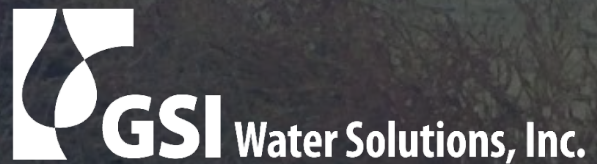


# Steering Committee Workshop: Non-Connection Options

## Morrow and Umatilla County Drinking Water Investigation

December 18, 2025



## Workshop Topics

1. Start-up and Introductions
2. Update on Roadmap project
3. Overview of Non-connection Concepts
4. Preliminary Case Study Concepts
5. OREM Treatment Pilot Testing
6. Open Discussion

<https://www.co.morrow.or.us/planning/page/morrow-and-umatilla-county-drinking-water-roadmap>

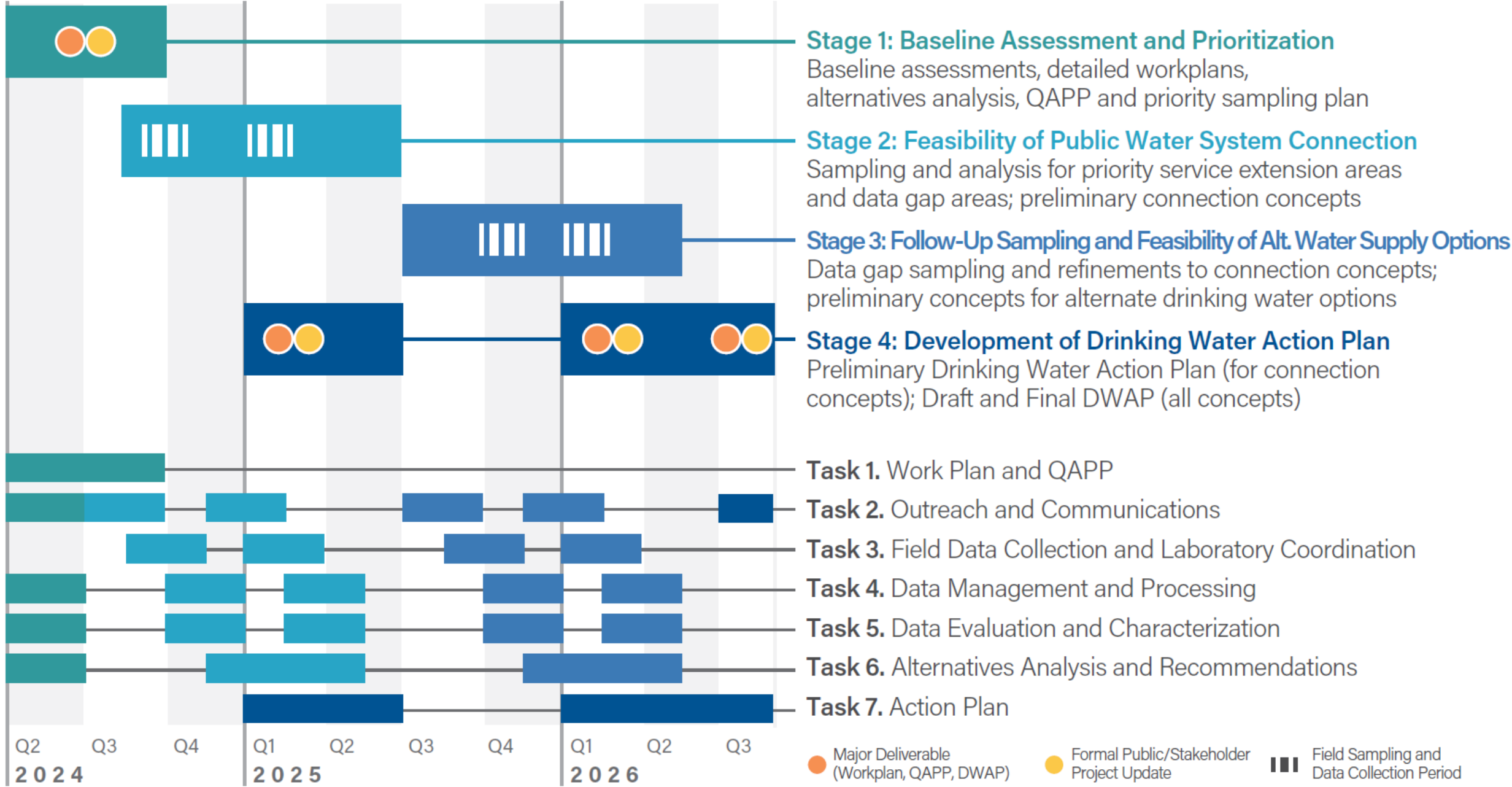
<https://drinkingwaterroadmap.org/>

# Workshop Objectives

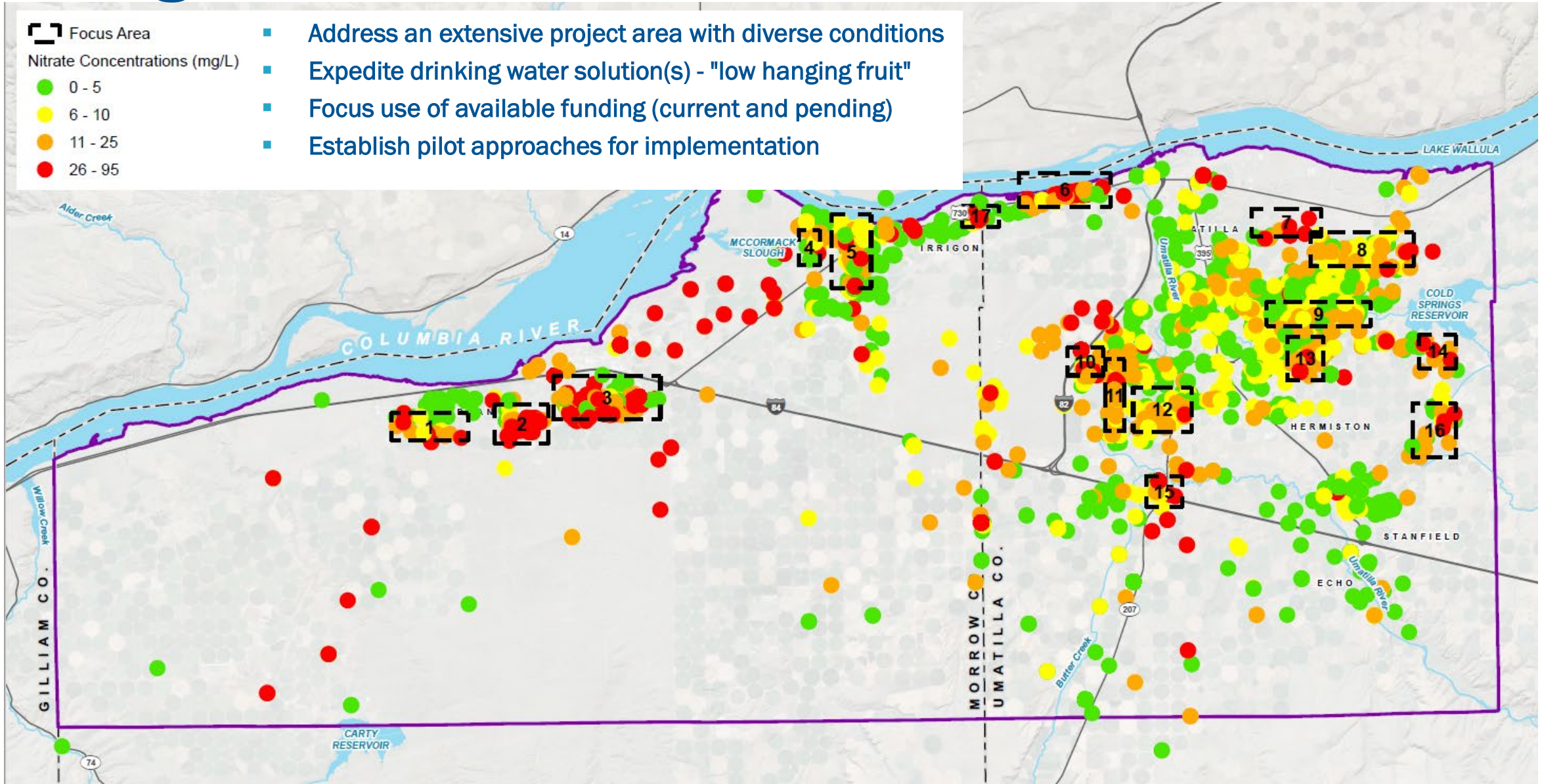
- Receive input from Steering Committee on the non-connection evaluation approach and implementation issues to focus the concept development



## 2. Project Update



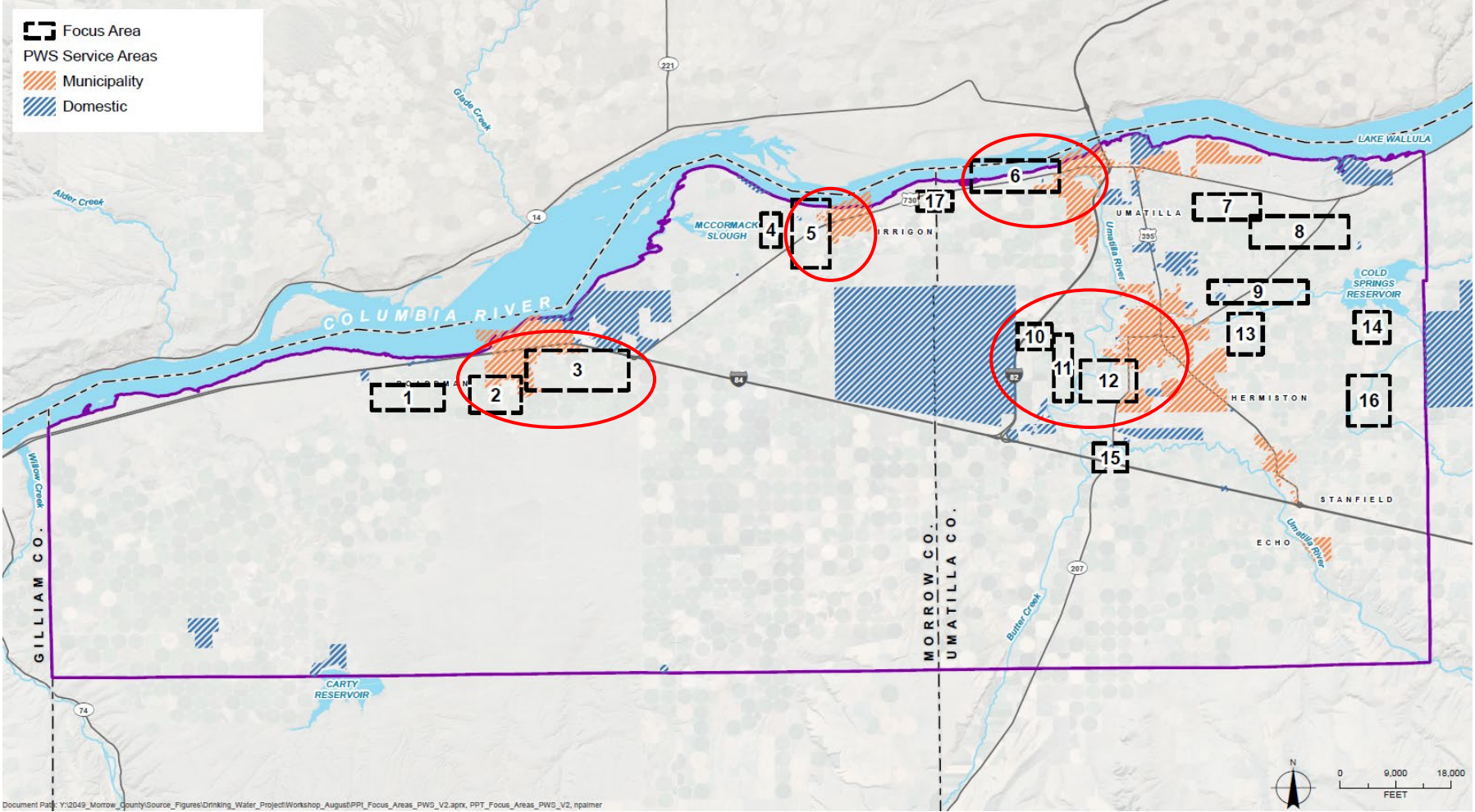
# Stage 1 Identified Potential Focus Areas



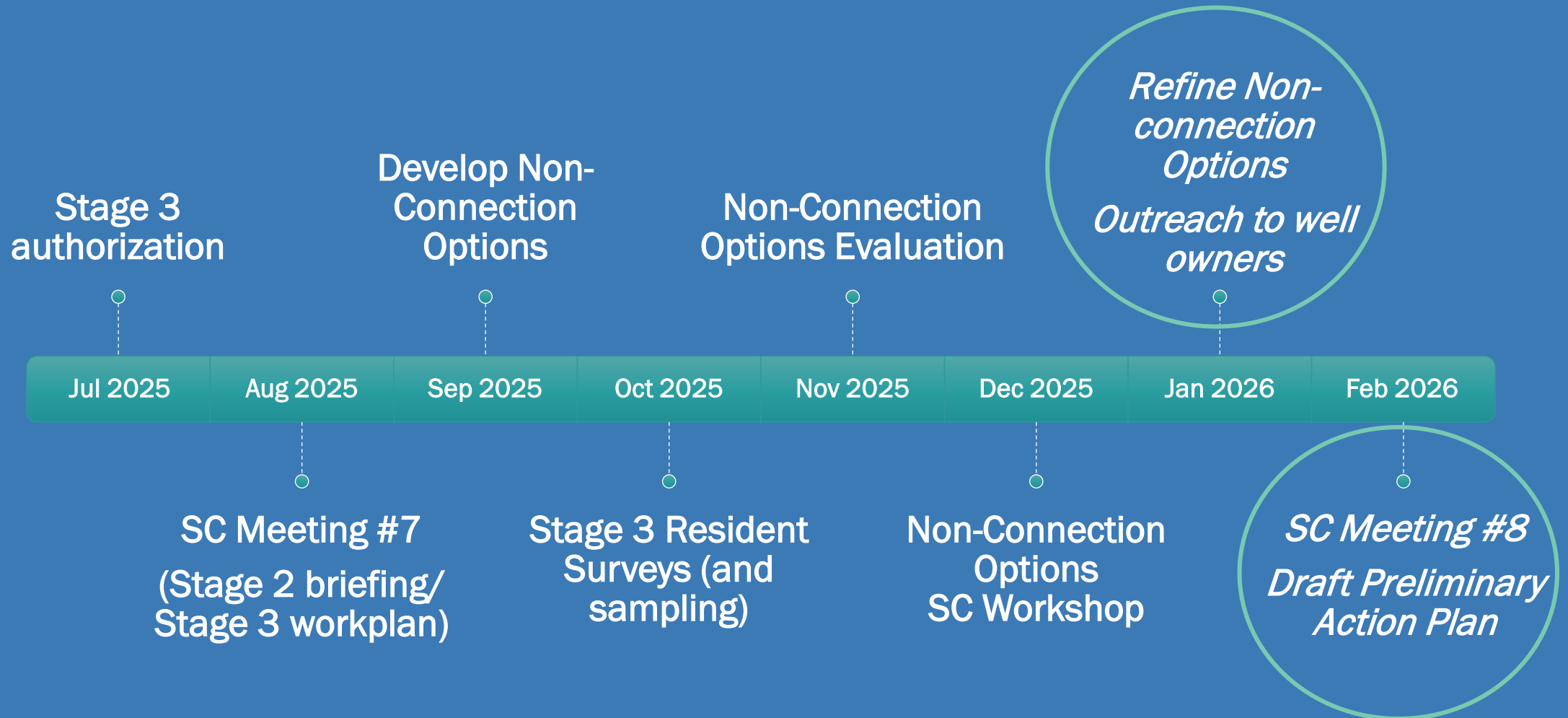
- Address an extensive project area with diverse conditions
- Expedite drinking water solution(s) - "low hanging fruit"
- Focus use of available funding (current and pending)
- Establish pilot approaches for implementation

# Focus Areas with municipal system opportunities

## Stage 2 PWS Connection Concepts Memo



# Stage 3 Schedule Milestones (2025-2026)





### **3. Overview of Non-Connection Options**

# Non-Connection Evaluation Approach

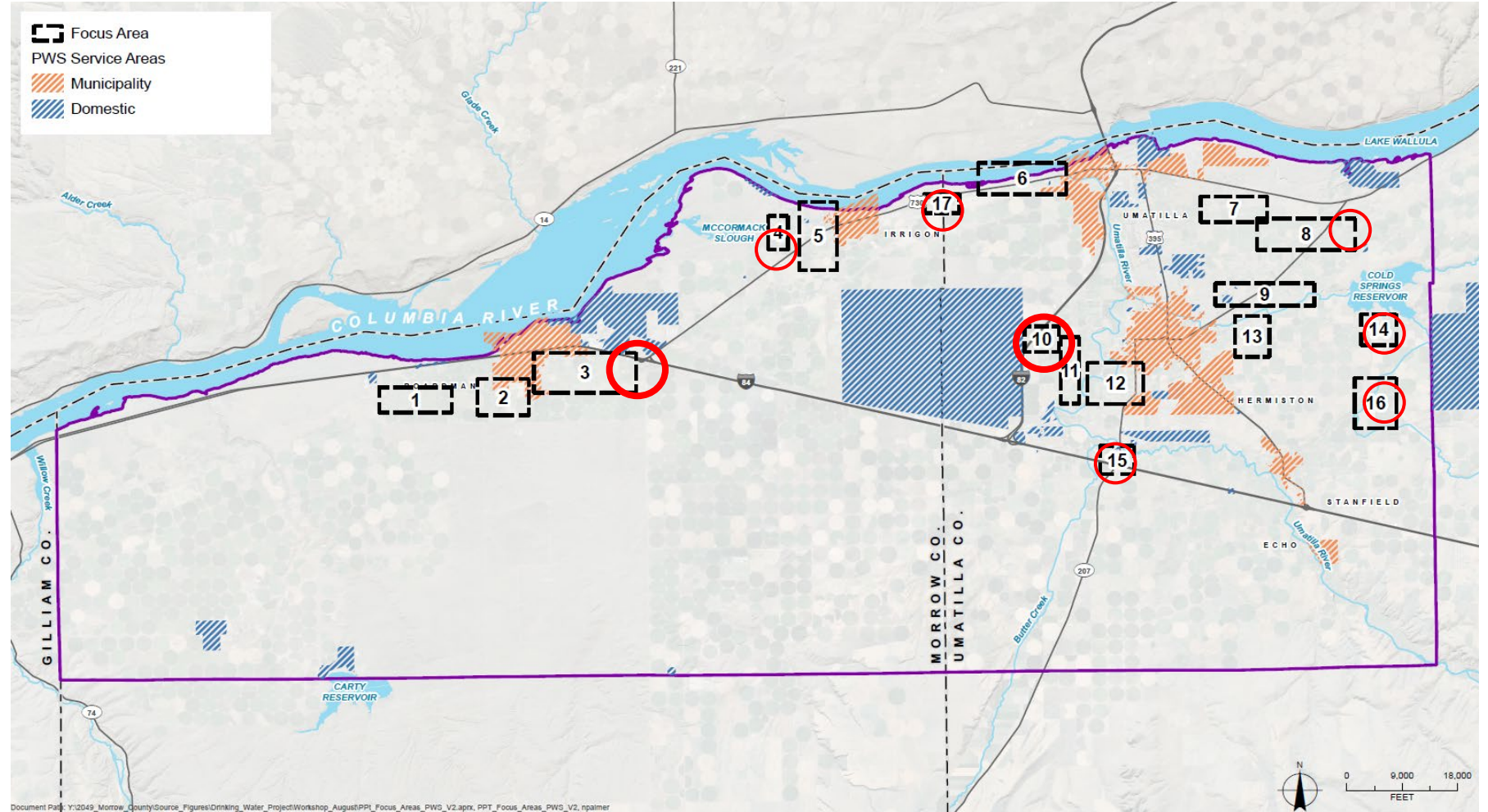
- System concepts
  - Oregon Very Small System, Community Water System
- Shared well
  - New well or well improvements assumed with treatment
- Treatment options
  - Point of use vs. centralized
  - Infrastructure, O&M, costs, resident preferences
  - Waste stream, residuals

# Evaluation of Non-Connection Options

- Develop and evaluate non-connection concept case studies
  - Implementation factors
  - Conceptual design and costs (capital, O&M)
  - Map of the infrastructure and service area
- Wait until project team completes outreach and follow-up with well owners to identify potential case study areas

# Follow-up outreach to evaluate interests and concerns

## Stage 3 Non- Connection Potential Case Study Areas



# Key Implementation Factors: Administration, Permitting, and Operations

- Willingness and interest
- Type of water system (Very Small, Community)
- Water rights and water uses
- Operations – special district
- Waste discharge

# Type of Water System

- Oregon Very Small System
  - 4 to 14 connections
- Community Water System
  - 15 or more connections or 25+ people year-round
- Requirements differ for:
  - Source protection, water treatment, distribution system, monitoring and reporting, operator certification

# Water Rights and Water Uses

- Constraints:
  - Critical groundwater area; no new groundwater permits
  - Residents generally prefer retain domestic wells for irrigation; irrigation is a very large volume of water to treat
  - Large volume of waste discharge if treating for irrigation use
- Opportunity: SB 1154
  - Water right can be issued in an amount equal to the water formerly supplied by domestic well that will be abandoned when a customer connects to a *public water system*
  - Default cap of 5,000 gpd per abandoned well, unless Water Resources Commission changes it by rule

# Water Rights and Water Uses

- Concept:
  - Identify exempt well(s) to abandon (voluntarily) and “transfer” water use permit to a shared community well to serve domestic water demands\*.
  - Existing exempt domestic wells will be retained for irrigation use.
  - Water system will have a shared community well, treatment, storage, and distribution system sized to meet domestic water demands.
- At ~200 gpd/household for domestic uses, one abandoned well water right (max 5,000 gpd) can serve an average of 25 households

*\*Domestic uses: drinking, cooking, shower, laundry, toilet flushing*

# Concept Development for Case Studies

- Formation of special district/community system
- Engineering and permitting
- Capital costs
  - Land acquisition, well, treatment, storage water distribution, booster pump, service lines and meters
- Administration, operations and maintenance

# New Community Well: Concepts

- Main Elements to Consider:
  - Permitting
  - Well Location (Siting)
  - Well Design
  - Well Drilling and Construction
  - Well Testing
  - Documentation
  - Commissioning & Other Infrastructure
- Each of These Elements Drive Cost



# New Community Well: Siting

- Well Location Based on Several Factors
  - Proximity to Households Served
  - Property Ownership and Space Requirements
  - Other Infrastructure
    - Wellhouse & Controls
    - Treatment
    - Storage
    - Distribution



# New Community Well: Well Design

- Key Design Considerations

- Hydrogeologic Conditions

- Water Bearing Zones & Depths
    - Borehole Stability
    - Nitrate Concentrations

- Yield Requirements

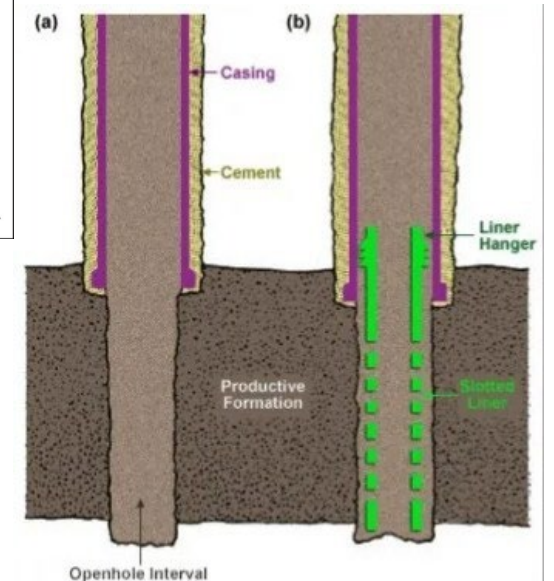
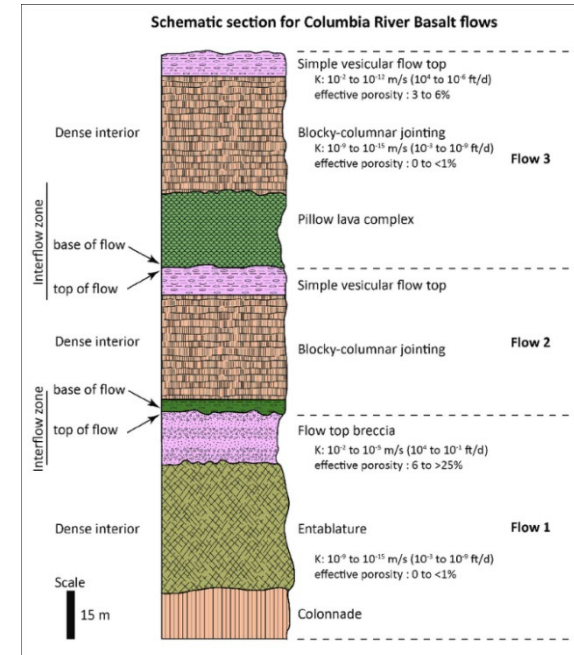
- Safety Factors

- Pumps & Other Down-Hole Equipment

- Drive Borehole & Casing Diameter

- Materials & Longevity Requirements

- Casing & Liners



# New Community Well: Well Drilling & Construction

- Key Considerations
  - Drilling Methods and Available Space
    - Messy Operation – Requires Space
    - Cuttings & Water Management
  - Procurement and Oversight Requirements
    - Specifications
    - Oversight
    - Documentation

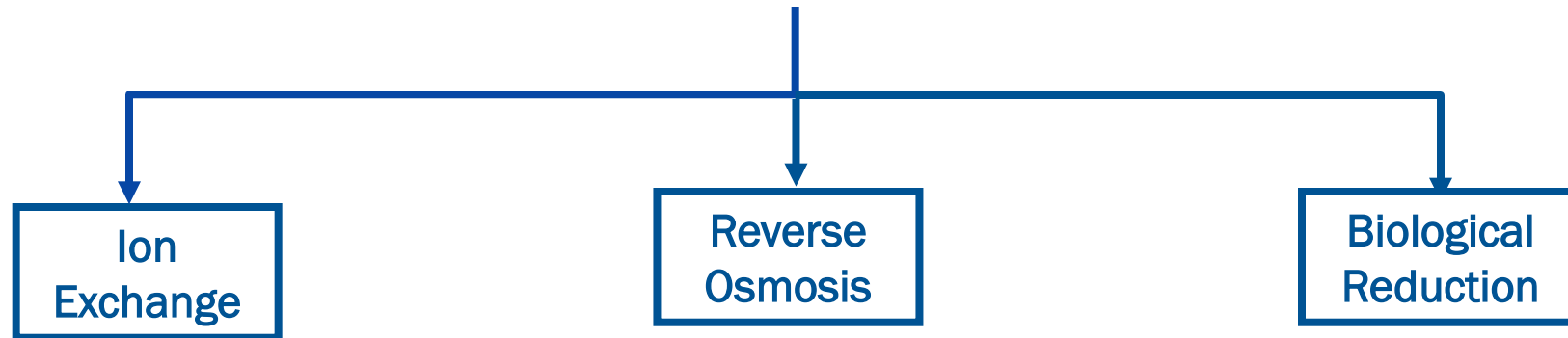


# New Community Well: Well Testing & Commissioning

- Types of Testing
  - Production and Sustainable Yield
  - Geochemistry & Nitrates
  - Alignment, Camera, Disinfection
- Commissioning
  - Wellhead, Enclosures Control Panels
  - Utility Tie-In and Infrastructure
  - Startup, O&M and Testing Requirements
  - Documentation

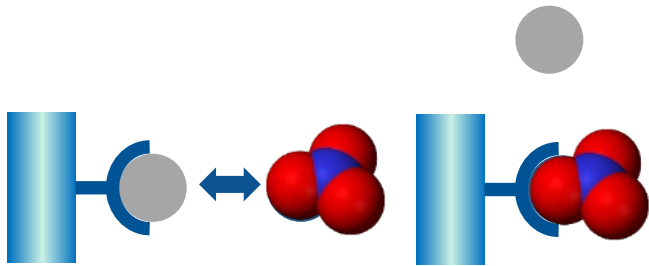


## Nitrate Removal



# Overview of Treatment Options

# Ion Exchange (IX): Key Considerations



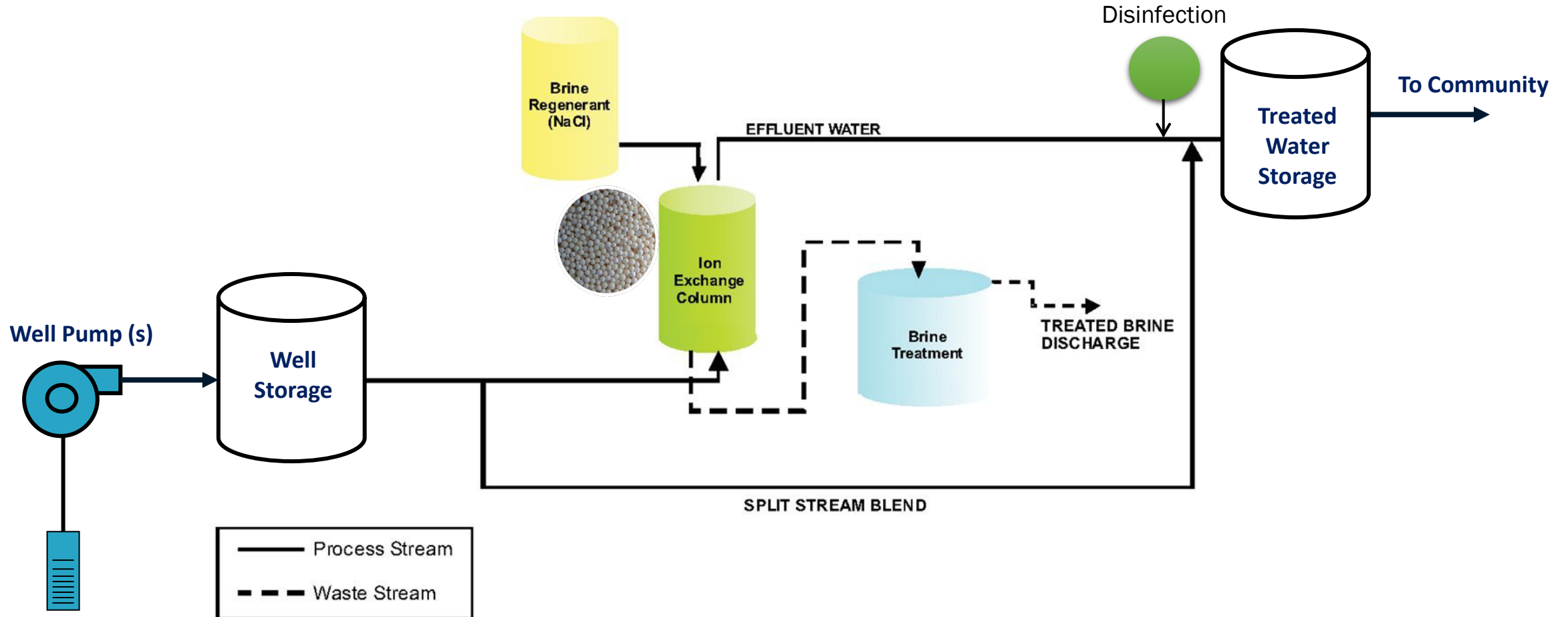
## Benefits

- + Proven technology for community scale
- + Readily commercially available
- + Compact footprint
- + Moderate energy; high efficiency

## Challenges

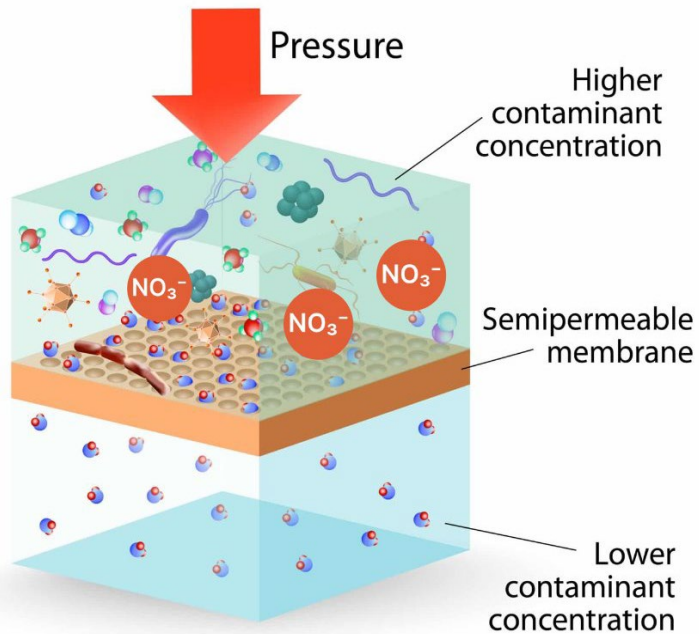
- Generates a contaminant-laden brine
- Finished water quality can impact distribution system stability / LCR Compliance

# Ion Exchange (IX): Process Overview



CONVENTIONAL ION EXCHANGE PROCESS TRAIN

# Reverse Osmosis: Key Considerations



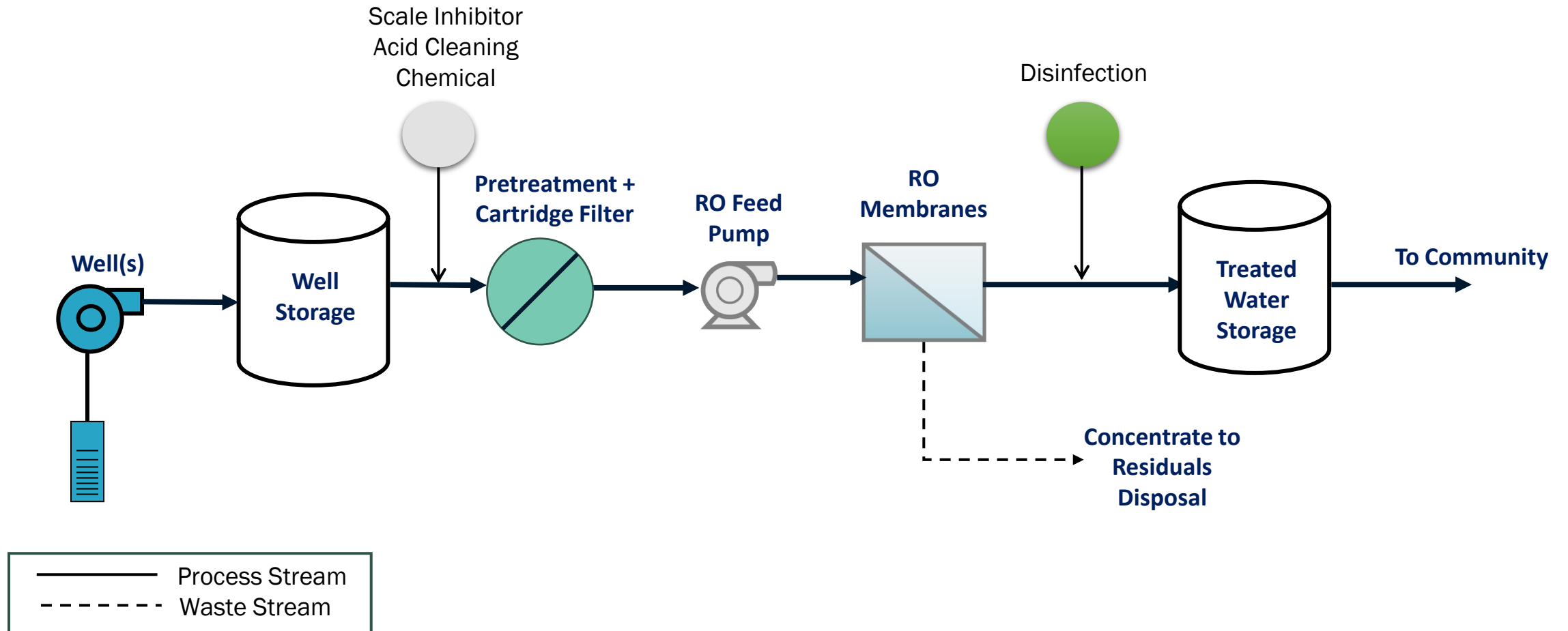
## Benefits

- + Proven technology for community scale
- + Readily commercially available
- + Compact footprint

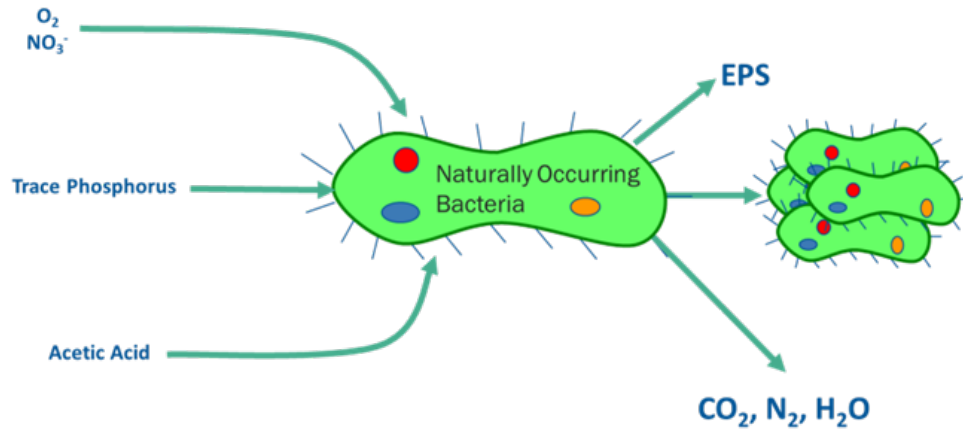
## Challenges

- High energy; lower efficiency
- Generates concentrated waste stream
- Recovery dependent on well water quality/dissolved minerals
- Requires a high level of operational certification

# Reverse Osmosis: Process Overview



# Biological Reduction: Key Considerations



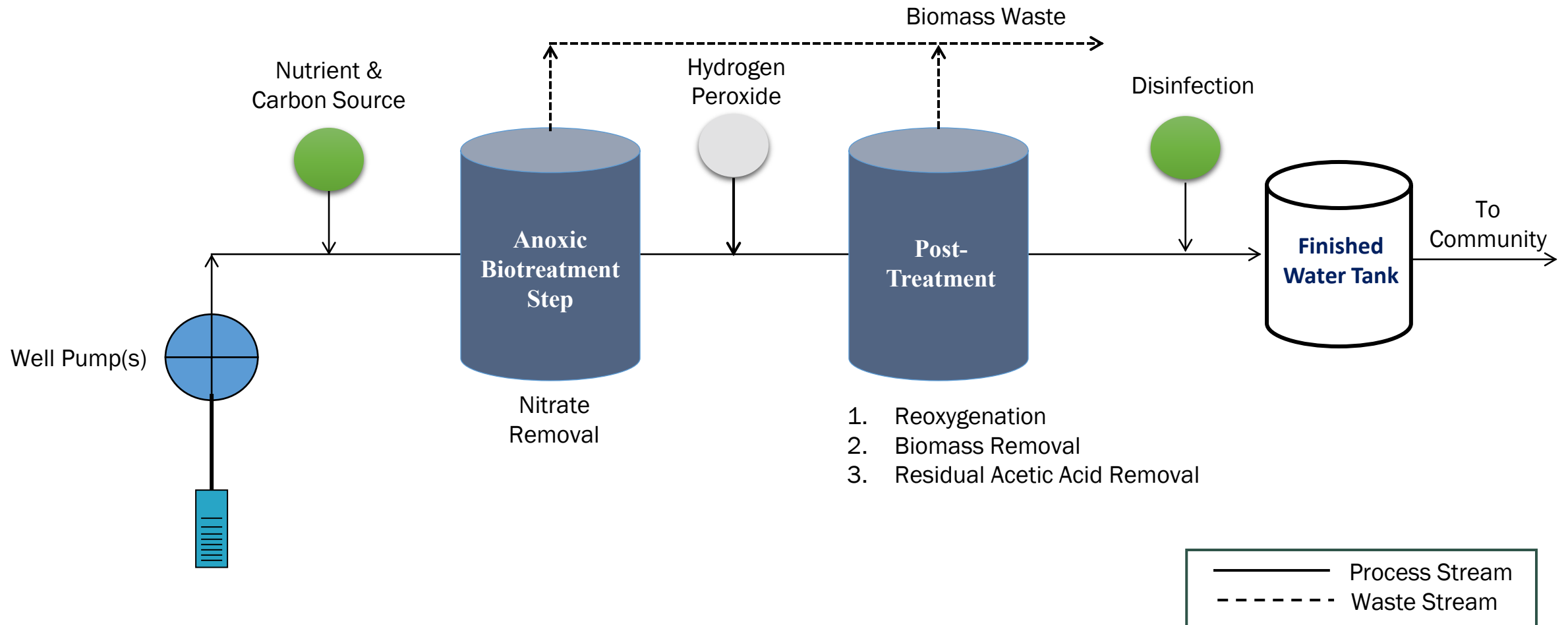
## Benefits

- + Low energy use, high efficiency
- + No concentrated waste stream (byproducts are N<sub>2</sub> and biomass)

## Challenges

- Limited applications in the United States
- Biomass control is critical, requires operator oversight
- Initial biological acclimation required; need operations support for start-up and shut-down

# Biological Reduction: Process Overview



# Biological Treatment: Community-Scale Pilot

Pilot study tested biological treatment for small-system groundwater treatment



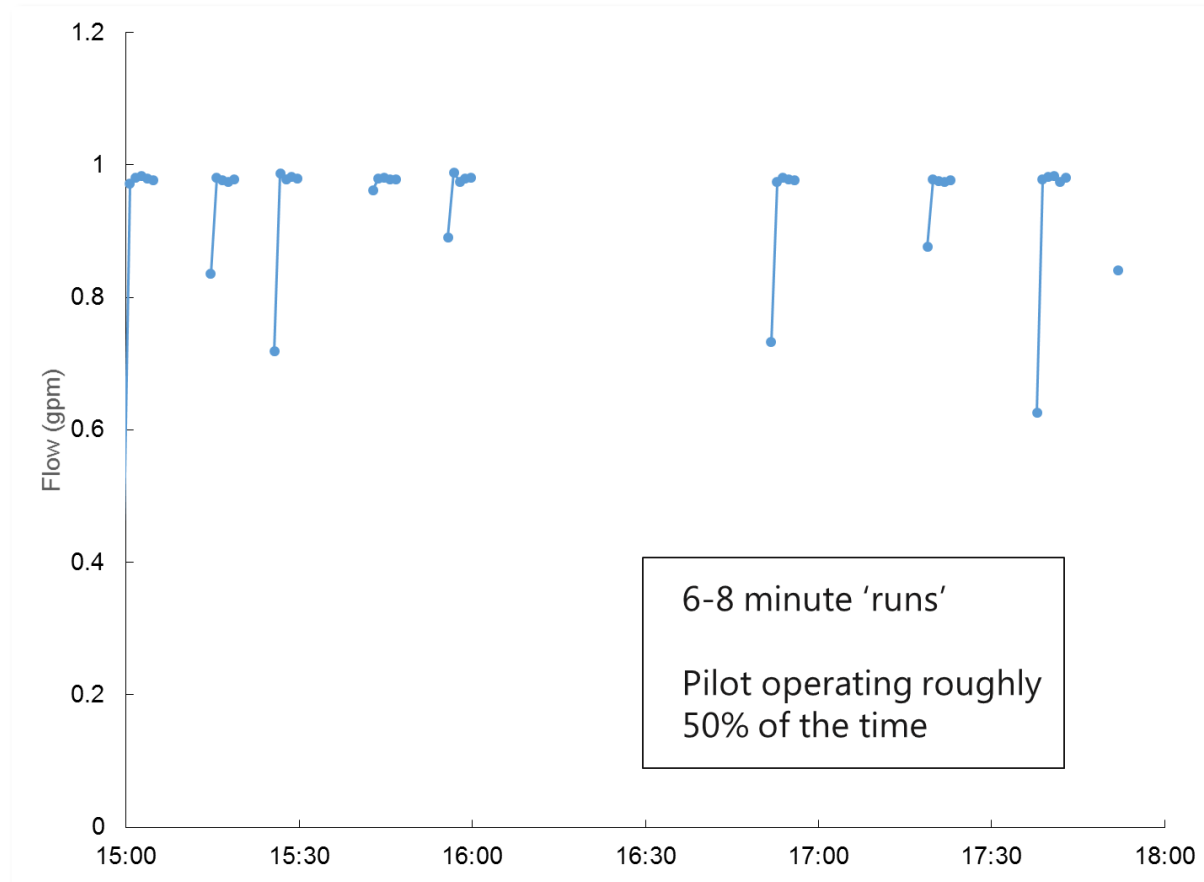
# Biological Treatment: Community-Scale Pilot

Containerized, automated pilot tested intermittent, on-demand operation



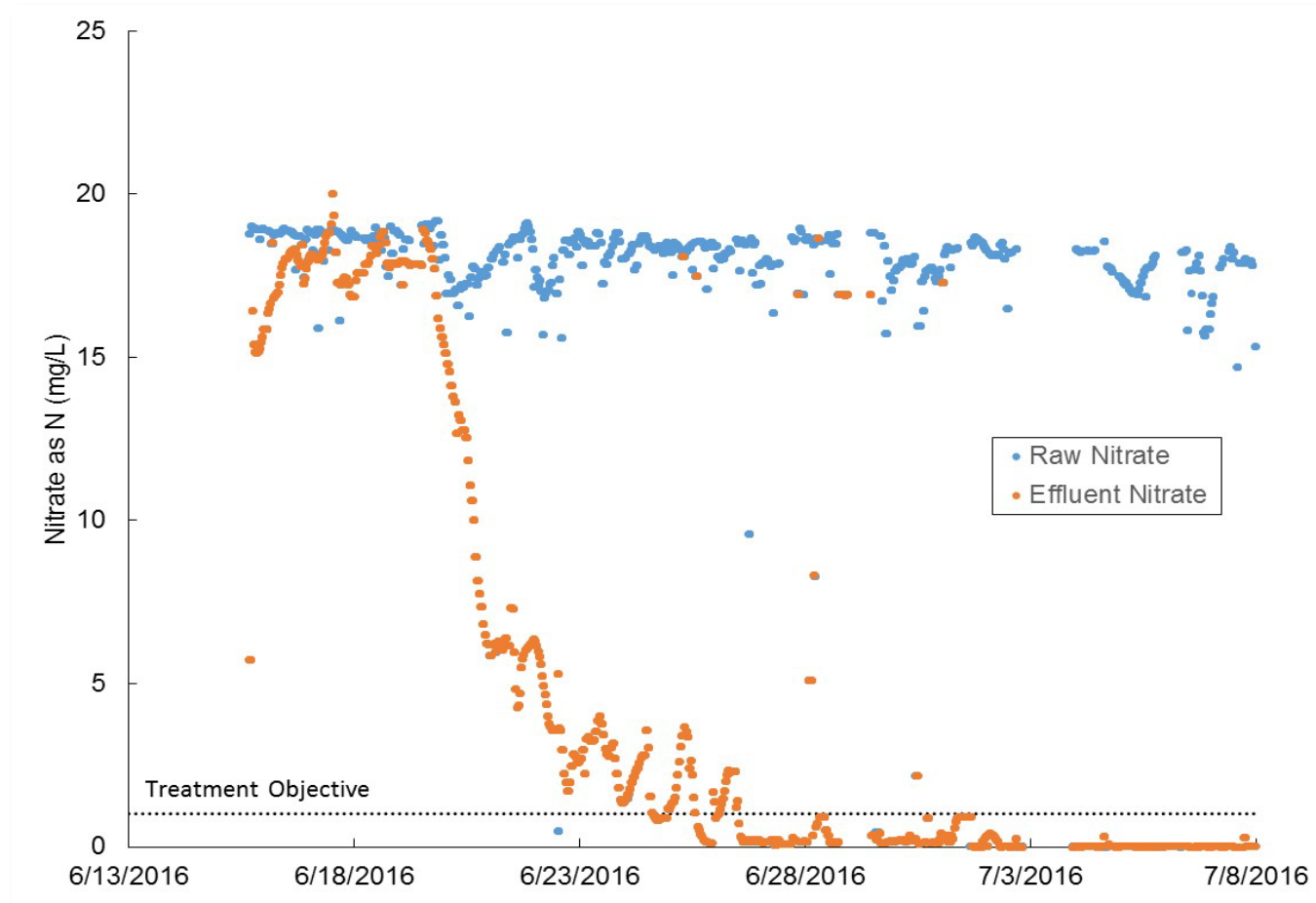
# Biological Treatment: Community-Scale Pilot

## Intermittent, on-demand operation



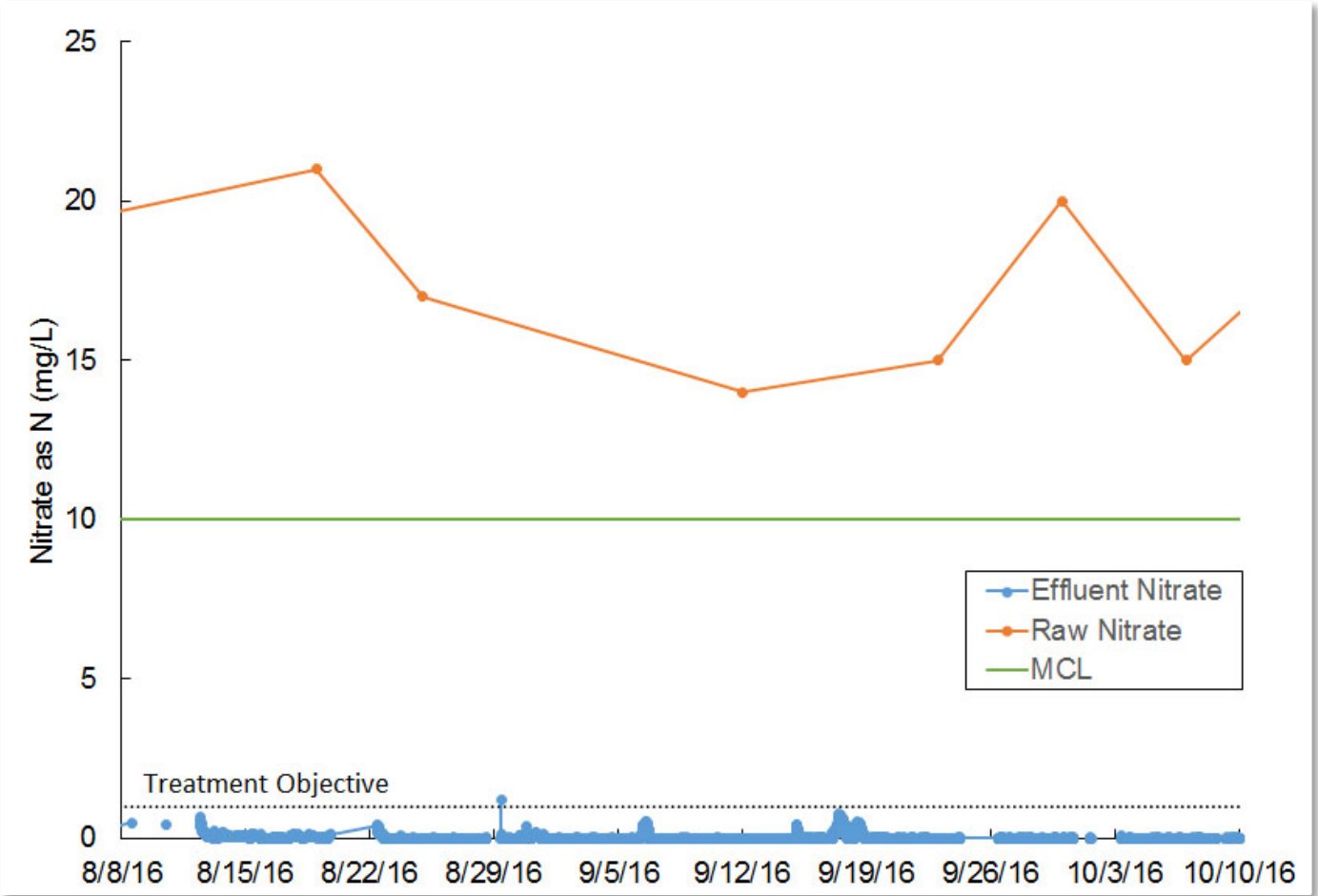
# Biological Treatment: Community-Scale Pilot

Acclimation occurred within 10 days



# Biological Treatment: Community-Scale Pilot

## Sustained nitrate removal



# Biological Treatment: Community-Scale Pilot Takeaways

- Contaminant destruction; no concentrated waste stream
- Removes a broad range of contaminants
- Robust over a wide range of operating and water quality conditions
- Remote, automated operation and monitoring limits operator attention requirements

# Summary - Nitrate Treatment



## Ion Exchange

- Requires media regeneration
- Disposal of concentrated waste (brine)
- Adds chloride to the finished water



## Reverse Osmosis

- High energy use
- Concentrated waste stream



## Biological Reduction

- Low energy use
- No concentrated waste stream

# Non-Connection Options Evaluation Factors

# Summary – Residuals Handling Methods

	Ion Exchange	Reverse Osmosis	Biological Reduction
Waste Characteristic	Waste Brine Stream	Concentrated Waste Stream	Innocuous Backwash Waste Stream
Water Quality	Small Volumes, High [NO <sub>3</sub> <sup>-</sup> ]	Large Volumes, High [NO <sub>3</sub> <sup>-</sup> ]	Small Volumes, No [NO <sub>3</sub> <sup>-</sup> ], Waste Biomass
Permitting Considerations	Land application of residuals with nitrate concentrations is strictly managed.	Land application of residuals with nitrate concentrations is strictly managed.	Land application for filtration waste permitted by NPDES/DEQ.
Residuals Handling Options	<ul style="list-style-type: none"> <li>• Septic haul waste program</li> <li>• Other?</li> </ul>	<ul style="list-style-type: none"> <li>• Septic haul waste program</li> <li>• Other?</li> </ul>	<ul style="list-style-type: none"> <li>• Septic haul waste program</li> <li>• Agronomic land application in summer months, store waste during winter</li> <li>• Other?</li> </ul>

# Summary – Relative Capital Costs

	Regional	Community	Point of Use
RO	\$\$\$	\$\$	\$
IX	\$	\$	\$
Bio	\$\$	\$\$	n/a

- **RO** systems generally have highest capital cost, requiring membranes, high-pressure pumps and chemical cleaning/residuals handling systems.
- **IX** has the lowest capital costs, requiring treatment reactors and chemical regeneration systems, and can typically be integrated into existing well systems w/out significant impacts.
- **Biological Reduction** has more capital costs, requiring treatment reactors, post treatment facilities and chemical addition systems.

# Summary – Relative O&M Costs\*

	Regional	Community	Point of Use
RO	\$\$\$	\$\$	\$\$
IX	\$\$	\$\$	\$\$
Bio	\$\$	\$\$	n/a

- **RO** process is the most energy-intensive/high-pressure, producing a high volume of waste stream/residual and requiring several chemicals.
- **IX** process is more energy intensive, producing a smaller volume waste stream than RO, but brine/chemical residuals are difficult to dispose.
- **Biological Reduction** is the least energy intensive, producing little waste stream/residuals and requiring few chemicals.

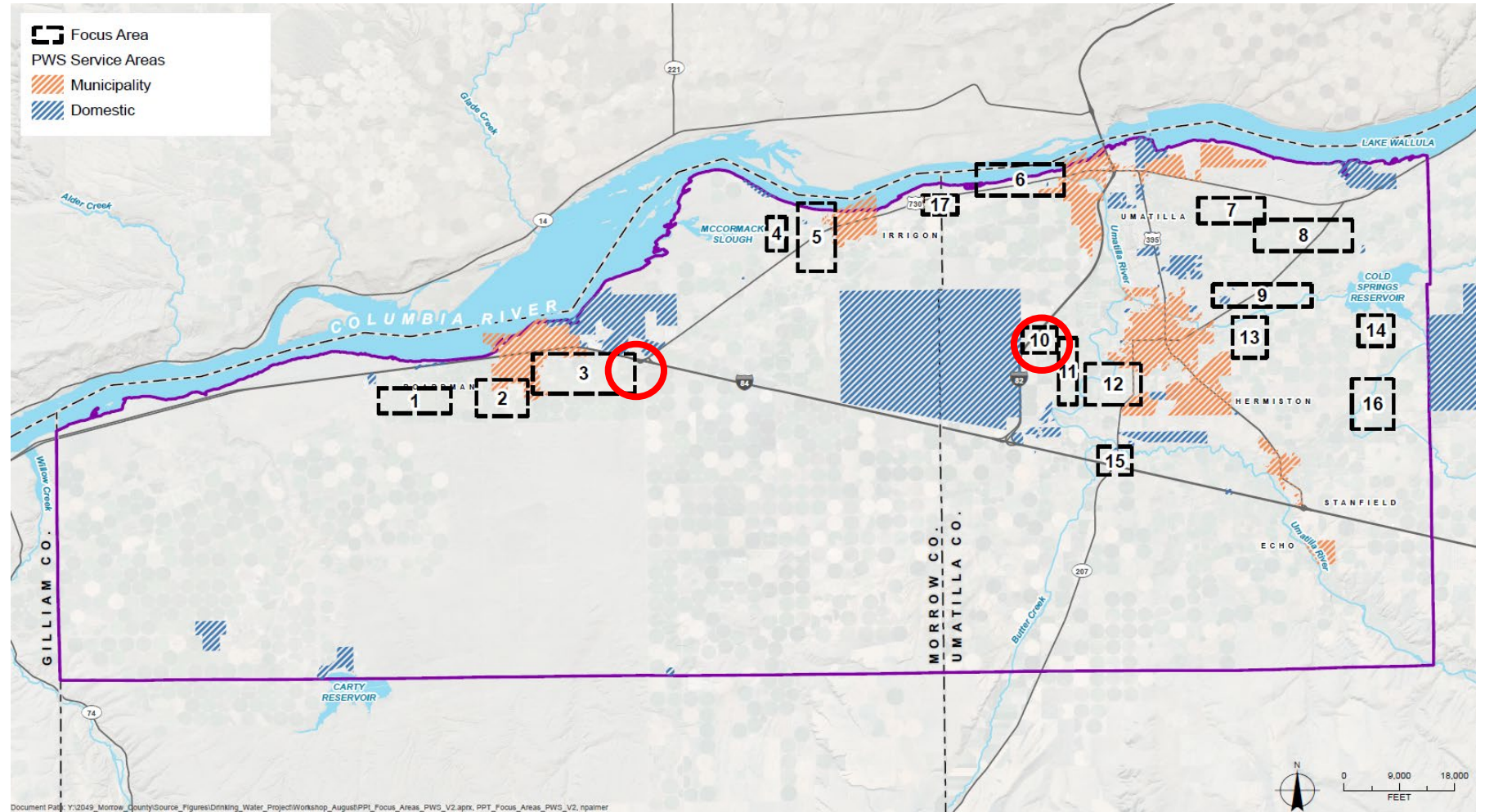
\*Not considering the impacts of PFAS

A photograph of a rural landscape. In the foreground, a large, leafless tree stands on the left. Behind it is a wooden fence and a metal gate. In the background, there is a barn and a field of tall, dry grass. The sky is blue with scattered white clouds. A semi-transparent dark blue banner is overlaid across the middle of the image, containing the text "4. Preliminary Case Study Concepts" in white.

## 4. Preliminary Case Study Concepts

## Follow-up outreach to well owners to evaluate interests and concerns

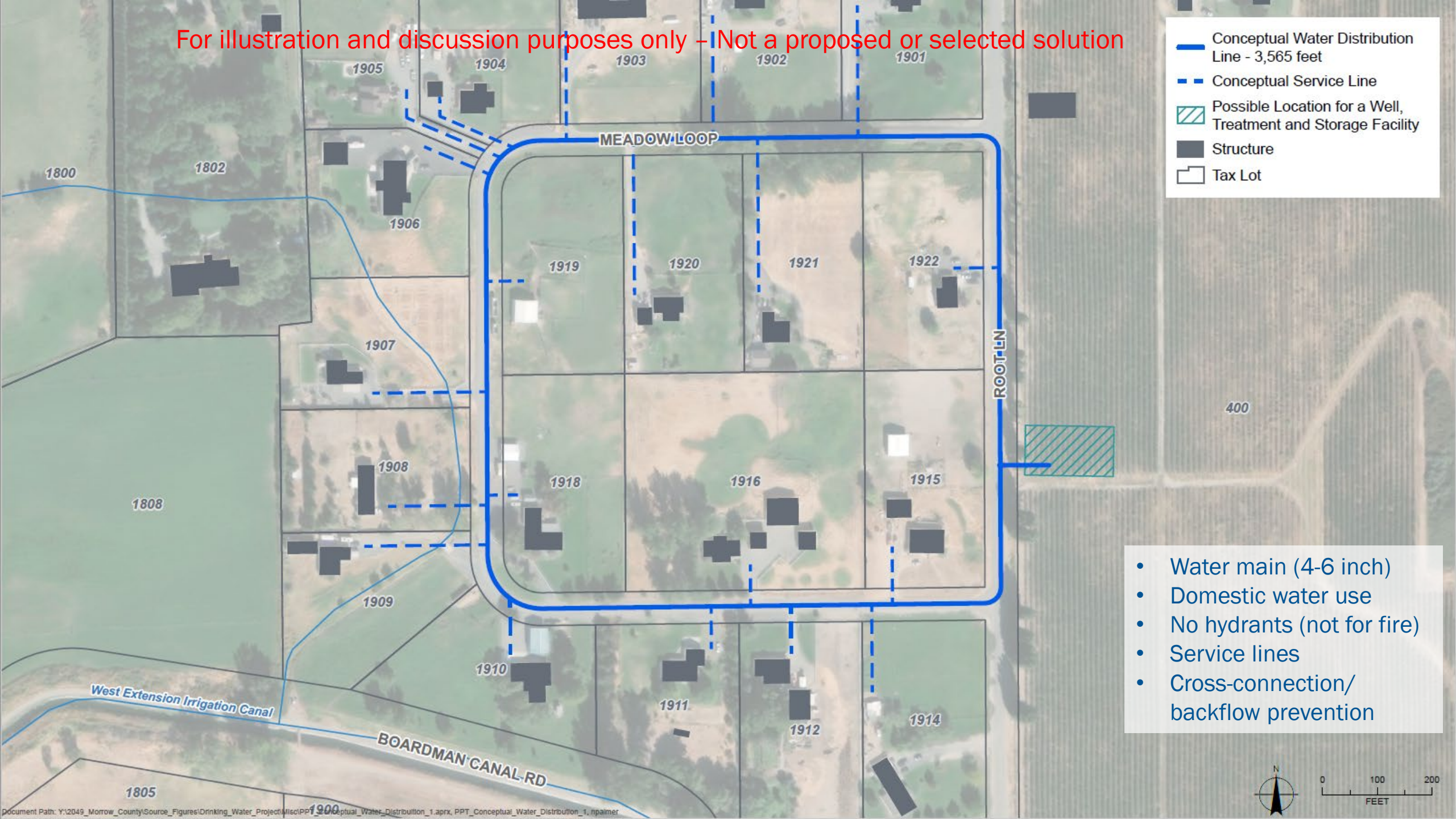
# Preliminary Case Study Concepts



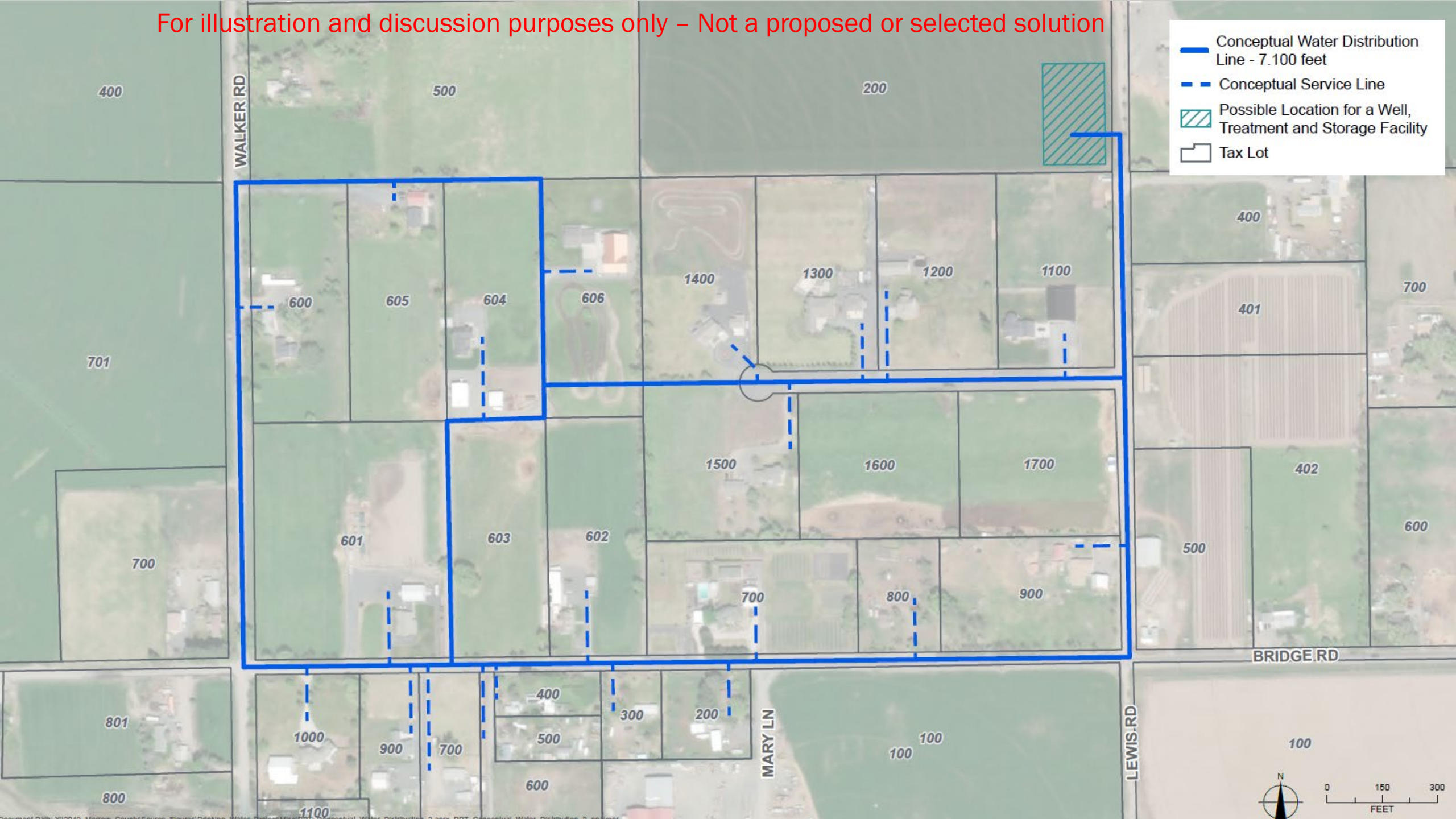
# Water Distribution

- Water main (4-6 inch)
- Domestic water
- No hydrants (not for fireflow)
- Service lines
- Cross-connection/backflow prevention

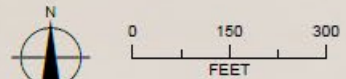
For illustration and discussion purposes only – Not a proposed or selected solution



For illustration and discussion purposes only - Not a proposed or selected solution



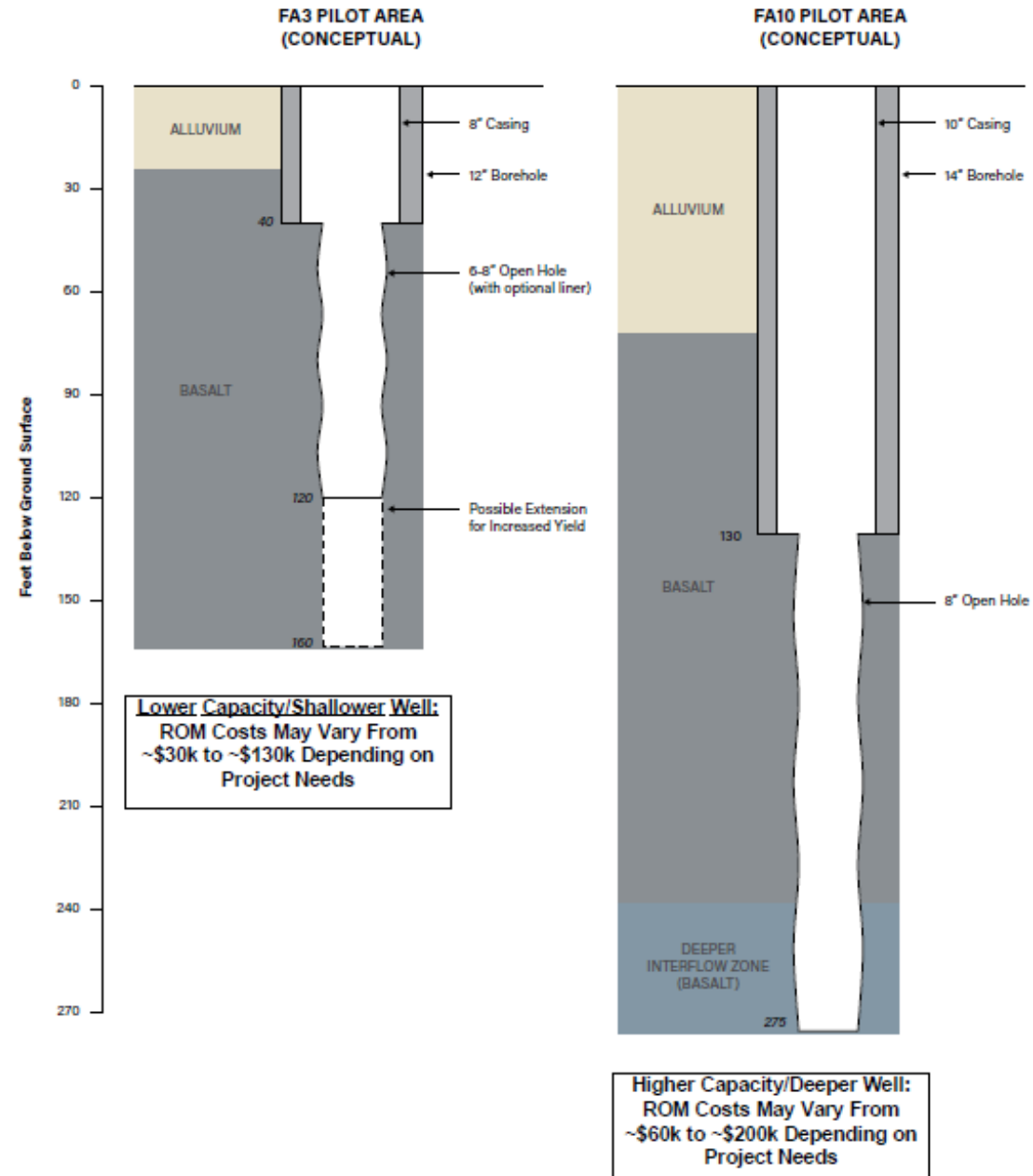
- Conceptual Water Distribution Line - 7.100 feet
- Conceptual Service Line
- Possible Location for a Well, Treatment and Storage Facility
- Tax Lot



# Well Design Concepts & Costs

## Key Variables:

- Siting, specifications, oversight
- Screen design, materials
- Testing: pumping, plumb, video
- Well development
- Controls and appurtenances
- Reporting



# FA3 – Residuals (Treating All Household Water)

➤ For 12 households In Boardman–900 gpd/household water

	Ion Exchange	Reverse Osmosis	Biological Reduction
<b>Total Water Treated</b>	11,000 gal/day	11,000 gal/day	11,000 gal/day
<b>Efficiency</b>	95%	75% <sup>1</sup>	95%
<b>Residuals Volume</b>	500 gal/day	2700 gal/day	500 gal/day
<b>Water Quality</b>	<ul style="list-style-type: none"> <li>• High Salt Concentration</li> <li>• Concentrated Nitrate</li> </ul>	<ul style="list-style-type: none"> <li>• High TDS</li> <li>• Concentrated Nitrate</li> <li>• Other contaminants</li> </ul>	<ul style="list-style-type: none"> <li>• Low TDS</li> <li>• No Nitrate</li> <li>• Waste Biomass</li> </ul>

<sup>1</sup> Reverse osmosis recovery rate determined by groundwater chemistry.

# FA3 – Residuals (Domestic Treatment)

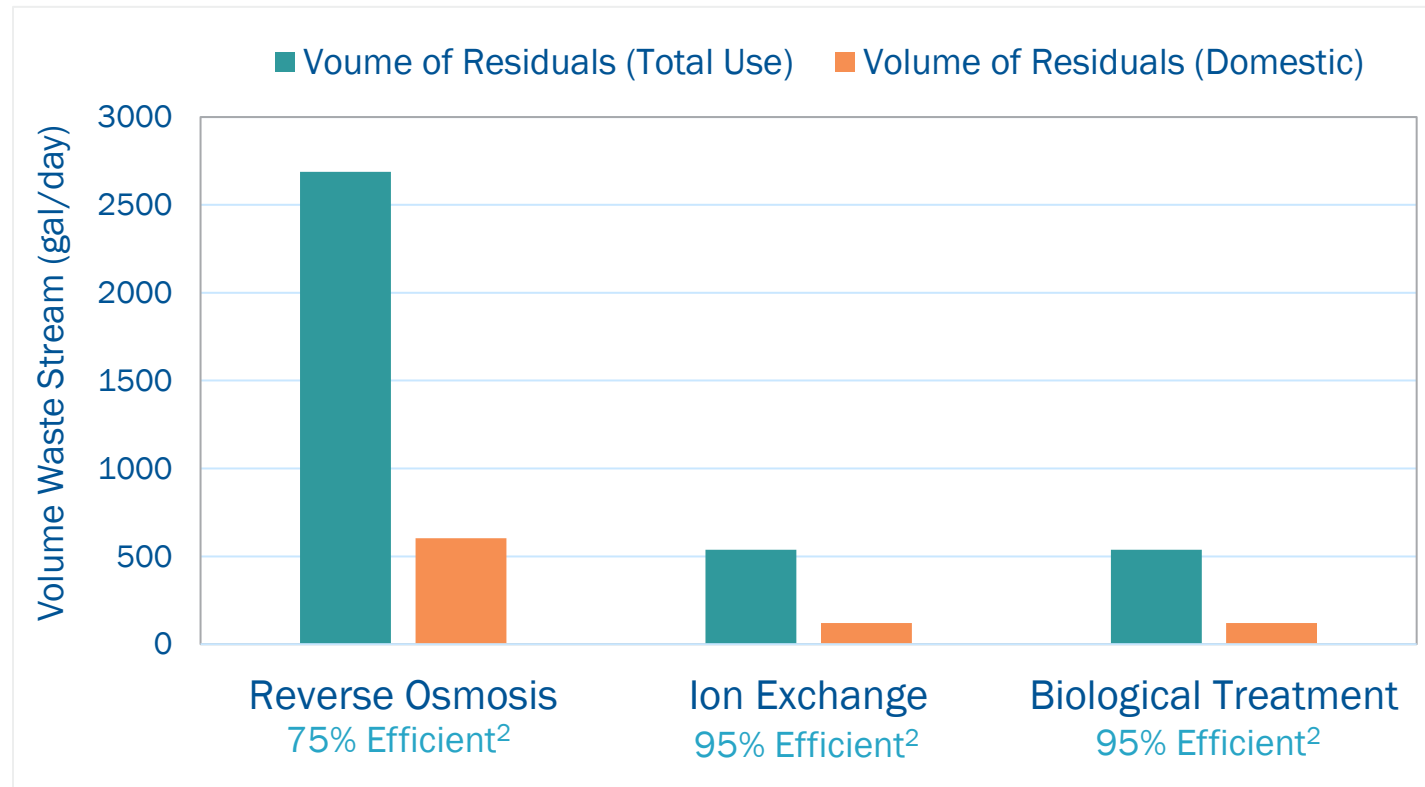
➤ For 12 households In Boardman–200 gpd/household domestic water

	Ion Exchange	Reverse Osmosis	Biological Reduction
<b>Total Water Treated</b>	2400 gal/day	2400 gal/day	2400 gal/day
<b>Efficiency</b>	95%	75% <sup>1</sup>	95%
<b>Residuals Volume</b>	120 gal/day	600 gal/day	120 gal/day
<b>Water Quality</b>	<ul style="list-style-type: none"> <li>• High Salt Concentration</li> <li>• Concentrated Nitrate</li> </ul>	<ul style="list-style-type: none"> <li>• High TDS</li> <li>• Concentrated Nitrate</li> <li>• Other contaminants</li> </ul>	<ul style="list-style-type: none"> <li>• Low TDS</li> <li>• No Nitrate</li> <li>• Waste Biomass</li> </ul>

<sup>1</sup> Reverse osmosis recovery rate determined by groundwater chemistry.

# FA3 – Residuals Comparison Summary

- 12 households In Boardman–
  - 200 GPD/household domestic water, 900 GPD/household total water<sup>1</sup>



- 1) Boardman water demands from master plan.
- 2) Planning level recoveries (efficiencies) assumed for residuals handling comparison.

# FA3 – Residuals Comparison Summary

➤ For 12 households In Boardman–200 GPD/household domestic water, 900 GPD/household total water<sup>1</sup>



- Estimated required footprint for 6 months of waste residuals storage<sup>1</sup>
- Assume 5 ft water depth in lagoons
  - A: RO<sup>2</sup> Footprint, All Water
  - A\*: RO<sup>2</sup> Footprint, Domestic Water Only
  - B: Bio/IX<sup>3</sup> Footprint, All Water
  - B\*: Bio/IX<sup>3</sup> Footprint, Domestic Water Only

- 1) Estimated lagoon footprint for 180 days of storage, 5 ft of water depth in lagoons, neglecting rainfall and evaporation.
- 2) Planning level RO recovery: 75%
- 3) Planning level IX/Biological efficiency: 95%



## 5. OREM Treatment Pilot Testing

# Other Non-Connection Options

- What if point of use treatment or community water systems aren't feasible (or preferred):
  - Water delivery
  - Water solar harvesting
  - Rainwater harvesting
  - Aquifer recharge
  - Others?
- Oregon Resiliency and Emergency Management (OREM) water treatment pilot study

# Next Steps

# Refine Small System Concepts at Case Study Area(s)

- Concept:
  - Identify exempt well(s) to abandon and “transfer” to a shared community well to serve domestic water demands
  - Existing exempt domestic wells will be retained for irrigation use.
- Conceptual layout and design
  - Infrastructure (land acquisition, well, treatment, storage water distribution, booster pump, service lines and meters)
- Administration and implementation constraints
  - Service area and agreement concept
  - O&M requirements

# Near-term Next Steps

- Review survey responses and conduct targeted outreach follow-up
- Select final case study areas and refine non-connection concepts (costs and implementation review)
- Conduct OREM meeting and coordinate pilot testing
- Steering Committee briefing of findings
- Stage 4 workplan
  - Further assess “unconventional” non-connection options?



# Discussion