Barriers to Using Decentralized Wastewater For Community Solutions: 2007 to 2019

Mary Clark

Indirect Discharge Program Manager, State of Vermont

Why Should We Consider Decentralized Wastewater Systems?

- Uses soils to treat and disperse water back into environment;
- Can provide similar or better treatment as direct discharge systems;
- Can be cost effective by saving piping wastewater distances;
- Scalable/phasing flexibility;
- Frees up land uses and facilitates economic growth.

20,000 GPD Community System in Recreational Field, Warren, Vermont

Public Perceptions

- Centralized sewers are the ultimate solution;
- Older/substandard onsite systems can pollute groundwater and surface waters;
- Onsite systems can't treat wastewater to the same levels as a WWTF;
- Failing systems are individual homeowner problems, not the community;
- Solutions cost too much to construct and operate

Path to Wastewater Solutions for Villages

TYPICAL ENGINEERING STUDIES

Pre-Engineering Tasks

Help for a local wastewater steering committee

What do you want?

- Identify community vision for future of village
- Survey businesses & residents on plans for future

What do you need?

- Survey locations and status of existing wells and septic systems
- Identify permitting and enforcement concerns including archeological
- **Test wells to determine if there is contamination**

What solutions are possible?

- GIS analysis of soils and environmental constraints
- Preliminary soil tests
- Investigate available technologies

How to Proceed?

- Define a scope of services
- Discuss with community and

Feasibility Study

Hire an engineering firm

Determine existing conditions:

- Review work to date
- Conduct soil tests and other site investigations (obtain archeological review)
- Conduct environmental review

Identify alternative wastewater solutions

- Propose 3 or more alternatives

Evaluate alternatives

- Identify pros and cons of each alternative
- Develop cost estimates
- Identify finance strategies and possible fee structures
- Identify long term management structures

Preliminary Engineering Report (PER)

Engineer completes a PER if project will involve public funds for construction

Report on work so far:

- Existing conditions
- Need for project
- Alternatives considered

Recommend a wastewater (or drinking water) project:

- Preliminary design
- Project schedule
- Permit requirements
- Sustainability
- Financing

Other Tasks - Depending on Proposal

Additional work may be necessary before proceeding to final design

Secure land

- Legal agreements with landowners, land trusts and other entities
- Preliminary purchase and sale
- Zoning and other land use permitting issues

Secure funding

- Coordinate with business and housing projects that need wastewater
- Income surveys to qualify for USDA-RD funds
- Apply for public funds
- Engage public in preparation for bond vote
- Set up a local loan program

Decide on system management

- Who will be responsible for long term system management?
- How will fees be structured and collected?

GOAL

Wastewater project ready for

- **bond vote**
- **final design**
- **construction**

US EPA Funded Study Via the Water Research Foundation 2004-2007

- Led by Stone Environmental Inc. http://ndwrcdp.werf.org/research_project_04-DEC-2.asp
- Summarizes perceptions of industry representatives to identify
  - Barriers to using decentralized wastewater solutions and
  - Opportunities for overcoming the barriers

Reported Major Categories of Barriers

- Consulting engineer's financial reward for using centralized wastewater treatment systems
- Engineer's lack of knowledge of decentralized systems
- An unfavorable regulatory system for decentralized systems
- Lack of systems thinking applied to wastewater issues

Barriers: Funding

- Engineering contracts are higher for larger scaled projects
- Engineers are used to sewer-type projects with increased design and oversight fees vs. smaller scaled specs and limited inspections
- Funding programs like the Clean Water State Revolving Fund (SRF) are designed for large sewer projects
  - Priority point system categories
  - Federal and State limitations for qualified projects
  - Additional Federal paperwork/studies

Recommended Actions for Improving Funding

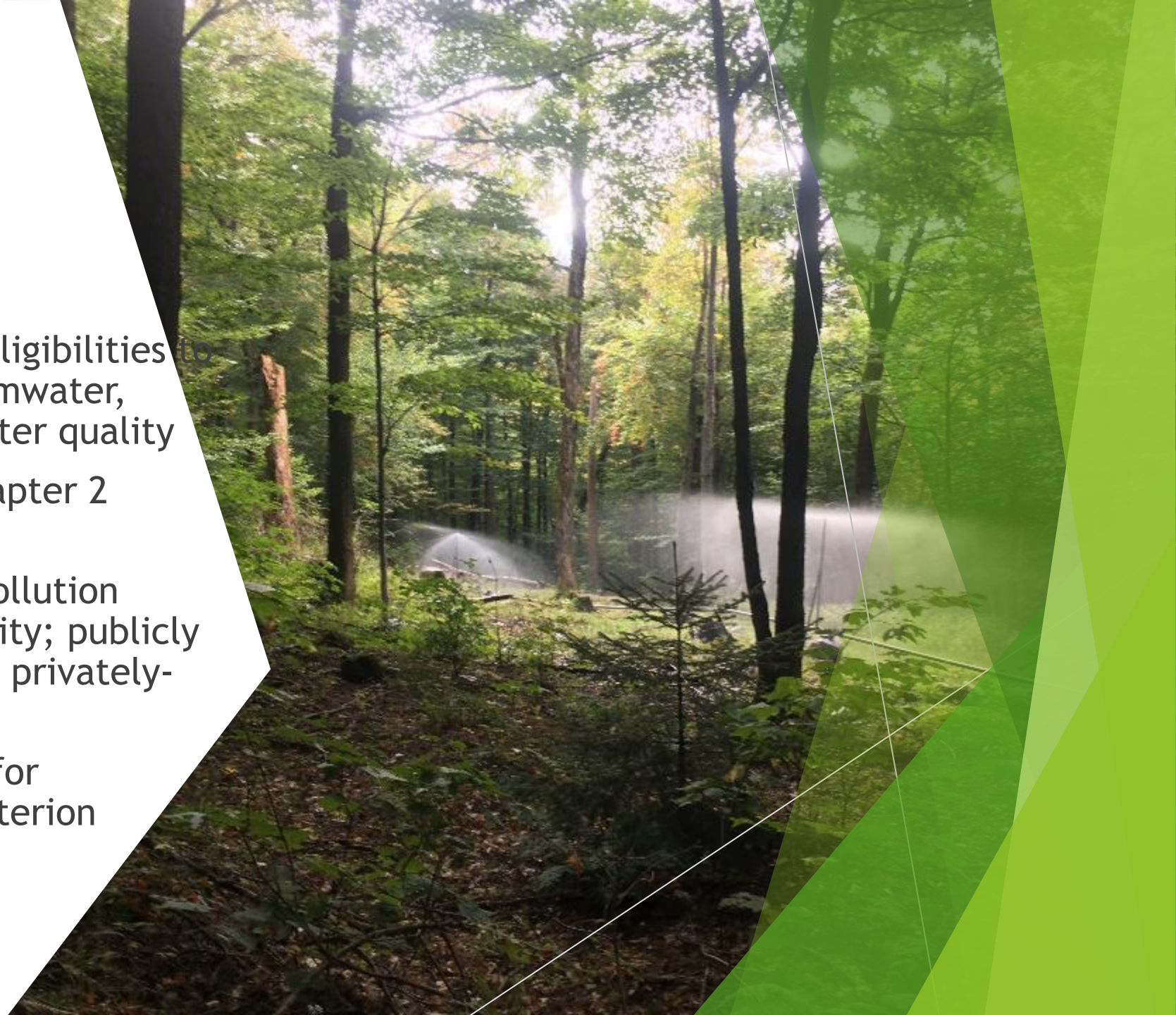
- SRF – expand eligibilities to allow decentralized solutions
  - Federal and state statutes changed to allow use
  - Priority point system ranking changes for better competition of funds
  - Expand eligibility to include individual upgrades
- USDA Rural Development
  - Better priority ranking system
  - Cost-effectiveness
- Incorporate integrated water resource management, public health and environmental risks to ranking factors

Funding: 2019 Snapshot

- CWSRF was expanded in 2008 ARRA infrastructure efforts
- Environmental Financial Advisory Board report titled:

  "Funding Strategies for Decentralized Wastewater Systems Nov. 2017"
- CIDWT/Univ. of TN: Projecting Costs of Decentralized Wastewater Management Options, 2010
- New Water Infrastructure and Resiliency Finance Center
  - https://www.epa.gov/waterfinancecenter

Funding: 2019 Vermont Snapshot



- Statutes revised to expand on eligibilities to decentralized wastewater, stormwater, CSO's, green infrastructure, water quality
- State Env. Protection Rules, Chapter 2 revised 12/1/2017
  - New definitions for water pollution abatement and control facility; publicly owned treatment works and privately-owned wastewater systems
  - New Project Rating System for determining Priority List Criterion

Funding: 2019
Vermont Snapshot

- Solving Village Water/Wastewater Infrastructure Solutions, Statewide Support
- DEC NBRC Grant
  - Three pilot villages; East Burke, West Burke, and Wolcott
  - Goal is to help communities get to bond vote/final design & construction stages

Path to Wastewater Solutions for Villages

TYPICAL ENGINEERING STUDIES

Pre-Engineering Tasks

Help for a local wastewater steering committee

What do you want?

- Identify community vision for future of village
- Survey businesses & residents on plans for future

What do you need?

- Survey locations and status of existing wells and septic systems
- Identify permitting and enforcement concerns including archeological
- **Test wells to determine if there is contamination**

What solutions are possible?

- GIS analysis of soils and environmental constraints
- Preliminary soil tests
- Investigate available technologies

How to Proceed?

- Define a scope of services
- Discuss with community and

Feasibility Study

Hire an engineering firm

Determine existing conditions:

- Review work to date
- Conduct soil tests and other site investigations (obtain archeological review)
- Conduct environmental review

Identify alternative wastewater solutions

- Propose 3 or more alternatives

Evaluate alternatives

- Identify pros and cons of each alternative
- Develop cost estimates
- Identify finance strategies and possible fee structures
- Identify long term management structures

Preliminary Engineering Report (PER)

Engineer completes a PER if project will involve public funds for construction

Report on work so far:

- Existing conditions
- Need for project
- Alternatives considered

Recommend a wastewater (or drinking water) project:

- Preliminary design
- Project schedule
- Permit requirements
- Sustainability
- Financing

Other Tasks - Depending on Proposal

Additional work may be necessary before proceeding to final design

Secure land

- Legal agreements with landowners, land trusts and other entities
- Preliminary purchase and sale
- Zoning and other land use permitting issues

Secure funding

- Coordinate with business and housing projects that need wastewater
- Income surveys to qualify for USDA-RD funds
- Apply for public funds
- Engage public in preparation for bond vote
- Set up a local loan program

Decide on system management

- Who will be responsible for long term system management?
- How will fees be structured and collected?

GOAL

Wastewater project ready for

- **bond vote**
- **final design**
- **construction**

What's your state/town doing to solve funding barriers?

Barriers: Education

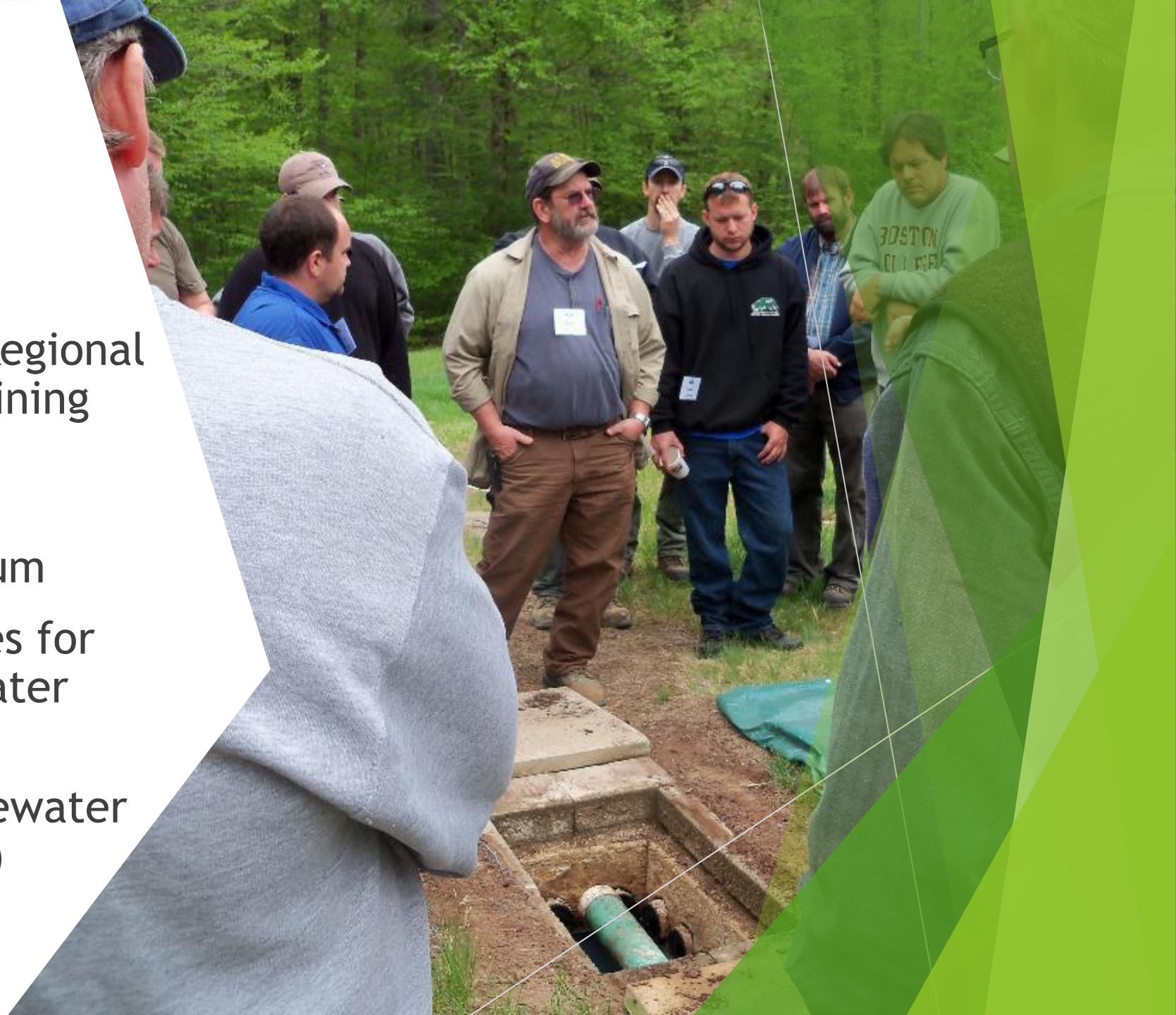
- Decentralized designs not a part of engineering course curriculums
- Newer decentralized technologies and techniques may not have a proven track record, limited studies
- Engineer's soil and groundwater training may not be applicable to soil-based wastewater treatment and dispersal systems

Recommended Actions for Improving Engineer's Education

- Increase Curriculum Topics to Include Decentralized System Design
- Increase Funding for University Research of Decentralized Systems
- Increase Data Sharing on Decentralized System Performance
- Apply Reliability and Costing Tools in an Asset Management Framework

Education: 2019 Snapshot

- University-Sponsored Regional Onsite Wastewater Training Centers
- Universities including decentralized curriculum
- Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT)
- National Assn. of Wastewater Technicians (NAWT.org)



Education: 2019 Snapshot

- Water Finance Center
  - New onsite septic system learning module for homeowners and database of various funding programs
- Water Research Foundation (www.werf.org) Research Projects and Webinars
  - 2018 LIFT Technology Webinar Series
  - 2016 Onsite Non-Potable Water Programs
  - 2010 When to Consider Distributed Systems in Urban and Suburban Context
  - One Water

Education: 2019 Snapshot

- Examples, Text Books And Guides
  - Engineering:
    - *Soil-based Wastewater Treatment (Jose A. Amador and George W. Loomis, 2018)*
    - *Decentralized Water Reclamation Engineering: A Curriculum Workbook (Robert L. Siegrist, 2017)*
  - UMN: *Small Community Wastewater Solutions, H2O&M, Community Septic System Owner's Guide*

Education: 2019 Snapshot

- New On-Line Training
  - NOWRA Online Learning Academy: NOWRA.org
- New Curriculum
  - NOWRA: Advanced Design of Onsite Wastewater Systems

What's your state/town doing to solve education barriers?

Barriers: Complex Regulatory System

- Decentralized regulatory jurisdictions at state, county and local boards of health
- No centralized approval process for new technologies/techniques that is universally accepted
- Regulations may be too lax, too inflexible, too prescriptive

Recommended Actions for Improving The Regulatory Climate

- Achieve greater uniformity in decentralized technologies
  - Model Regulations
  - Decentralized Wastewater Glossary
- Improve data sharing
  - Regulators have high-quality permit, maintenance and monitoring tools
- Brainstorm how regulatory framework can facilitate use

Regulatory Climate: 2019 Snapshot

- Decentralized Glossary published
- No major changes to complex regulatory scheme
- SORA listserv important communications bridge amongst regulators
- EPA/Chesapeake Bay watershed nutrient data sharing agreement
- Use of proprietary and government data management programs

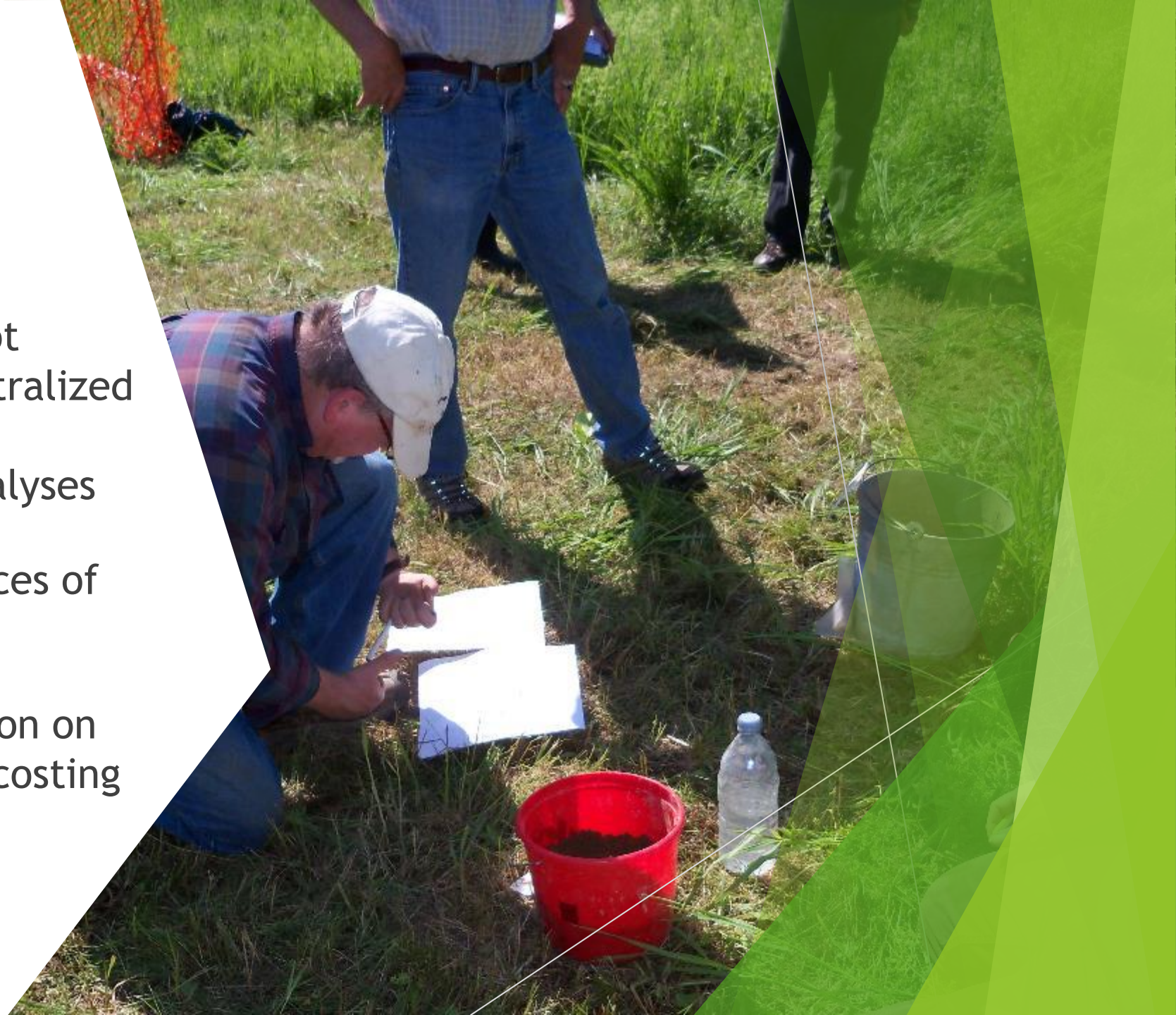
Regulatory Climate: 2019 Vermont Snapshot

- New Wastewater System & Potable Water Supply Rules including new design criteria like for bottomless sand filters, eliminating need for “perc” test, adding wastewater strength criteria
- Working on reducing barriers between these rules and Indirect Discharge Rules (6,500 GPD+ indirect discharge systems)
  - Design criteria, redundancy
  - Monitoring, inspection and reporting
  - Annual operating fees, 5-year permit renewals

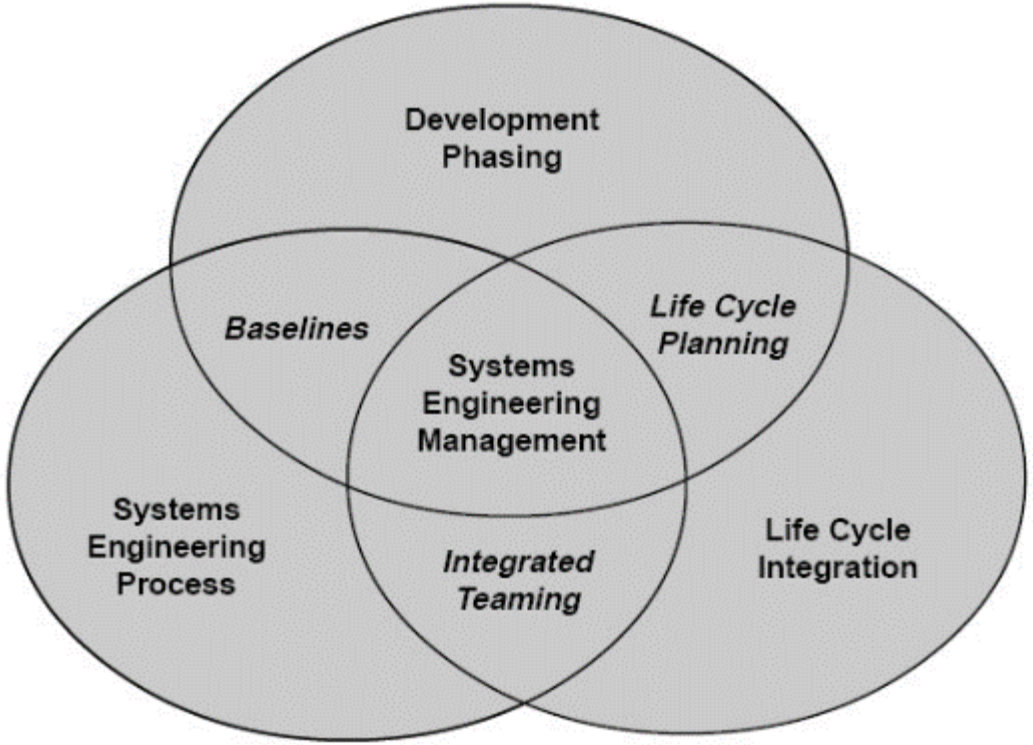
What's your state/town doing to solve regulatory barriers?

Barriers: Systems Engineering

- Consulting engineers are not required to consider decentralized solutions when conducting community alternatives analyses
- The unintended consequences of siloed regulatory programs
- There is a lack of information on assessing needs, life-cycle costing



Recommended Actions for Improving Use of Systems Engineering



- Require wastewater planning to include relationships to other water sectors
- Utilities encourage integrated water resources approaches
- Train engineers in broad systems thinking

Systems Engineering: 2019 Snapshot Continued

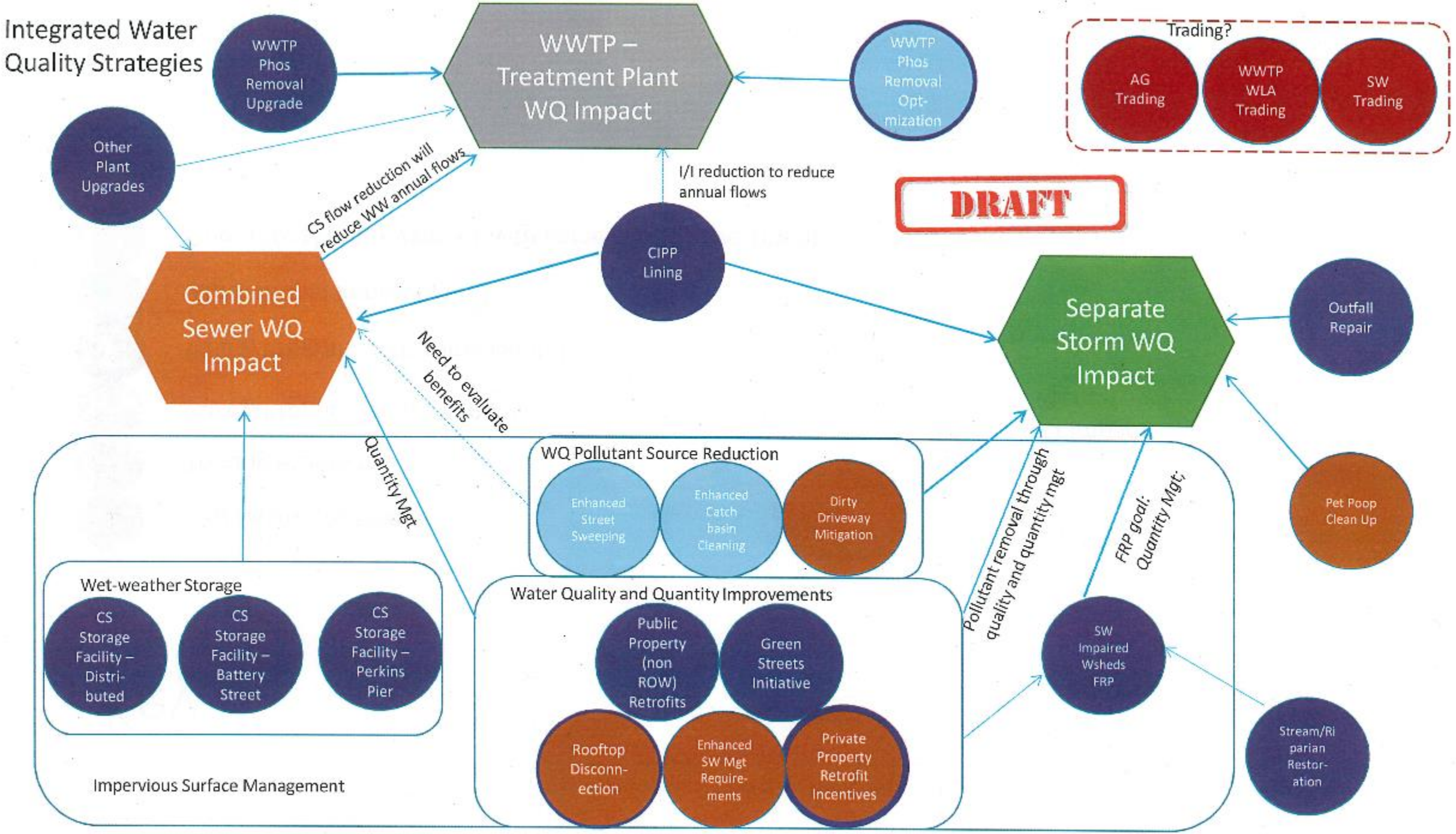
- Interdisciplinary Engineering
- Sustainable Community Development
- Ecological Design
- WRF & WEF LIFT Intelligent Water Systems Challenge

Systems Engineering: 2019 Vermont Snapshot

- Integrated Water Resources Project (Burlington, Vermont)
- Network Analysis Tool

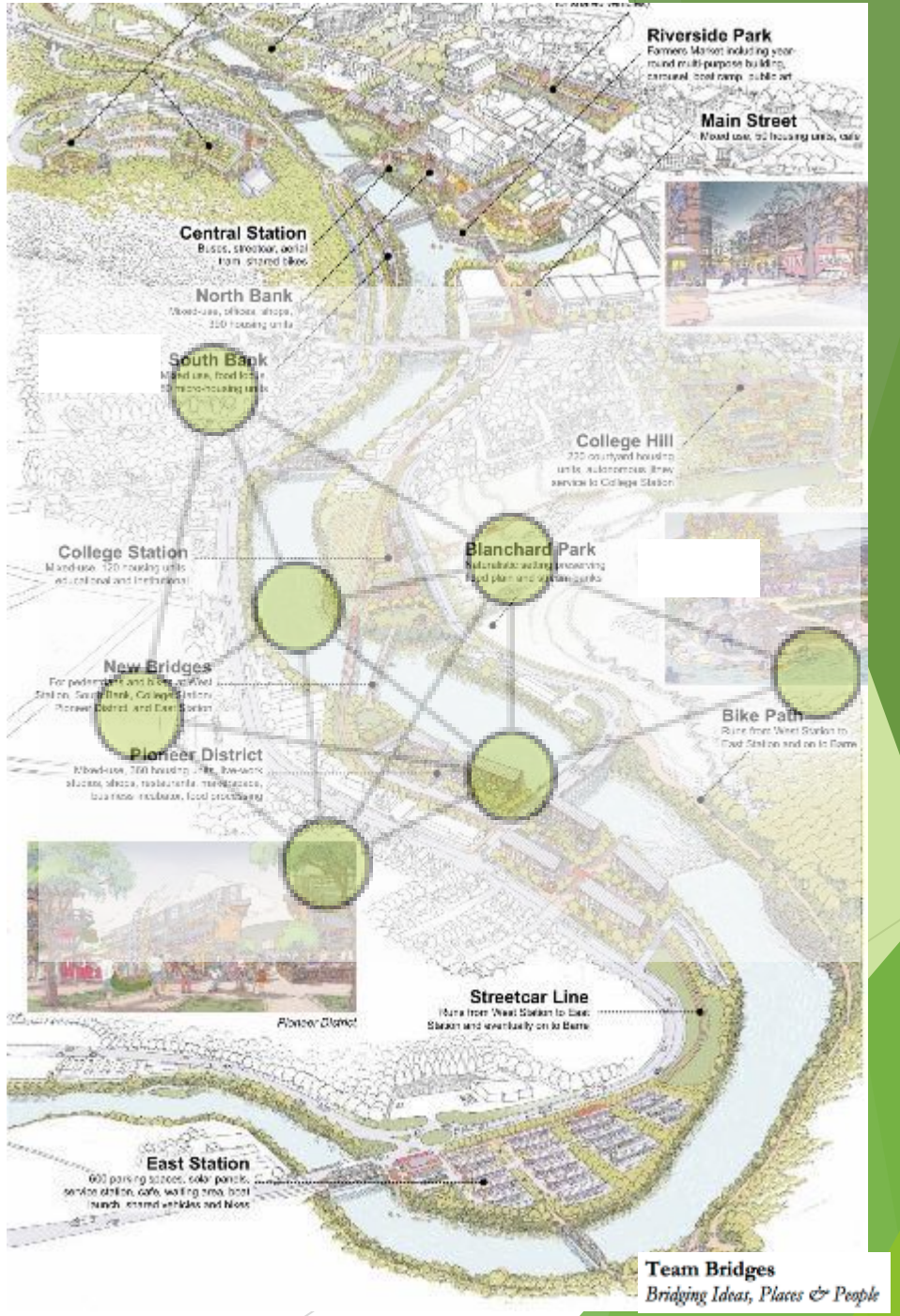
Integrated Water Quality Planning: Municipal Wastewater and Stormwater

- Examine all obligations as a whole
- Identify the community's relative priorities for addressing human health and water quality improvements (and what tools will used preferentially, such as green infrastructure), and then
- Address these priorities through appropriate sequencing and scheduling of work based on implementing the projects with the highest cost benefit (including non-water quality related benefits) first.


Integrated Water Quality Strategies
WWTP Phos Removal Upgrade
WWTP – Treatment Plant WQ Impact
WWTP Phos Removal Opt-mization
Trading?
AG Trading
WWTP WLA Trading
SW Trading
Other Plant Upgrades
CS flow reduction will reduce WW annual flows
I/I reduction to reduce annual flows
DRAFT
CIPP Lining
Combined Sewer WQ Impact
Separate Storm WQ Impact
Outfall Repair
Need to evaluate benefits
Quantity Mgt
WQ Pollutant Source Reduction
Enhanced Street Sweeping
Enhanced Catch basin Cleaning
Dirty Driveway Mitigation
Pollutant removal through quality and quantity mgt
FRP goal: Quantity Mgt;
Pet Poop Clean Up
Wet-weather Storage
CS Storage Facility – Distri-buted
CS Storage Facility – Battery Street
CS Storage Facility – Perkins Pier
Water Quality and Quantity Improvements
Public Property (non ROW) Retrofits
Green Streets Initiative
SW Impaired Wsheds FRP
Rooftop Disconn-ection
Enhanced SW Mgt Require-ments
Private Property Retrofit Incentives
Stream/Ri parian Restor-ation
Impervious Surface Management

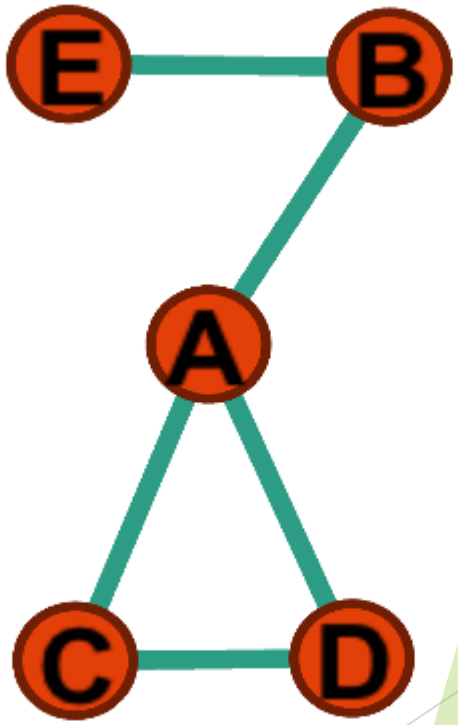
Network Analysis

- Identifies existing community network connections,
- Key local features,
- Ways to enhance network functioning

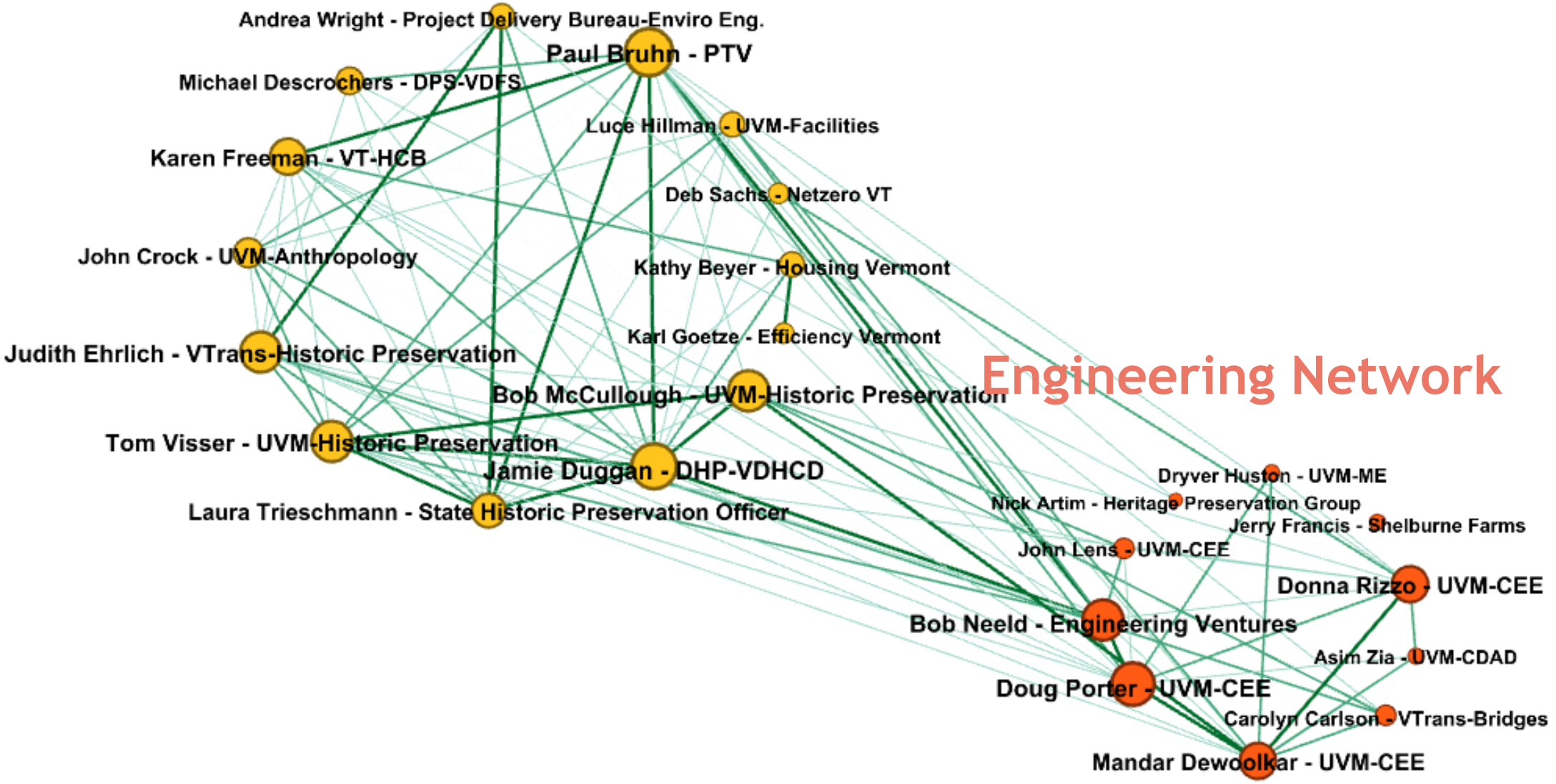


Network Analysis Overview

- Two main network features:
  - Nodes (Circles); could be people, places, organizations
  - Edges (Links); relationships between nodes
- Insights:
  - Spreading (resources, disease, ideas, etc.)
  - Robustness and fragility
  - Optimization



Cultural Resources Network



What's your state/town doing to solve systems thinking barriers?

Conclusions: More Work to Do!

- The use of decentralized systems continues to lag due to barriers
- The good news is we have a strong team at EPA that is dedicated to finding solutions for our industry
- The EPA MOU Partnership work and strategic goals are developing products that will move us forward

Questions?