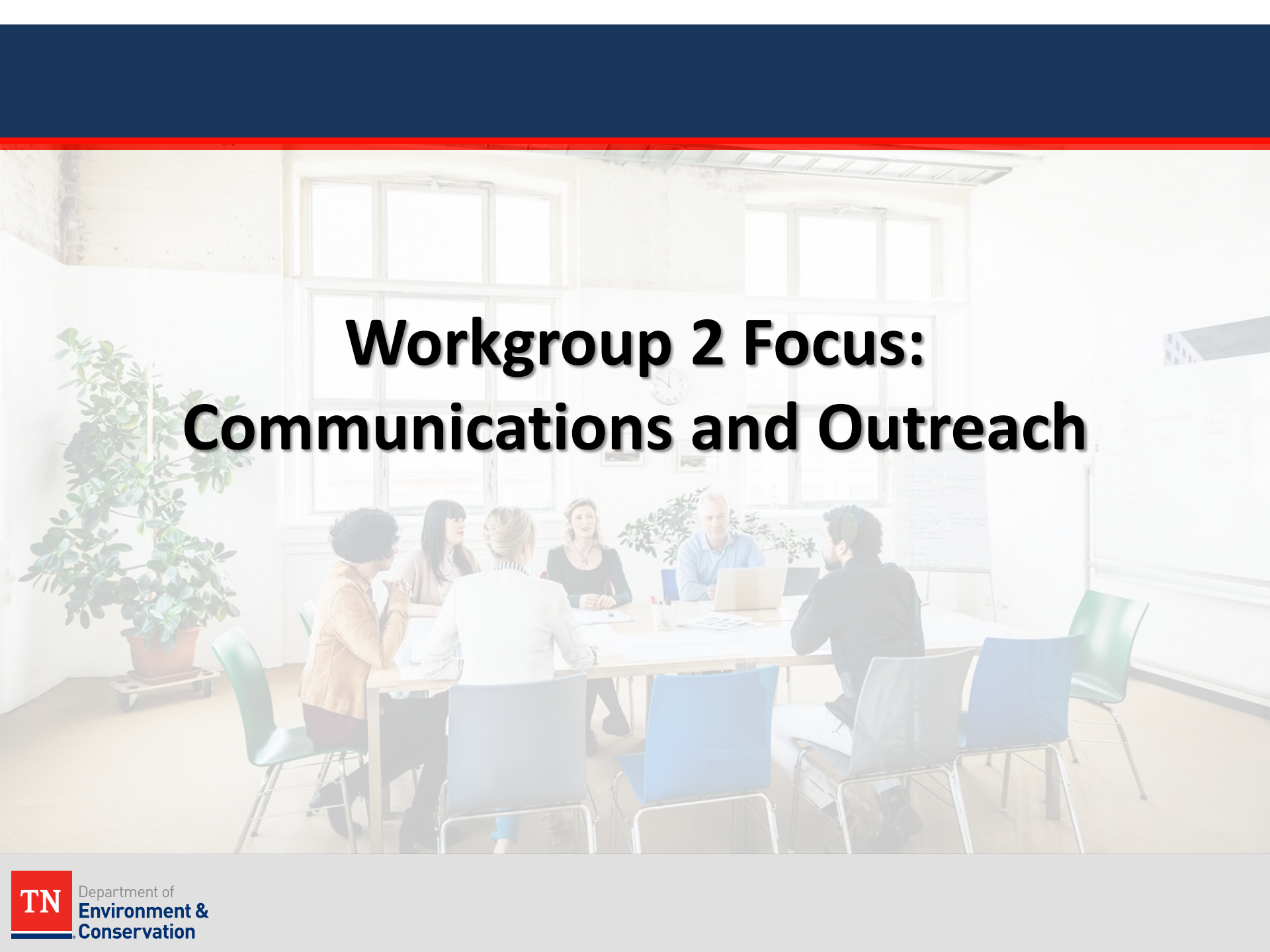
- Future discussion topics:
 - Policy
 - Compliance and enforcement
 - Data storage / sharing
 - Economic impact study
- Anticipate integrating information from all workgroups:
 - Definitions
 - Pathogen removal and crediting
 - Source water characterization
 - Enhanced source control
 - Monitoring of pathogens and chemicals
 - Processes for piloting and permitting

Open Discussion: Questions & Comments



Group Discussion

- Are there **key terms** related to potable reuse that still need to be defined?
- Are there **other existing rules** in TN that may need to be amended to enable potable reuse? What about guidance documents or policies?
- What **key areas of intersection exist** between other workgroups and Regulatory Framework? How do we best orchestrate this collaboration?
- Are there any **missing topics** that you would have expected the Regulatory Framework workgroup to cover?



Workgroup 2 Focus: Communications and Outreach

Meeting Topics



Workgroup has met 4 times to date and discussed the following topics:

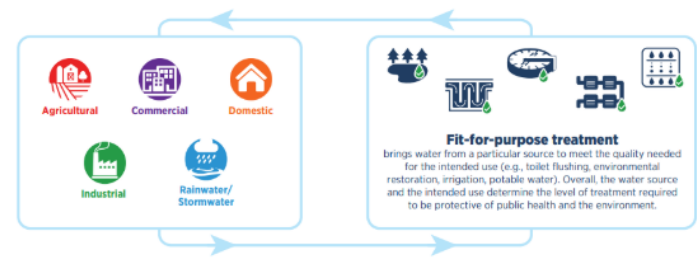
- **External communications** needs, goals, and audiences to introduce water reuse to the public, including TDEC's website
- **Effectiveness and limitations of messaging** through review of water reuse articles and case studies
- **Applicability of states' potable water reuse regulations** communication plan requirements to TN
- **Real-world experience** from CO's water reuse regulation communications workgroup lead on decision-making process and communication requirements

Water Reuse in Tennessee

Water reuse is the use of reclaimed water which is treated effluent from a wastewater treatment system for beneficial purposes. A common source of reclaimed water is treated municipal wastewater effluent, which then undergoes additional "fit-for-purpose" treatment, that is appropriate for the intended beneficial end use. Types of water reuse are defined by their end use and include "non-potable" applications such as landscape irrigation, toilet flushing, and industrial use and "potable" applications for human consumption. Potable reuse involves advanced treatment processes and is typically defined under two main types:

- **Indirect potable reuse** uses an environmental buffer before the water is treated at a drinking water treatment plant.
- **Direct potable reuse** involves the treatment and distribution of advanced treated water (with or without retention in an engineered storage buffer) directly into a drinking water treatment plant.

Examples of Reuse Sources and Uses



Two Prongs to Water Reuse Communications

- **External facing communications** about water reuse
 - TDEC to the public
 - Establishes model messaging for utilities exploring water reuse to use in their own communities
- **Communication plan requirements** for water reuse found in **regulations**
 - *Primary focus of Communications Workgroup*
 - Basis for review of other states' water reuse regulations for communications requirements and creating an applicability assessment for TN



Review of Communication Plan Requirements

Communication Plans in draft/final potable water reuse regulations generally address these elements:

- **Required topics/messages to cover in communications**
- **Communications requirements for different project phases**
- **Approved methods of communications**
- **Stakeholder/service area customer identification**
- **Accessibility**
- **Reporting on communication plan requirement implementation**
- **Public notification**
- **Violations**

Applicability Findings: Overarching Thoughts

- Colorado's approach to Communication Plan requirements seems most applicable to TN
 - Easy to understand in regulation
 - Comprehensive, cohesive in regulatory language (not spread out among different sections of the regulation)
 - Regulation is clear, but policy offers more details
- Arizona's approach also has some applicability to TN
 - Takes a phased approach to communications
 - Phases would need to be adjusted for use in TN based on piloting phase
- Both Colorado and Arizona's approaches would need adjustments to work in TN

Applicability Findings: Required Topics/Messages

- Colorado: Regulation provides a specific list of information that must be covered in outreach materials
- To be applicable in TN:
 - A policy should include a list of topics that the water reuse project communications must address. Communities will be looking for clarity and resources.
 - Communities should show the “why” – why is the project necessary and what is the problem?
 - Provide a model or template as guidance communities can adapt (like those provided by the TDEC stormwater program).

Example of CO's Required Communication Topics

- The name, business address, and phone number for the supplier or designee that the consumer may contact for additional information about the direct potable reuse project.
- An explanation of what direct potable reuse is and the reasons for the supplier's implementation of direct potable reuse.
- A description and/or depiction of the supplier's proposed direct potable reuse project.
- Identification of the wastewater treatment plant that serves as the source for the direct potable reuse project.
- The service area(s) that will be supplied with finished water from the direct potable reuse project.
- A statement that direct potable reuse is regulated by the Department under Regulation 11 and information on how to access Regulation 11.

Applicability Findings:

Approved Communications Methods

- Require that the permittee must use an “acceptable method of communication” and provide a rationale for what they choose
- In policy, include a list of approved methods of communication:
 - Coverage through a local news outlet (e.g., television, newspaper, social media)
 - Community event(s) (e.g., setting up table/booth)
 - Local school(s) and school events
 - Providing opt in email/text notifications to customers
 - Consumer confidence reports, water bill inserts, or other mail notification
 - Neighborhood association meeting(s)
 - Notice on bulletins and other publicly accessible areas
 - Online forums (e.g., Nextdoor)
 - Social media
 - Civic organizations
 - Other

Applicability Findings: Phase Requirements

- Pre-Design Phase
 - Planning Phase (6 months to 1 year prior to pilot)
- Pilot Phase
 - Pilot Study Plan
 - Pilot Study and Report
- Project Submittal Phase
- Review and Approval Phase



Applicability Findings: Pre-Design Phase

- **Identify water customers.**
- **Create list of water reuse project stakeholders.**
- Align stakeholders with **approved methods of communication.**
- **Notify stakeholders** about the planned pilot and the public meeting using an approved method of communication.
- Schedule and hold **at least one public meeting.**
- Communicate to the public through a **publicly-accessible repository.**
- **Document stakeholder feedback.**

Applicability Findings: Pilot Phase

- **Compile documentation on pre-application planning communications activities.**
- **Develop a pilot study communications plan.**
- Submit with the pilot study plan:
 - 1) the **compiled documentation of communication activities** conducted during the pre-application planning phase, and
 - 2) the **pilot communications plan.**

Applicability Findings: Pilot Phase

- **Conduct and evaluate activities** in the approved pilot communications plan submitted with the pilot study plan.
- **Maintain documentation** of activities.
- **Submit documentation** of activities conducted and lessons learned.



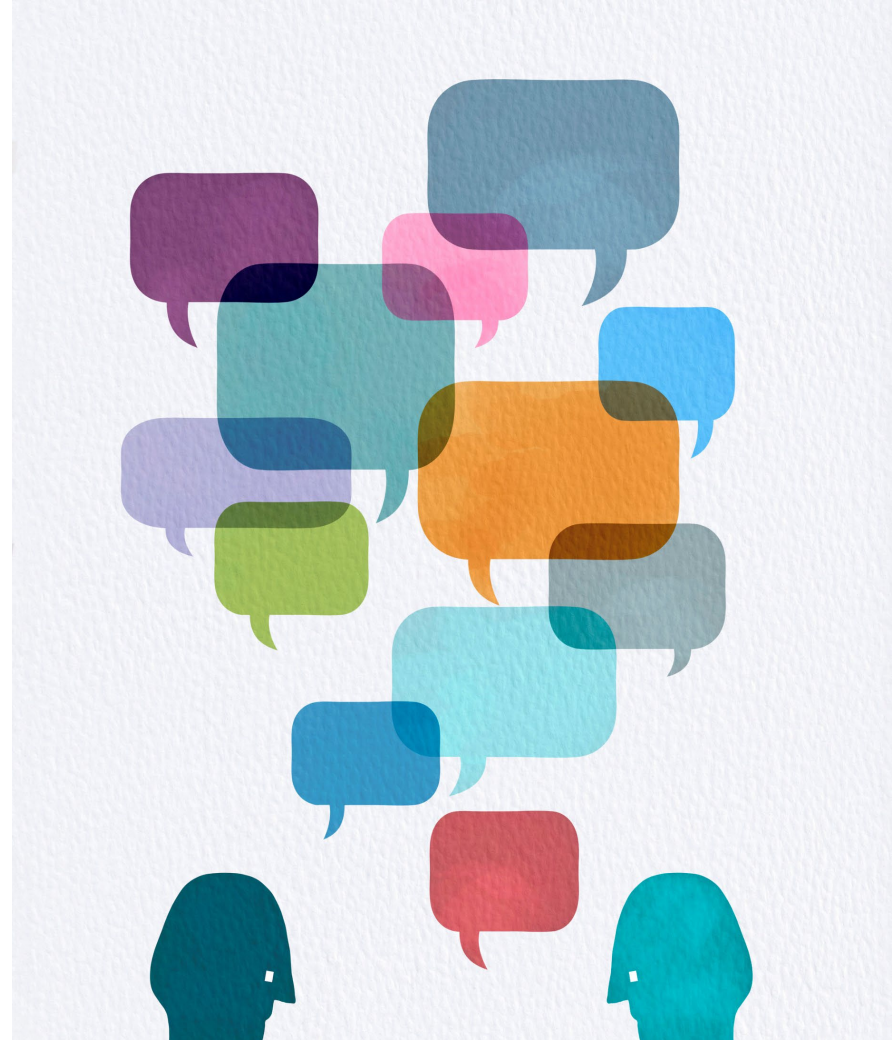
Applicability Findings: Project Submittal Phase

- Develop and submit a **report on pilot study communications activities**
- **Submit updated project communications plan**
- Schedule and hold **at least one public meeting no less than six months prior to distributing** advanced treated water from the potable water reuse project.

Applicability Findings: Phased Requirements

Review and Approval

- **Conduct and evaluate activities** in the approved communications plan.
- **Maintain documentation** of activities.
- **Submit annual documentation** of activities conducted and lessons learned.
- **Update communications plan** elements as required.



Applicability Findings:

Stakeholder/Service Area Customer Identification

- For the pilot phase, include a requirement to **develop a characterization of the stakeholders**
- In the project submittal phase, require a more **comprehensive stakeholder characterization** to ensure the right groups receive the information
 - Policy language would suggest how to conduct this characterization (e.g., survey in a utility bill)
- In policy, include best practice suggestion for applicant to **keep TDEC aware of outreach activities / engagement**
 - Do not create an expectation for TDEC's involvement

Applicability Findings: Accessibility

- TN has accessibility requirements in its Title VI Program
- To ensure Title VI is sufficient, workgroup will conduct additional research on this topic **to ensure that all communities are adequately notified** (e.g., in languages and formats understood by those served)

Title VI Program

Title VI ensures no person shall be excluded from participation in, or is denied the benefits of, or is subjected to discrimination under any program or activity receiving federal financial assistance from the Department of Transportation on the grounds of race, color, and national origin.



Applicability Findings: Reporting on Communication Plan Implementation

- From the pre-design phase into the project submittal phase, permittees should **demonstrate what they have learned** through:
 - Communications outputs (what they did)
 - Outcomes (input received and level of engagement/response with the outreach material)
- In policy, provide examples of how to report and use this information to include pilot-phase communication

Key Considerations

- Regulation versus policy
- Model communication tools/templates
- Review expectations



Future Discussion Topics

- Review TN's existing and other states' potable **notification requirements for violations**
- Review TN's existing and other states' potable **reporting requirements and violations**

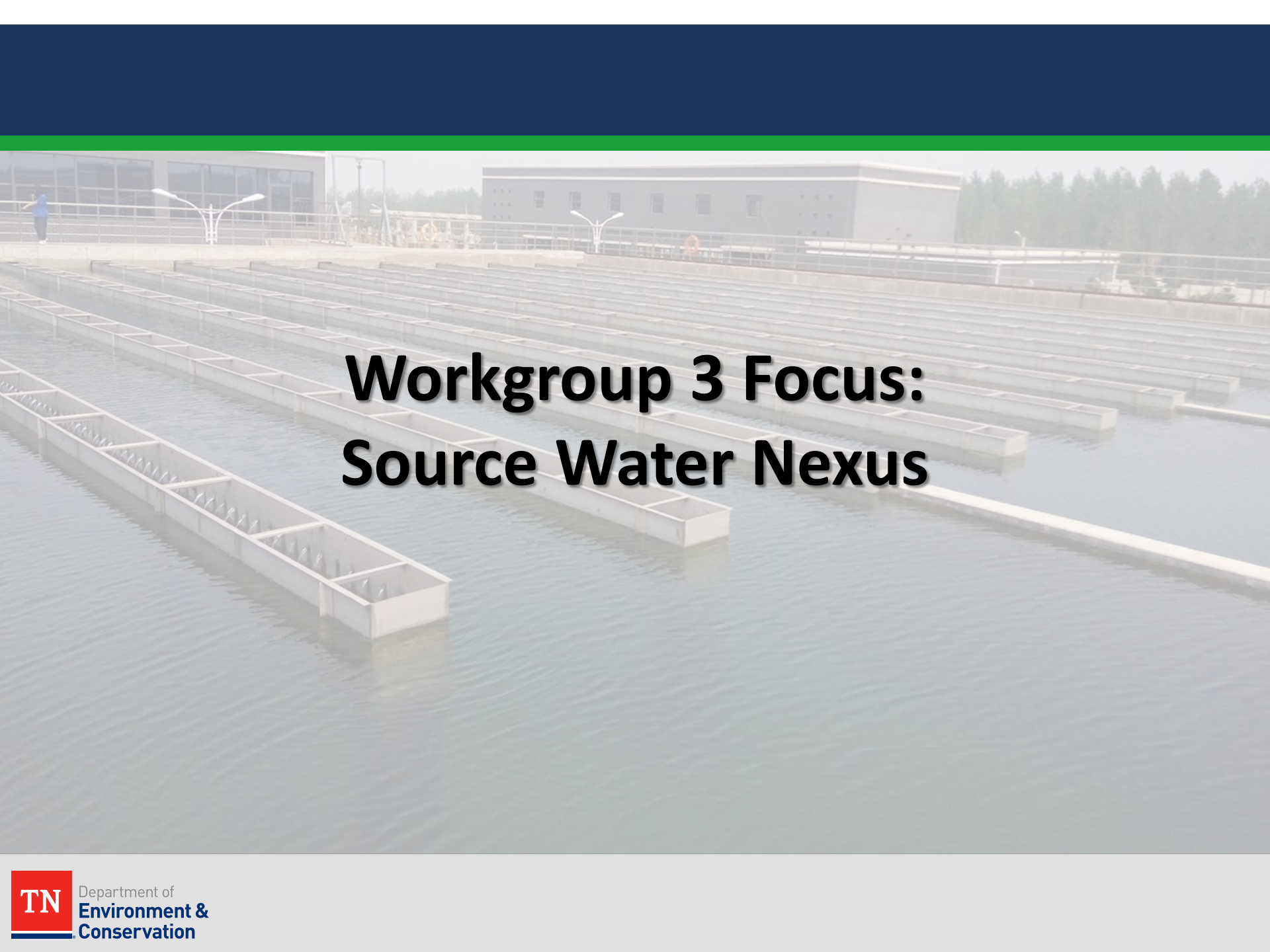


Open Discussion: Questions & Comments



Group Discussion

- What are your **primary concerns** related to public education / outreach for potable reuse?
- How can we **ensure collaboration and effective, enduring communication** with appropriate stakeholders for potable reuse projects?
- What **key areas of intersection exist** between other workgroups and Communications and Outreach? How do we best orchestrate this collaboration?
- Are there any **missing topics** that you would have expected the Communications and Outreach workgroup to cover?

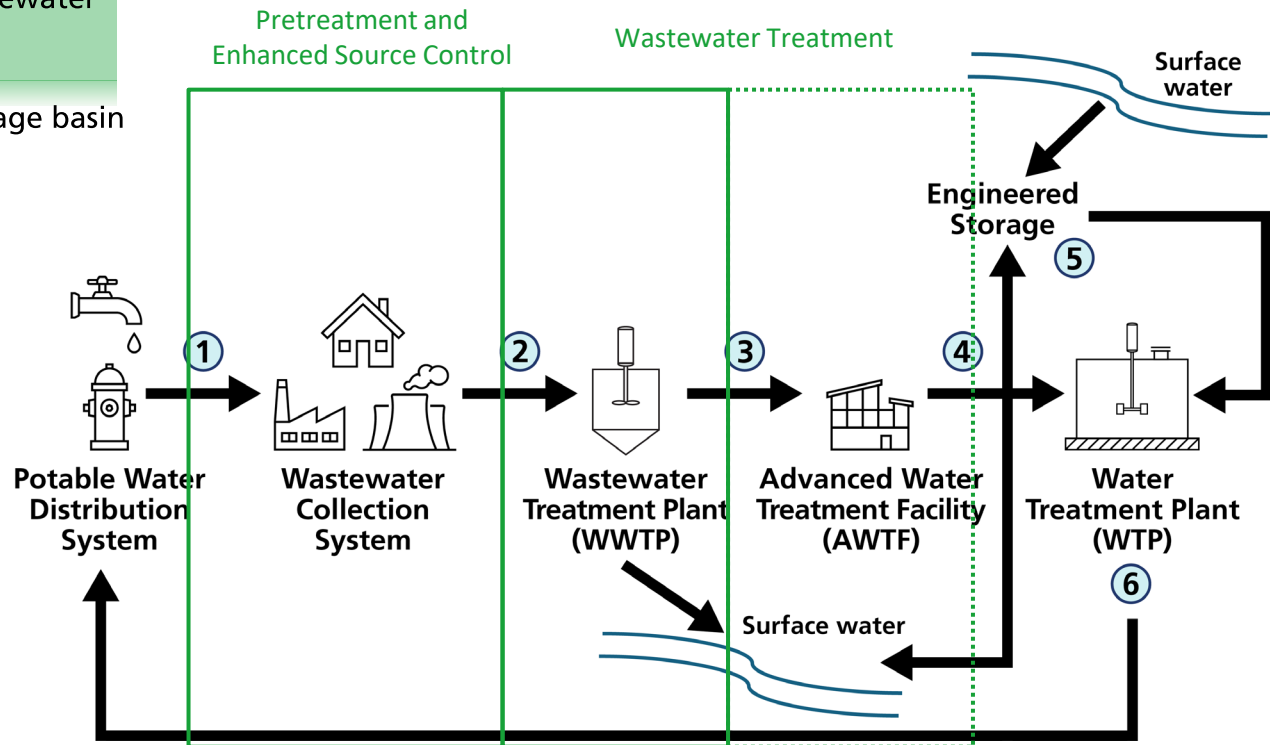


Workgroup 3 Focus: Source Water Nexus

Source Water Nexus

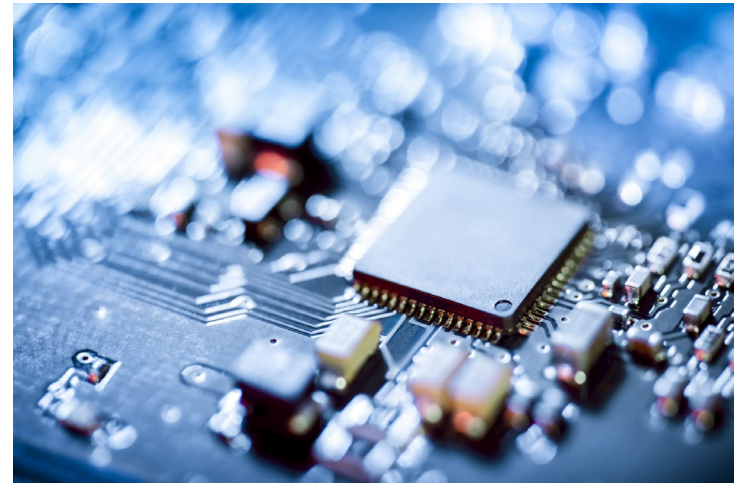
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- ④ Advanced treated water
- ⑤ Water held in engineered storage basin
- ⑥ Potable drinking water



Meeting Topics

- Tennessee's Pretreatment Program
 - Applicability for potable reuse
- Enhanced Source Control
 - State programs (AZ, CA, CO, FL)
 - Applicability to Tennessee



Tennessee's Pretreatment Program: Rule 0400-40-14

- Pretreatment Overview

- The pretreatment program is a component of the National Pollutant Discharge Elimination System (NPDES) Program.
- Main objectives:
 - Prevent the introduction of pollutants into wastewater facilities which will interfere, pass through, and/or be incompatible
 - Improve opportunities to recycle and reclaim wastewaters and sludges
 - Protect wastewater facility workers

- Status in TN

- 100 active pretreatment programs (Control Authorities)
 - Roughly 40% of wastewater authorities in TN
 - 115 WWTPs
 - 5 currently listed as developing
- 729 permitted Significant Industrial Users (SIUs)
 - 317 of which are classified as Categorical Industrial Users (CIUs) subject to federal categorical pretreatment standards

Tennessee's Pretreatment Program: Rule 0400-40-14

- Questions for the workgroup:
 - *What is the current state/practice for pretreatment in Tennessee?*
 - *What would need to change to enable potable reuse?*
- Existing pretreatment program contains the basic elements needed to support a water reuse program
- Expect limited amendments to 0400-40-14 to enable potable reuse, which appears to be consistent with other states' approaches



Tennessee's Pretreatment Program: Rule 0400-40-14

- Potential updates identified:
 - Update existing General Prohibition language to specify that users may not introduce pollutants that cause pass through, interference, or otherwise inhibit Potable Reuse.
 - Evaluate each source water provider independently as part of the source water characterization evaluation.
 - Add requirements for additional monitoring at different points in the collection system.
 - Apply local limits rather than broad categorical standards to be more protective.
 - Develop template documents to share with municipalities and a checklist for how to review them with the state.

Enhanced Source Control

- CO rule, 11.14(4): [The enhanced source water control program] *must demonstrate how the supplier will **reduce, eliminate, or alter the nature of constituents of concern** including target chemicals in treated wastewater sufficient to **meet the criteria for the critical control point monitoring ranges for direct potable reuse** through the characterization of sources contributing to the influent of a wastewater treatment plant.*

Enhanced Source Control

- Evaluated policies and regulations in CA, CO, AZ, and FL
 - What elements does TN already have in place?
 - What are program requirements in states with potable reuse regulations?
 - What will and won't work for TN and why?
- Compared the following elements across source control programs:
 - Legal authority
 - Program components / implementation
 - Supplier requirements / documentation
 - Outreach program
 - Surveillance and monitoring / early warning requirements
 - Reporting requirements
 - Violations
 - Source water characterization sampling
 - Hauled waste



Enhanced Source Control

- Legal authority
 - Assess state regulations to ensure consistent and appropriate classification of Significant Industrial User
 - Develop or expand local limits (pass through limits and influent criteria)
 - Expand CEC list to capture drinking water parameters, and identify CECs related to industrial impact
 - Consider establishing / including in joint agreement between the WWTP, AWTF, and WTP to clarify enforcement
- Program components and implementation of enhanced source control programs
 - Be as specific as possible in regulation
 - Communities need to have a pretreatment program that has been operational for at least one year
 - Require that the pretreatment program demonstrates effectiveness and possesses excess capacity beyond current wastewater treatment needs

Enhanced Source Control

- Outreach program
 - Require outreach to industry and develop a structure for these communications
 - Consider developing tools / checklists for how to approve DPR facilities and conduct outreach to those who do not currently have a pretreatment program
 - Ensure coordination with existing / new local businesses to ensure understanding of local ordinances which give utilities leverage to enforce pretreatment industrial permits
 - Education about domestic best practices (e.g., drug takeback programs) – to be coordinated with the Outreach and Communications workgroup

Enhanced Source Control

- Surveillance and monitoring / early warning requirements
 - Include requirements to enable early warnings of chemical peaks in the collection system
 - Florida's requirement for a continuous improvement plan for performance and reliability of the early warning system
 - Consider creating a database to log results for real-time monitoring to make it easy for TDH / TDEC to verify suspected issues



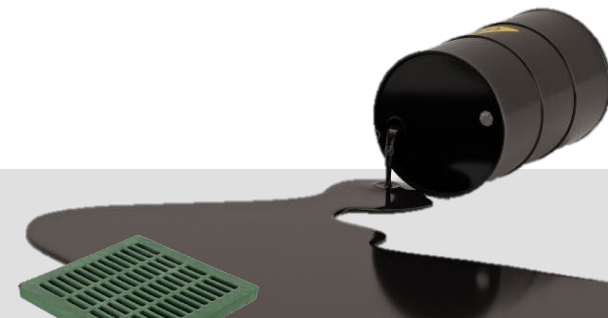
Enhanced Source Control

- Future-proofing regulatory language to account for new indicator compounds
 - Compare TDEC's lists of CECs to ensure consistency across all regulations and avoid loopholes (e.g., should leave room for CECs that were not identified/an issue during the time that the regulation is written)
 - Consider identifying a base list of CECs that the facility needs to monitor for in the potential regulation and require the applicant to propose a list of chemicals to monitor for



Enhanced Source Control

- Tracking CECs and performing source investigations
 - To keep track of non-domestic dischargers and CECs that they discharge to the collection system over time, survey every two years (currently survey every 5 years as part of the NPDES renewal process)
 - Consider establishing BMPs to minimize parameterization and allow enforcement action for violating the ordinance / local limits
 - Require cities to develop a Fats, Oils, and Grease (FOG) program
 - Consider sewershed monitoring to identify chemical peaks
- Enforcement response plan
 - The pretreatment program's enforcement response plan is likely sufficient under a potable reuse scenario but should be reviewed to identify potential modifications
 - Re-evaluate the plan when new industry moves in and/or there is significant population growth



Enhanced Source Control

- Reporting requirements and violations
 - Under the pretreatment program, currently must submit a report (usually twice a year) that details the reporting requirements
 - Abide by the tiered violation system for public notice
- Source water characterization sampling
 - Specify that the applicant is responsible for testing and initial / ongoing wastewater characterization
 - Use EPA's list of primary CECs in the Source Water Protection regulations as the list to be addressed by enhanced source control programs
- Hauled waste
 - Septage hauling should not be permitted for reuse scenarios
 - Treatment plants in TN do not typically sample hauled waste unless it is known to be from an industrial source

Future Discussion Topics

- Wastewater treatment
 - Required level of treatment
 - Treated wastewater characterization / per-permit application monitoring requirements
 - Critical control points, ongoing monitoring, action limits
 - Communication and coordination with the AWTF
 - Violations and response to violations
 - Reporting requirements



Open Discussion: Questions & Comments



Group Discussion

- Are there **other considerations** related to expanding or enhancing TN's pretreatment program to ensure source water protection?
- What are some **key challenges** to be aware of related to **wastewater treatment** in a potable reuse scheme?
- What **key areas of intersection exist** between other workgroups and Source Water Nexus? How do we best orchestrate this collaboration?
- Are there any **missing topics** that you would have expected the Source Water Nexus workgroup to cover?

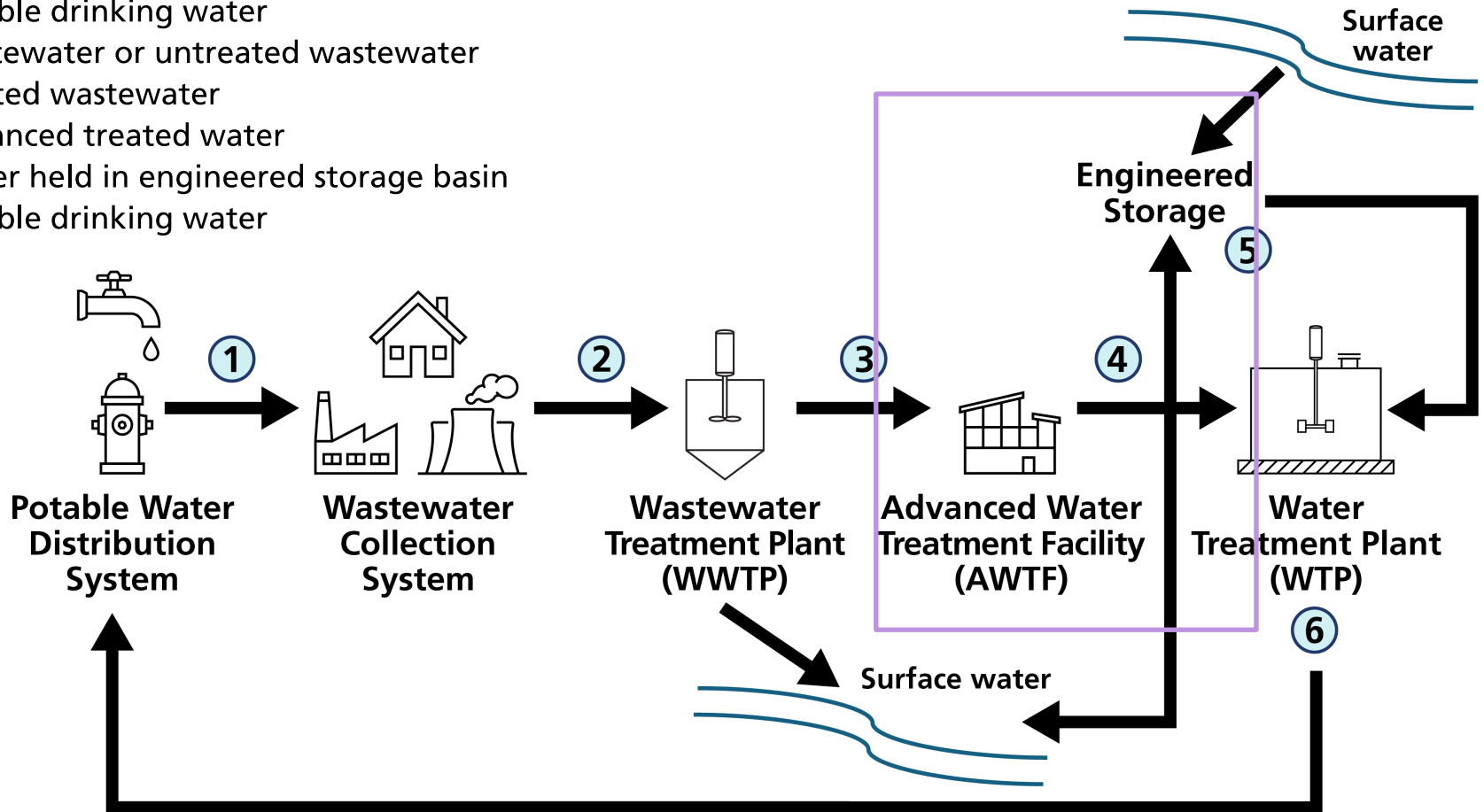


Workgroup 4 Focus: Advanced Water Treatment

Advanced Water Treatment

Process Streams:

- ① Potable drinking water
- ② Wastewater or untreated wastewater
- ③ Treated wastewater
- ④ Advanced treated water
- ⑤ Water held in engineered storage basin
- ⑥ Potable drinking water



Meeting Topics

- Workgroup has met 5 times to date and covered the following topics.
- Pathogen reduction treatment requirements
 - Quantitative Microbial Risk Assessment (QMRA) approach
 - Key assumptions, including potential operations issues
 - Expressing log reduction targets (LRTs) from raw or treated wastewater to finished drinking water
- Chemical reduction treatment requirements
 - Tiered chemical approach
 - Principle chemical constituents to address
 - Monitoring considerations
 - Critical control points

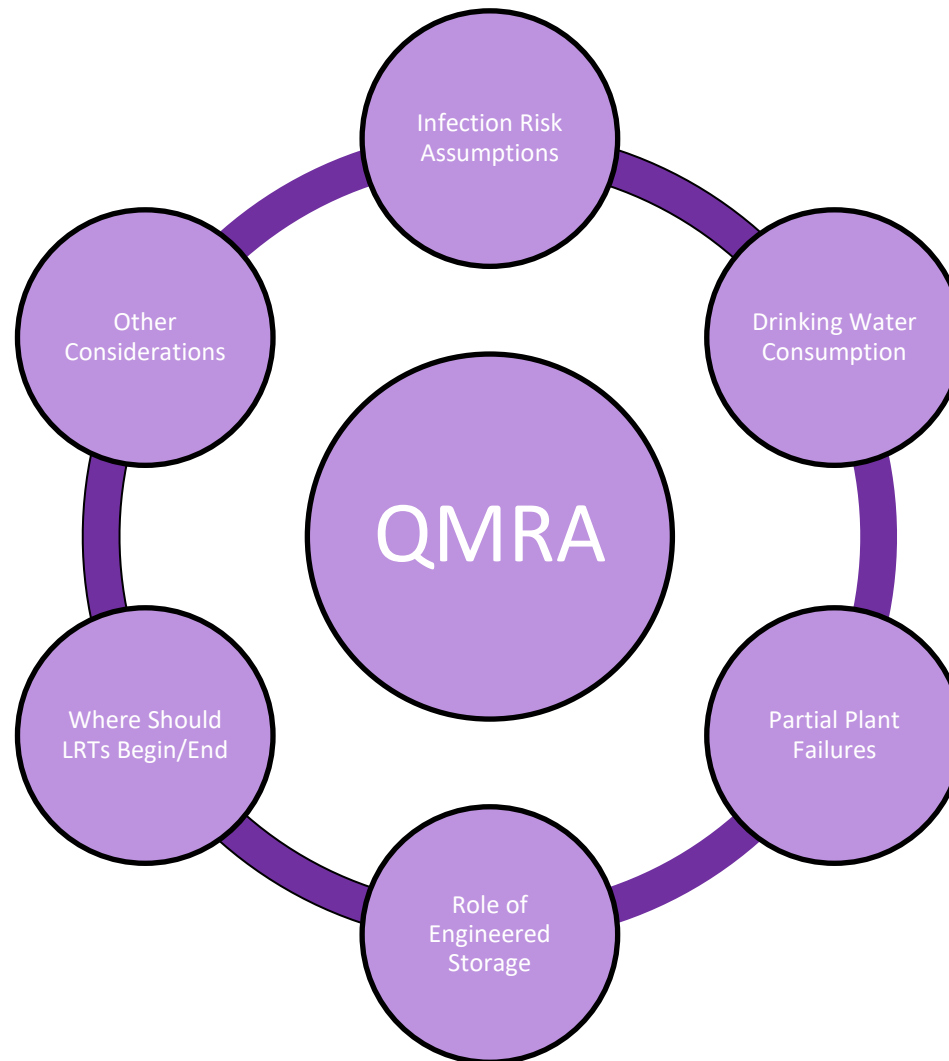
Assessing Pathogen Reduction Approaches

- Presentations from Spring Hill and Franklin pilot projects
 - Orientation of treatment train
 - Discussion of storage buffer purpose
 - Approach to account for pathogen log removal through treatment process
- Compared approaches across CA, CO, AZ, and FL
- Consulted literature
 - EPA's Risk-Based Framework for Developing Microbial Treatment Targets for Water Reuse
 - A Robust Scenario Analysis Approach to Water Recycling QMRA
 - Others

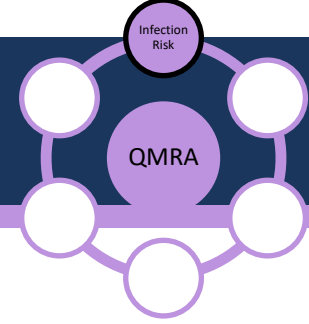
Pathogen Log Reduction Targets Across the States

Pathogen Log Reduction Targets (LRTs) (Enteric Viruses / Giardia / Cryptosporidium)			
California	Colorado	Arizona	Florida
20/14/15	12/10/10 <i>Alternative*: 8/6/5.5</i>	13/10/10 <i>Site-specific**: 8/6/5.5</i>	14/12/12

Quantitative Microbial Risk Assessment (QMRA)

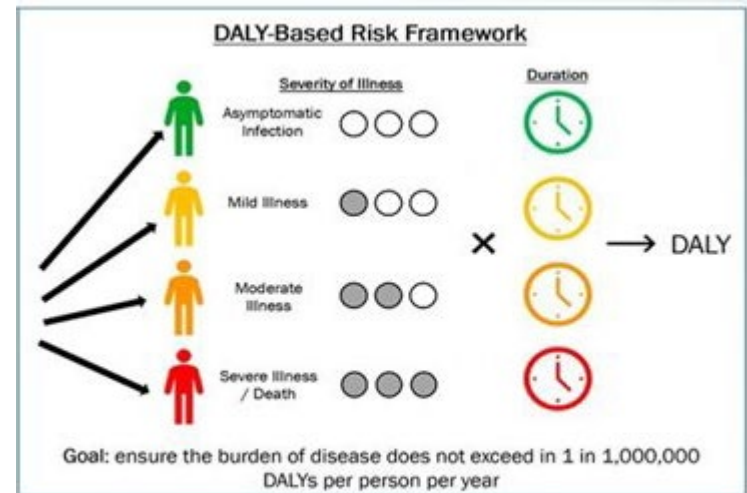
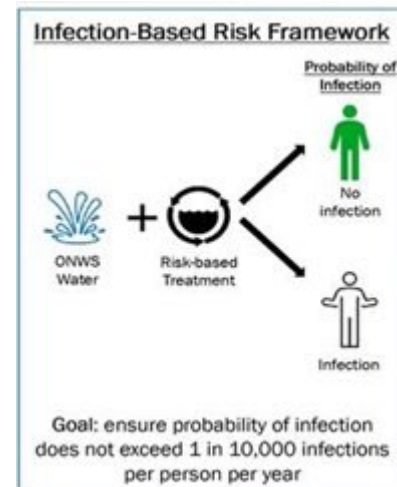


Infection Risk Assumptions



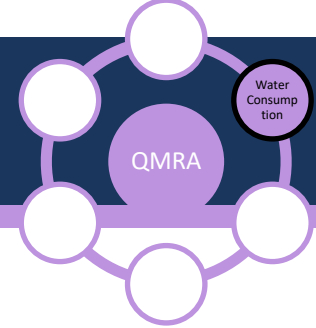
What infection risk assumptions seem most reasonable and applicable to TN?

- Looked at the following risk goals:
 - Annual risk goal = 10^{-4} infections per person per year (PPPY) = 1 in 10,000
 - Daily infection risk = 2.7×10^{-7} PPPD
 - DALY risk goal
- **1 in 10,000 annual risk** seems applicable to TN and consistent with most other states



NBRC (2023) "Health Risk-based Benchmarks for Onsite Treatment of Water"

Drinking Water Consumption



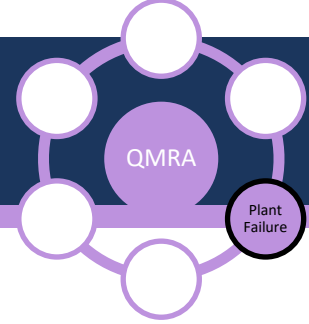
What assumptions approach regarding drinking water consumption events per day seems most reasonable and applicable to TN?

- Assessed assumptions about the volume and frequency of human consumption of drinking water which varied in some QMRA approaches (e.g., CA more conservative in assumptions)
- Discussed being **consistent with EPA (2.4L/day)**; this can help facilitate public communications

Table 3. State-of-the-science ingestion estimates.

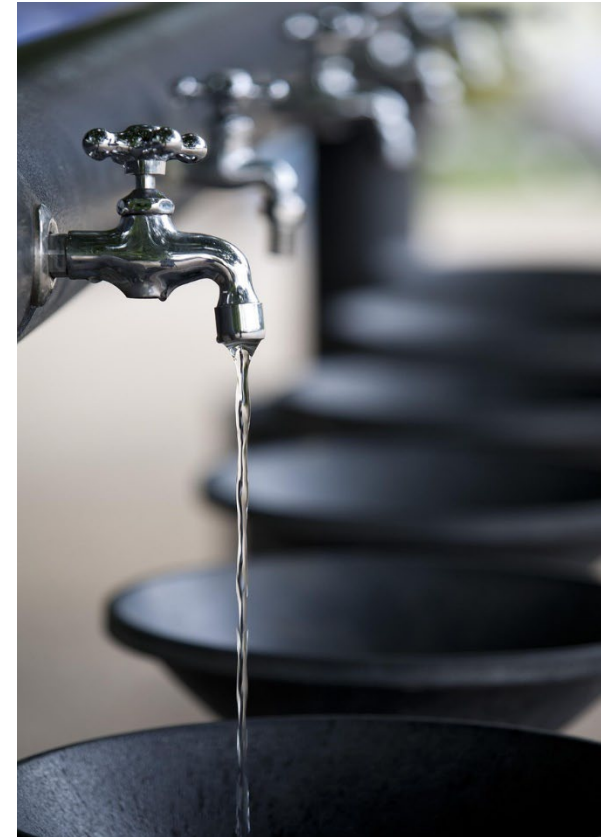
End Use	Daily Exposure Volume (L)	Exposure Frequency (days/year)	Fraction of Population Exposed	Key Assumptions and Citations
Potable use	2.4	365	1	90th percentile per capita U.S. ingestion (U.S. EPA, 2011, 2019, 2024) ^a

Partial Plant Failure

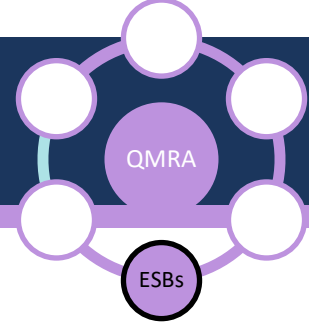


How should potential treatment process failures / treatment process redundancy be considered in relation to pathogen log reduction targets?

- Use **operational requirements**, **design redundancy**, and **monitoring** to ensure additional safety against potential failures
 - These aspects are handled through the “Critical Control Point” (CCP) approach
- Workgroup discussed avoiding unnecessarily high LRTs that would result in more costly treatment than required to ensure public health.



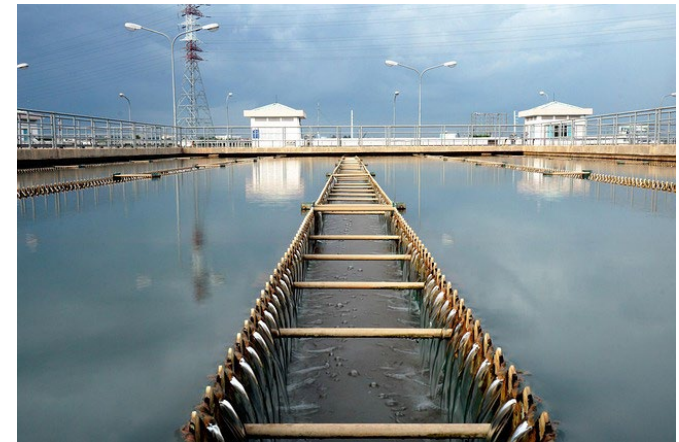
Role of Engineered Storage Buffer



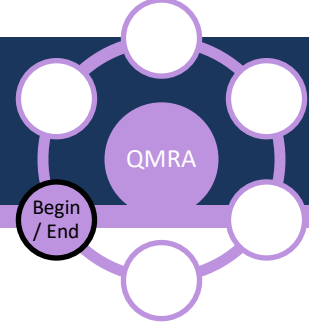
How should engineered storage buffers (ESBs) be factored into establishing and/or crediting pathogen LRT/LRVs?

- ESBs can:
 - “allow time for treatment verification before passing water on to the next stage of the recycling process...”
 - “mitigate poor treatment performance and reduce overall risk...”
 - “can provide additional treatment redundancy...”

- A facility **should not get credit for pathogen reduction in the ESB**



Where Should LRTs Begin/End

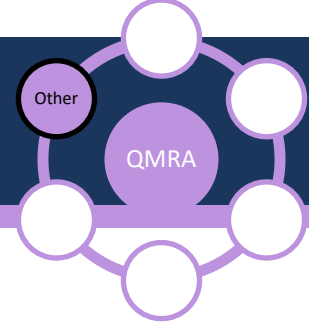


Should pathogen log reduction targets be based on starting with treated wastewater effluent or with raw wastewater?

- Workgroup in favor of **starting with raw wastewater for the pathogen removal LRTs**, but with considerations.
- Key considerations include whether treatment credit for pathogen removal would be allowed includes:
 - Wastewater Treatment Plant: QMRA supporting value
 - Water Treatment Plant: as is provided with current source water



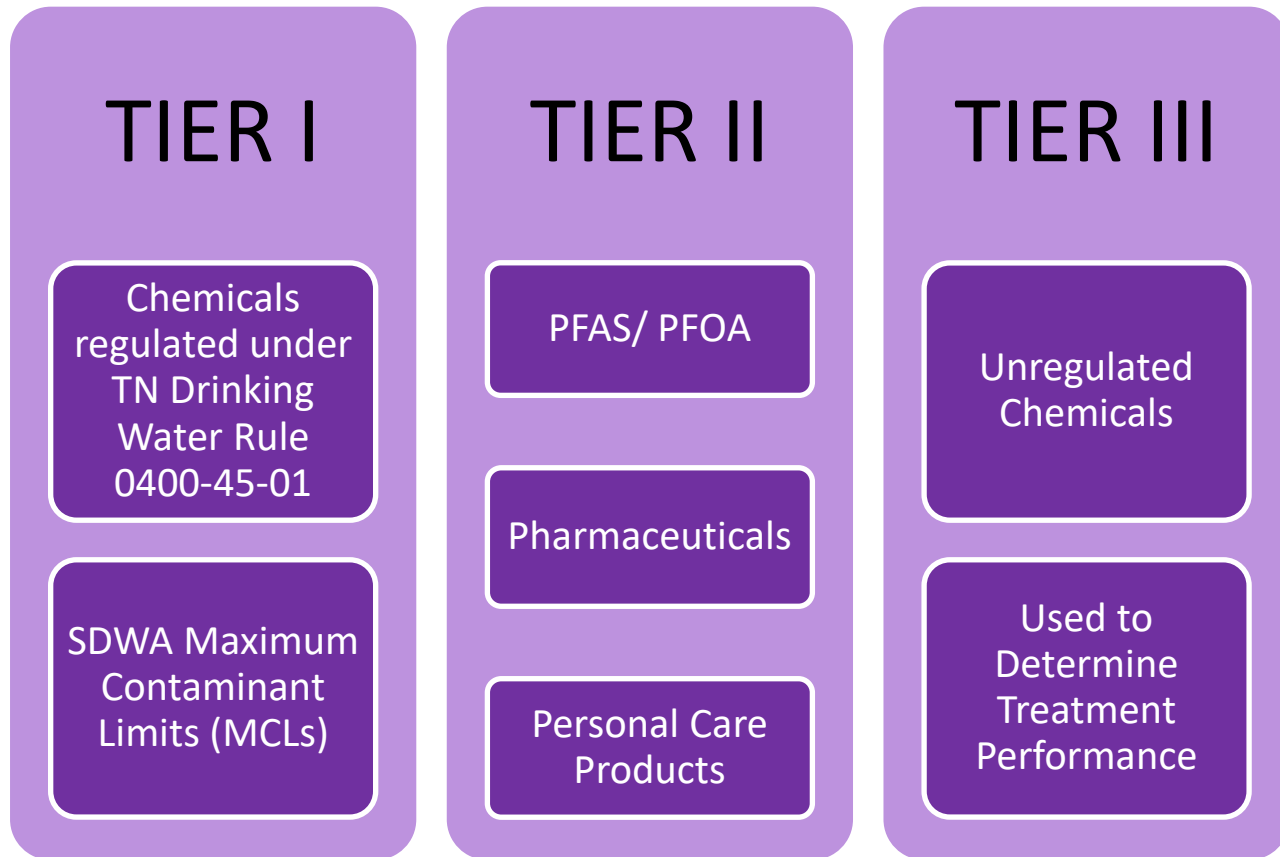
Other QMRA Considerations



- Target viruses (norovirus and adenovirus)
- Ratio of Gene Copies to Infectious Units (GC : IU)
- How might TN's sewer waste stream differ from other states?
 - *Drought vs. water rich areas*
 - *Industries*
 - *Retention time*
- Is a Tennessee-specific QMRA necessary to establish pathogen log reduction targets?
 - Consider key components from existing QMRAs to help determine most applicable LRTs

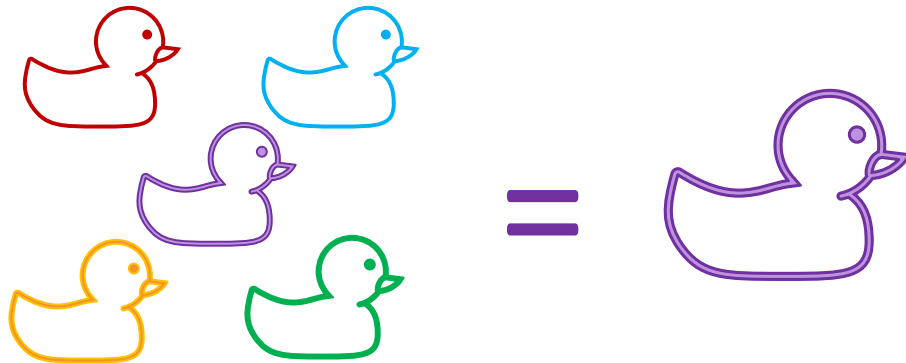
Chemical Reduction

What principle chemical constituents, including trace organic chemicals, need to be addressed with advanced treatment?



Chemical Reduction Approaches

- Tier II chemicals can be regulated through health advisories and other states' regulations.
- Approach should be *flexible* to allow for updates to add or remove chemicals based on new research or operating conditions. CO and AZ approaches offer a lot of flexibility.
- Potential use of surrogate compounds should be evaluated for monitoring.

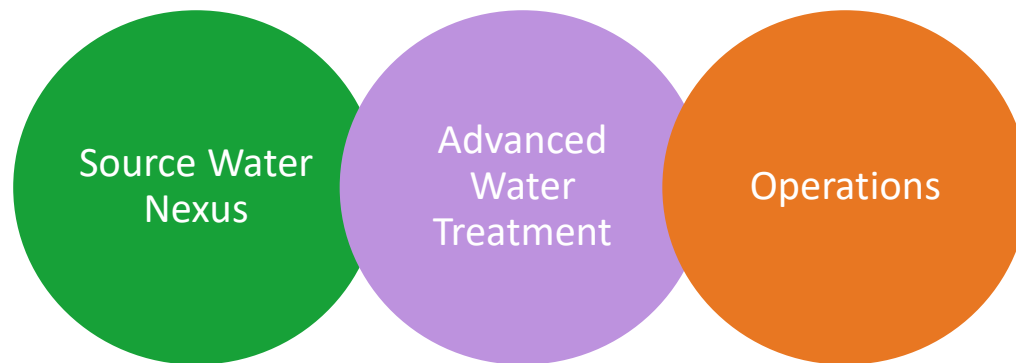


Since all ducks walk and quack,
use one as a surrogate to
represent them all

Monitoring

Where should monitoring occur and for what purpose?

- Monitoring at critical control points (CCPs) to ensure treatment processes are performing correctly to address the identified hazard at that point in the process (tie-in with Operations).
- End-of-pipe monitoring should occur at the WTP to determine any chronic health risks (most MCLs are based on lifetime exposures).
- Industrial users should be tracked to determine if they might cause an exceedance of a Tier I or Tier II chemical (tie-in with Enhanced Source Control).

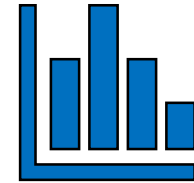


What are Critical Control Points?

- CCPs are used to control chemical/pathogen hazards in potable reuse systems.
- Each CCP should have defined performance-based indicator monitoring to ensure the barrier is working as designed.



Hazard
control



Performance
monitoring

Critical Control Points

What critical control points (CCP) need to be established to ensure effective monitoring?

- Workgroup in favor of CCP approach.
- CCPs should be located after wastewater treatment and after each unit process in advanced treatment that is controlling a particular hazard.
- It was discussed to have 3 separate treatment barriers (CCPs) for chemical reduction.
 - One advanced oxidation process
 - One physical separation process
 - One other CCP

Chemical Reduction: Monitoring Requirements

- **How can we ensure monitoring requirements are protective of public health but not overly burdensome for communities?**
 - High monitoring costs can be a good test of technical, managerial, and financial (TMF) capacity.
 - Build in the option for reduced monitoring
- **How can we best use surrogates / indicators for monitoring potable reuse system performance?**
- **Are there limitations in monitoring capabilities to consider?**



Future Discussion Topics

- Treatment design, requirements, and crediting
 - Technologies
 - Independent barriers for pathogens and chemicals
 - Treatment credits for removals
 - Blending requirements, if any
 - Attenuation period requirements, if any
- Operations considerations
 - Critical control points
 - Contingency plans for AWWTF interruptions
 - Action limits and corrective actions
 - Violations and required responses
- Monitoring and reporting requirements
- Design criteria updates

Open Discussion: Questions & Comments



Group Discussion

- Are there **implications for LRTs** that Advanced Water Treatment needs to consider **related to your workgroup**?
- What are your **primary concerns related to chemical reduction** for potable reuse?
- What **key areas of intersection exist** between other workgroups and Advanced Water Treatment? How do we best orchestrate this collaboration?
- Are there any **missing topics** that you would have expected the Advanced Water Treatment workgroup to cover?

Workgroup 5 Focus: Operations



Photo: Denver Water

TN

Department of
**Environment &
Conservation**

Meeting Topics

Workgroup has met 5 times to date and discussed the following topics:

- Operator certification requirements
- Utility to utility communications
- Standard operating procedures (SOPs) for the operations plan

Assessment process for each topic:

- Review potable reuse requirements in AZ, CA, CO, and FL
- Discuss potential applicability to TN



Plant Classification Requirements: TN Requirements

- Assumption that Advanced Water Treatment Facility (AWTF) would fall into Grade IV plant
- Existing Grade IV plant classification of Wastewater Treatment Plants and Wastewater Collection Systems would be applicable to potable water reuse
- Existing Grade IV plant classification of Water Treatment Plants and Water Distribution Systems would be applicable to potable water reuse

Plant Classification Requirements: Possible Updates to TN Regulations

- Possible updates to the technology checklist that assigns points in existing rules in the near future.
 - The process would start internally with engineering department to determine value of each technology.
 - Would then go to the Operator Certification Board for questions/comments/approval.
- This could be an opportunity to add some considerations for AWWTF technologies, such as an adjustment in points or adding categories.
- Likely will require coordination with Advanced Water Treatment Workgroup.

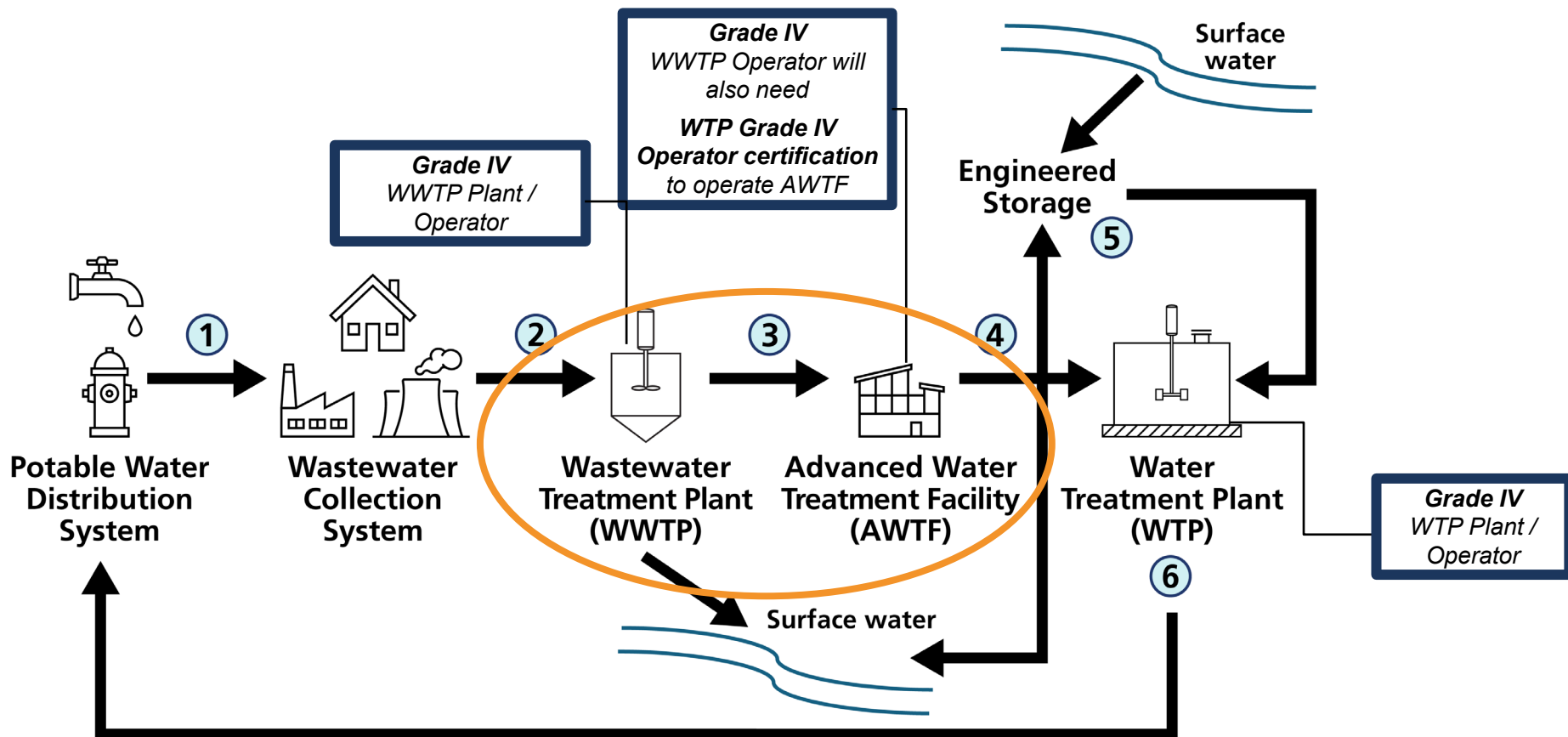
Review of Existing Operator Certification Requirements

- Wastewater Treatment Plant Operators
 - Grade IV certification needed for potable reuse system
 - If Advanced Water Treatment Facility is part of the WWTP, operators would also need Grade IV Water Treatment Operator certification to cover AWTF technologies
- Water Treatment Plant Operators
 - Grade IV certification needed for potable reuse system
 - If Advanced Water Treatment Facility is part of the Water Treatment Plant, Grade IV would be applicable because the certification exam covers applicable technologies
- Grade IV certified operator who is capable of making a decision for that plant should be on each shift.

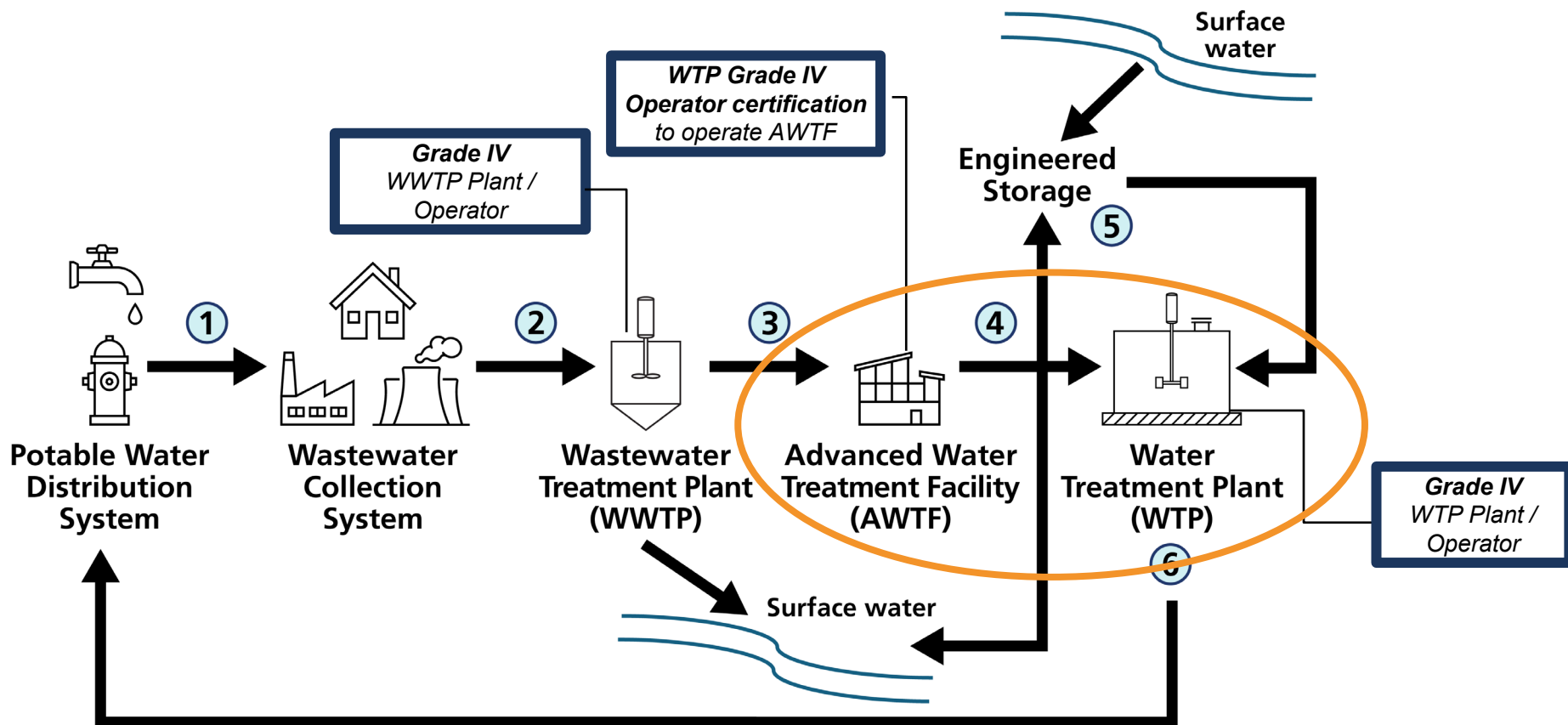
Operator Exam and Continuing Education Requirements

- TN's existing and new Grade IV water treatment plant operator certification standardized exams cover applicable AWTF technologies.
- TN continuing education changes suggested for potable water reuse
 - The Board Policy for training/continuing education would need to include AWTF technologies under the category of technical trainings (not under general trainings).
 - Biofiltration might be a category that needs to be added to TN's training.
 - The requirements in Board Policy should specify training types to make it less vague, such as "6 hours of 12 hours have to be spent on technical training" but not dictate the type of technology because each facility is different.

Plant Classification and Operator Certification: Changes Based on AWTF Location



Plant Classification and Operator Certification: Changes Based on AWTF Location



Utility to Utility Communications

- CO's approach of using more general regulation language and including specifics of what should be in a communications plan in a policy may work in TN.
- Workgroup also liked CO's approach of incorporating the communications plan as part of an overall operations plan.
- FL's communications plan requirements include cybersecurity and a minimum of what to include in their plan. These would be important for TN to incorporate.
- Make sure that any communications plan requirements have update requirements to ensure that they are living documents.

Standard Operating Procedures (SOPs) for the Operations Plan

- TN does not have rule requirements for SOPs for drinking water treatment or wastewater treatment plants.
- TN has 2000 SOP guidance for drinking water operators, but not wastewater treatment plant operators.
- AZ's approach to water reuse SOP requirements most applicable to TN.
 - Specific but not overly prescriptive
 - Could rely on regulation without needing policy
- Would want operators to review SOPs annually but resubmit to TDEC every three years to align with current guidance/policy.

Comparison of Existing SOP Requirements

Arizona

- Description of:
 - operation of each treatment process and standard operating procedure
 - all inspection and maintenance protocols, schedules and other requirements for treatment process equipment

California

- Description of:
 - how each treatment process is operated within the entire treatment train...and how the reliability features of the DPR project are implemented in the operation of the entire treatment train, including the standard operating procedures
 - the treatment process equipment inspection and maintenance program, including control point monitoring equipment inspection, maintenance, and calibration
 - records maintained to document the operations of the DPR project

Future Discussion Topics

(Coordinate with Adv. Treatment Workgroup)

- Pathogen reduction
 - Requirements for identification of critical control points (CCP)
 - Requirements for identification of CCP monitoring
 - Identification of alert limits and action limits at each CCP with an associated action plan with deadlines for addressing alert limit and action limit exceedances
- Chemical reduction
 - Requirements for identification of CCPs
 - Identification of indicator compounds and CCP monitoring
- Target chemicals
 - Requirements for identification for removal in treated wastewater
 - Requirements for identification of CCP monitoring
 - Identification of alert limits and action limits at each CCP for indicator compounds and target chemicals with an associated action plan with deadlines for addressing alert limit and action limit exceedances.

Future Discussion Topics

- Process schematic that identifies each CCP for pathogen and chemical reduction and the CCP for treated wastewater within the wastewater treatment plant
- Identification of a CCP dashboard that allows for online monitoring for display to the supplier's wastewater and water treatment operator(s)
- Supplier's demonstration of Technical, Managerial, and Financial (TMF) Capacity
- Violations of operations requirements and responses / corrective actions

Open Discussion: Questions & Comments



Group Discussion

- Are there thoughts or questions on **plant certification or operator certification**?
- Are there thoughts or questions on **continuing education requirements** for operators involved in potable water reuse?
- What **key areas of intersection exist** between other workgroups and Operations? How do we best orchestrate this collaboration?
- Are there any **missing topics** that you would have expected the Operations workgroup to cover?

Water Reuse Task Force

Meeting 2

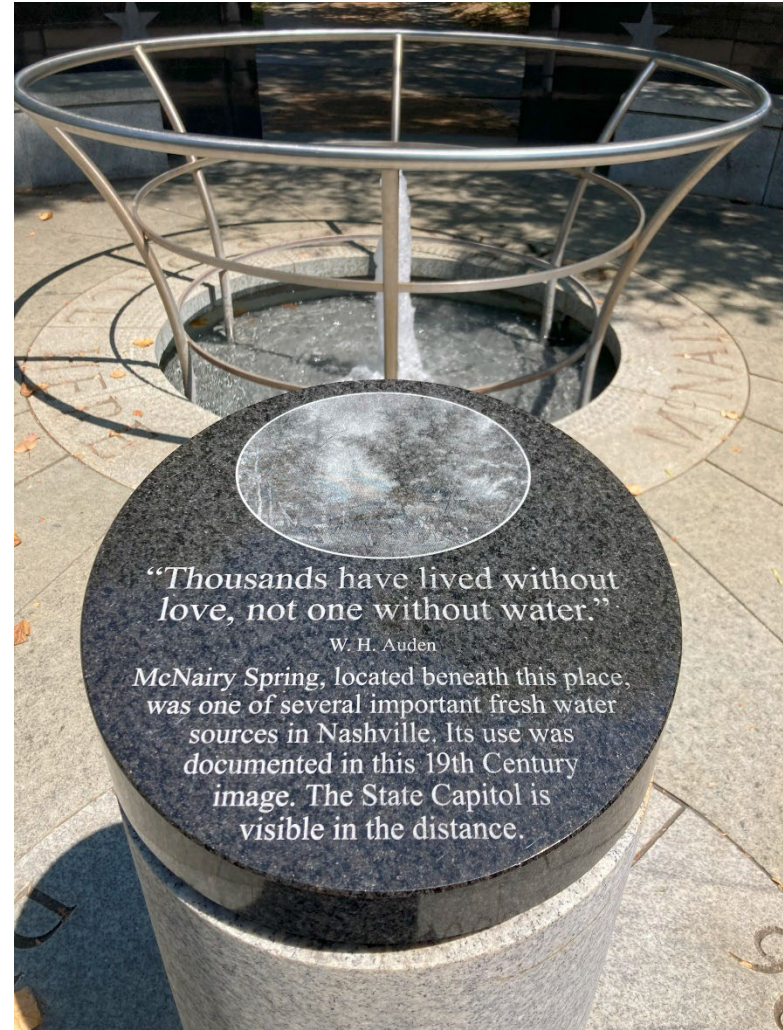
April 30, 2025



Wrap-up

Wrap-Up

- Takeaways
- Action Items



Next Steps

- Open to additional feedback, questions, and suggestions
- Facilitation Committee debrief
- Next workgroup meetings:



6/2/2025	Source Water Nexus	Wastewater treatment
6/5/2025	Advanced Water Treatment	Critical control points, chemical classes, characterization of treated wastewater for alerts and action limits
	Operations	
6/6/2025	Regulatory Framework	TBD
6/13/2025	Outreach and Communications	Other states' communications requirements

Thank you!

