

# Re-inventing the Nation's Urban Water Infrastructure [ReNUWIt]

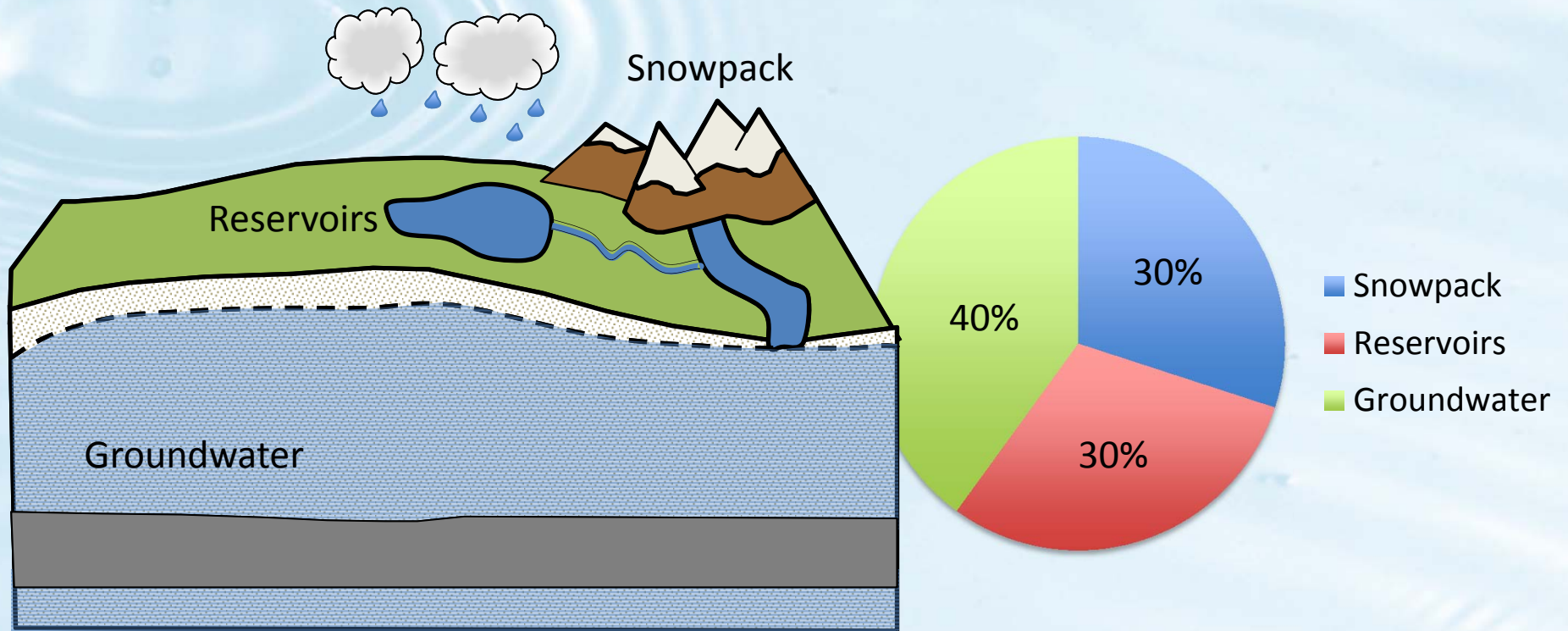


## **Sustainable Urban Water Supplies**

**Richard G. Luthy  
Stanford University**

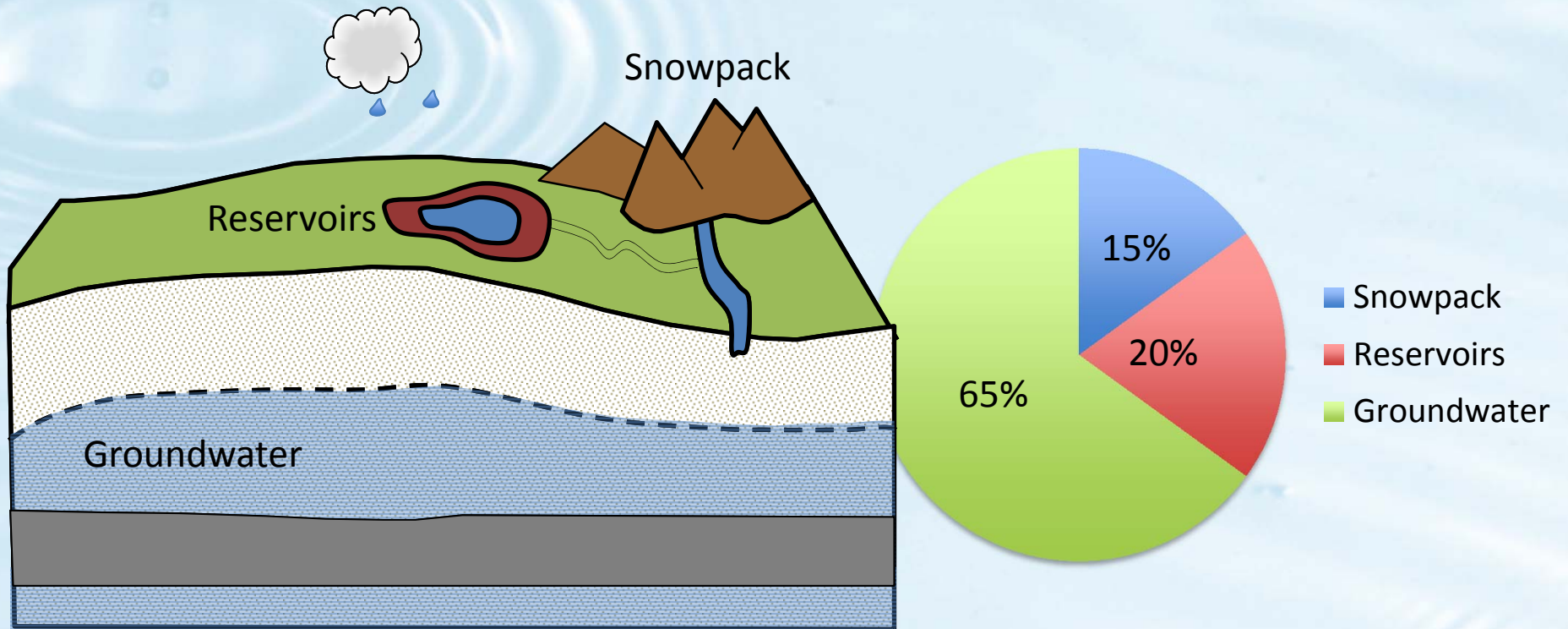
San Mateo C/CAG Retreat, April 14, 2016

# Water in California



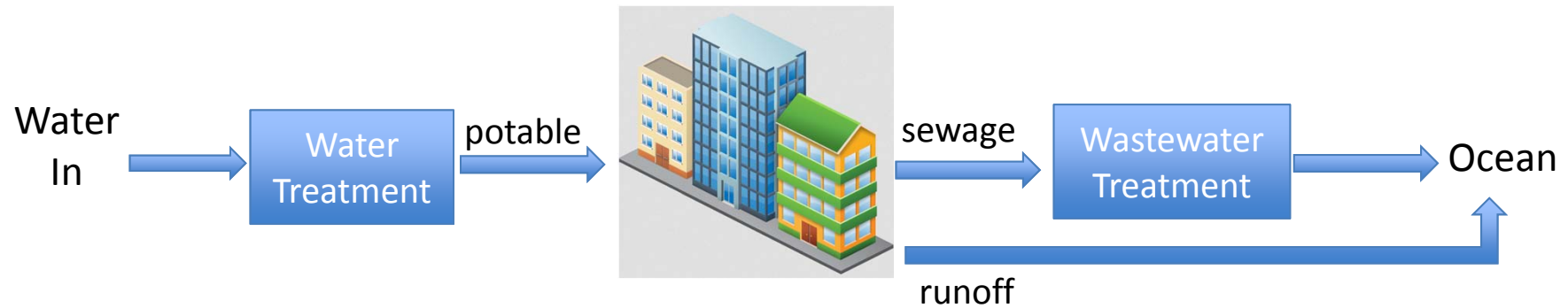
Water sources during *average* climatic conditions

# Water in California



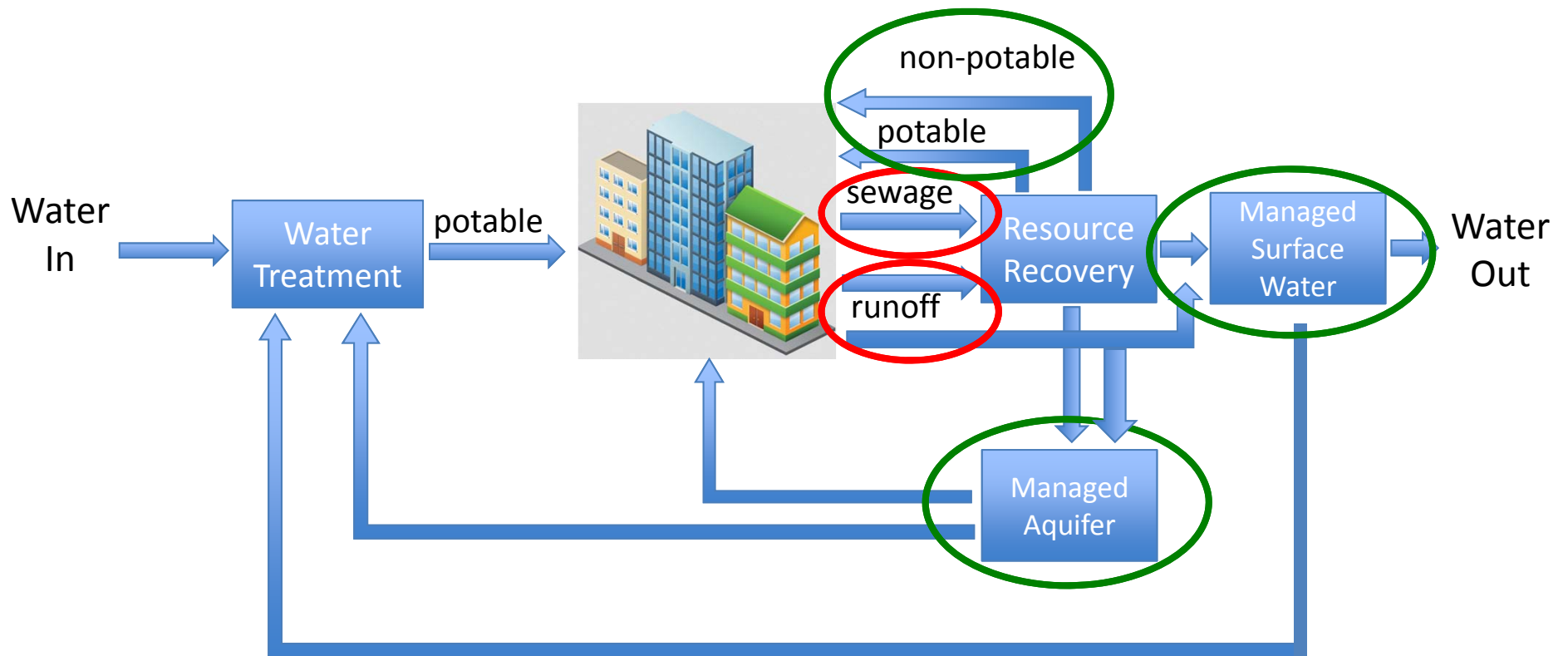
Water sources during *drought* conditions

# 20<sup>th</sup> Century Linear System





# 21<sup>st</sup> Century: Closing Loops



# Self-Sufficiency Revolution



Mayor Kevin Faulconer  
San Diego



Mayor Eric Garcetti  
Los Angeles



Mayor Sam Liccardo  
San Jose

# Diversified Water Supply



**ReNUWIt**  
Re-inventing the Nation's  
URBAN WATER  
INFRASTRUCTURE



**Stormwater  
Harvesting**



**Water  
Reuse**



**Water Use  
Efficiency**



**Seawater  
Desalination**

# Stormwater for urban water supply



Stormwater has the ***potential*** to supply up to 630,000 acre feet of water in Southern California and the Bay Area



# Stormwater Harvesting



ReNUWIt  
Re-inventing the Nation's  
URBAN WATER  
INFRASTRUCTURE

Montebello Forebay  
(Whittier, CA)



# Distributed Systems

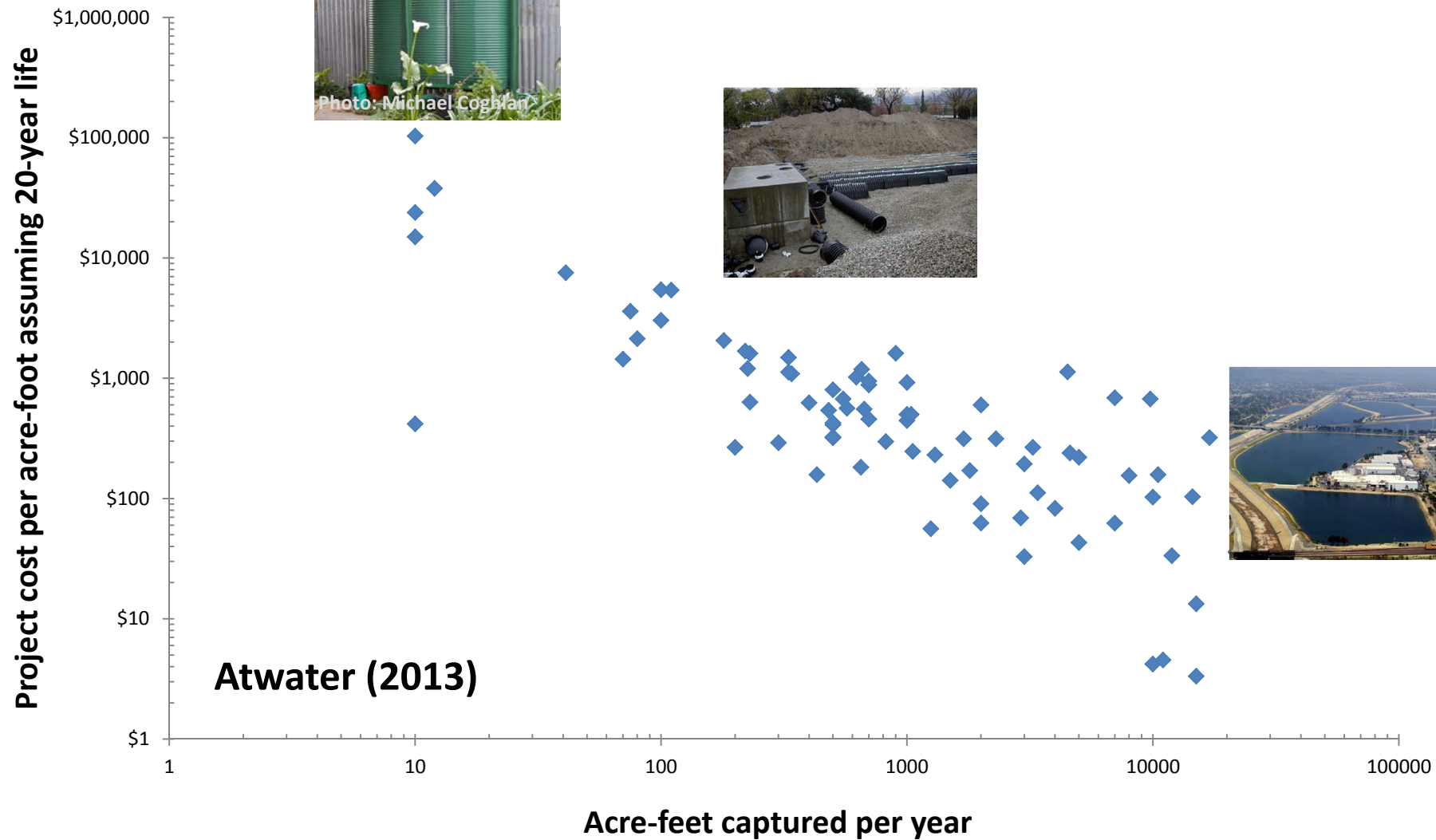


**Elmer Avenue Retrofit  
(LADWP)**





# A Question of Scale



# A Question of Storage

Photo A TreePeople's 216,000-Gallon Cistern Under Construction

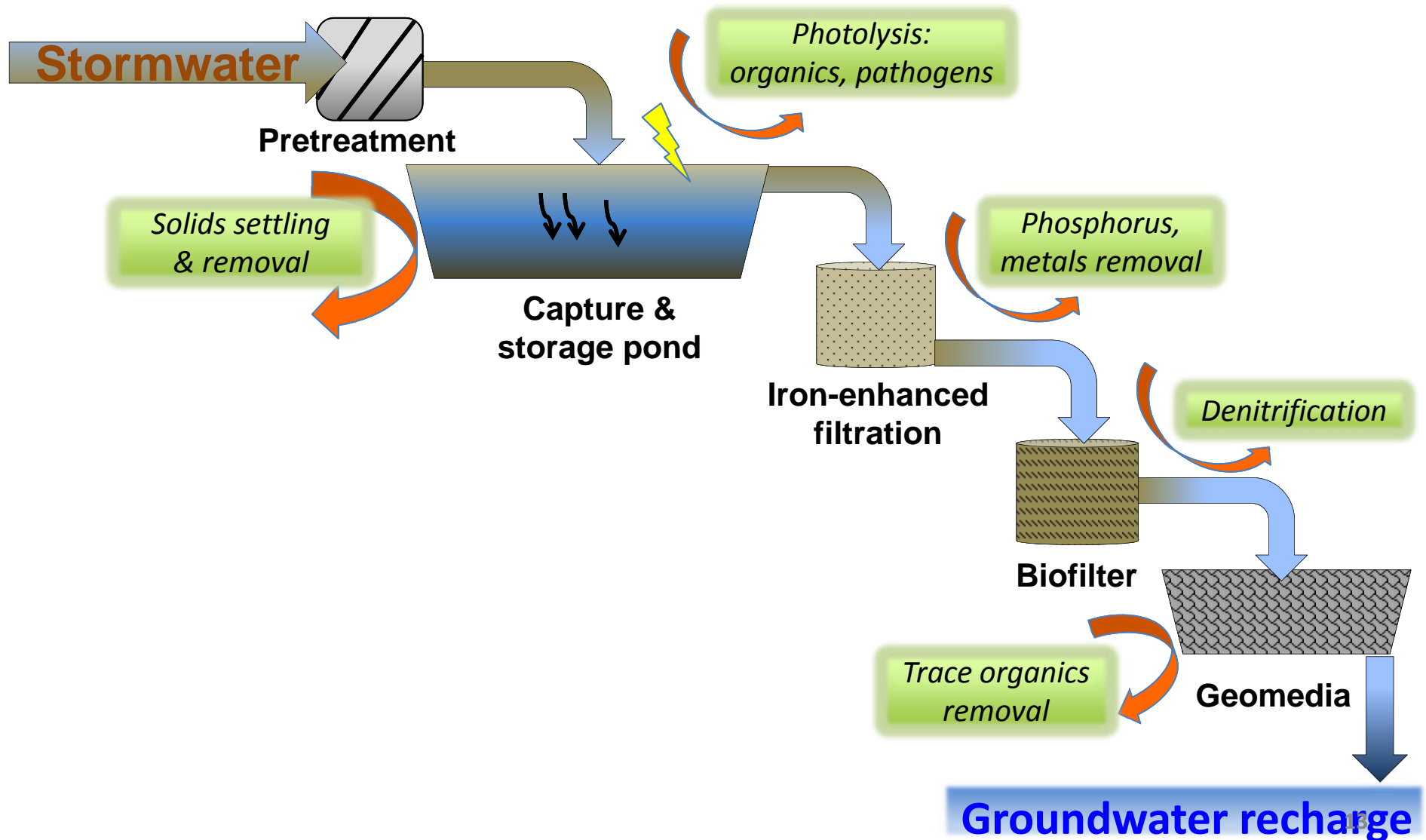


Storage is  
challenging with  
seasonal rainfall  
patterns

Photo B TreePeople's Parking Lot with Storm Drains Piped to Cistern



# Stormwater: capture, treatment & recharge





# What might a CTR-system look like?

## Rory M. Shaw Wetlands Park

- Convert 45-acre gravel pit to facility for stormwater retention, treatment, groundwater recharge, habitat & recreation.
- Costs: \$46 mill (\$28 mill for land), \$240,000/year (O&M)
- Volume recharge: 900 AFY





# Wetlands Park, Sun Valley District Los Angeles

## Today:

45 acre pit

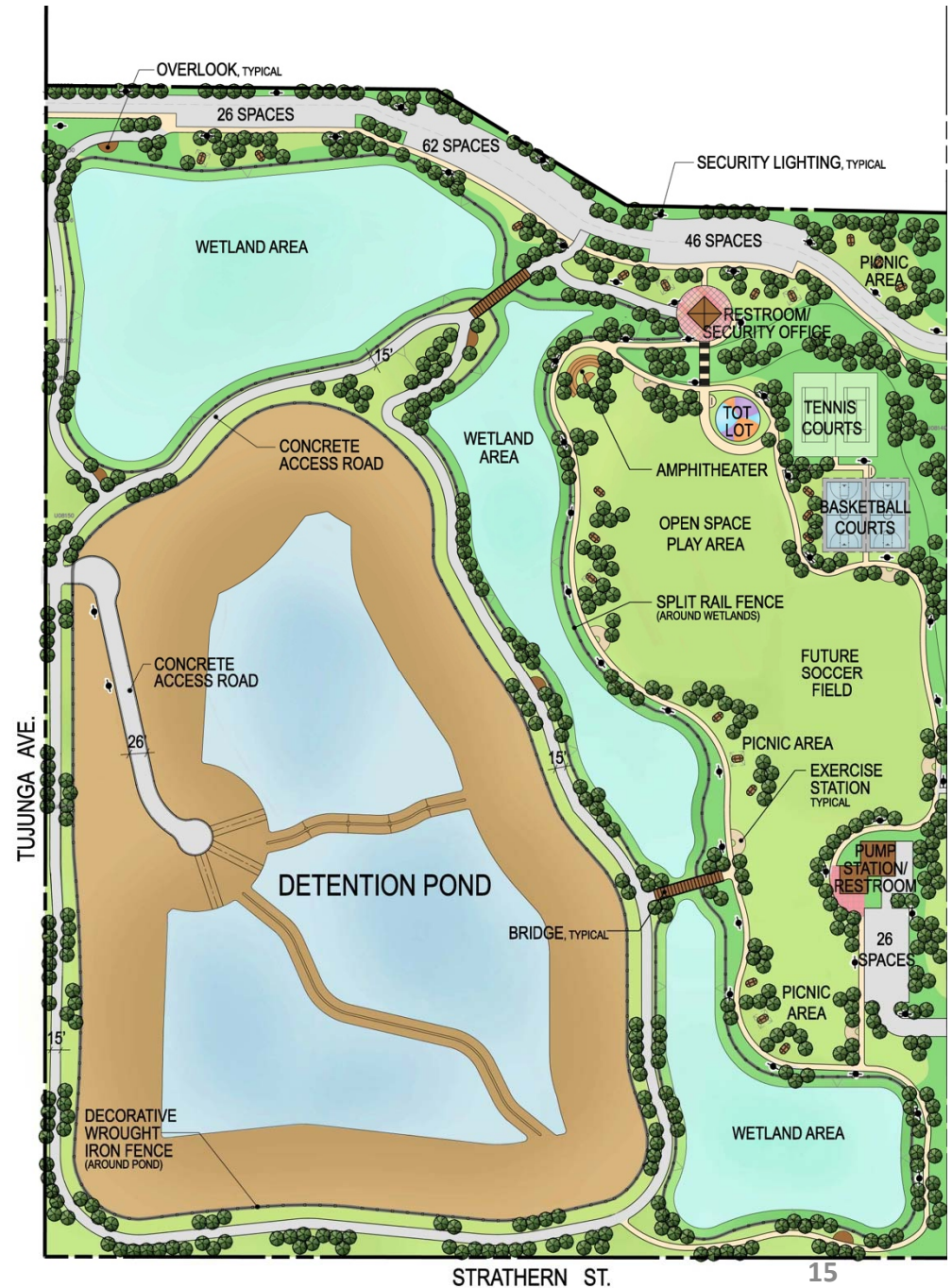


Salvage yards & industrial drainage



**Future:**  
Stormwater  
collection,  
treatment &  
recharge.

45 acre  
treatment  
wetland and  
park



# Urban stormwater

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## Pathogens

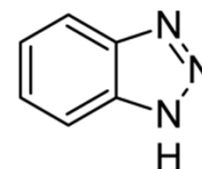
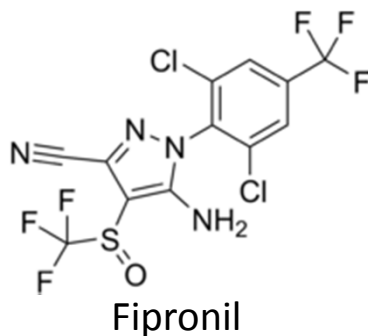
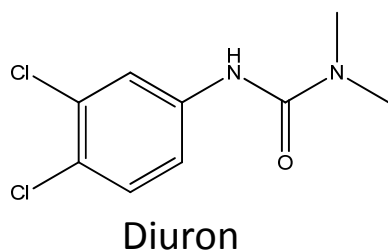
E. coli, enterococci

## Urban-use biocides

diuron, triazines,  
chlorophenoxyacetic acids,  
pyrethroids, fipronil

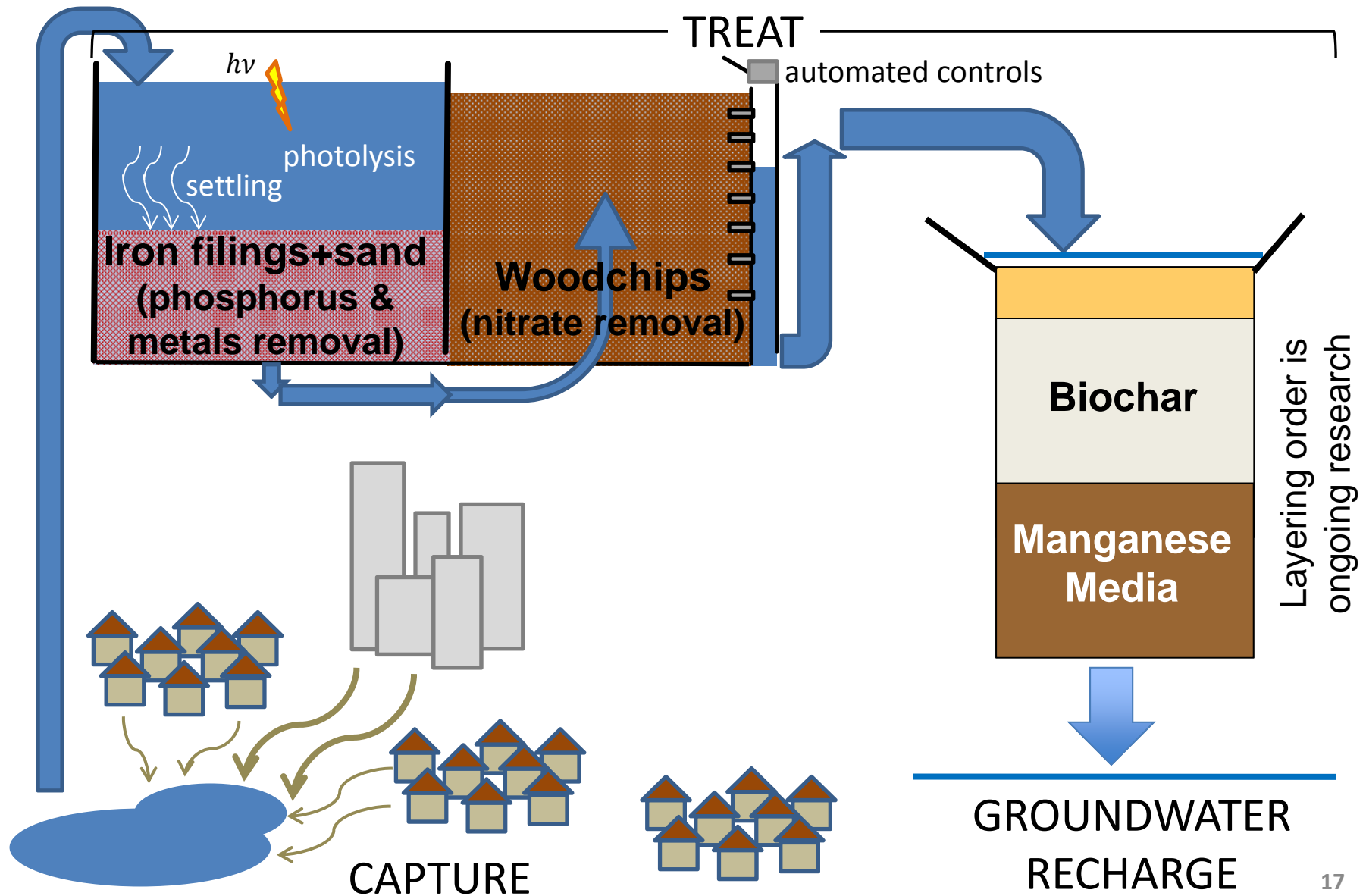
## Vehicle-related compounds

PAHs, benzothiazoles &  
alkylphenols (rubber)  
benzotriazoles (anti-freeze)



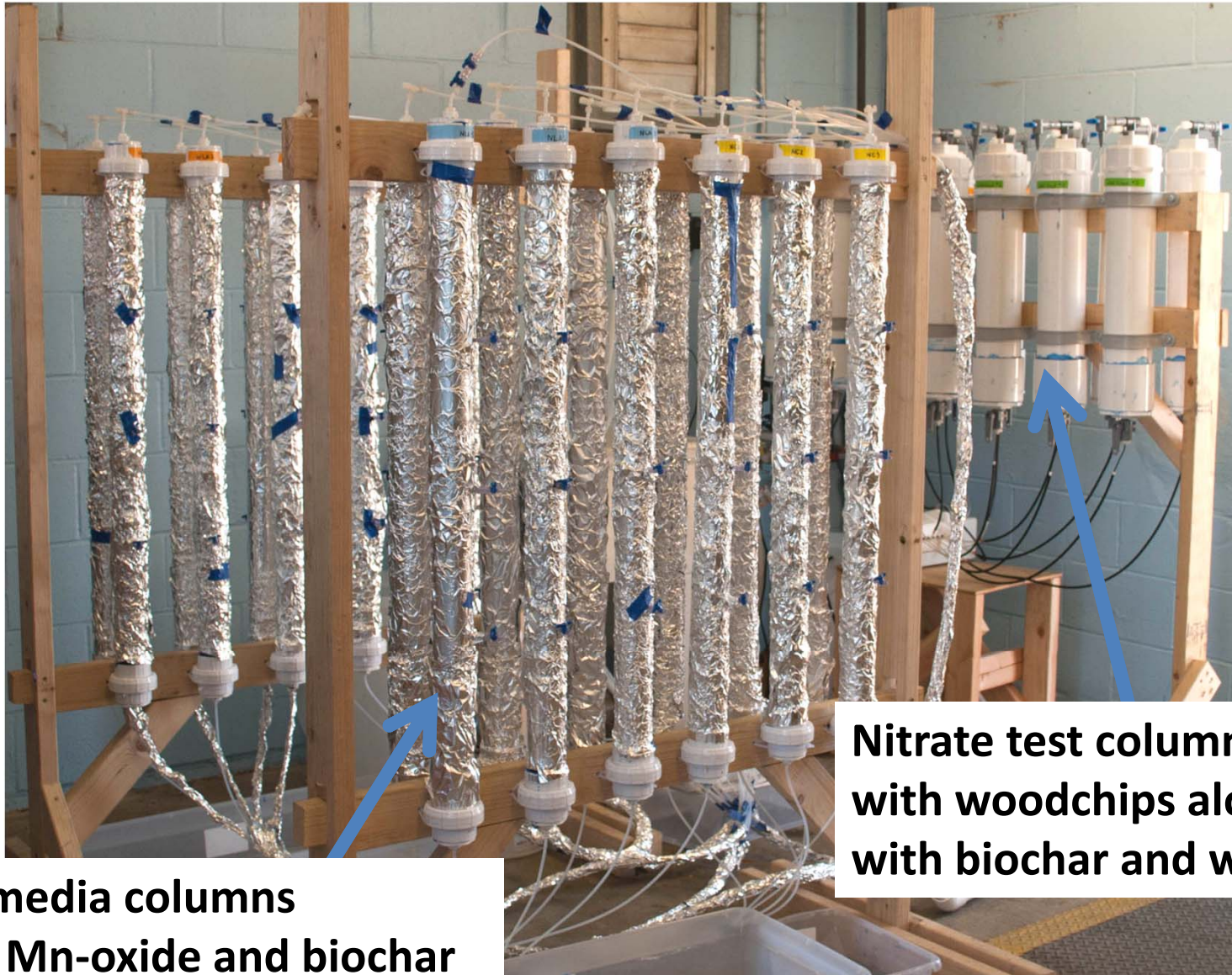


# Capture, Treat, and Recharge System



# Test bed configuration: field work

(Sonoma County Water Agency, LADWP/BOS/LACFCD)



**Geomedia columns  
with Mn-oxide and biochar**

**Nitrate test columns  
with woodchips alone, and  
with biochar and with straw**

# Diversified Water Supply



**Stormwater  
Harvesting**



**Water  
Reuse**



**Water Use  
Efficiency**

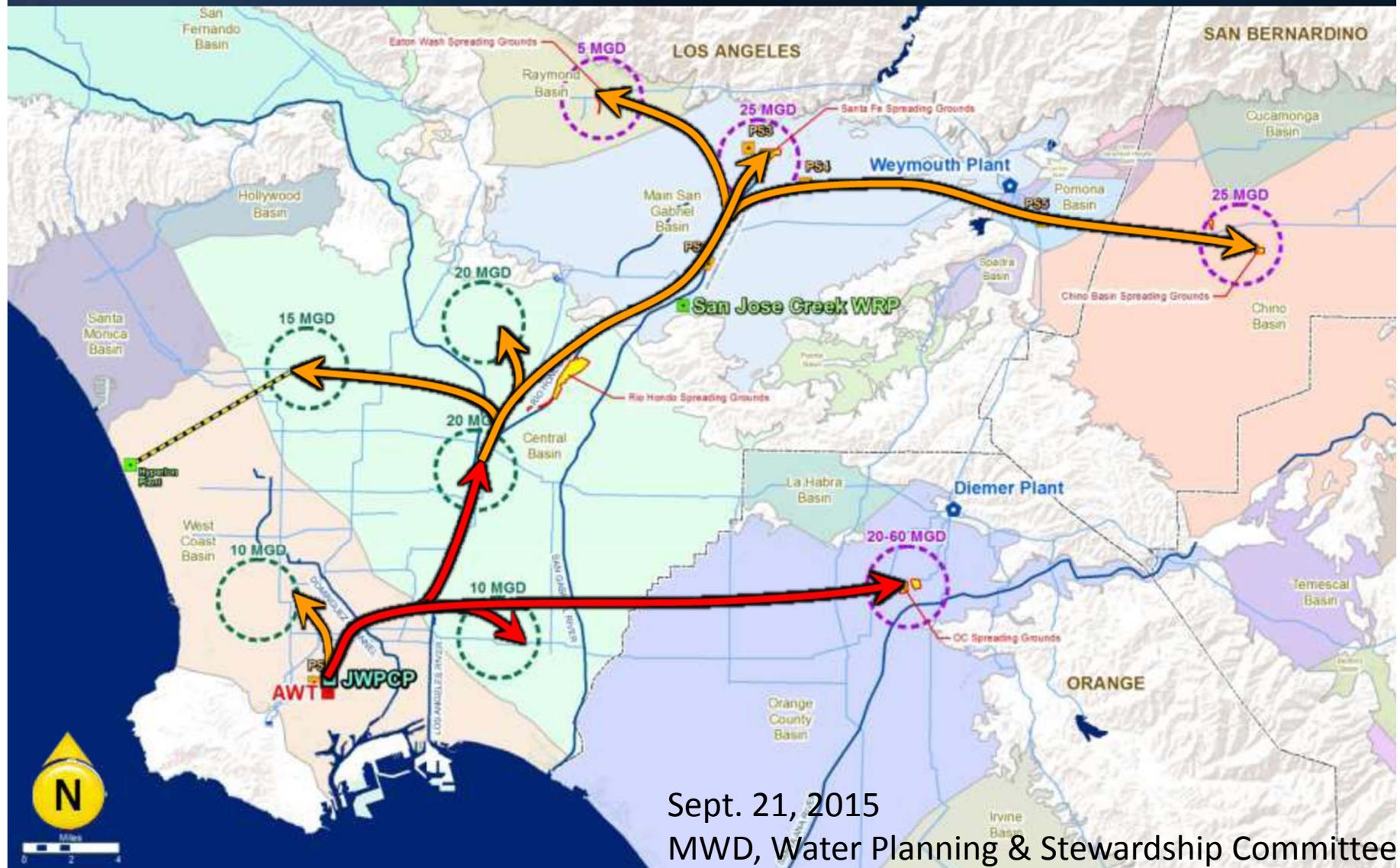


**Seawater  
Desalination**



# MWD— big central water recycle plan

## Potential Full Program (Up to 150 MGD)

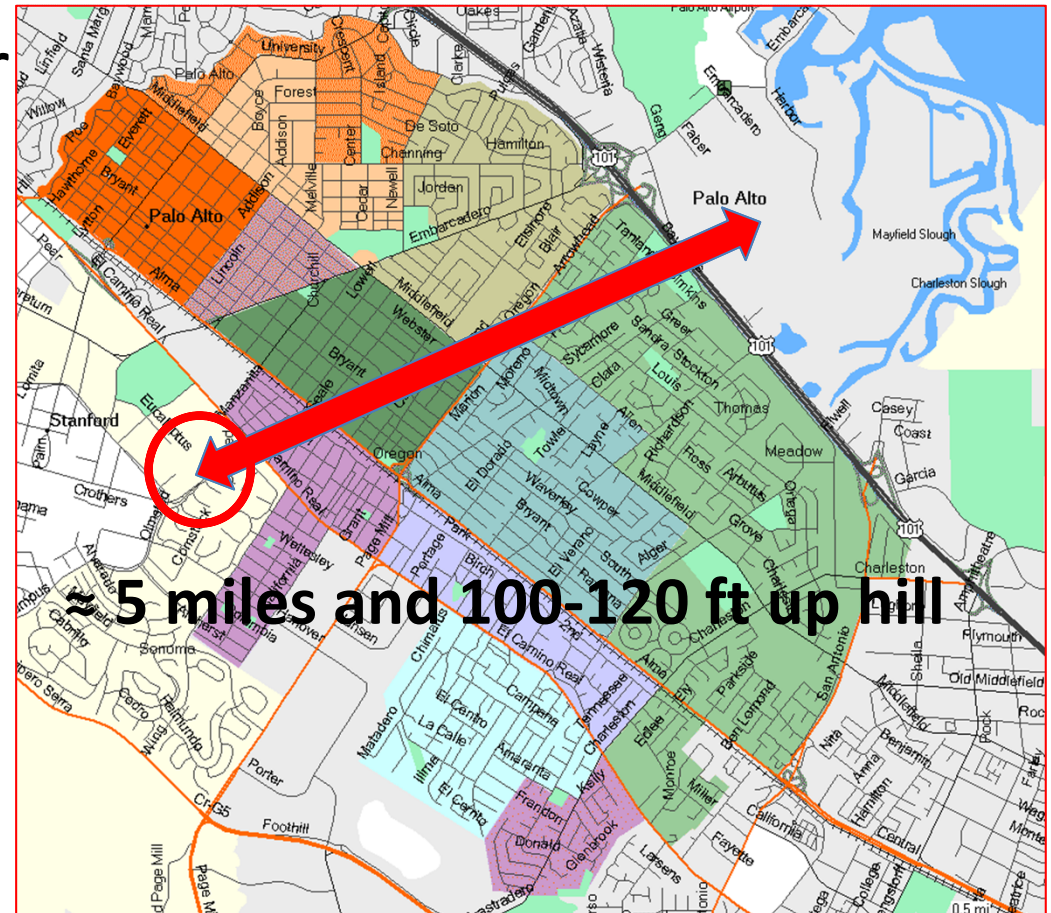


Sept. 21, 2015

MWD, Water Planning & Stewardship Committee

# Decentralized water reclamation

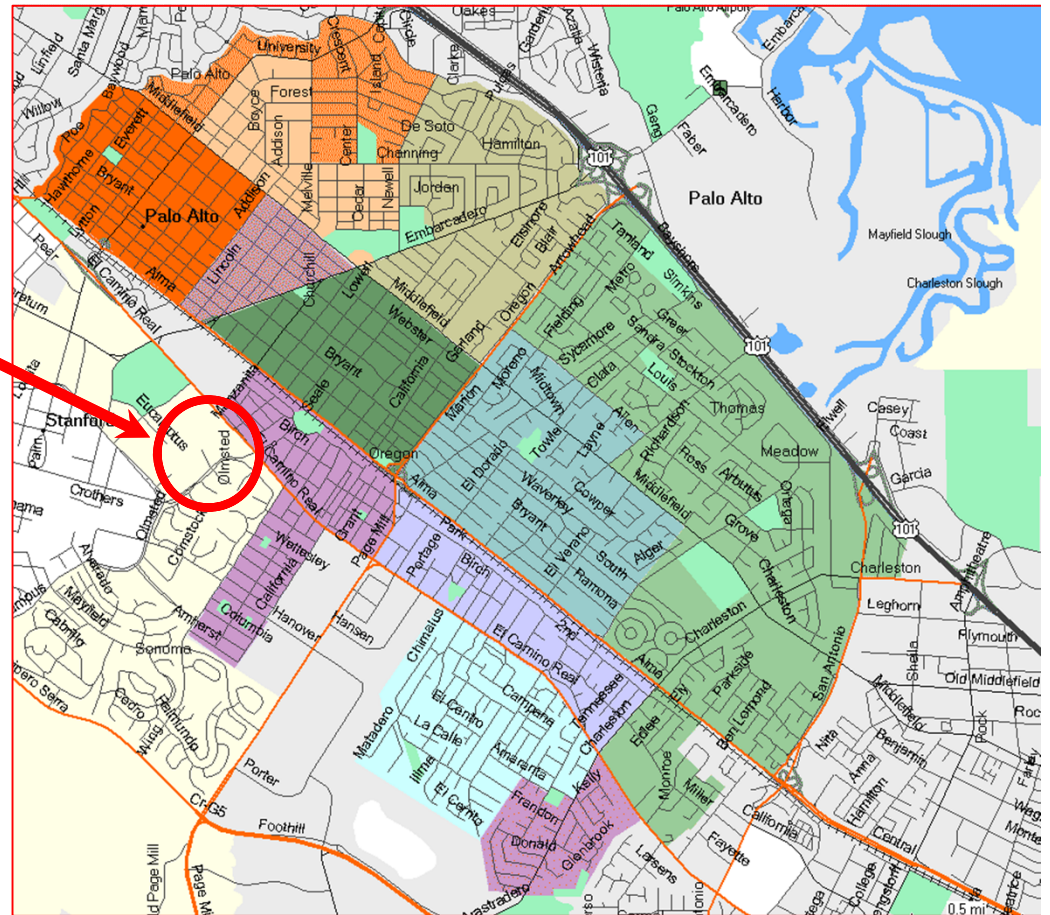
- Avoid pumping water back up hill
- Save energy by avoiding pumping
- Reclaim the water where it's generated and needed





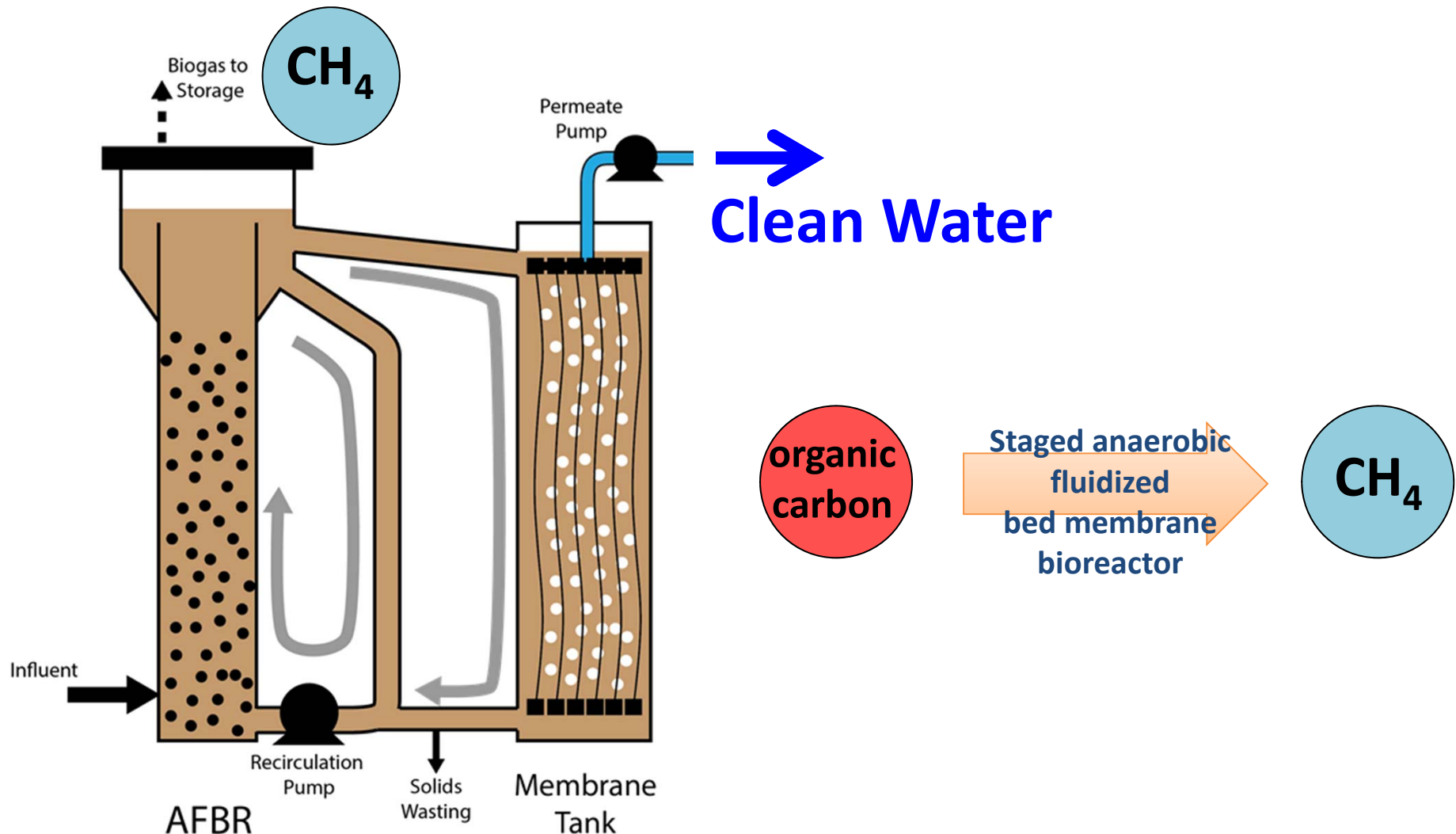
# Decentralized water reclamation

- Stanford wastewater at Serra Street approx. **360 ppm salt**
- Palo Alto recycled water approx. **770 ppm salt**
- Stanford wastewater best for irrigation & long-term salt management



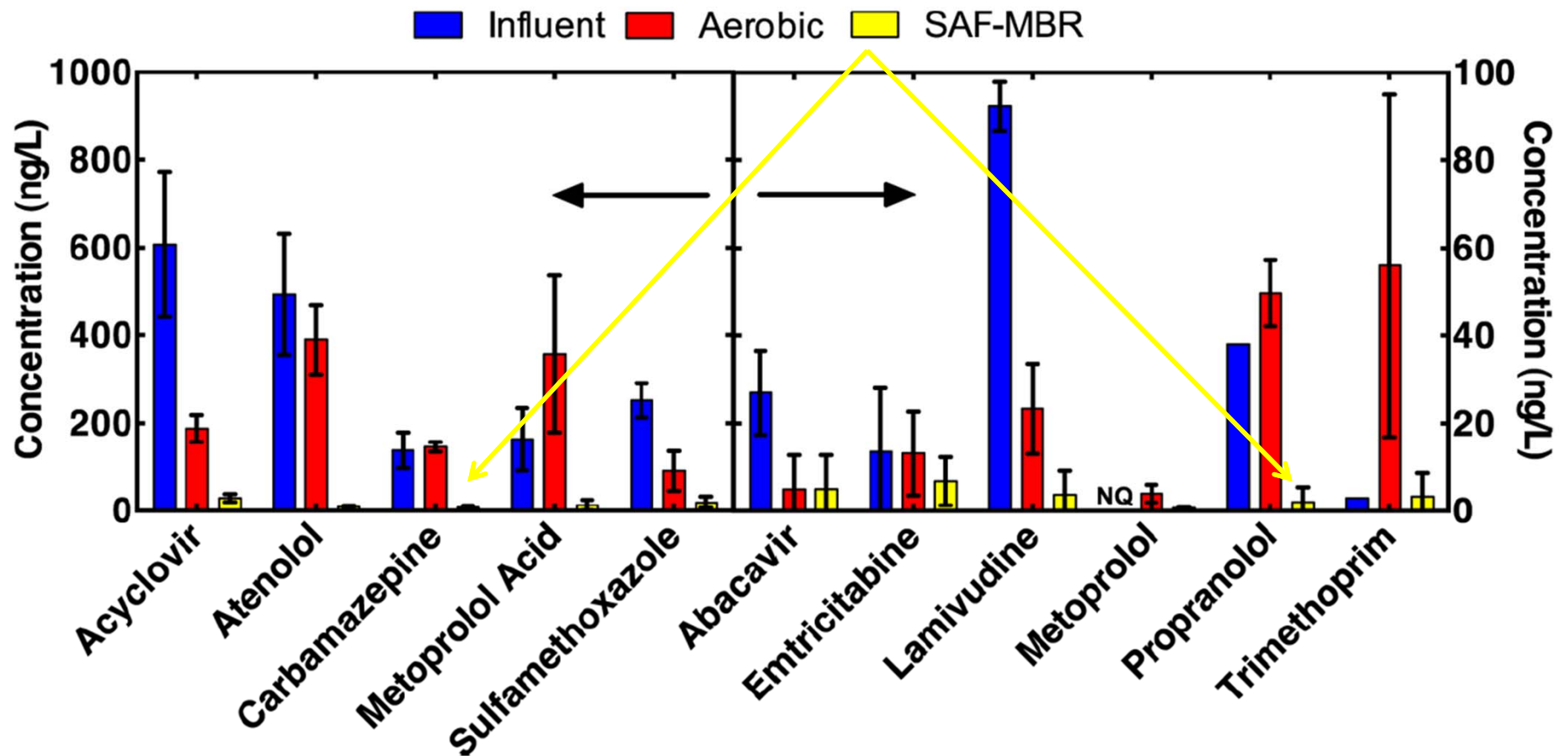


# Water reclamation with energy recovery



“Green energy” because it’s from biomass not fossil fuels

# Superior removal of pharmaceuticals: new anaerobic system vs aerobic system



# Energy-positive decentralized water reclamation

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Scale-up from lab to  
pilot system

Potential to  
revolutionize  
wastewater treatment  
& water recycle

Codiga Center  
Stanford Univ.



# Partnerships

## Proposal to Calif. Energy Commission

Silicon Valley Clean Water

Stanford University

GE Water

Brown & Caldwell

Kennedy-Jenks

SCVWD

Covello Group

Prepared for  
Silicon Valley Clean Water



**STANFORD**  
UNIVERSITY

### Grant Funding Opportunity GFO-15-317 Maximizing Water and Energy from New Anaerobic Wastewater Treatment Technology

January 2016





# Take-home messages

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Fryer Creek, Sonoma, CA

- **Recycling & energy recovery**
  - Decentralized systems
  - New technologies
- **Capturing urban stormwater**
  - Contribute to water supplies
  - Enhance urban amenities
- **Demonstrate at test-bed scale**
  - Partnerships for scale-up
  - Decision-support tools