

Water Reuse for a New City in Oregon: Solutions for Southeast Damascus



PNCWA

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CH2MHILL

PRESENTED BY

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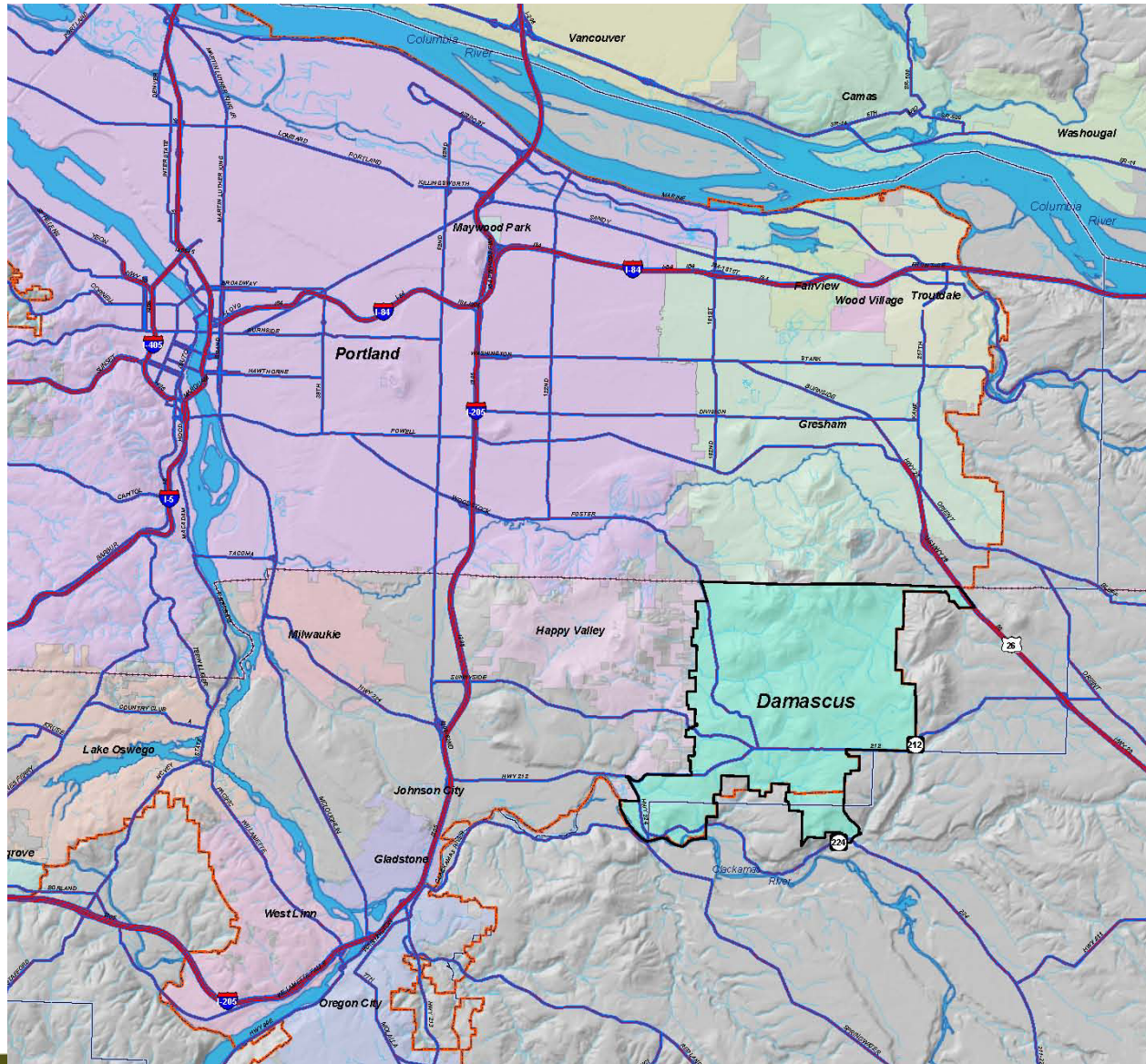
Presentation Outline

- Introduction
 - Location and Context of the City and of the Project
- Phase 1 Options Analysis
 - Wastewater treatment and reuse alternatives
 - Multi-Criteria analysis: capital cost and non-financial costs
- Phase 2 Refined Alternatives
 - Watershed context
 - Staged implementation wastewater treatment and reuse
- Conclusions
- Next steps

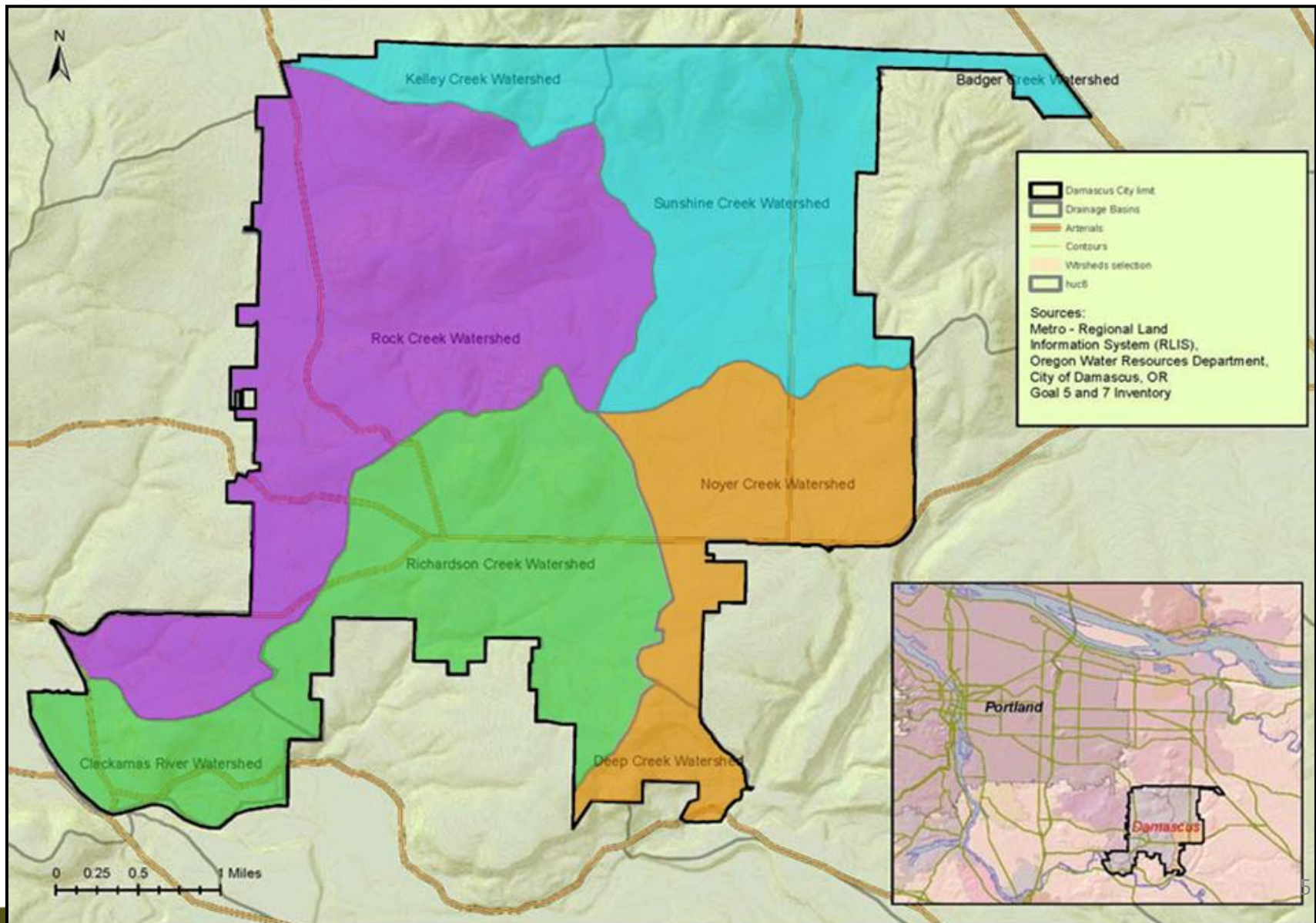


Location and Context

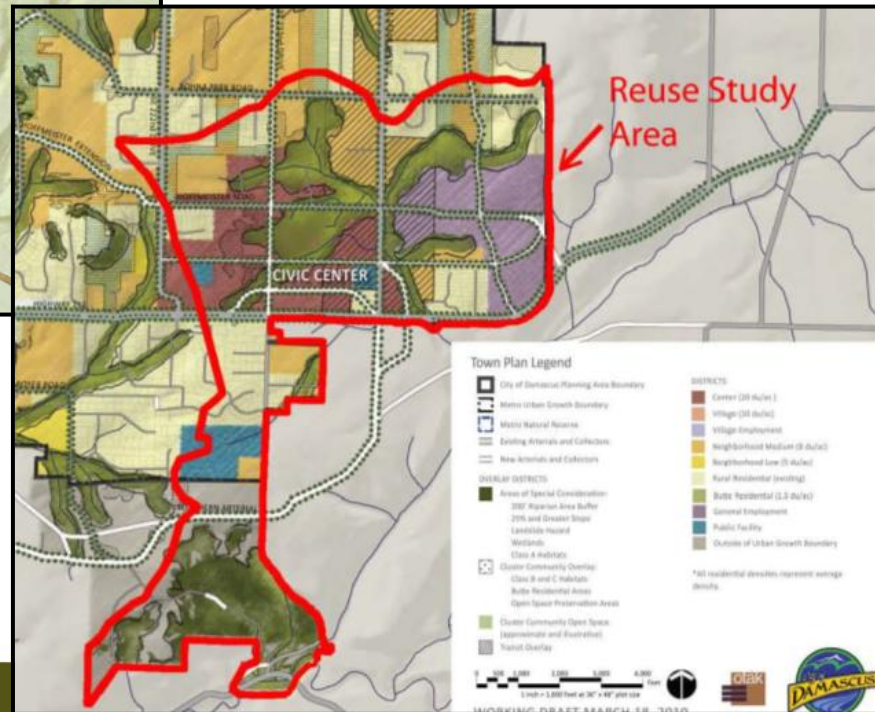
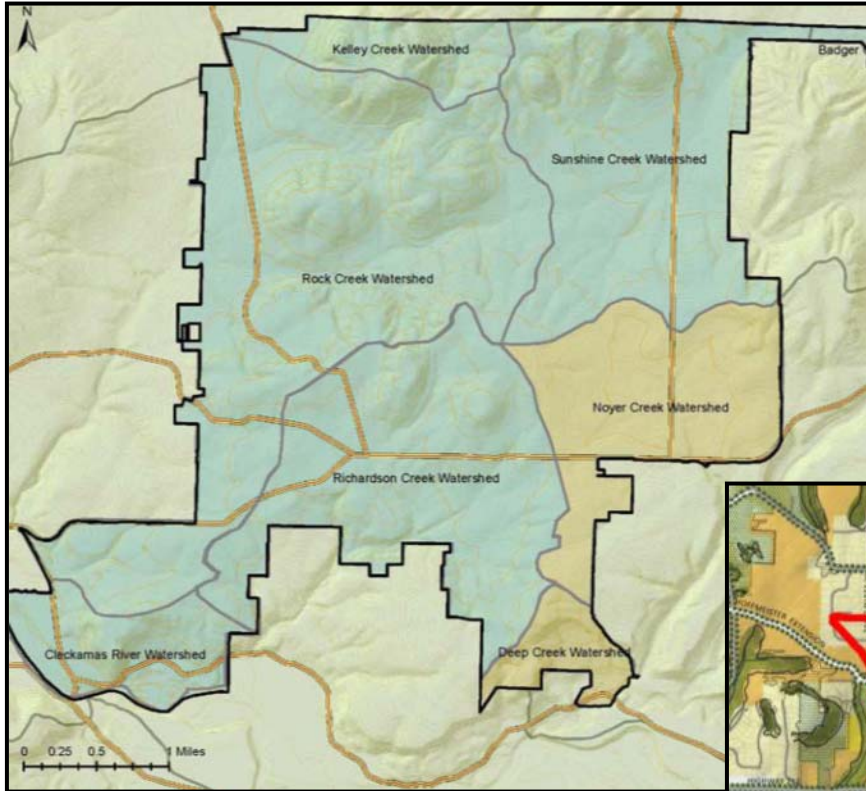
Damascus, Oregon



Planning without a watershed context



Southeast Damascus study area



Geography, topography, & climate

Irrigation months in Oregon – 24 to 28 inches



Study area

2.2 square miles
1,400 acres

Build-out

2,918 households - 220 gpd
11,700 employees - 80 gpcd

Wastewater

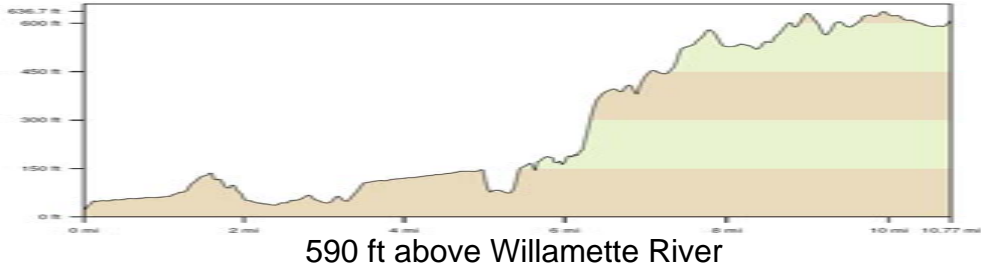
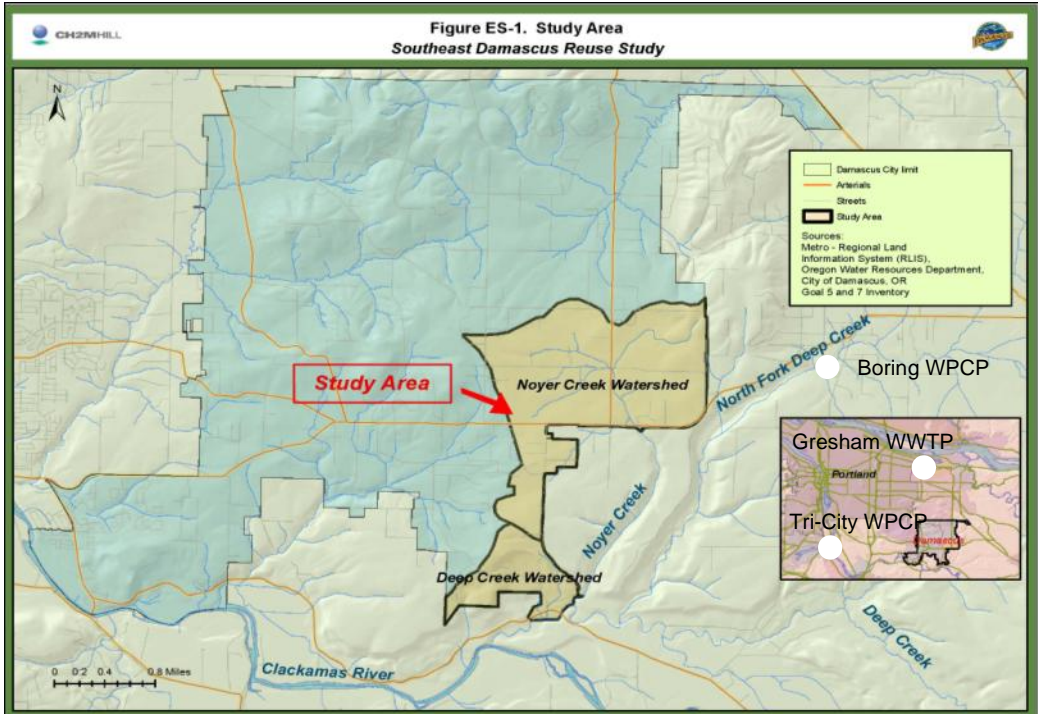
- 1.5 mgd dry (avg)
- 3.0 mgd wet (max month)

Existing water service

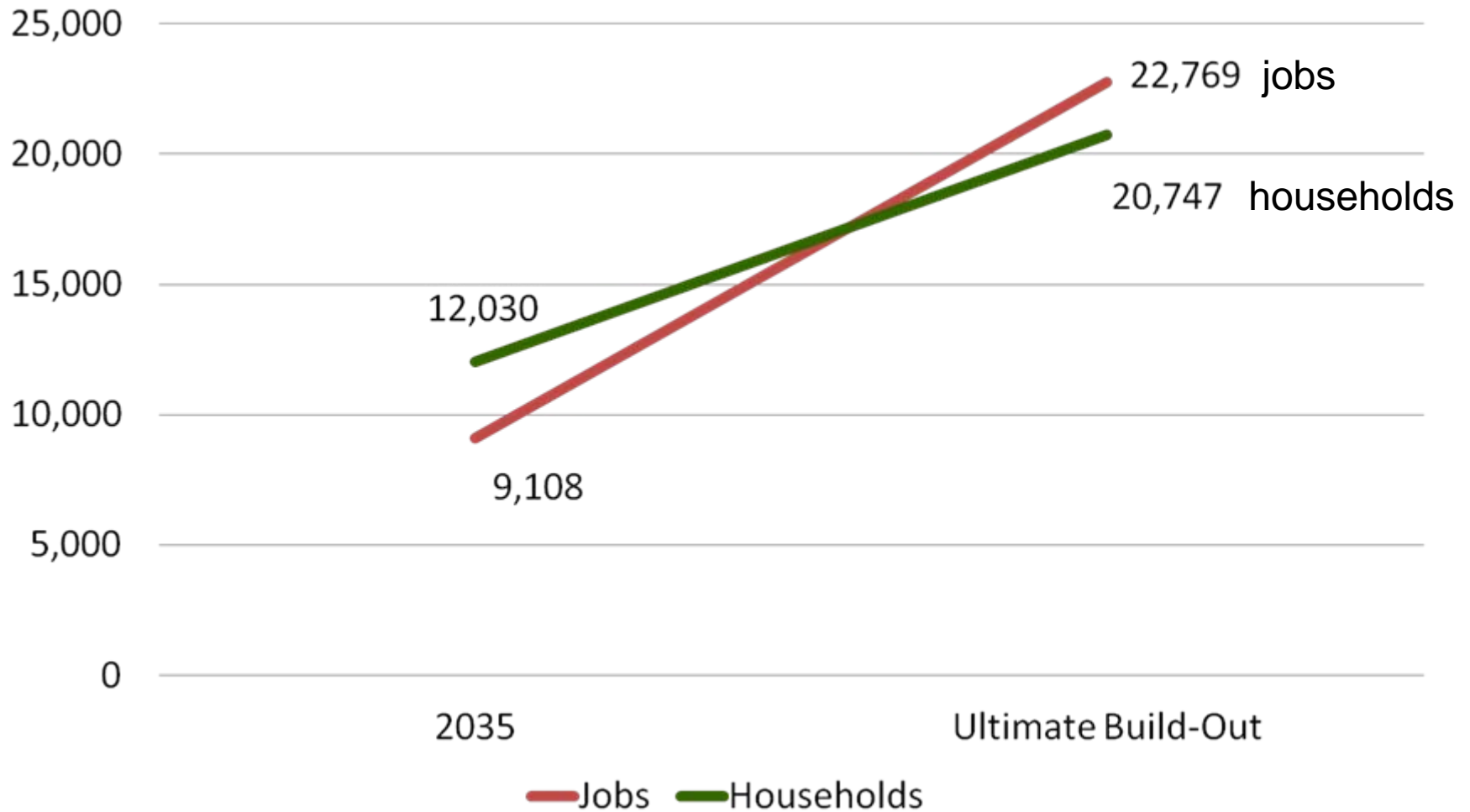
Sunrise Water Authority
Boring Water District (East)
Private wells

Existing wastewater service

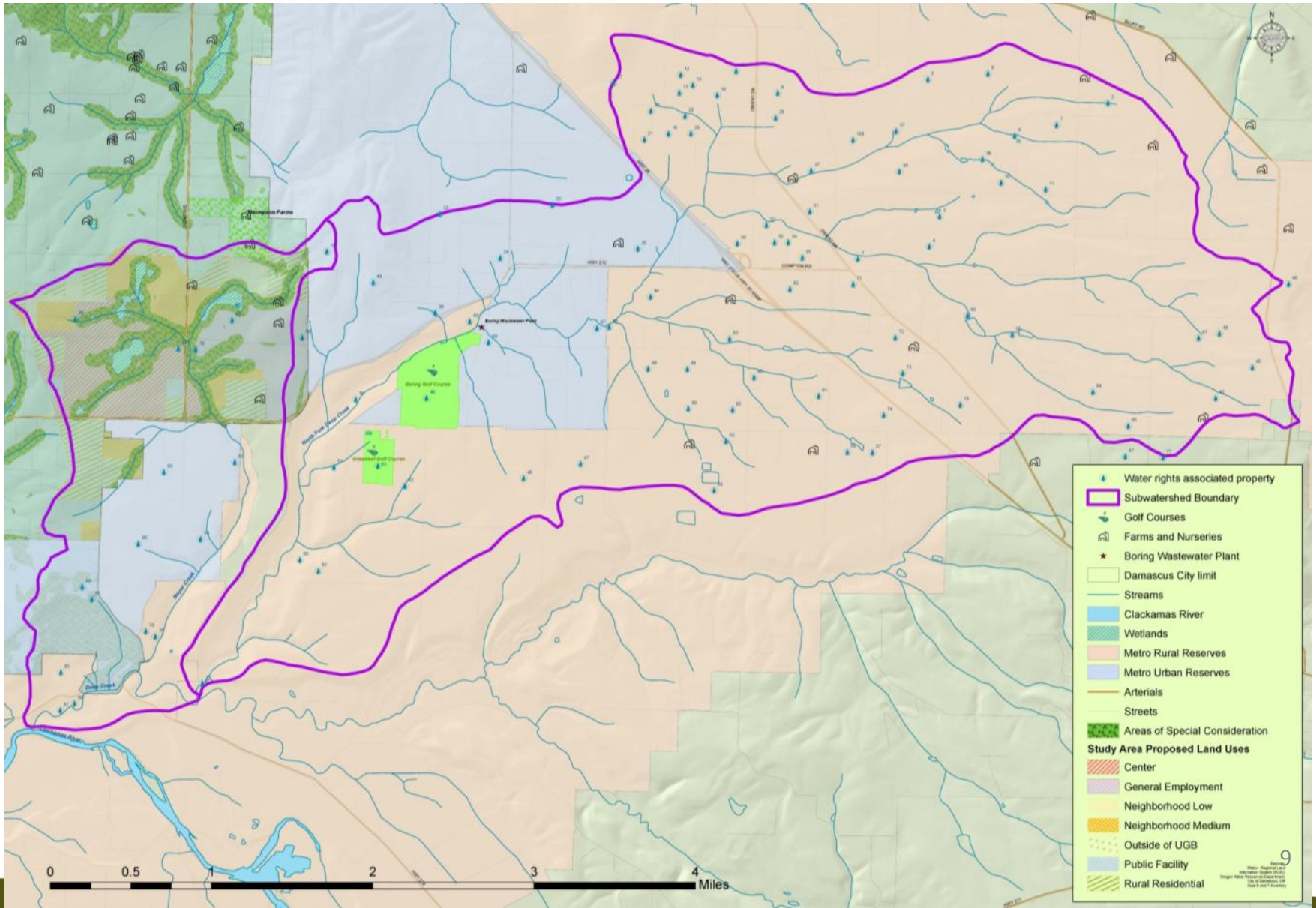
ISDS
Boring WPCP (East 2 miles)
Tri-City WRF (West 9 miles),
Gresham WWTP (North 9 miles)



Growth projections outpace water resources



Demands on surface water are greater than the flow in the streams



The Three-Basin Rule

- Legislation limiting surface water discharges, WPCF, and NPDES permits (OAR 340-041-0350)
 - Clackamas, Mackenzie and North Santiam Rivers
 - Specifically prohibited:
 - New NPDES permits for domestic STPs
 - Increased mass load limits for existing facilities
 - EQC may approve a new WPCF if:
 - No discharge to surface water,
 - EQC finds that STP is preferable to individual onsite systems
- Another example of land use planning without a watershed context



Phase 1: Options Analysis

Southeast Damascus Reuse Study

Goals for study

- Evaluate a universe of wastewater service and water reuse opportunities
- Estimate capital costs and evaluate non-financial costs
- Other goals:
 - Support City Council's Sustainability Policy
 - Support City Council's core values:
 - Well-designed communities and core areas
 - Environmental responsibility and protected special places
 - Identify wastewater/reuse solutions that might be applicable elsewhere in Damascus
 - Prepare to launch wastewater and water master planning work

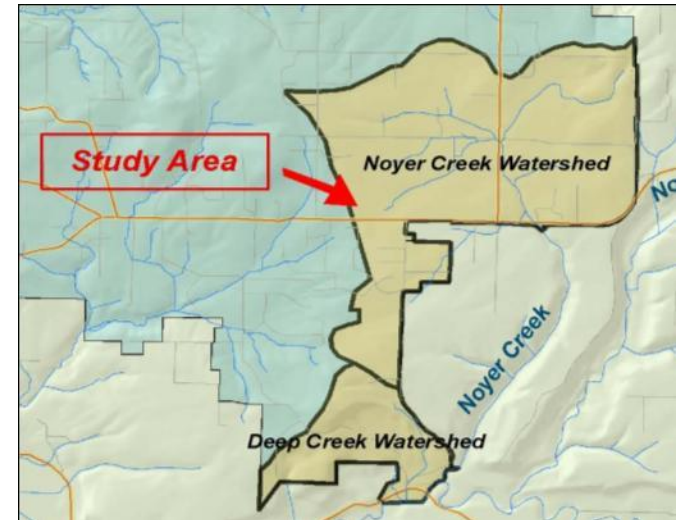
Work guided by Sounding Board

- Input sought from local stakeholders and state regulators to guide alternatives development
 - Sunrise Water Authority
 - Clackamas Water Environment Services (WES)
 - City of Gresham
 - Oregon Department of Environmental Quality (DEQ)
 - Oregon Water Resources Department (OWRD)



Initial assumptions

- Reuse inside the study area
- Capital cost not only deciding factor
- Not limited by technology or regulations
 - Three Basin Rule
 - Current reuse regulations
- Each utility pays for itself
 - Reuse
 - Wastewater
 - Potable water supply



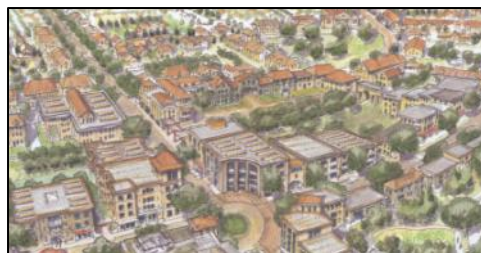
What kind of reuse?

- Class A
 - Oxidized, filtered, and disinfected
 - Wide range of uses, including aquifer recharge
- Class B
 - Oxidized and disinfected, not filtered
 - Controlled access
- Class C
 - Oxidized and disinfected, more bacteria
 - Golf courses
- Class D
 - Oxidized & disinfected, more bacteria
 - Nonfood crops
- Oxidized but not disinfected
 - Timber and non-consumed seed crops

The universe of wastewater and reuse options

• Wastewater treatment

- Location and discharge points
 - Tri-City WRF
 - Gresham WWTP
 - Boring WPCP
 - Decentralized
- Variations
 - Conservation & better construction
 - Type of treatment
 - » Conventional Secondary
 - » MBR
 - » Living Machine
 - » STEP
 - » Lagoons
 - » Poplar trees



• Reuse

- Location and discharge points
 - Tri-City WRF
 - Gresham WWTP
 - Boring WPCP
 - Decentralized
 - Scalping plants
- Seasonal variations
- Storage
- Uses
 - Unrestricted access
 - Fire flows
 - Substitute supply - Swap reuse for existing water rights
 - Augmentation

Costs – Wastewater treatment with unrestricted seasonal reuse

Estimated Cost of Wastewater and Reuse Systems for Southeast Damascus – 1.7 mgd ADWF

| Wastewater Treatment Plant Location | Estimated Wastewater System Construction Cost (millions) | Estimated Reuse System Construction Cost (millions) | Total Estimated Wastewater and Reuse System Construction Costs (millions) | Estimated Selling Price per ccf of Reuse Water |
|-------------------------------------|--|---|---|--|
| Expand Tri-City WPCF | \$70.7 | \$24.6 | \$95.3 | \$4.67 |
| Expand Gresham WWTP | \$56.4 | \$26.2 | \$82.6 | \$4.86 |
| Expand Boring WPCF | \$49.9 | \$8.4 | \$58.3 | \$1.97 |
| Decentralized | \$51.0 | \$4.9 | \$55.9 | \$1.41 |

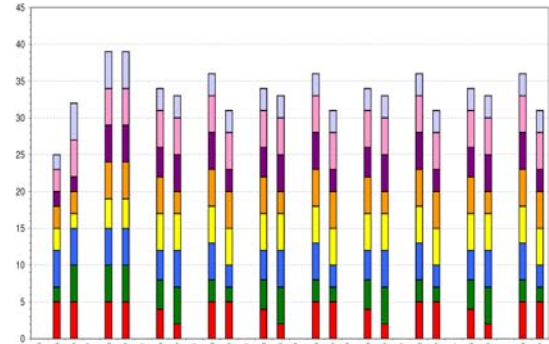
Estimated selling price for reuse water includes capital costs amortized over 30 years at 5%, electrical power, and operations and maintenance costs for reuse system only. O&M costs for wastewater treatment were not calculated.

Water and reuse rates for nearby utilities

| Utilities | Potable Water | | Reuse |
|-------------------------|---------------------------|---|--------------|
| | System Development Charge | Rate per ccf | Rate per ccf |
| Sunrise Water Authority | \$6,040 | Residential - \$1.55 to \$2.75 Commercial - \$1.80 to \$3.10 | - |
| City of Gresham | \$4,153 | \$1.99 to \$3.01 | - |
| City of Portland | \$2,690 | \$2.44 | - |
| City of Newberg | - | \$2.60 to \$4.18 | \$3.30 |

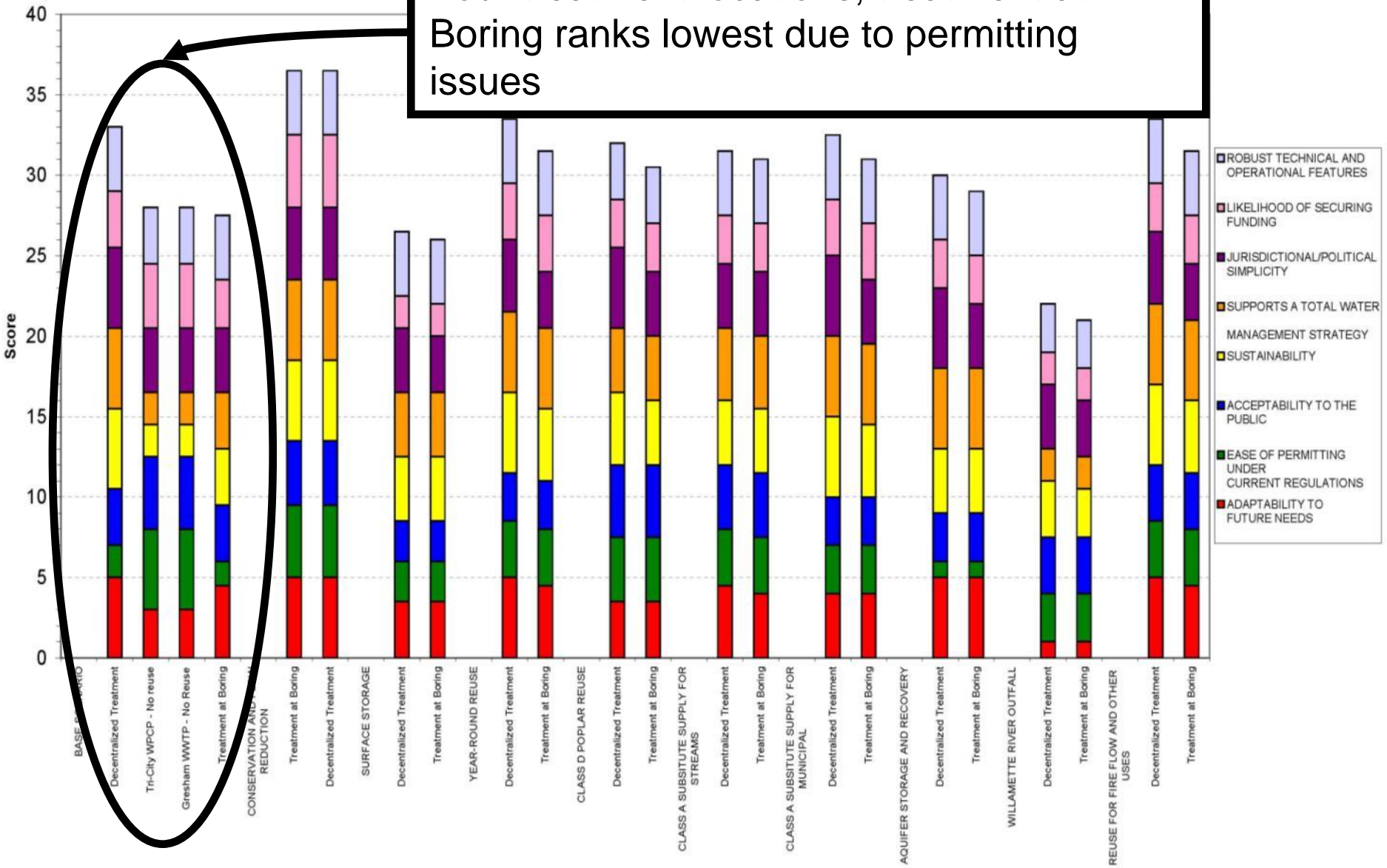
Non-financial evaluation criteria

1. Adaptability to future needs
2. Ease of permitting under current regulations
3. Acceptability to the public
4. Sustainability
5. Supports a total water management strategy
6. Jurisdictional/Political simplicity
7. Likelihood of securing funding
8. Robust technical and operational features

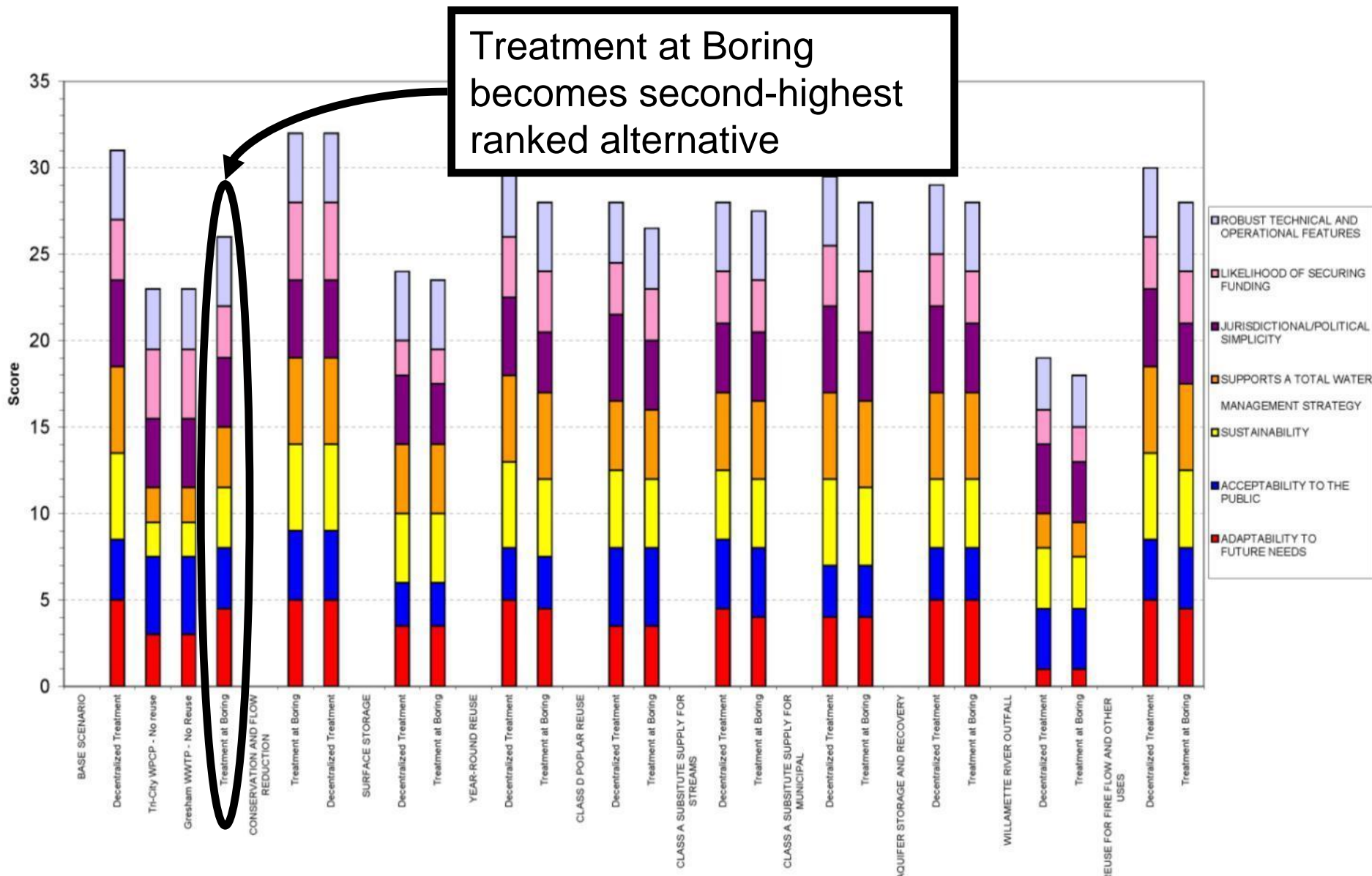


Results of the non-financial evaluation – all criteria

Four treatment locations; treatment at Boring ranks lowest due to permitting issues



Non-financial evaluation – without permitting



Conclusions from the Phase 1 Study: Reuse makes sense for SE Damascus

- City council considers reuse a necessary part of the overall solution
- Reuse makes sense from both the capital cost and non-financial cost perspective
- Local treatment solutions are most cost-effective
 - Expand and upgrade the Boring facility to treat flow from SE Damascus to Class A quality *or*
 - Use decentralized MBR facilities throughout SE Damascus



Phase 2: Refined Alternatives

Phase 2 Objective and Scope of Work

Objective:

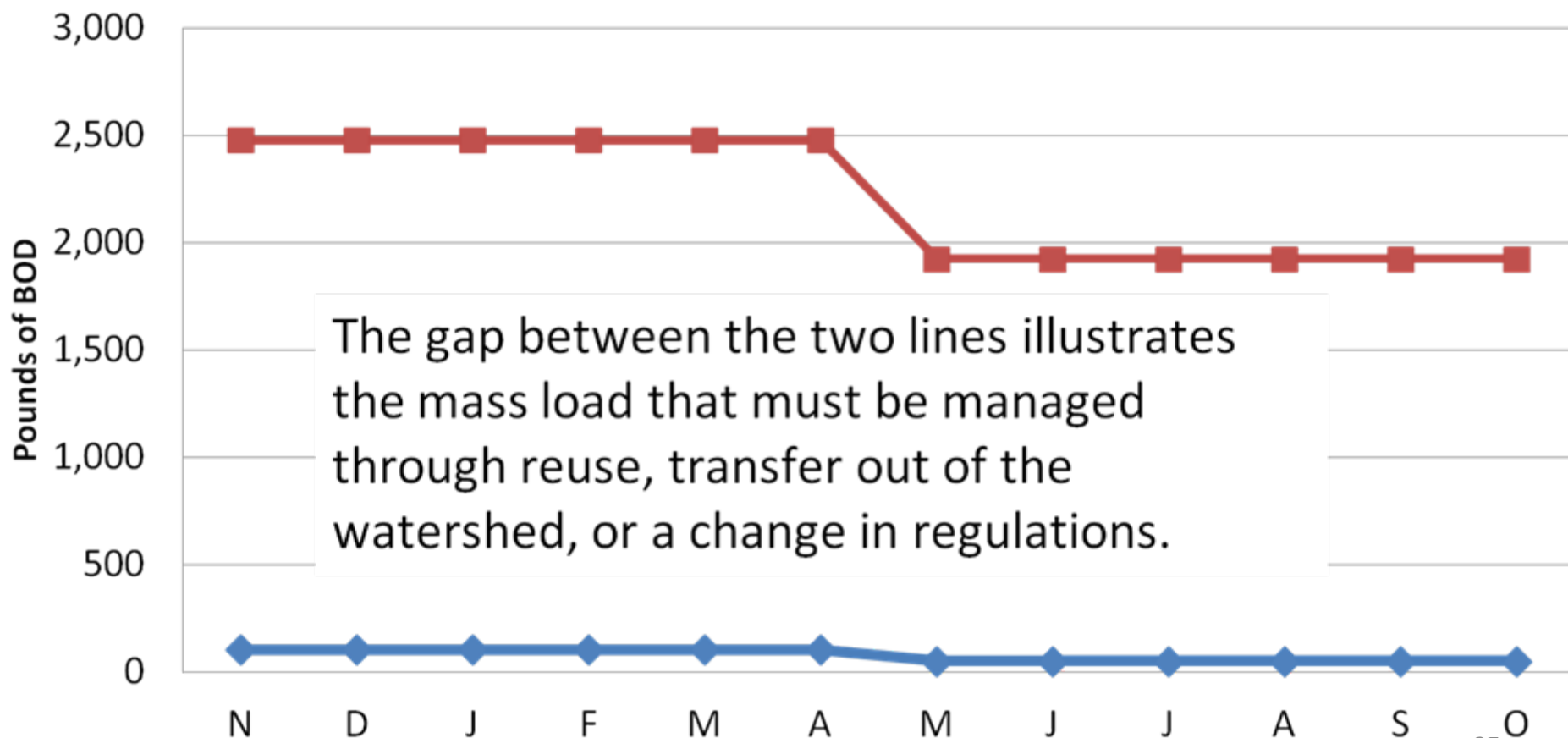
Refine the best alternatives from the Phase 1 work and move closer to a recommended solution



Watershed Context: What the 3-Basin Rule means for SE Damascus

Wastewater Effluent BOD Load to Surface Waters

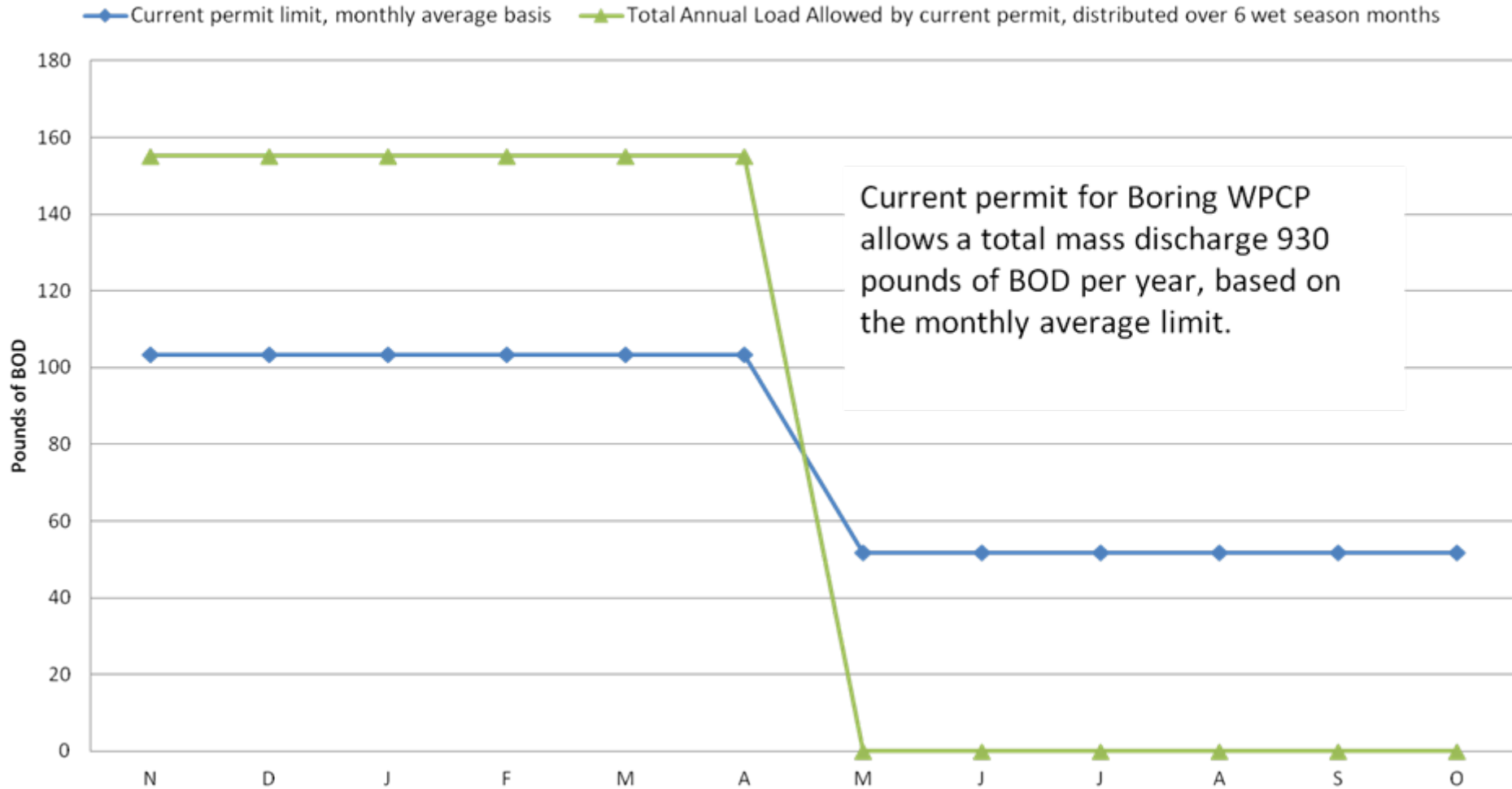
- ◆ Current permit limit, monthly average basis
- Load to surface water with no reuse and year-round discharge, Buildout



The gap between the two lines illustrates the mass load that must be managed through reuse, transfer out of the watershed, or a change in regulations.

Watershed context

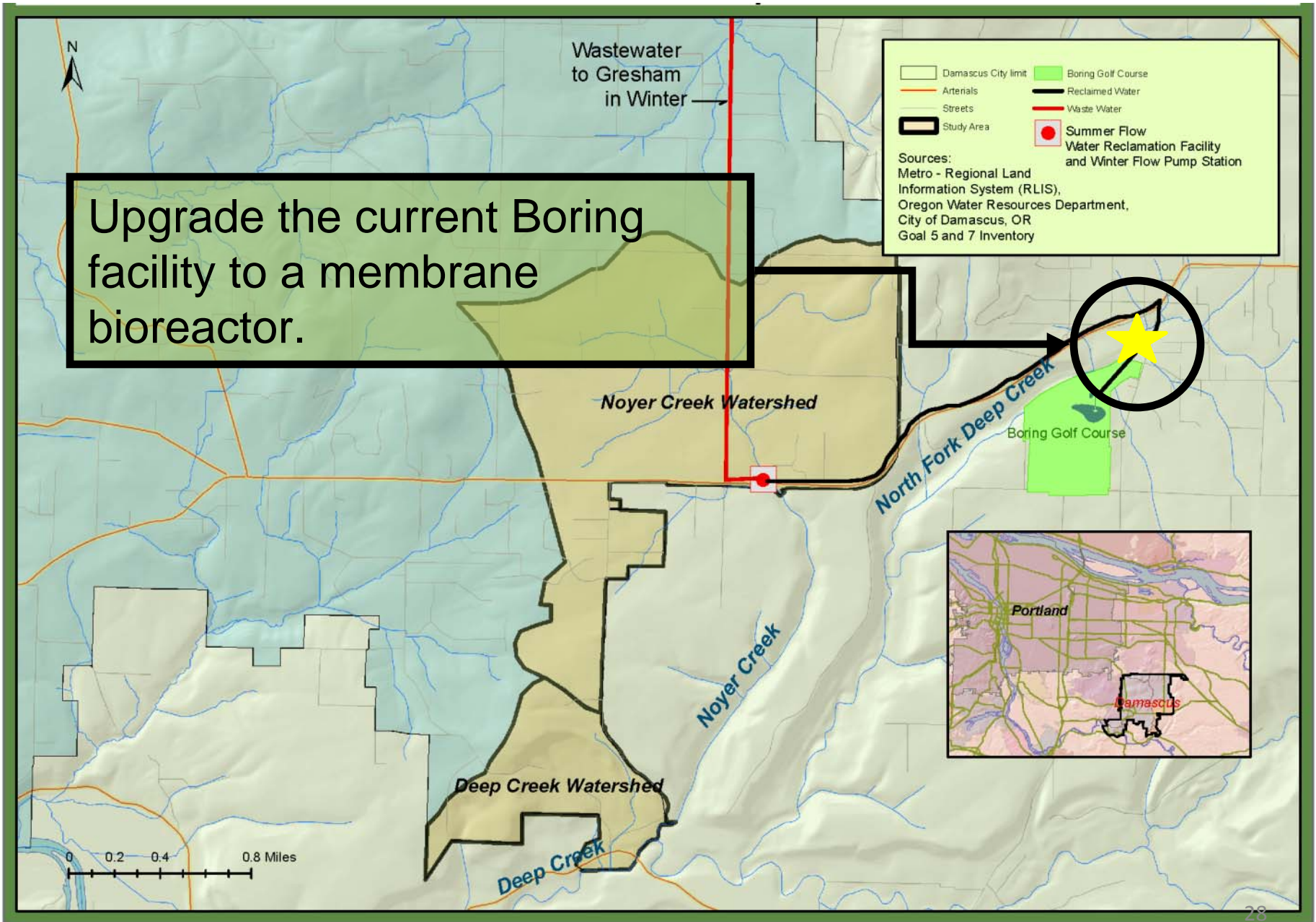
Two Ways to Approach the Annual Mass Load Limit



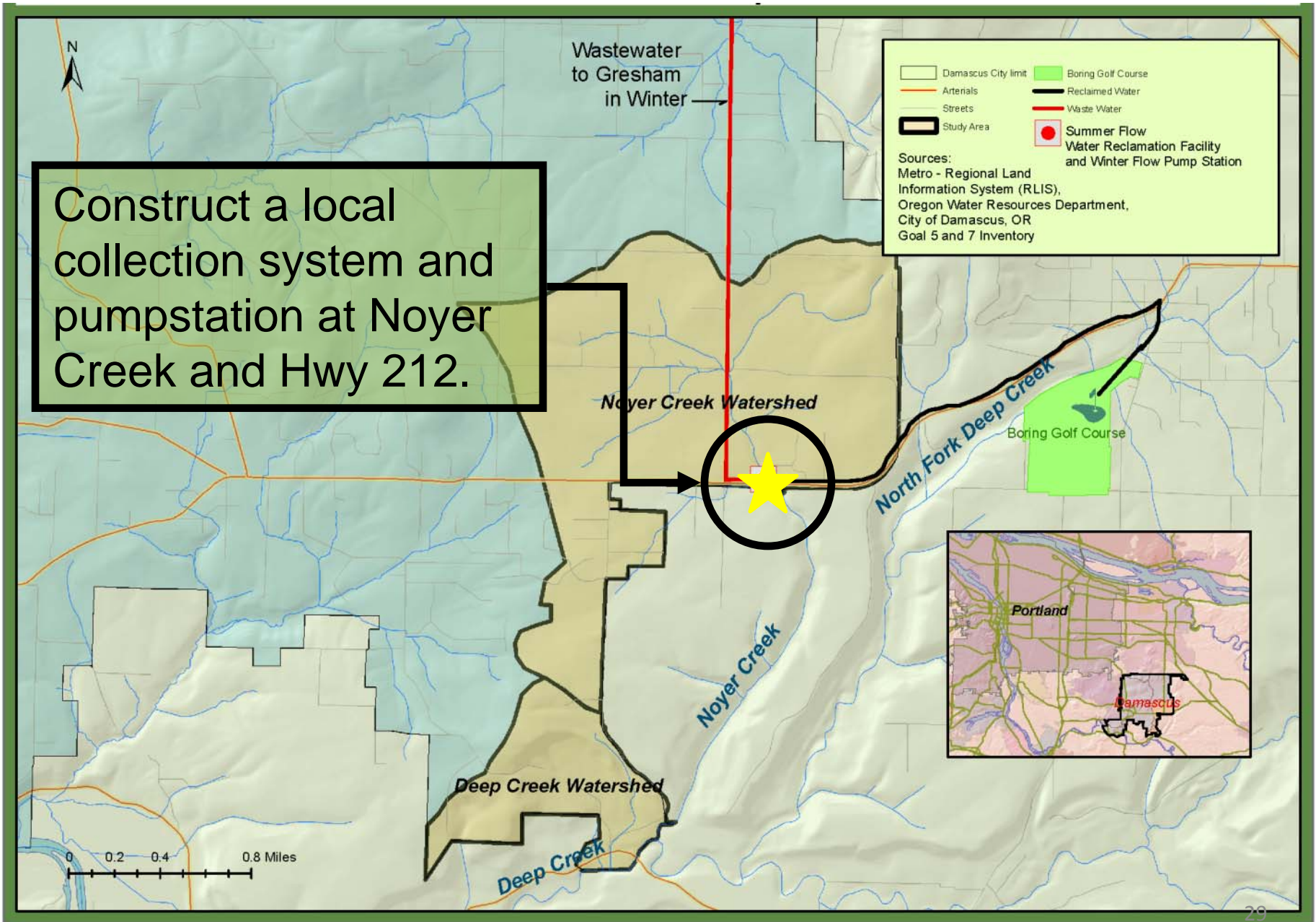
Refined wastewater treatment and reuse alternatives

- Nine new alternative wastewater treatment and reuse scenarios developed and reviewed with stakeholders
- The difference between centralized and decentralized treatment options became less distinct
 - How big does something have to be to be “centralized?”
 - Sites might change use over time
- From these scenarios grew a recommendation for implementation in stages to serve development

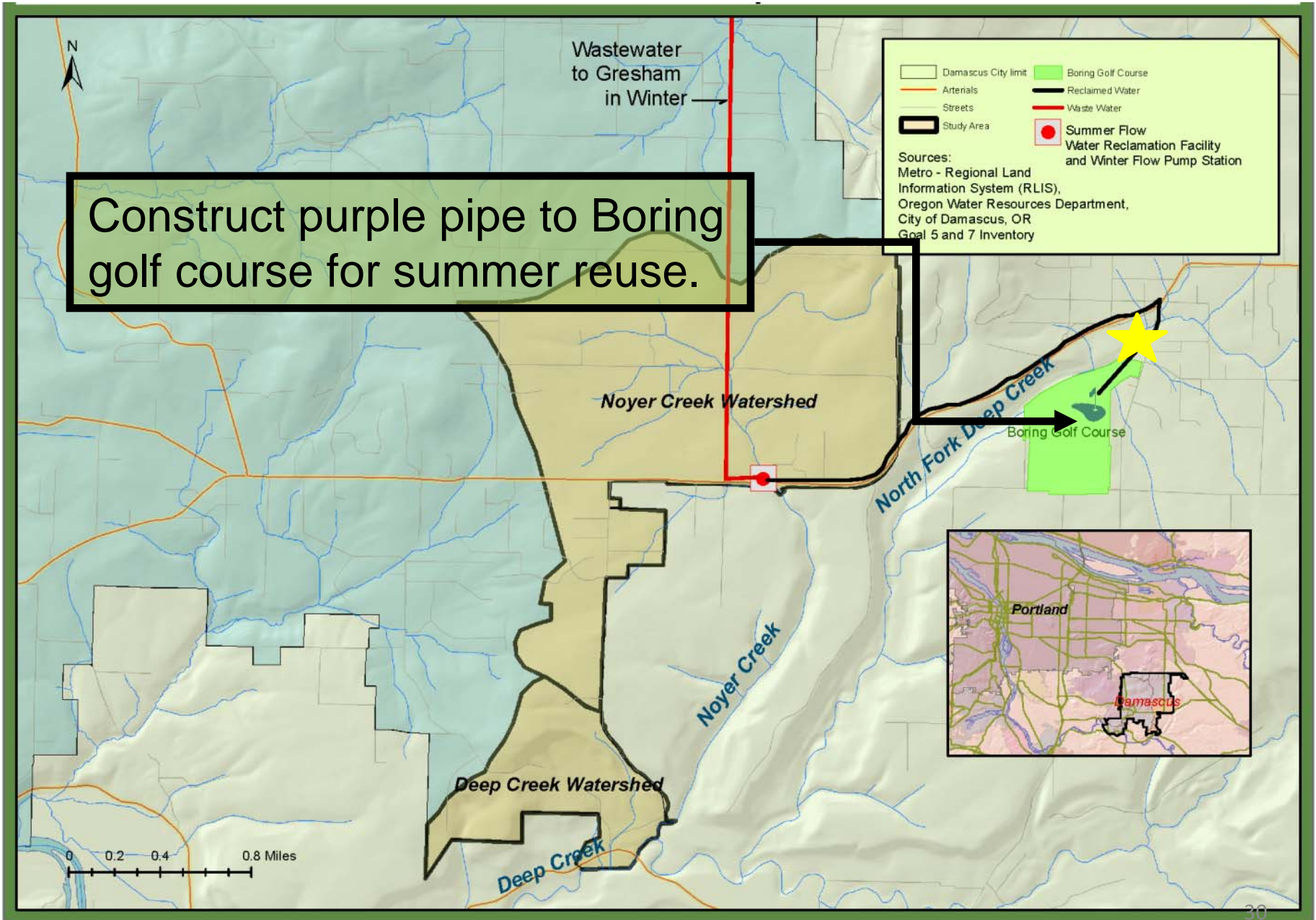
Stage 1 – Approximate Planning Horizon 2020



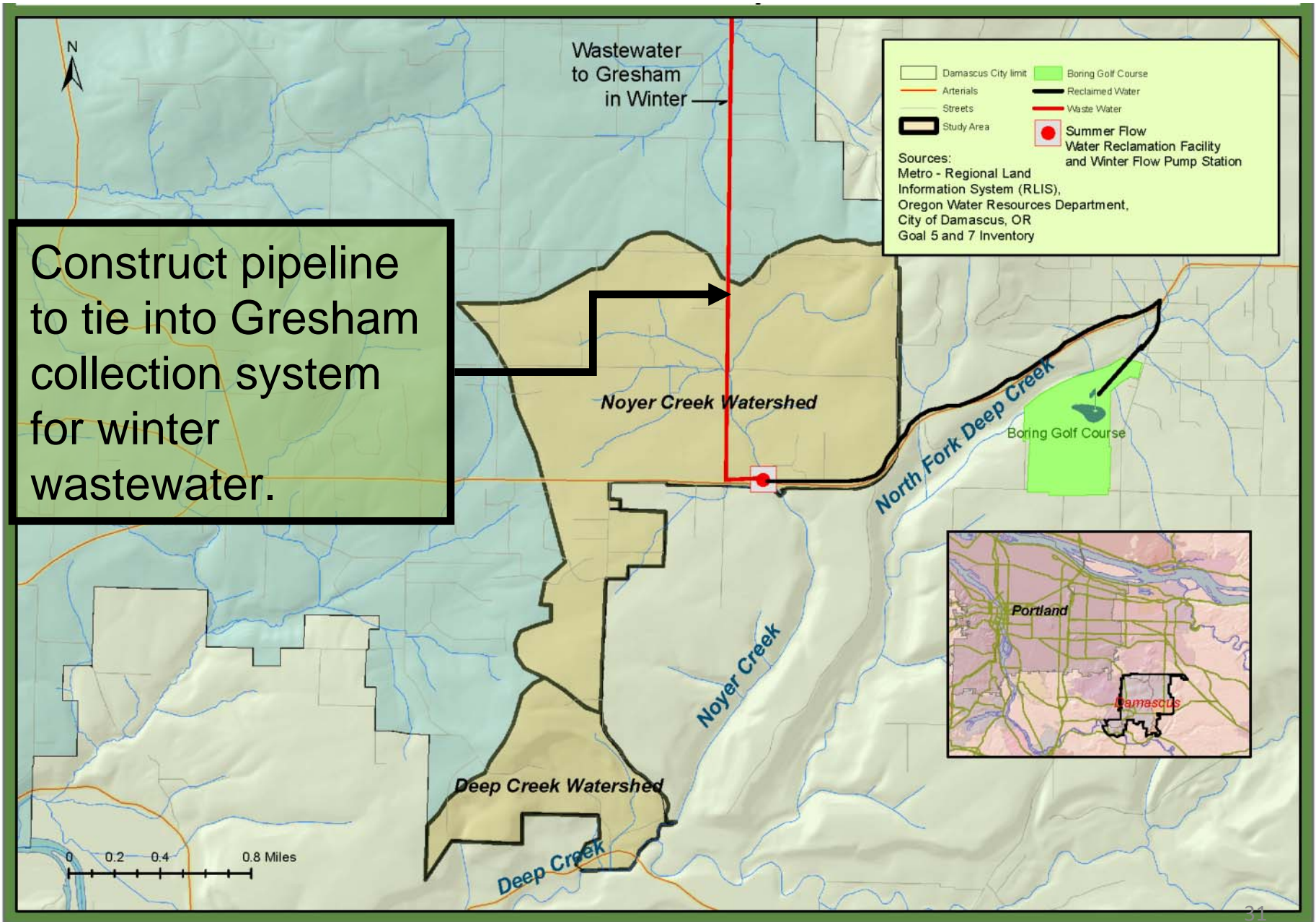
Stage 1– Approximate Planning Horizon 2020



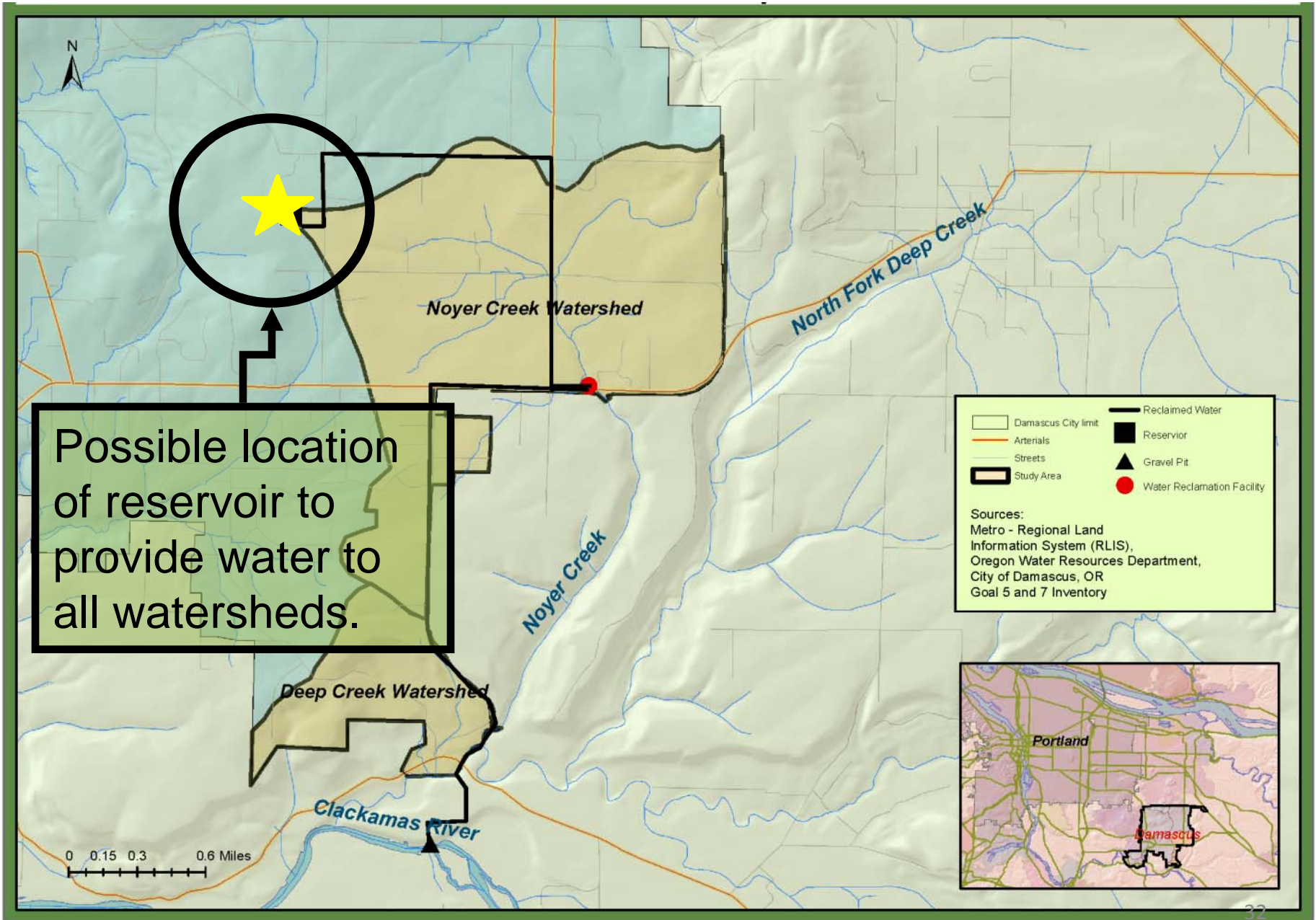
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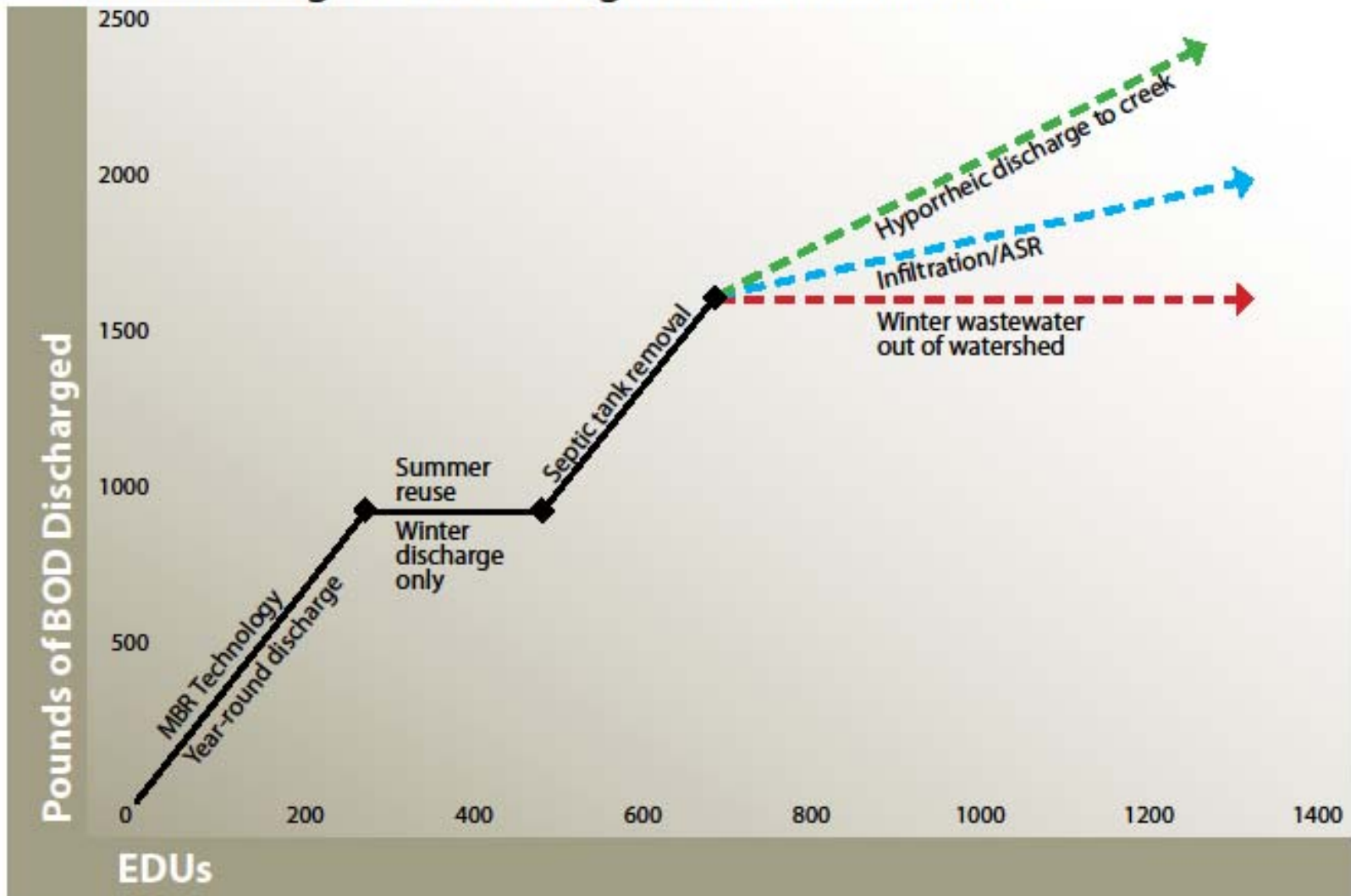
Stage 1 – Approximate Planning Horizon 2020





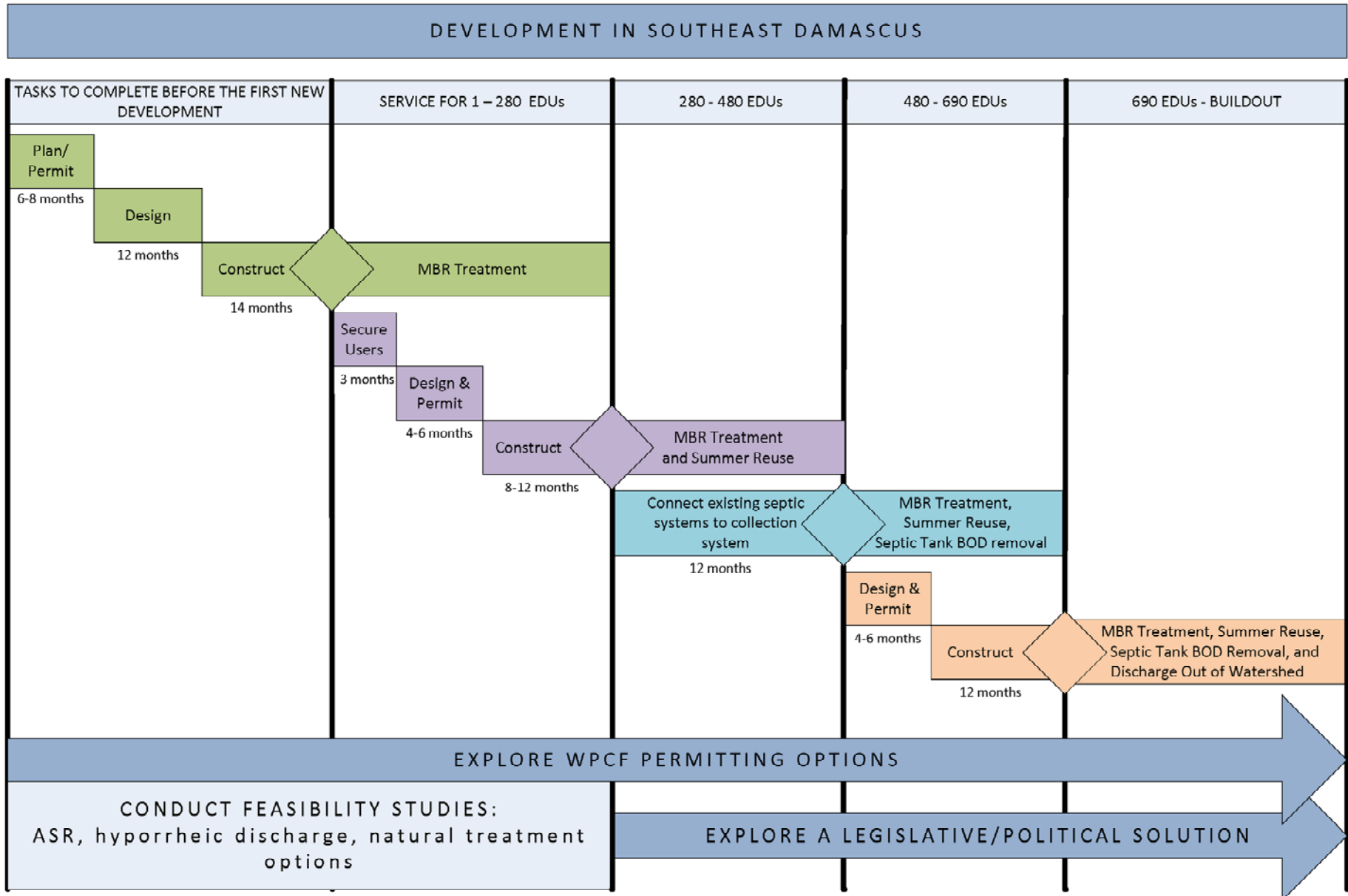
Stage 2: Addressing Regulatory Concerns

BOD Management Strategies for SE Damascus



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Timing for decisions





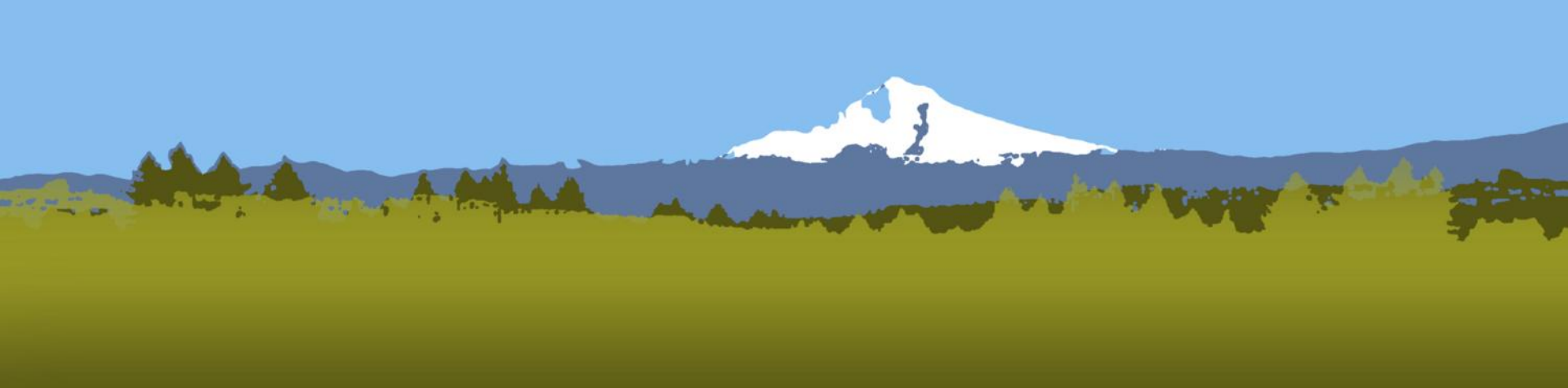
Conclusions

Conclusions

- Reuse in SE Damascus is viable and cost-effective
 - Distance from existing treatment facilities drives local solutions
 - Lack of existing infrastructure allows for new thinking
 - Traditional boundaries between water/wastewater can be changed
- Reuse provides multiple benefits
 - Improved streamflow for environmental flows and water rights
 - Improved groundwater/aquifer levels
 - Reduced water source quantity issues
 - Reduced pollution from septic systems
- Regulatory hurdles exist
 - Water quality vs. Water Quantity

Discussions with DEQ & OWRD

- Opportunities to work with existing mass limits
- Supportive of reuse programs in Damascus
- Aware of water quantity issues
- Open to creative solutions used elsewhere
 - ASR in California and Arizona
 - Natural treatment solutions
- Encouraging solutions within the existing regulatory framework before pushing beyond current limits
 - WPCF permitting as a means to work within the 3-Basin rule



Next Steps

From planning to development

- Integrated Water Resource Management Plan
 - Test the SE Damascus solutions as part of the overall solutions for the City
 - Includes stormwater and inter-basin solutions
- Pilot programs
 - Explore ASR solutions, working with drinking water providers
 - Explore hyporrheic discharge, natural treatment options solutions
- Advisory group
 - Continue discussions with Sounding Board agencies
 - Involve environmental/watershed groups
 - Build support for healthy watershed solutions



Questions or Comments?

Wastewater treatment and reuse: Best options

Southeast Damascus



Direction from
Council

Only wastewater treatment

1. Treat at Tri-City facility, convey wastewater in Rock Creek Interceptor
2. Treat at the Gresham facility, convey wastewater in Clackamas interceptor

Wastewater treatment plus reuse

1. Expand Boring WPCP
2. Decentralized treatment in SE Damascus