



WINSSS

Water Innovation Network for Sustainable Small Systems

A National Center for Innovative Small Drinking Water Systems

Universities of Massachusetts (Amherst), Texas (Austin), Nebraska, Florida, Illinois, South Florida, and Carollo Engineers



The National Challenge

- the costs of modernizing and sustaining the Country's water infrastructure is estimated in the hundreds of billions of dollars and worldwide in excess of \$2 trillion.
- \$380B estimated need over next 20 years in US for potable water alone.
 - See:
http://water.epa.gov/grants_funding/dwsrf/upload/epa816r13006.pdf

US Community Water Systems

- Total systems: 153,138
 - Serving 322.46 M

Size (# served/system)	Small & V. Small (<3.3K)	Medium (3.3-10K)	Large (10-100K)	V. Large (>100K)
# Systems	143,611	5,192	3,902	433
Pop served	38.94 M	30.18 M	110.93 M	142.41 M



Primary focus of WINSSS

- Small systems present the greatest challenges

National Center for Water Innovation

- This “National Center” will: *EPA’s Vision*
 - conduct research
 - develop and demonstrate innovative and sustainable technologies
 - advance the state-of-the-art nationally and internationally
 - leverage modern data and information systems
 - foster interaction among technology developers, end-users, and other stakeholders
 - provide education, training and technical assistance
 - collaborate with local, regional (multi-state), and national water technology innovation efforts
- Although EPA cannot fund commercialization, applicants are strongly encouraged to leverage existing collaborative, regional (multi-state) water technology innovation and adoption efforts.
- Two awards: DeRISK Center (HQ at Univ of Colorado, Boulder) as well as WINSSS

Focus on small systems:

97% of the nation's CWS serve communities with populations of 10,000 or less

WINSSS Center

- National EPA Center for Water Innovation
 - Water Innovation Network for Sustainable Small Systems (WINSSS)
 - Funding
 - \$4.1M committed from US EPA for 7/1/2014-6/30/2017
 - Plans for continuation beyond 2017
 - WINSSS Scope
 - Focus on near-term technologies
 - Ready for piloting & demonstration within 5 years
 - Accelerate acceptance & use of new technologies
 - Special consideration to needs of small systems
 - Close association with New England water cluster (NEWIN)
 - Mobile pilot plant for testing of multiple technologies

From Laboratory to Practice

- WINSSS will identify, develop, demonstrate, and facilitate widespread acceptance and applicability of innovative technologies and approaches to:
 - measure or treat microbiological or chemical contaminants or their precursors;
 - apply new information technology systems; and
 - improve the sustainability of small drinking water systems.
- The *vision* for WINSSS is to develop a center that spans and links the **continuum of technology development** through technology acceptance



Health Violations

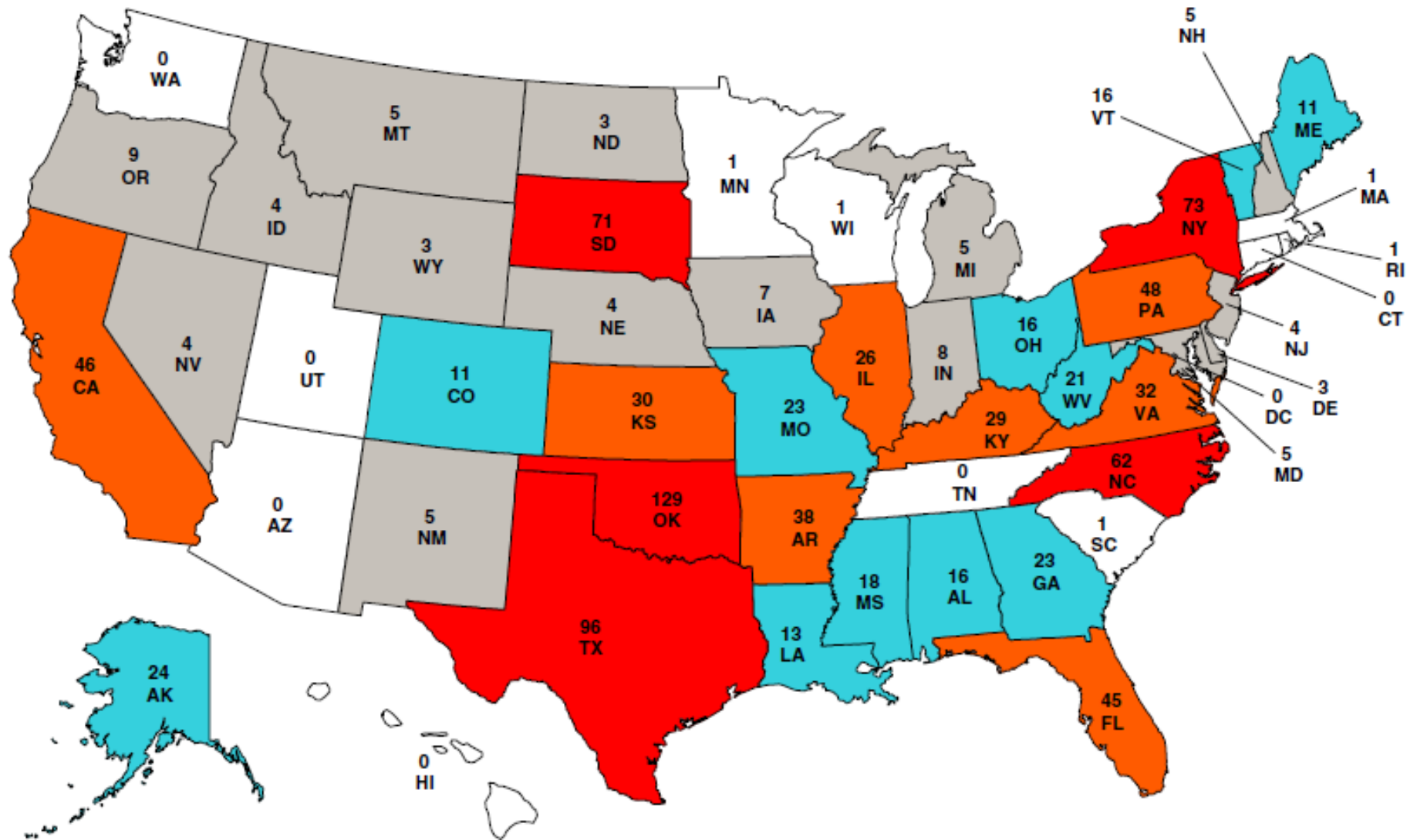
- During FY 2014 (from sdwis fed)
 - Many more non-health violations

Reason	All Sizes		Serving < 10K	
	# systems	population	# systems	population
Lead & Copper	8,542	17.94 M	8,193	6.05 M
Coliform Bacteria	6,179	9.89 M	6,000	2.64 M
DBPs	789	9.54 M	689	1.24 M
Arsenic	550	0.69 M	538	0.30 M
Nitrates	555	0.37 M	552	0.13 M
Other Inorganics	98	0.29 M	92	0.06 M
Volatile Organics	21	0.06 M	20	0.01 M
Synthetic Orgs.	12	0.05 M	10	0.003 M
Radioactive	288	0.49 M	278	0.019 M

DBP Violations

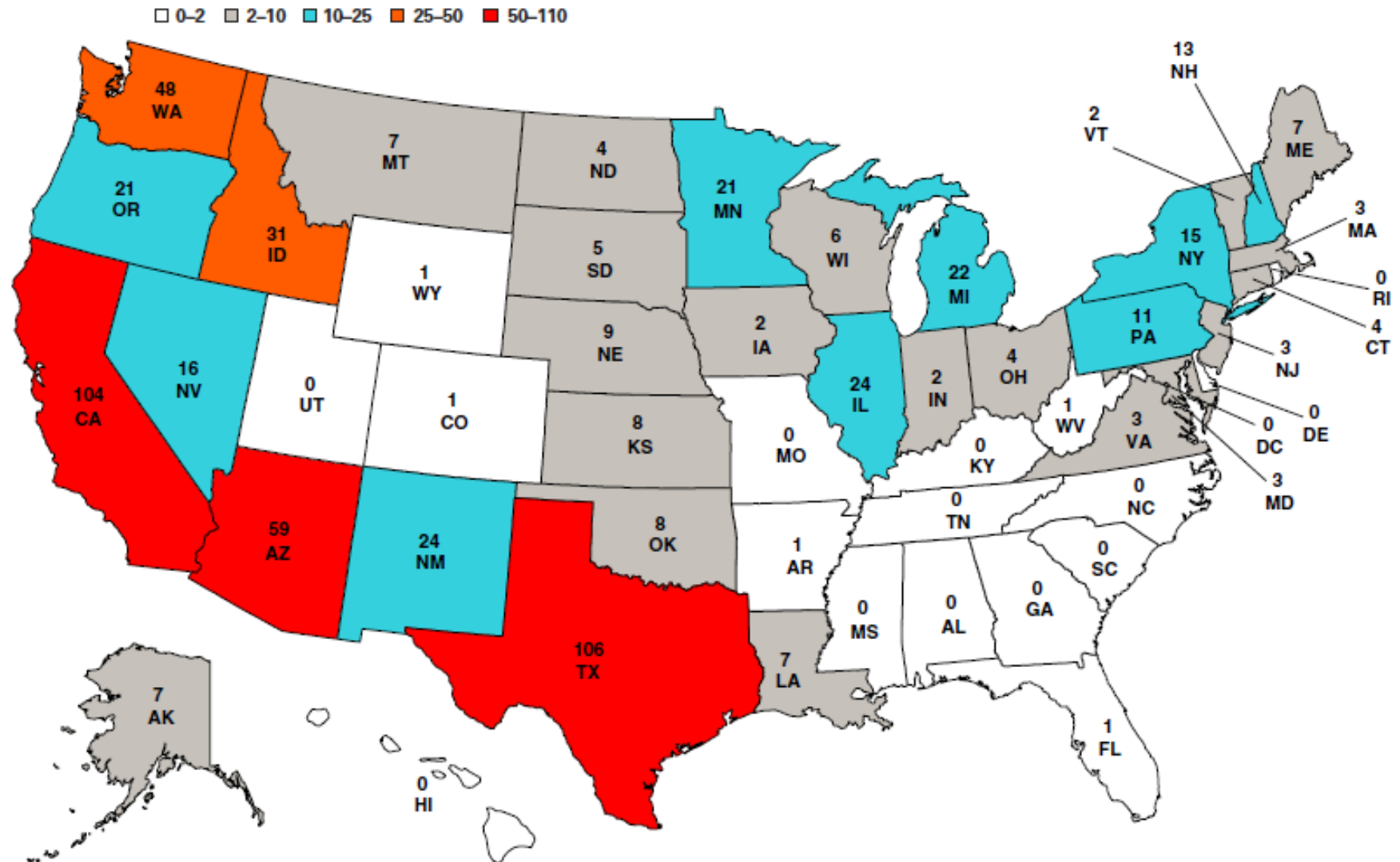
FIGURE 2 Number of systems with disinfection by-product maximum contaminant level violations

□ 0-2 □ 2-10 □ 10-25 □ 25-50 □ 50-130



Arsenic Violations

FIGURE 3 Number of systems with arsenic maximum contaminant level violations



WINSSS Center Team

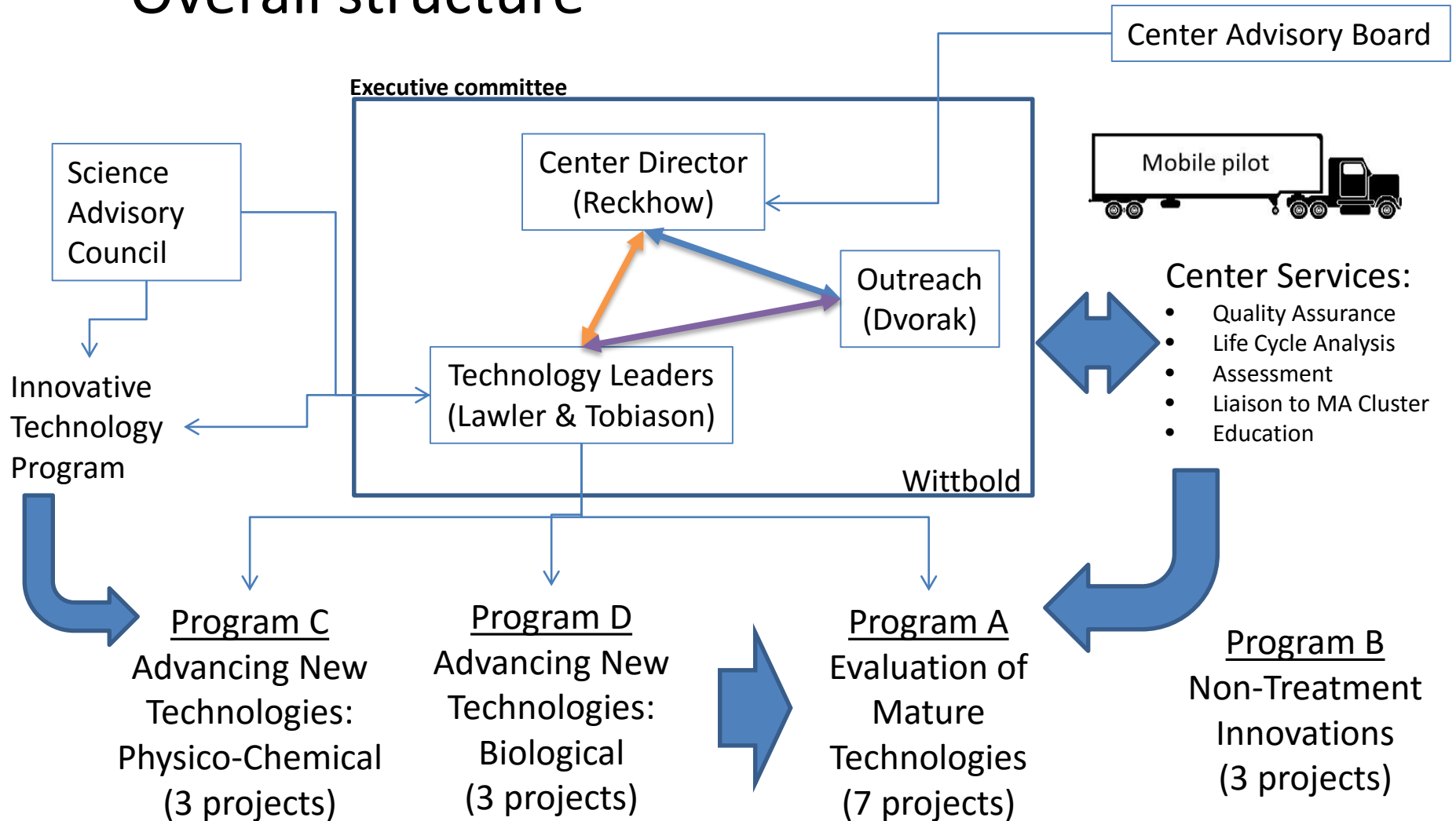
- University of Massachusetts (Amherst)
 - Dave Reckhow , John Tobiason, Caitlyn Butler, Chul Park and Prashant Shenoy
- University of Texas (Austin)
 - Desmond Lawler, Lynn Katz, Mary Jo Kirisits, Kerry Kinney, Navid Saleh, Gerald Speitel
- University of Nebraska (Lincoln)
 - Bruce Dvorak (Co-PI), Rebecca Lai, Chittaranjan Ray
- University of Florida (Gainesville)
 - Treavor Boyer
- University of Illinois (Urbana-Champaign)
 - Steven Wilson
- University of South Florida
 - Jane Zhang
- Carollo Engineers
 - Jess Brown

WINSSS vision





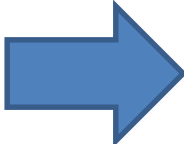


- To develop **technological solutions** that can be readily implemented by small systems
- To **reduce barriers** to their use by utilities
- To **stimulate research** for small systems among the academic and entrepreneurial community
- To develop new models for technology & educational **outreach** in support of small systems

Four Major Programs

- Overall structure



Administrative Unit

- **Governance**
 - External
 - Advisory Board & Water Cluster  Reckhow
 - Quality Management  Wittbold
 - Research Program Management  Lawler & Tobiason
- **Center Services**
 - SU1: Education & Outreach  Dvorak
 - SU2: Outcome Assessment & sustainability  Butler & Zhang
 - SU3: Technology Incubator  Lawler & Tobiason
 - SU4: Center Sustainment  Reckhow

Science Advisory Committee

Name	Affiliation	Position
Marjorie Aelion, PhD	UMass Amherst School of Public Health, Amherst, MA	Dean
Marlo Berg	Texas Commission on Environmental Quality	Drinking water section
Sarah Clark	HDR, Inc, Denver CO.	Senior Project Manager
John McClellan, PhD	Tighe & Bond, Inc, Westfield, MA	Vice President
Ken Mercer, PhD	AWWA, Denver, CO	Senior Manager, Technical and Research Programs
Chris Miller	Miller and Associates, Kearney NE	Small systems consultant
Madjid Mohseni, PhD	University of British Columbia,	Professor Director, RES'EAU
Orren Schneider, PhD	American Water, Vorhees NJ	Manager, Water Technology
Scott Summers, PhD	University of Colorado Boulder	Professor Director, DeRISK
Pasky Pascual	US EPA	US EPA WINSSS Project Manager

Program A: Mature Technologies

Lawler & Tobiason: overall program lead

- A1: Implementing **ferrate** treatment of drinking water in the US
 - Reckhow & Tobiason
- A2: Simultaneous removal of inorganic contaminants, DBP precursors, and particles in alum and ferric **coagulation**
 - Lawler & Katz
- A3: Contaminant reduction, life cycle impacts, and life cycle costs of **ion exchange** treatment and regeneration
 - Boyer & Zhang
- A4: **Natural filtration** impacts on post disinfection water quality in small systems
 - Dvorak & Ray

Starting year 2&3

- A5: Intermittent treatment plant operation: understanding and minimization of detrimental impacts
 - Tobiason
- A6: Coagulant selection and dosing control for particle and NOM removal: guidance for small systems and demonstration
 - Tobiason & Lawler
- A7: Effect of climate change on water treatment practice at small systems
 - Lawler, Kirisits & Tobiason

Program B: non-treatment innovations

Dvorak: overall program lead

- B1: Developing a standardized approach for **state acceptance** of innovative technologies for small systems
 - Dvorak, Reckhow & Wilson
- B2: Simplified **data entry system** for asset management built off existing software
 - Wilson, Dvorak
- B3: A distributed **sensing and monitoring system**: application to SWTR compliance and point of use devices
 - Shenoy, Lai & Reckhow

Program C: New Physico-chemical Technologies

Katz: overall program lead

- C: Assessment and Development of Treatment Processes for DBP Precursor and DBP Removal in Small Water Systems
- C1: **Electrodialysis** coupled with RO and NF membranes
 - Lawler
- C2: **Peroxide oxidative coupling** linked with a super-hydrophilic hollow-fiber membrane system
 - Saleh
- C3: Hollow fiber membrane **air stripping**
 - Kinney

Program D: New biological technologies

Kirisits: overall program lead

- D1: Nitrification
 - Kirisits, Brown, Kinney & Speitel
- D2: Denitrification Starting year 2
 - Kirisits, Kinney & Speitel
- D3: Biological Treatment and Nitrogenous DBPs
 - Reckhow & Park

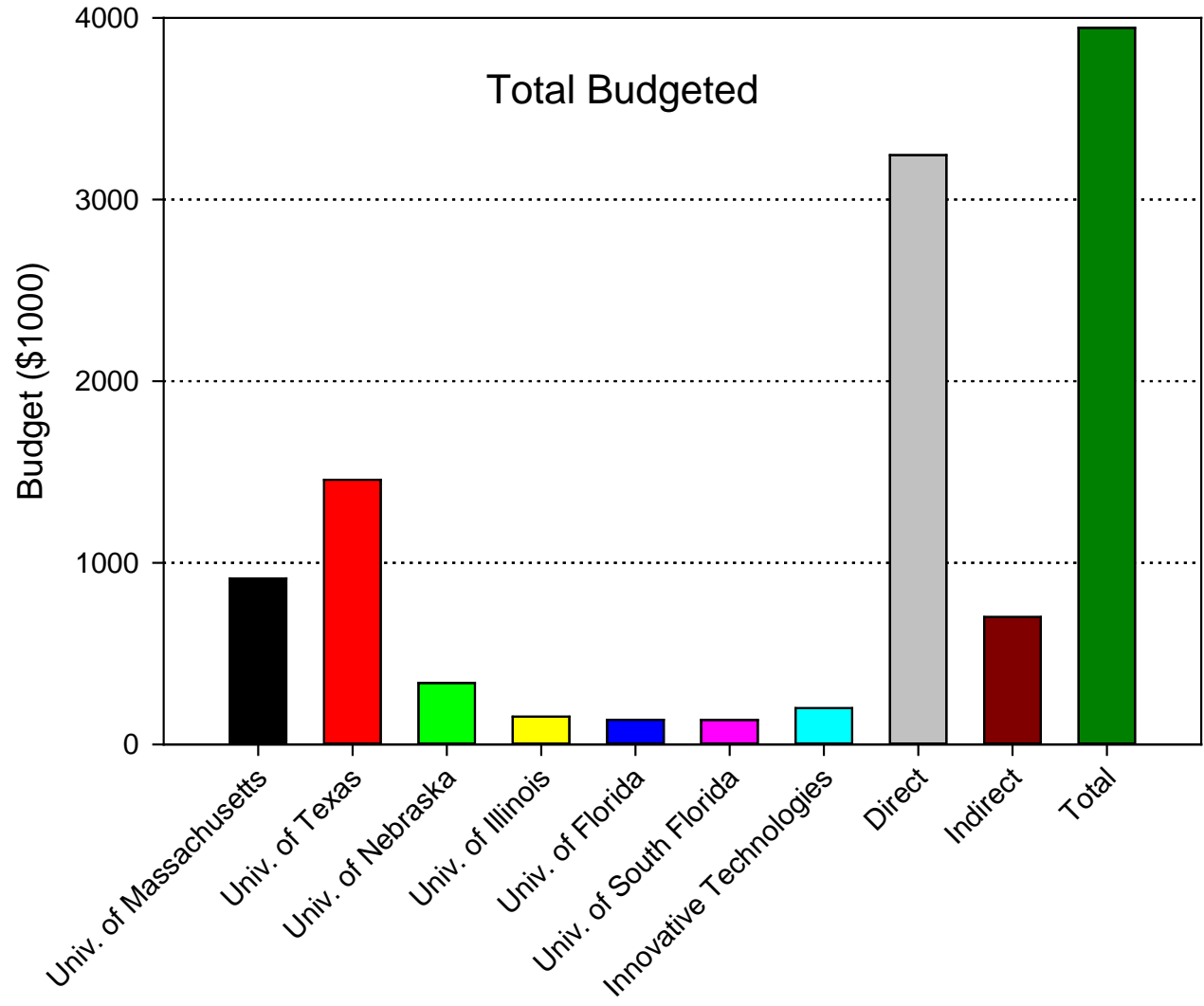
Potential Impacts

- Mapping of Projects to Health Violations
 - Based on FY 2014 (from sdwis fed)

Reason	All Sizes		Serving < 10K		Addressed by Project #
	# systems	population	# systems	population	
Lead & Copper	8,542	17.94 M	8,193	6.05 M	B3,D
Coliform Bacteria	6,179	9.89 M	6,000	2.64 M	A1,B3
DBPs	789	9.54 M	689	1.24 M	A1,A2,A4,A6,B3,C1,C3,D
Arsenic	550	0.69 M	538	0.30 M	A1,B3
Nitrates	555	0.37 M	552	0.13 M	A3,A4,B3,D
Other Inorganics	98	0.29 M	92	0.06 M	A1,A3,B3
Volatile Organics	21	0.06 M	20	0.01 M	C3
Synthetic Orgs.	12	0.05 M	10	0.003 M	A1,C1
Radioactive	288	0.49 M	278	0.019 M	A3,B3

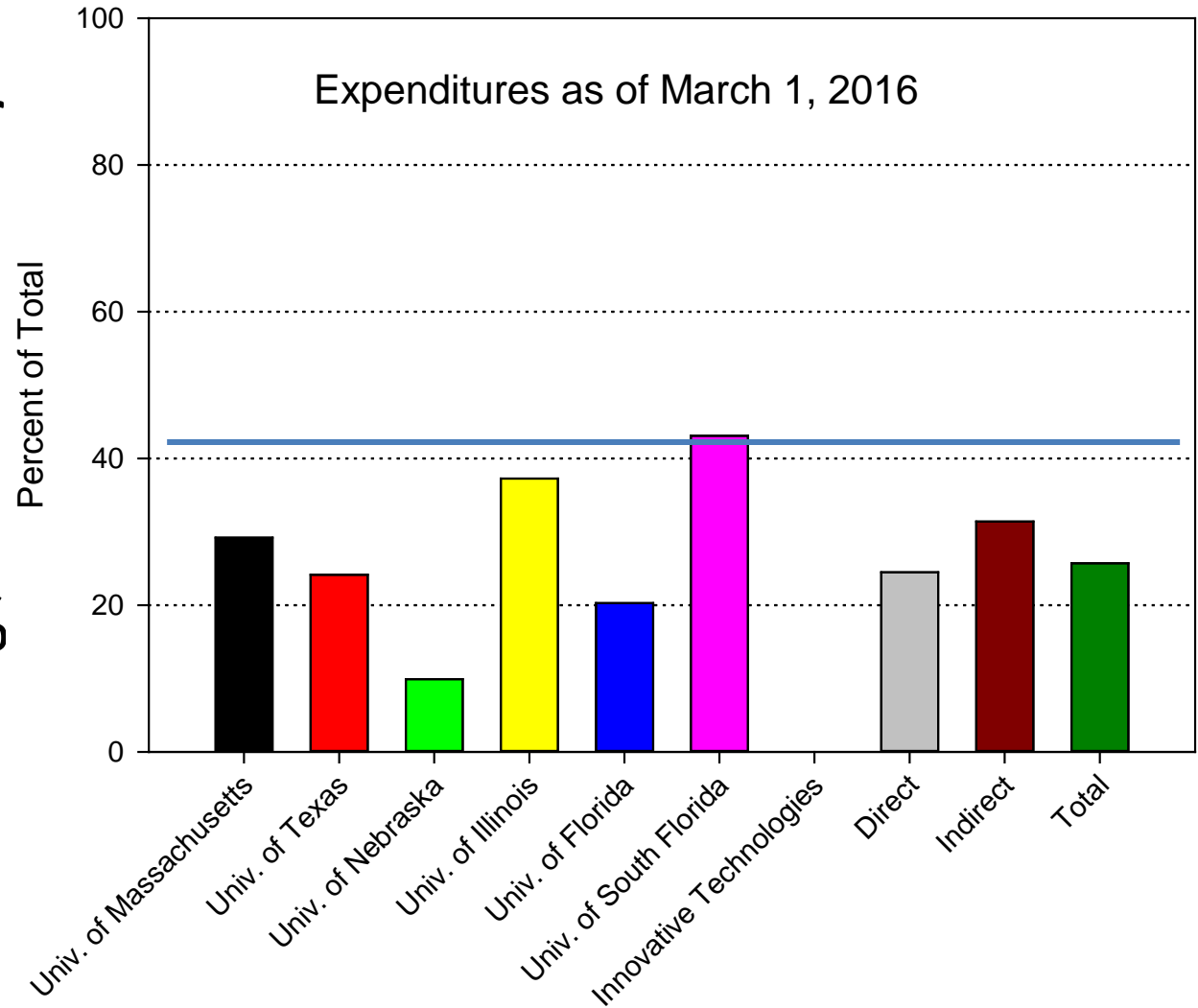
Total Budget

- By Institution
- \$154K yet to be awarded



Expenditures to Date

- 41.6% of 4-yr project lifetime has expired
- Will get another 3.8%



Center Advisory Board (CAB)

- The Center Advisory Board will be made up of seven to ten members
 - drawn primarily from the public sector
 - State government, federal agencies.
 - Also includes representation from NEWIN
 - This group will be able to advise on the policy, management, outreach and other broad aspects that are impediments to technology adoption. Special emphasis will be made in the area of implementation and cooperation with industry Water Clusters for the purposes of commercializing innovations for SWS.
- The selection of “innovative” projects to fund will come from a collaborative process involving the SAC, the MA Water Cluster steering committee, and the Center Advisory Board (CAB).

CAB, Membership I

- Ned Bartlett



**Undersecretary of
Energy and
Environmental Affairs**

- Carolyn Dykema



**Massachusetts State
Representative, 8th
Middlesex District**

- Malcolm Coles

**– Corporation for
National &
Community Service,
Atlantic Area
Manager**



- Karen Golmer



**Executive Director, New
England Water
Innovation Network**

- Julian Cyr



MA Dept of Health

- Gary J. Hartz



**Director, Office of
Environmental Health &
Engineering, Indian
Health Service**

CAB Membership Reps

- Ken Moraff



**Director, Office of
Ecosystem Protection,
US EPA Region 1**

- Curtis Spalding



**Administrator, US EPA
Region 1**

- Keith Barnicle



**District Representative,
2nd MA District**

- James McGovern



**US Congressman, 2nd
MA District**

Mobile Pilot Trailer in WINSSS proposal

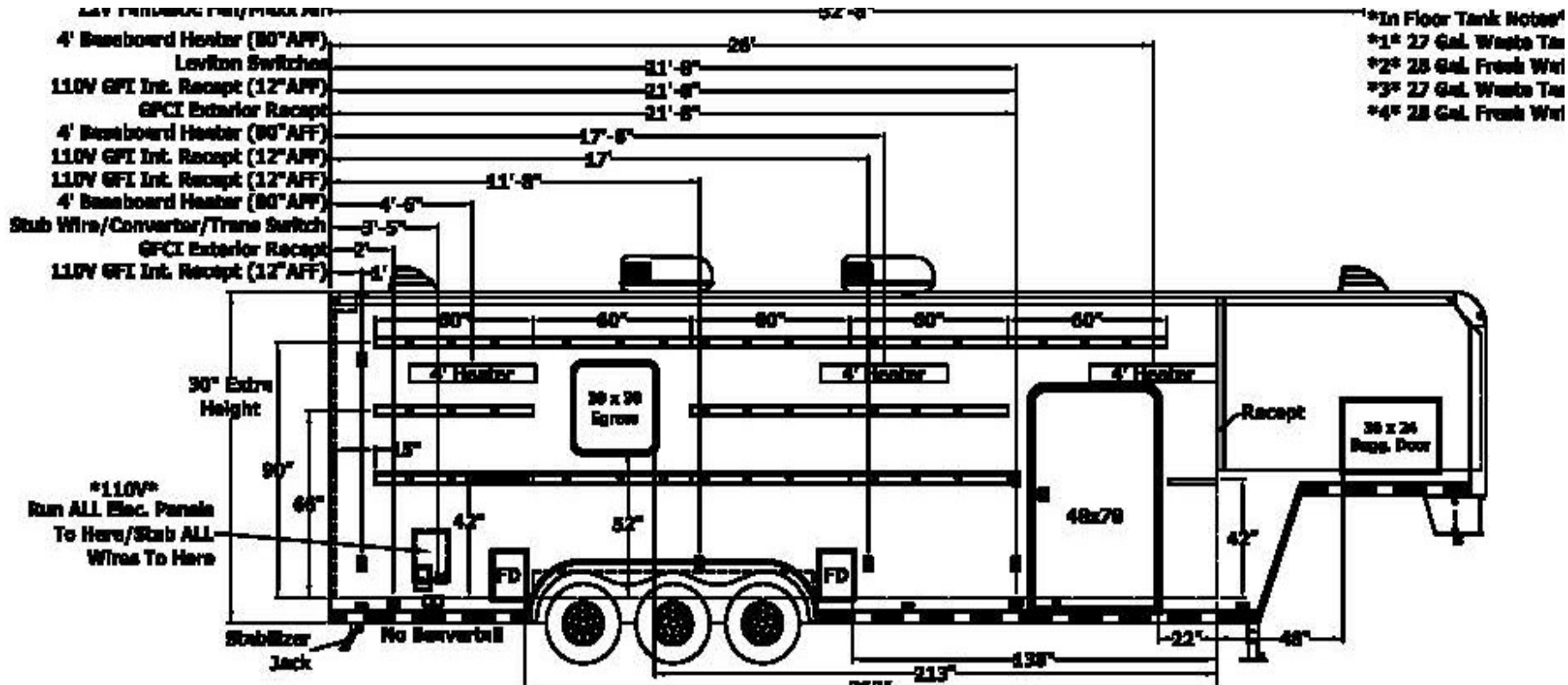
- A key unique component of the New England Test Bed will be the purchase of a **mobile piloting trailer** with matching funds provided by the Massachusetts Clean Energy Center (MassCEC, see letter). This pilot trailer will be utilized by the Center for testing technologies in small systems and will be the first of its kind associated with a Water Cluster in the United States. In addition, this trailer will become a key component of the piloting facilities planned under the **Massachusetts Water Cluster's NEWIN initiative**, which is **intended for use by private companies, water utilities, university groups, and consultants for the purpose of testing new technologies**. It is anticipated that uniform-piloting requirements will be developed as part of the New England test bed (and will be informed by the workgroups described above). It is anticipated that as part of the Center outreach to entrepreneurs, some will hire the use of the mobile facility for testing of their innovations in New England small utilities.



Mobile Pilot Unit

Parallel trains
Up to 10 gpm

Will have 2 parallel
trains, experimental &
control



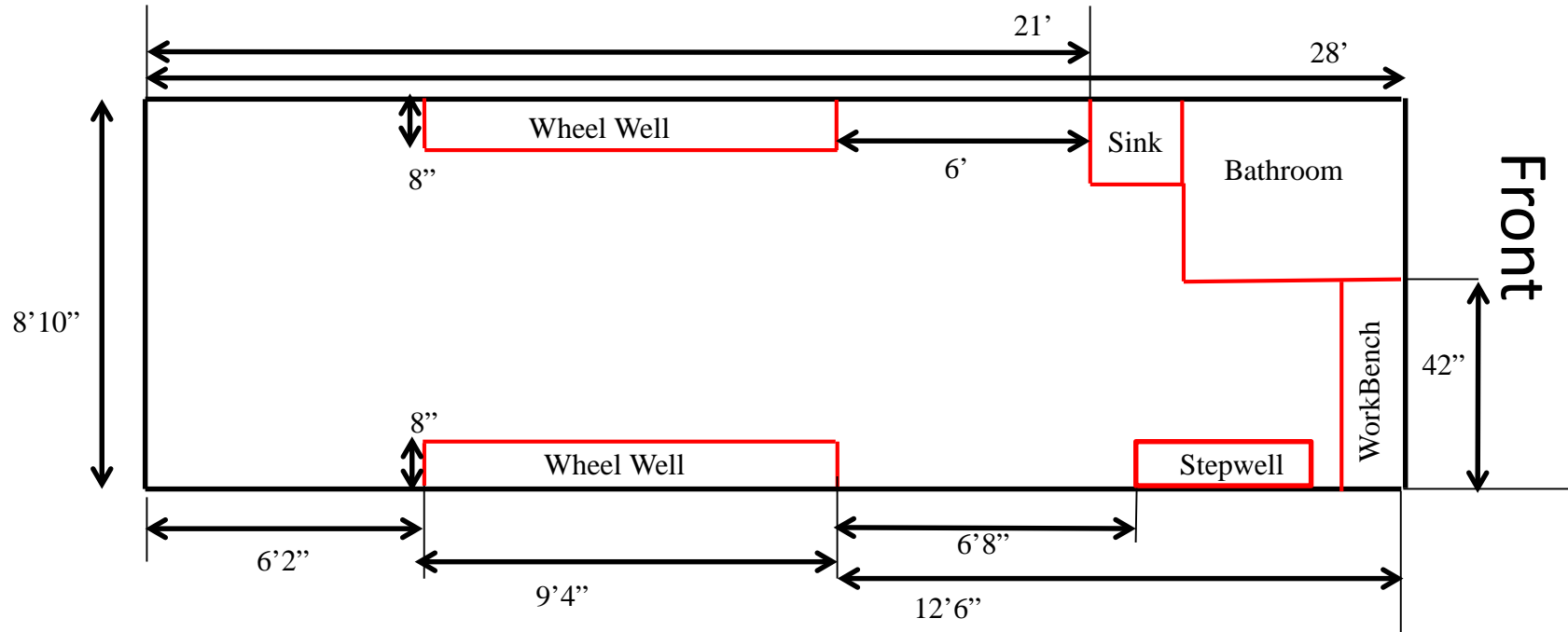
Exterior Views



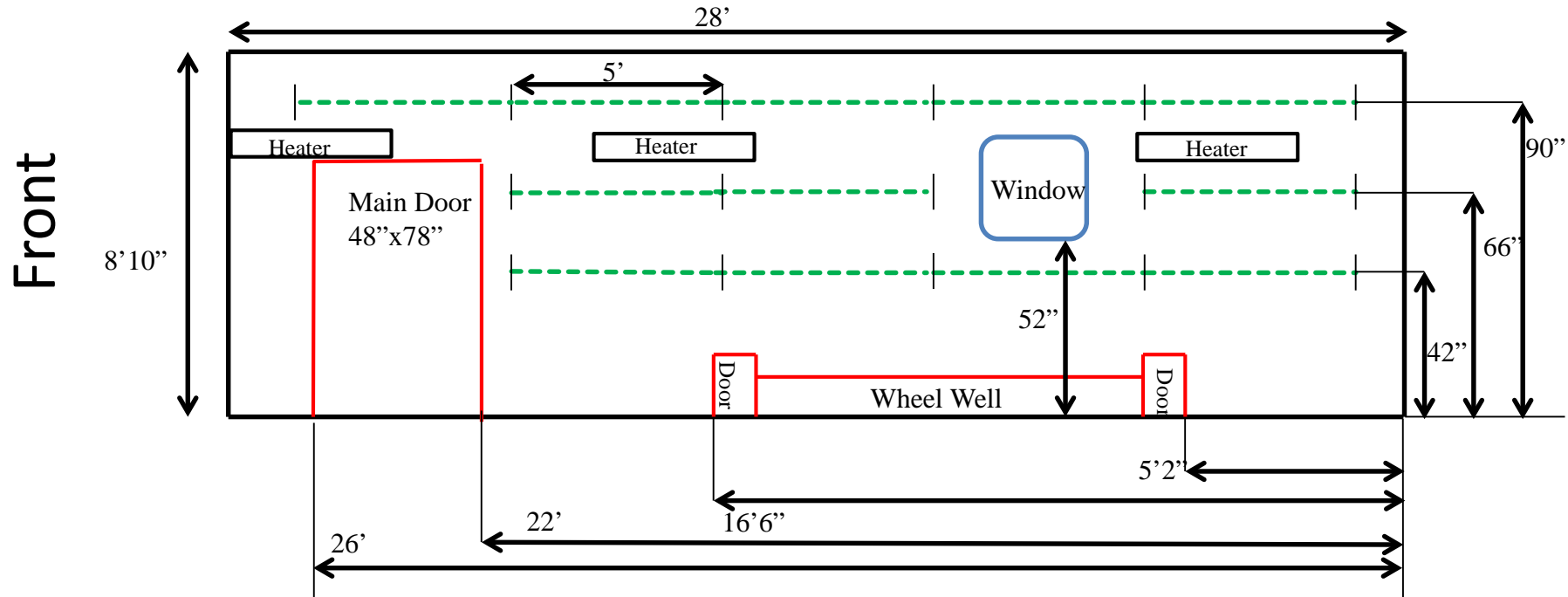
Interior Views



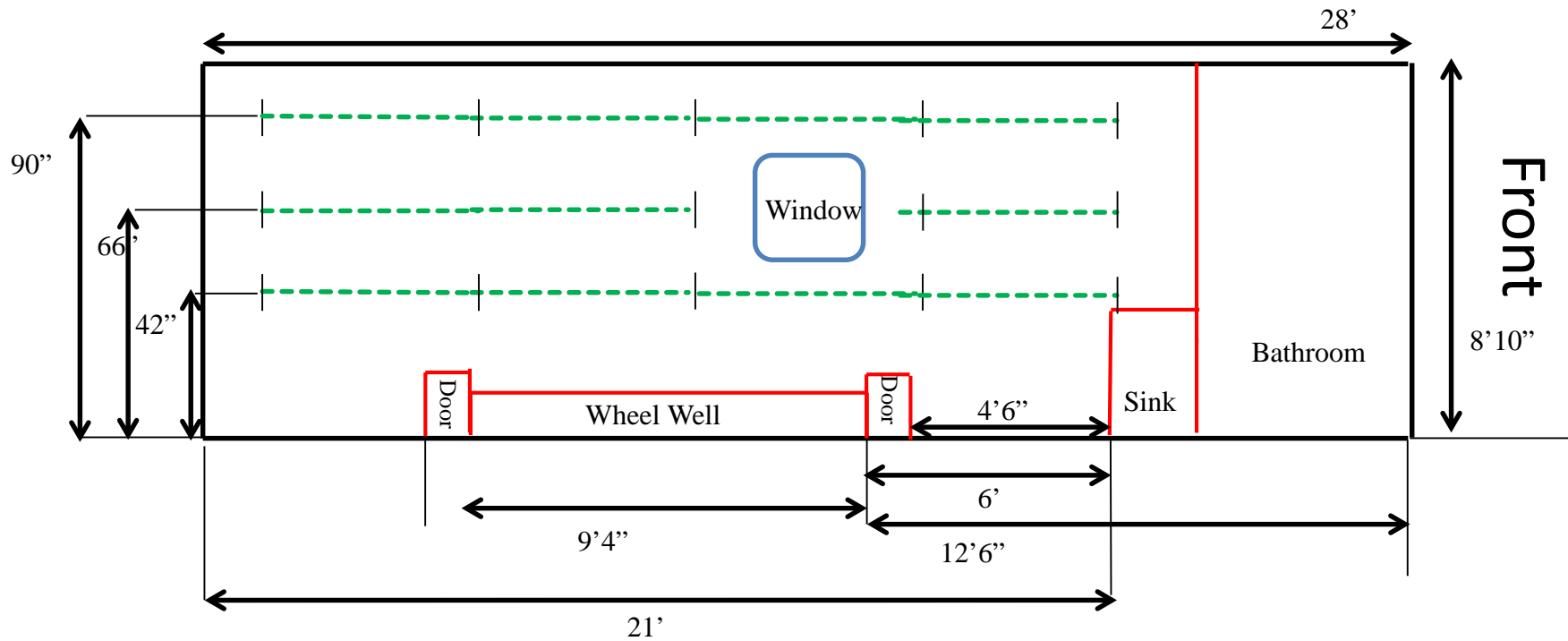
Plan View



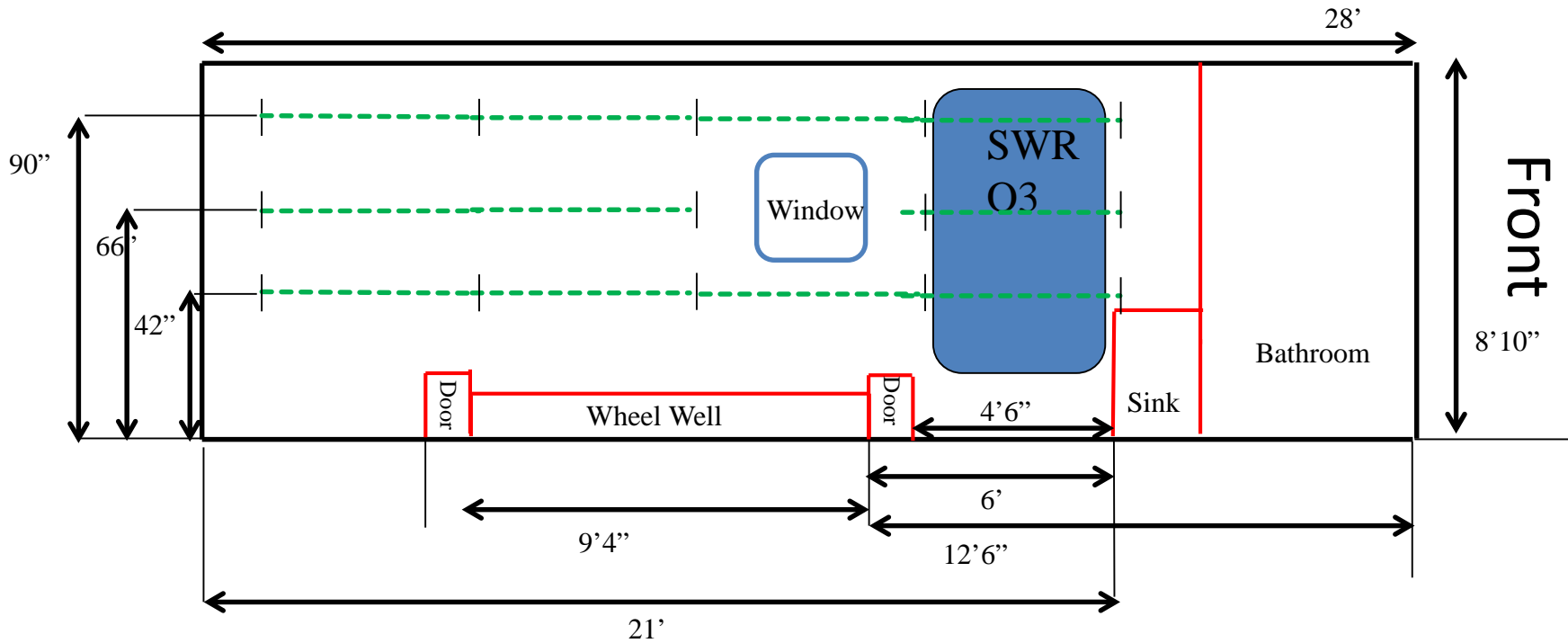
Right Wall (Main Door Side)



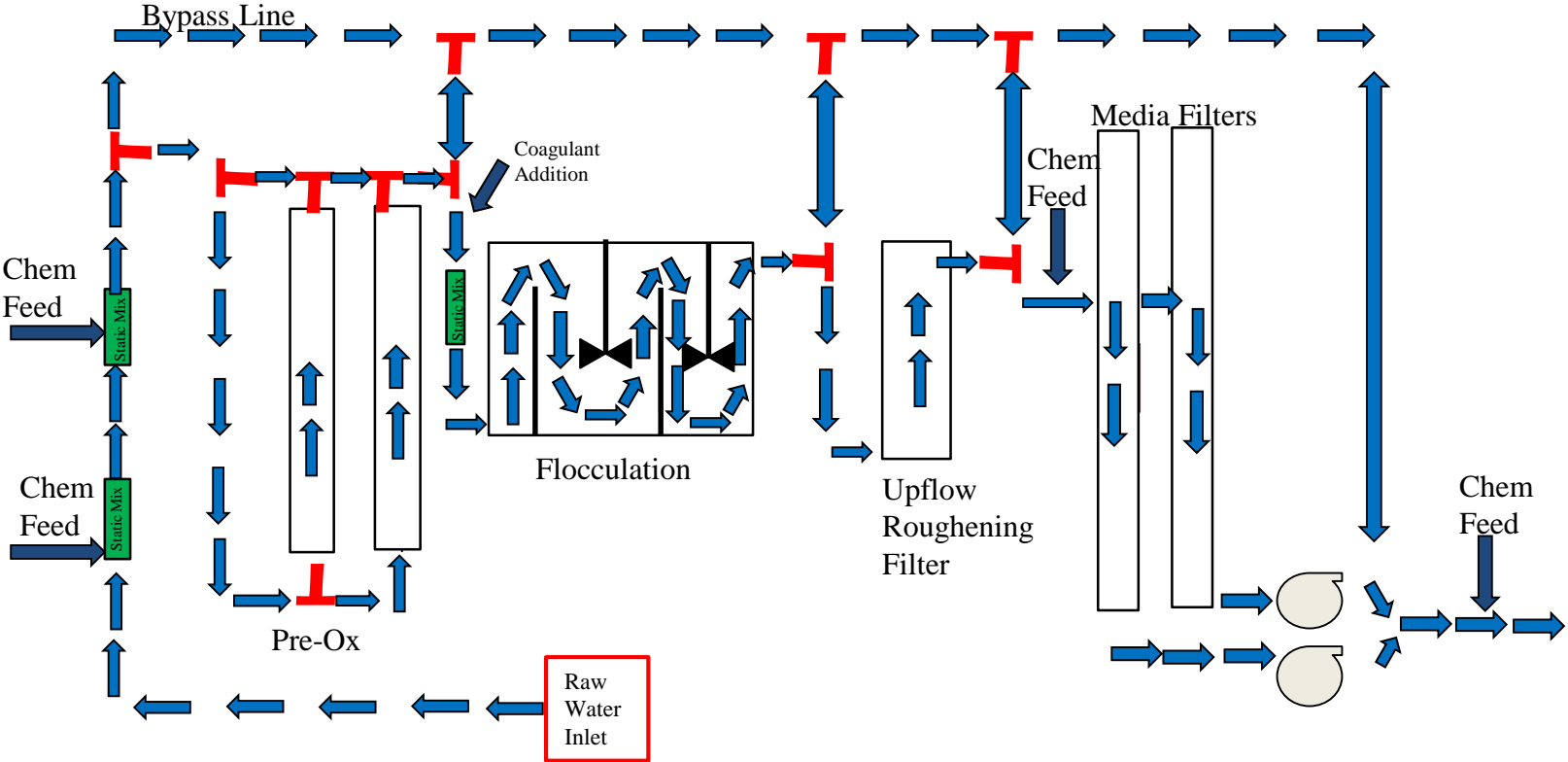
Left Wall (Sink/Bathroom Side)



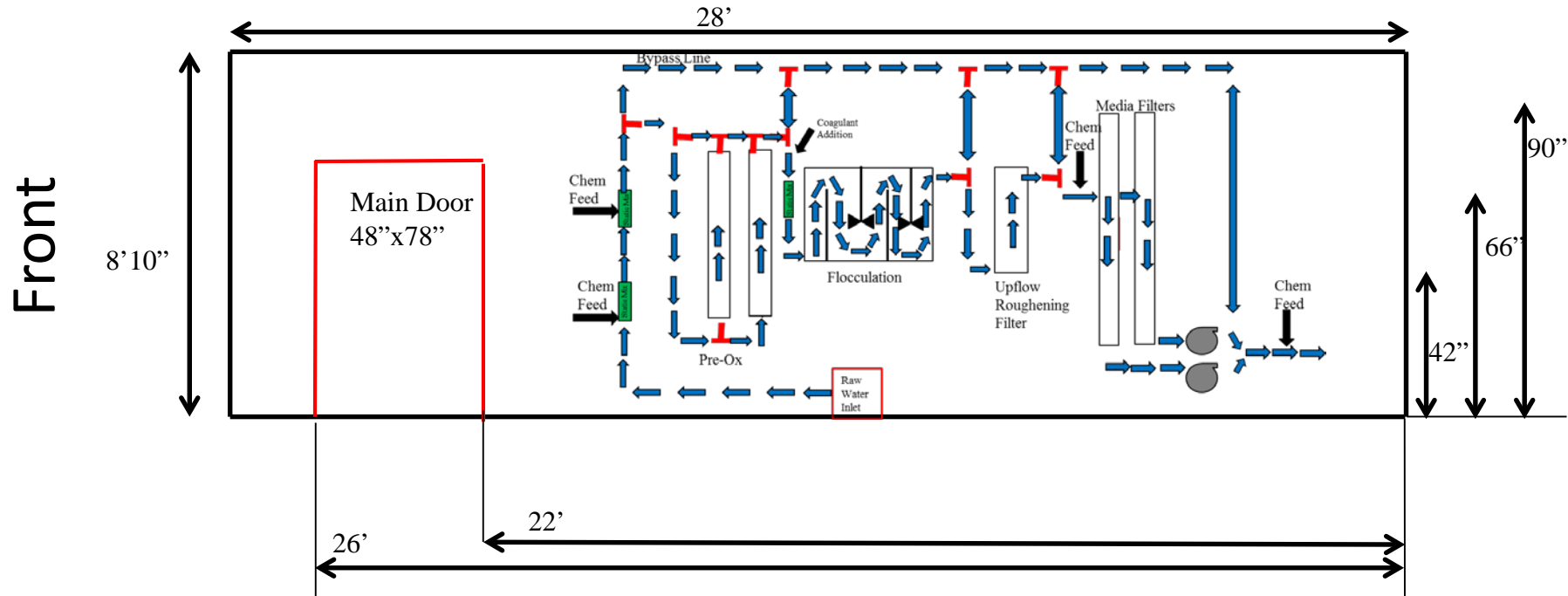
Left Wall (Sink/Bathroom Side) with Ozone System



Proposed units for: Oxidation, flocculation, clarification & filtration



Right Wall (Main Door Side) with proposed units



How will your technology fit in to this mobile facility?

Collaboration

- Building on each Center's strengths



Collaboration between centers

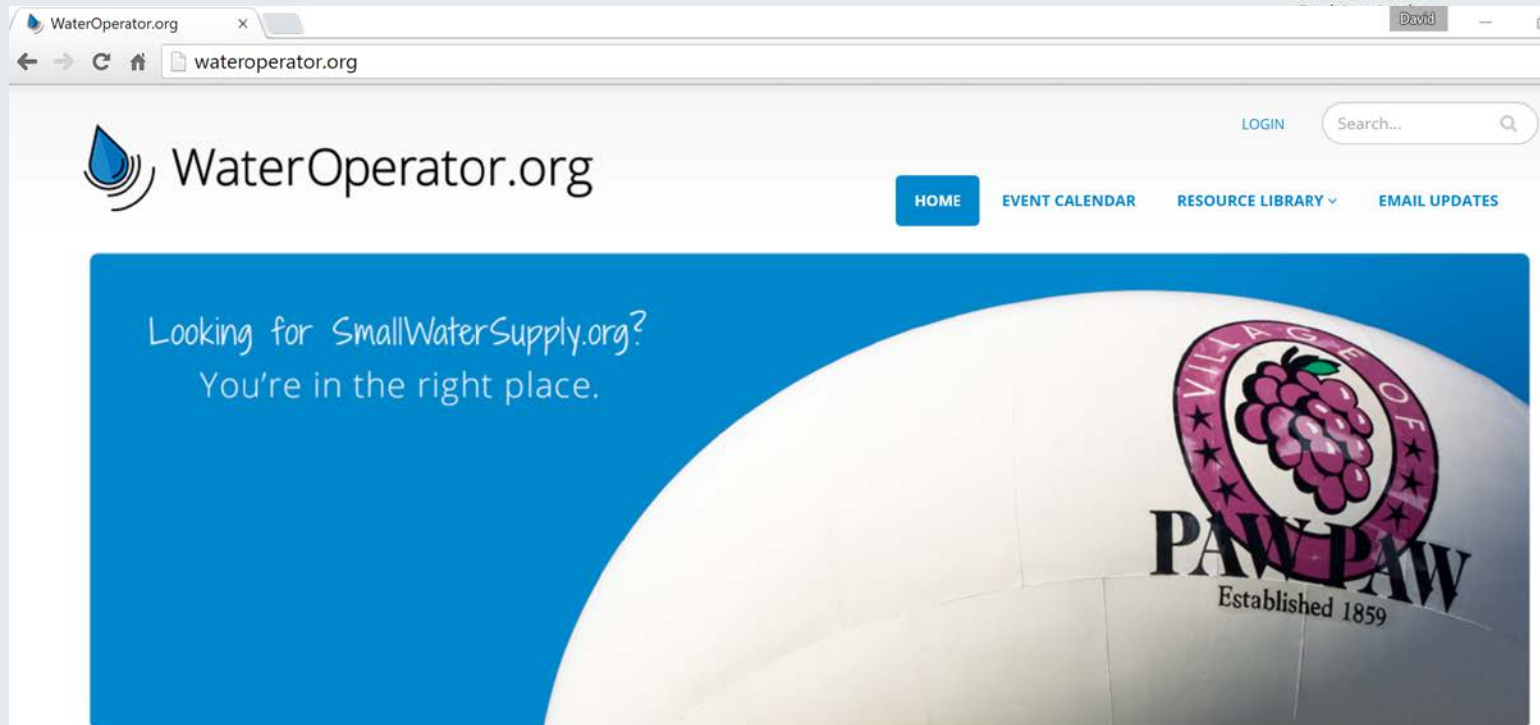
- Joint newsletter

- Hosted by Steve & Jennifer Wilson

- <http://smallwatersupply.org/> => <http://wateroperator.org>

- Most recent: #4, dated 29 January 2016

- <http://us10.campaign-archive1.com/?u=8d16ba5b97dc0fd4e661dd11e&id=acc8ac4f2b>



Contact Information for WINSSS

- Website: <http://www.umass.edu/winsss/>



Water Innovation Network for Sustainable Small Systems
This project is funded by the USEPA under the STAR program

Mission & Background ▼ Programs & Projects ▼ Leadership ▼ **Partners** Other ▼ Treatment ▼

WINSSS: A National Center for Innovative Small Drinking Water Systems



A Collaboration between the University of Massachusetts and the University of Texas

With major Contributions from the Universities of Nebraska, Florida, Illinois, South Florida and Carollo Engineers

The Water Innovation Network for Sustainable Small Systems (WINSSS) brings together a national team of experts to transform drinking water treatment for small water systems (SWS) to meet the urgent need for state-of-the-art innovation, development, demonstration, and implementation of treatment, information, and process technologies in part by leveraging existing relationships with industry through the Massachusetts Water Cluster.