

# Potable Reuse in California: Lessons Learned and the Path Forward

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**Trussell Technologies**

*Congresswoman Michelle Lujan Grisham's!  
Water Innovation Summit!  
Albuquerque, NM, October 14, 2014!*

**Trussell**  
TECHNOLOGIES INC

The logo for Trussell Technologies Inc. features the company name in a serif font, with 'Trussell' in a larger size and 'TECHNOLOGIES INC' in a smaller, all-caps sans-serif font below it. To the right of the text is a graphic of a water droplet falling into a pool of water, creating a splash and ripples.

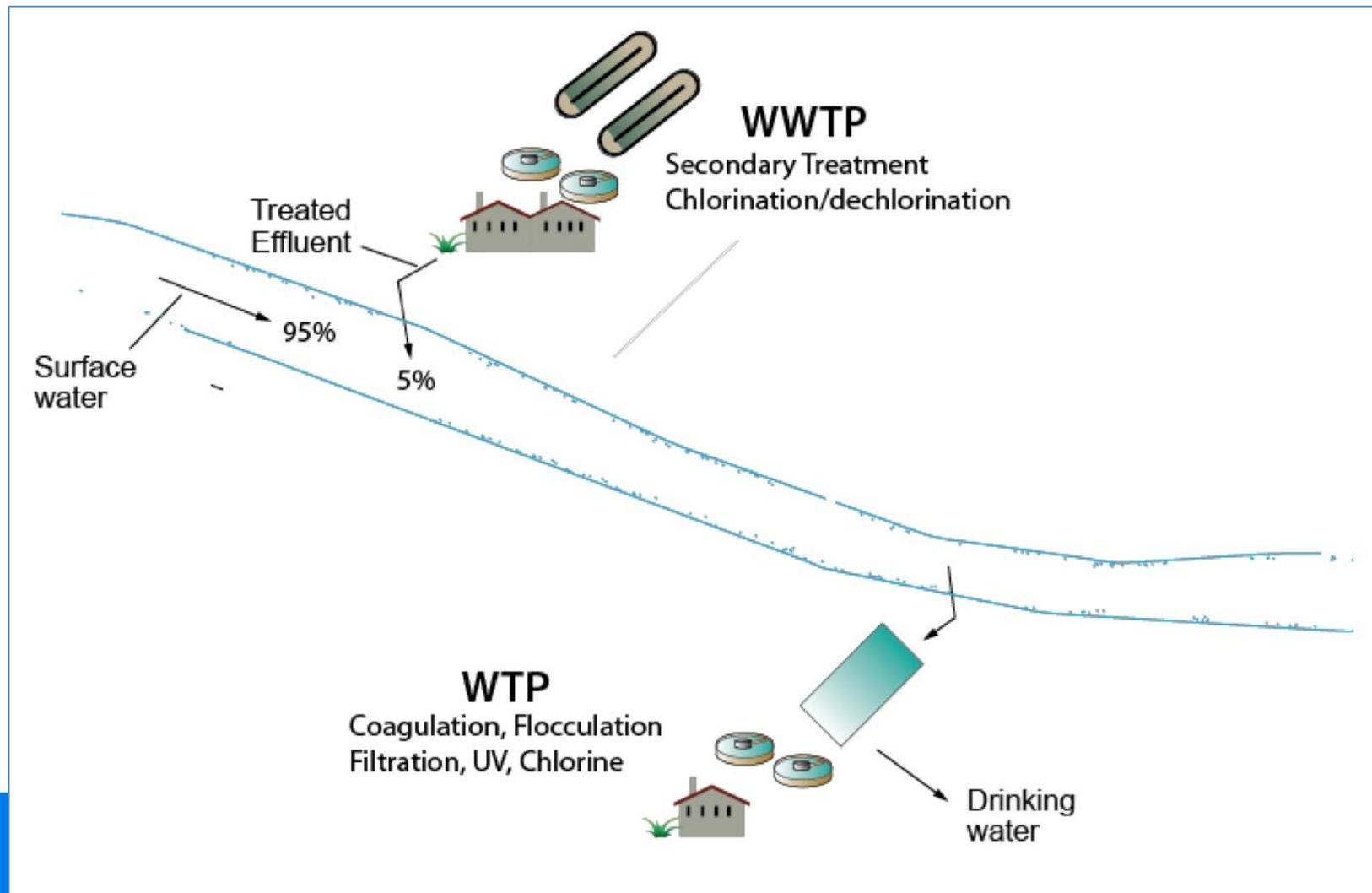
# Structure of Potable Reuse

- De facto reuse
- Indirect potable reuse
- Direct potable reuse



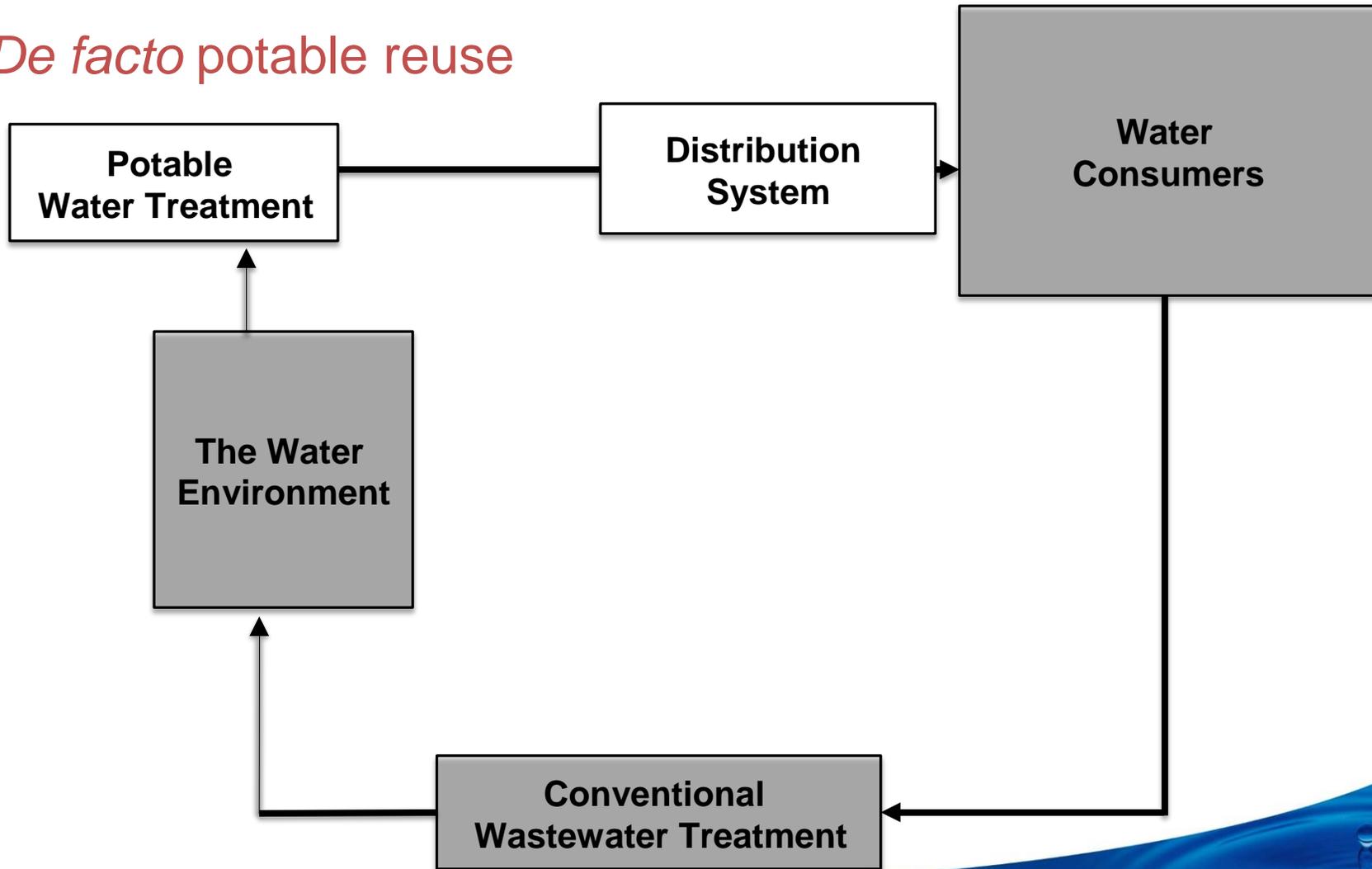
# Structure of Potable Reuse

## *De facto* potable reuse



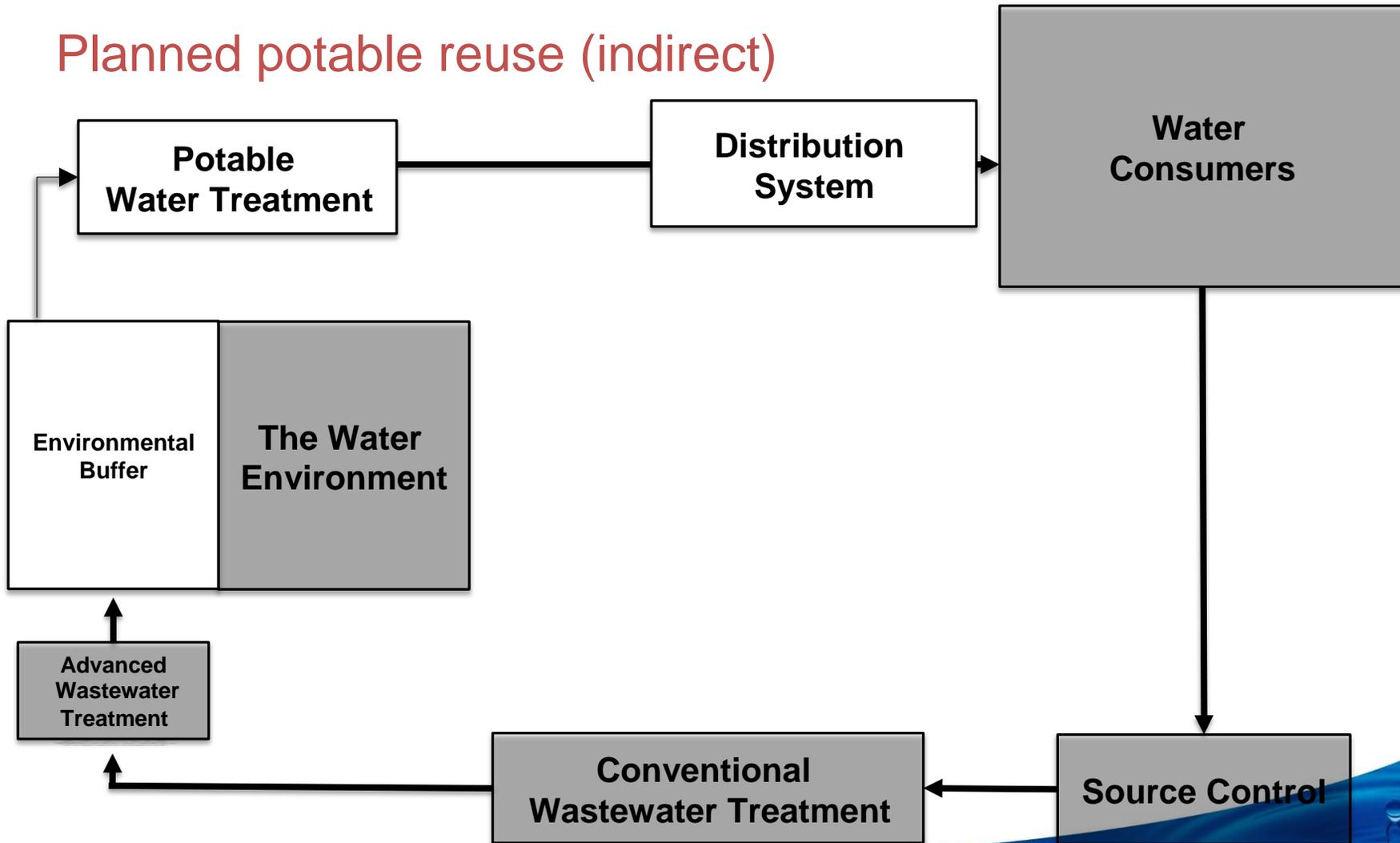
# Structure of Potable Reuse

*De facto potable reuse*



# Structure of Potable Reuse

Planned potable reuse (indirect)



# Indirect Potable Reuse (IPR)



Source Control



WWTP



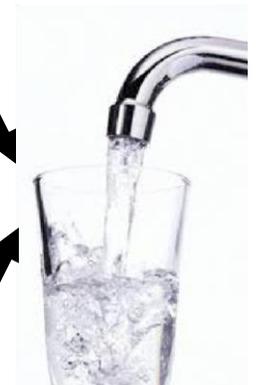
Advanced Water Treatment



Aquifer Injection / Spreading



Reservoir Augmentation



WTP / Distribution



# Direct Potable Reuse (DPR)



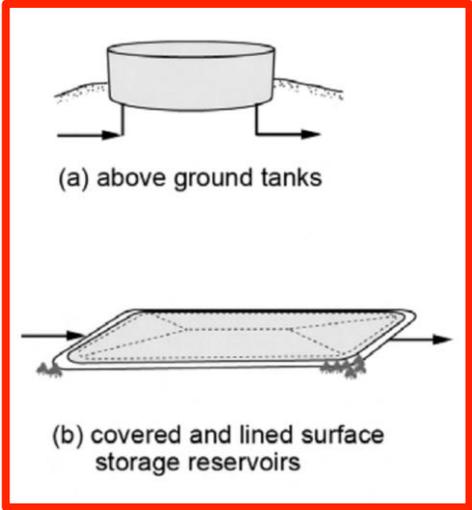
Source Control



WWTP



Advanced Water Treatment



Engineered Storage Buffer (ESB)



Flange-to-flange



WTP / Distribution



# **HISTORICAL PERSPECTIVE**



# Current CA Potable Reuse Projects

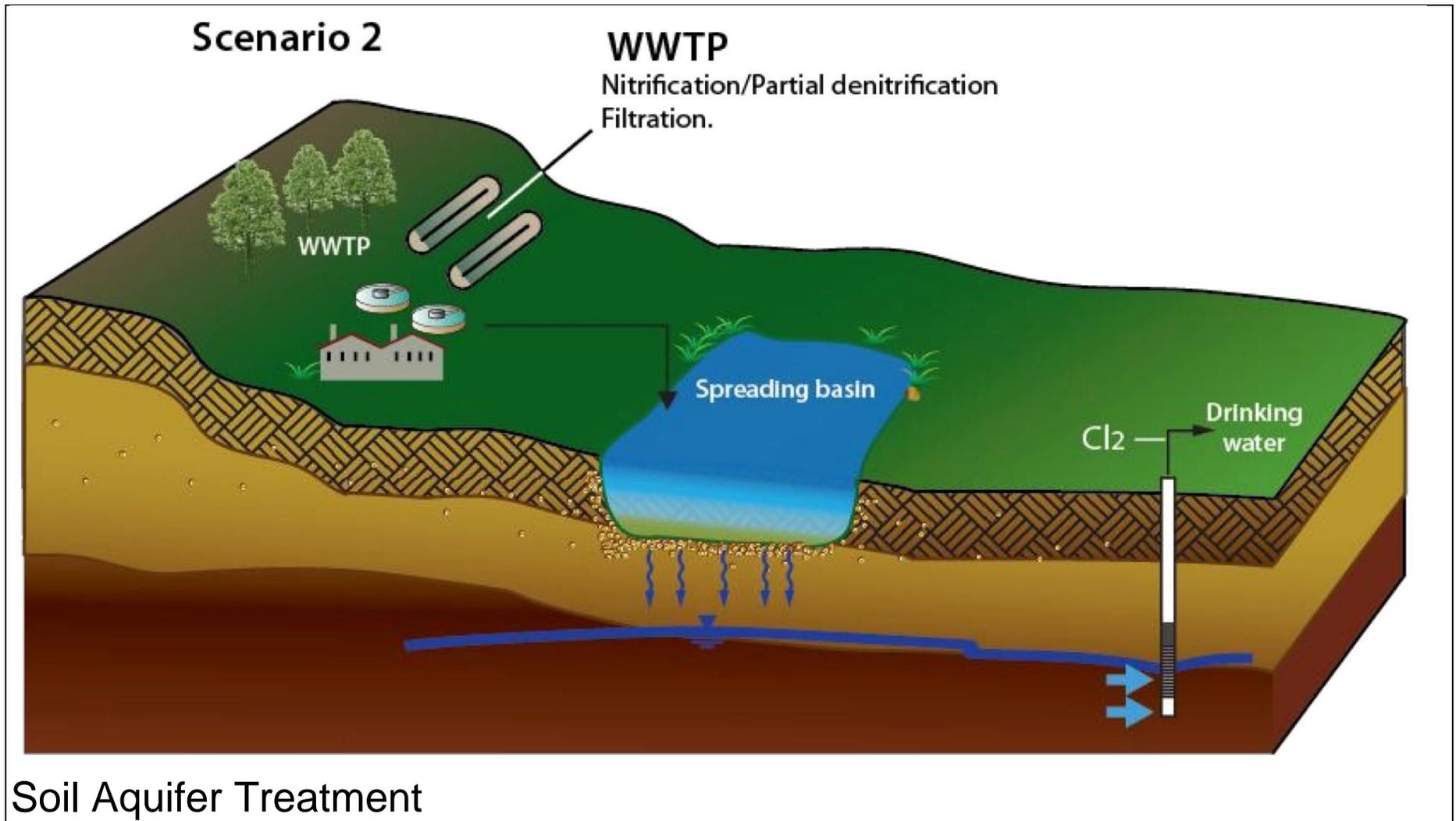
- All are **IPR projects** doing **groundwater recharge**
- 7 existing projects



The “Granddaddy” in the West  
LA’s Montebello Forebay  
Recharge Project



# Groundwater Recharge: Surface Spreading

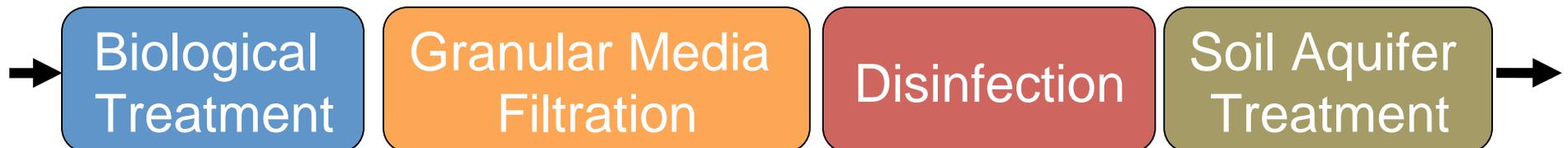
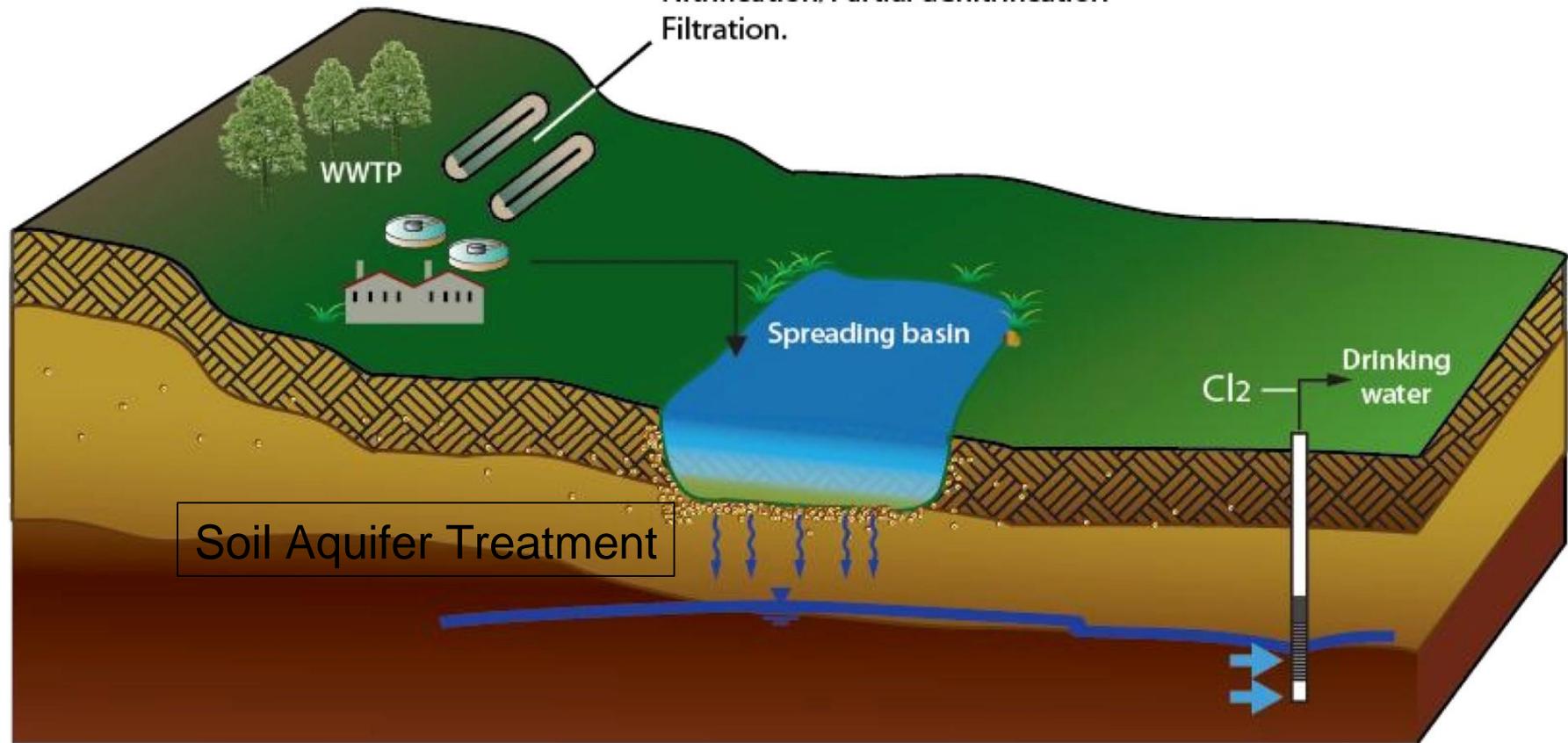


# Groundwater Recharge: Surface Spreading

Scenario 2

WWTP

Nitrification/Partial denitrification  
Filtration.





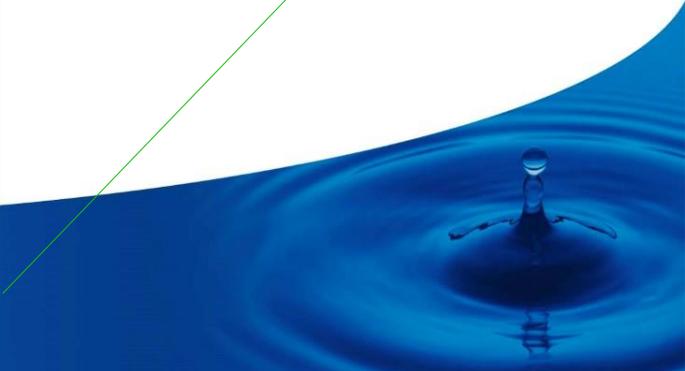
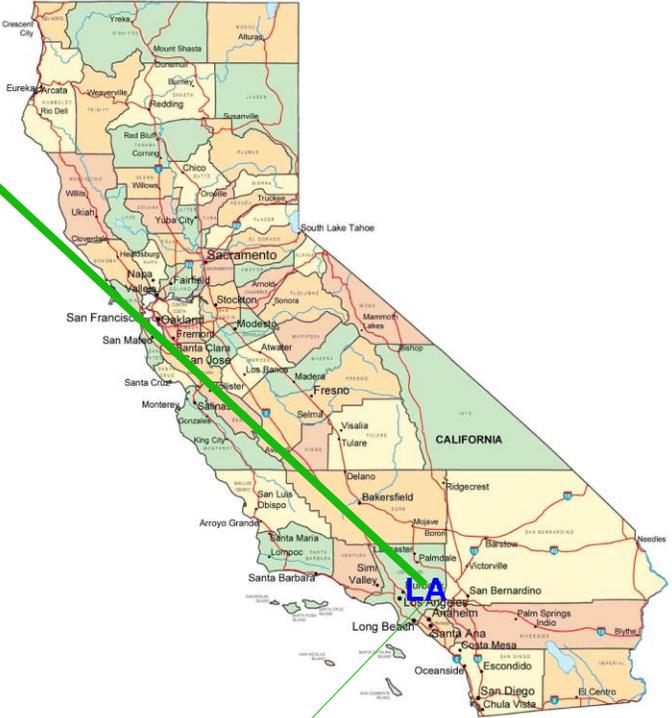
# Montebello

# Forebay



# Montebello

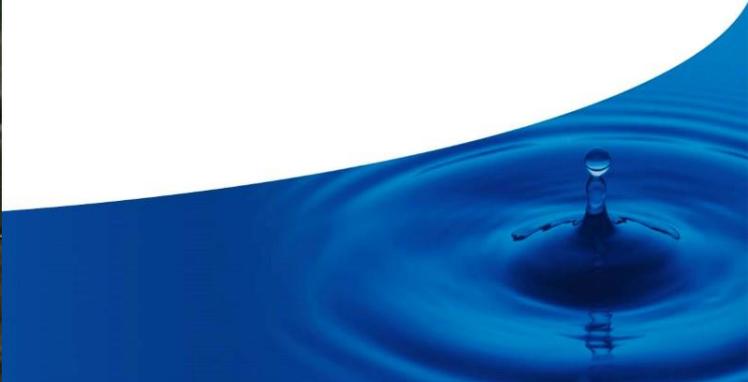
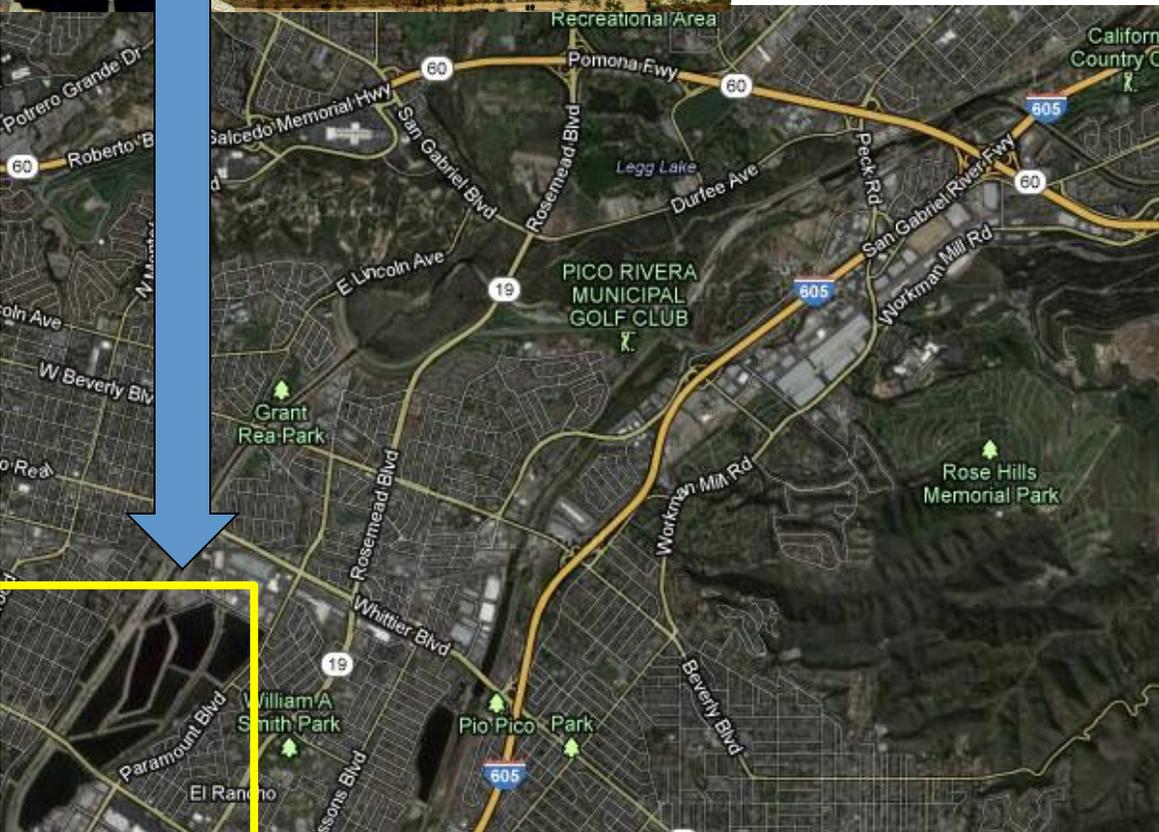
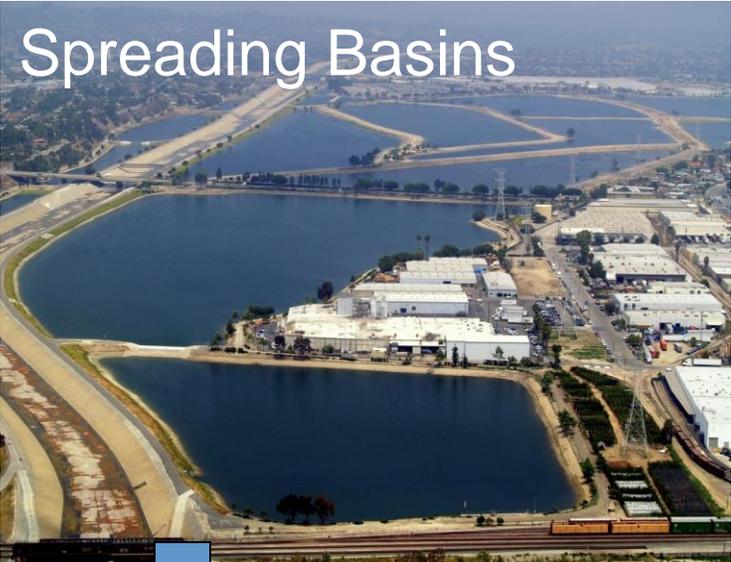
# Forebay



# Montebello

# Forebay

Spreading Basins

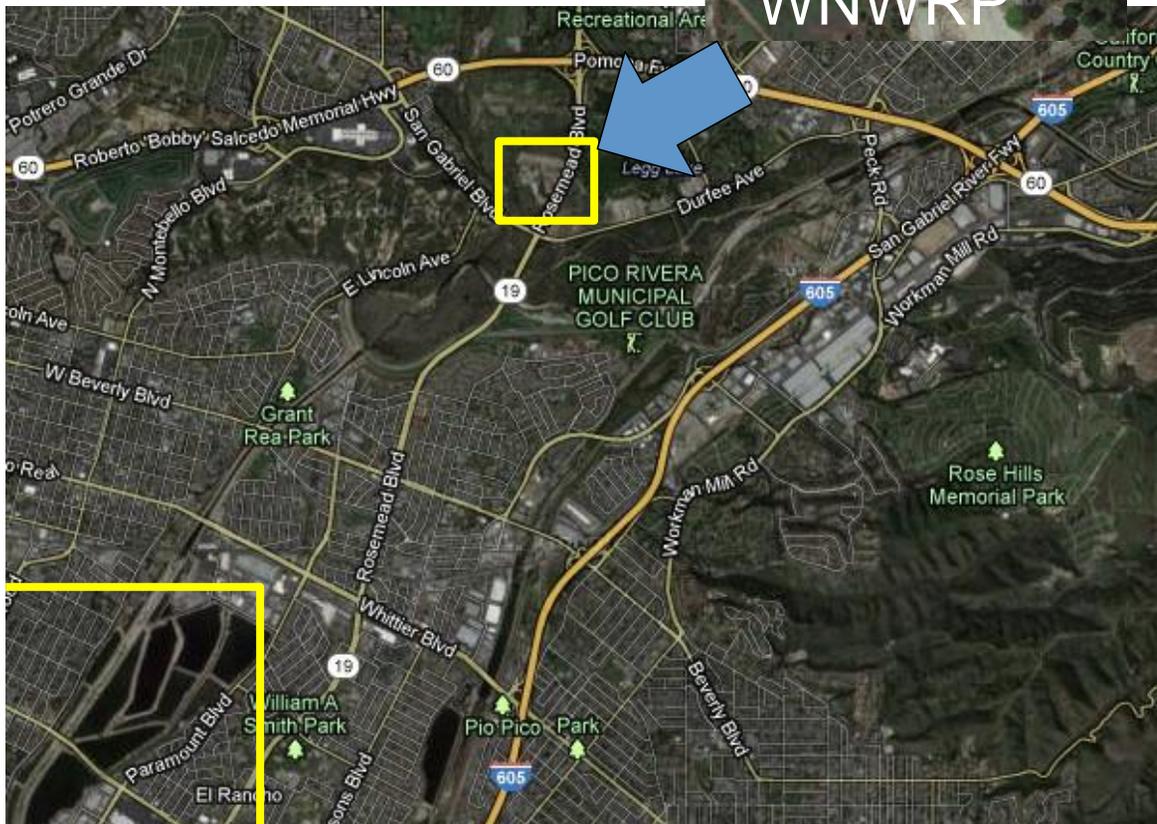


# Montebello

## Forebay

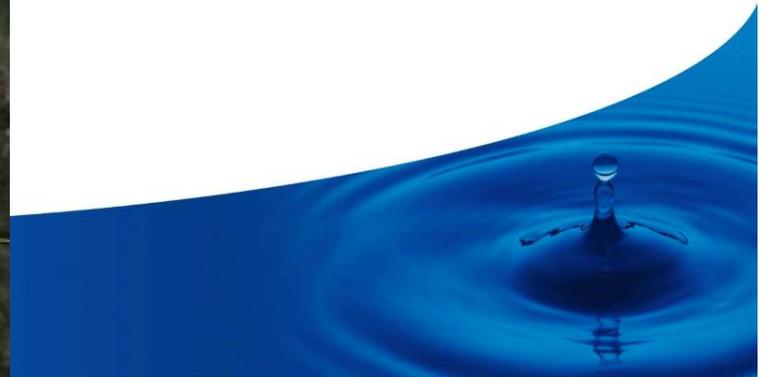
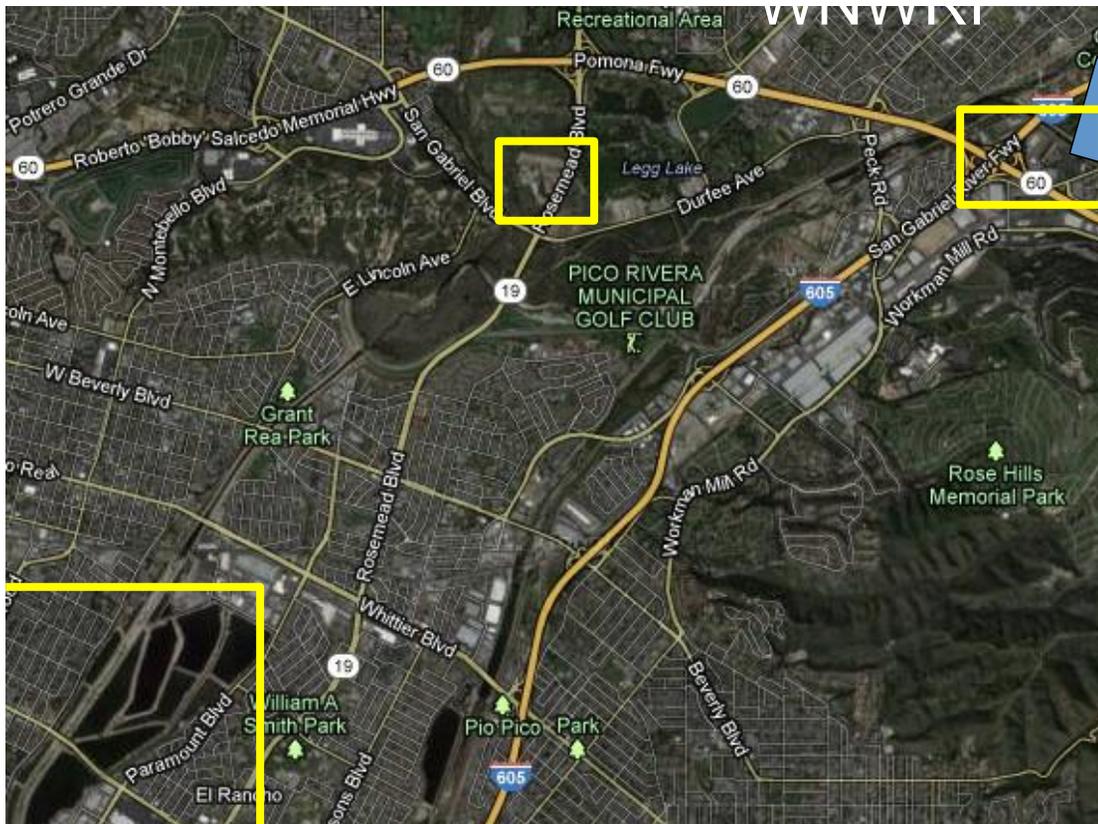


WNWRP



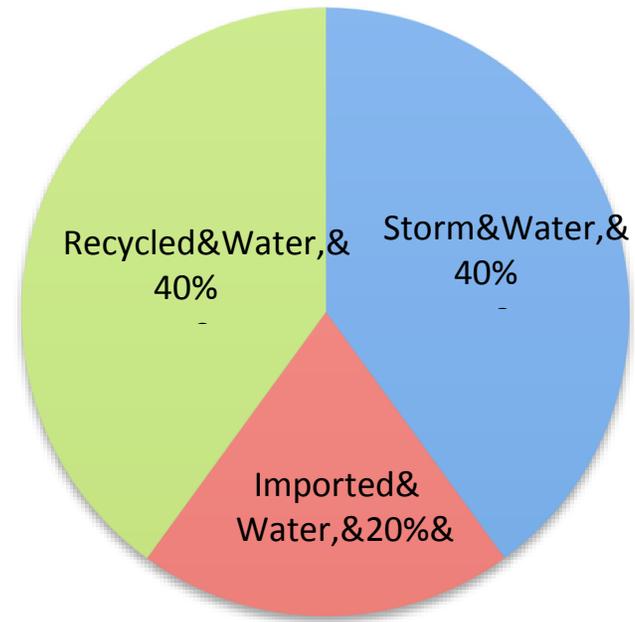
# Montebello

## Forebay



# Montebello Forebay

- Operating since 1962
- Surface spreading
  - 560 acres
  - ~44 MGD
- Extensive testing
  - Epidemiology
  - Trace organics
- Expansion now underway



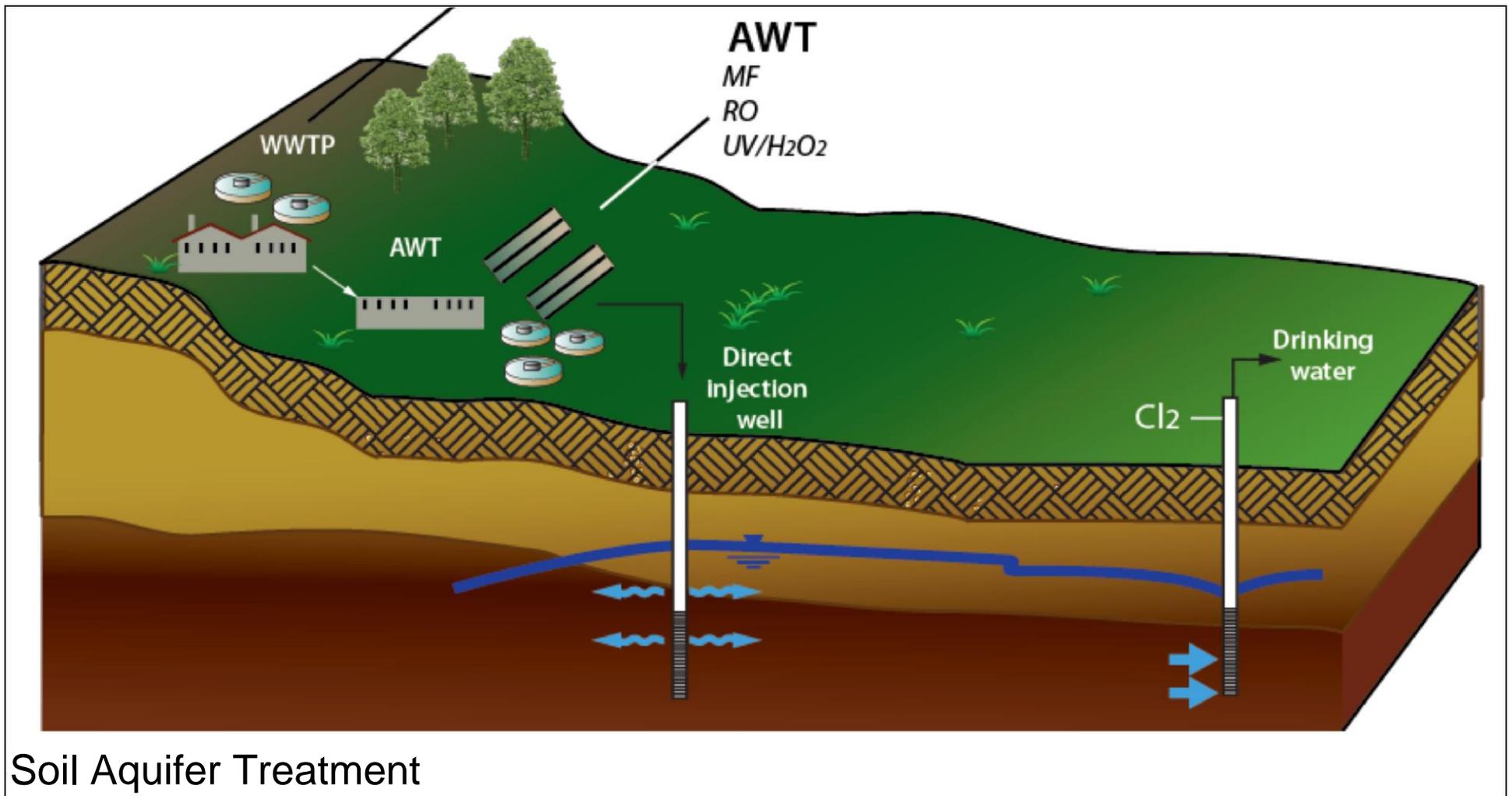


# GROUNDWATER REPLENISHMENT SYSTEM

Ground Water Replenishment  
System

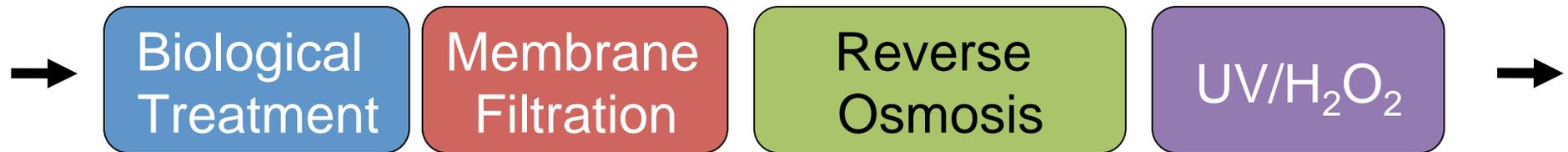
Orange Co., CA

# Groundwater Recharge: Subsurface Injection



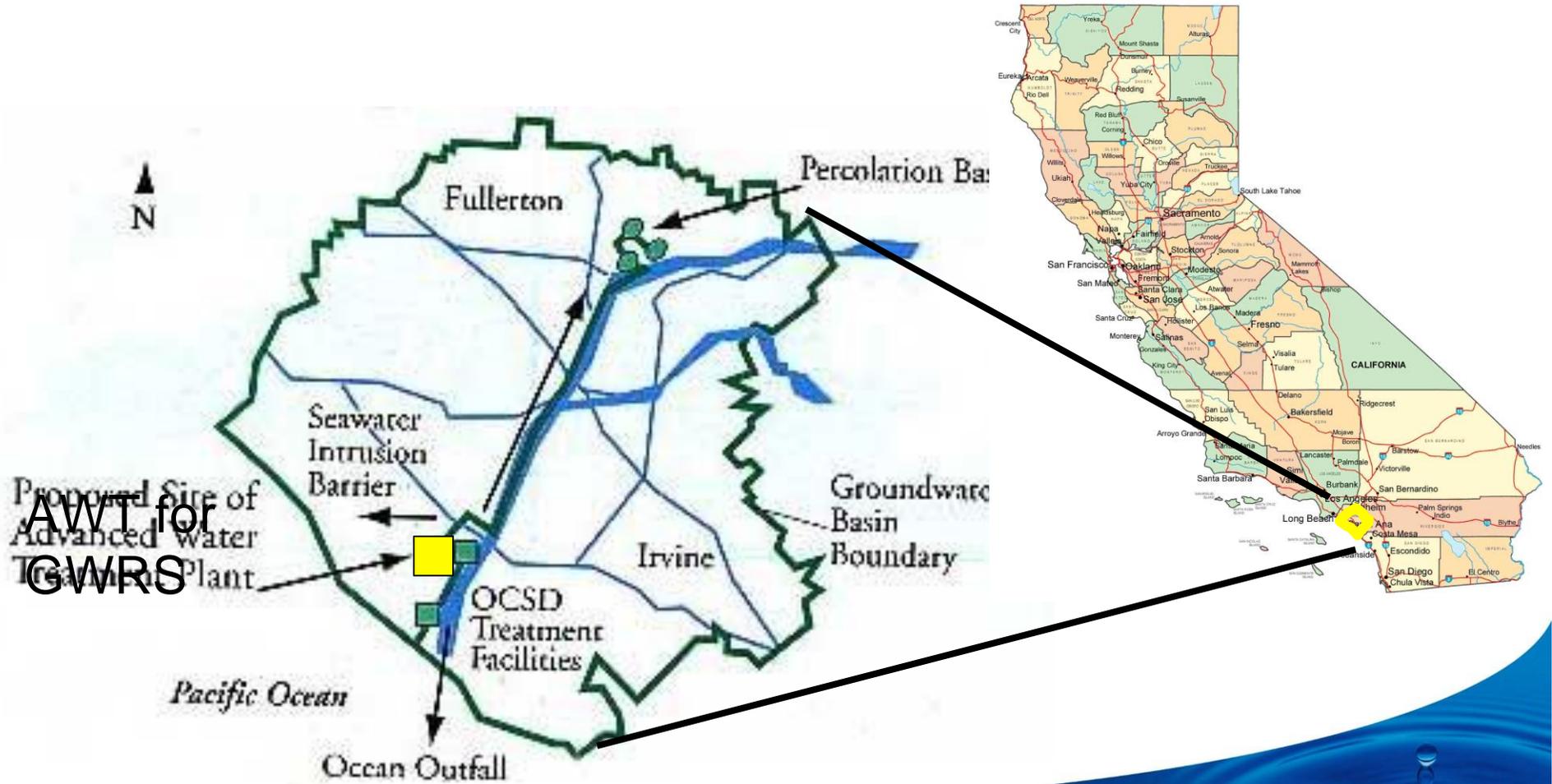
# Orange County GWRS

- Advanced process train

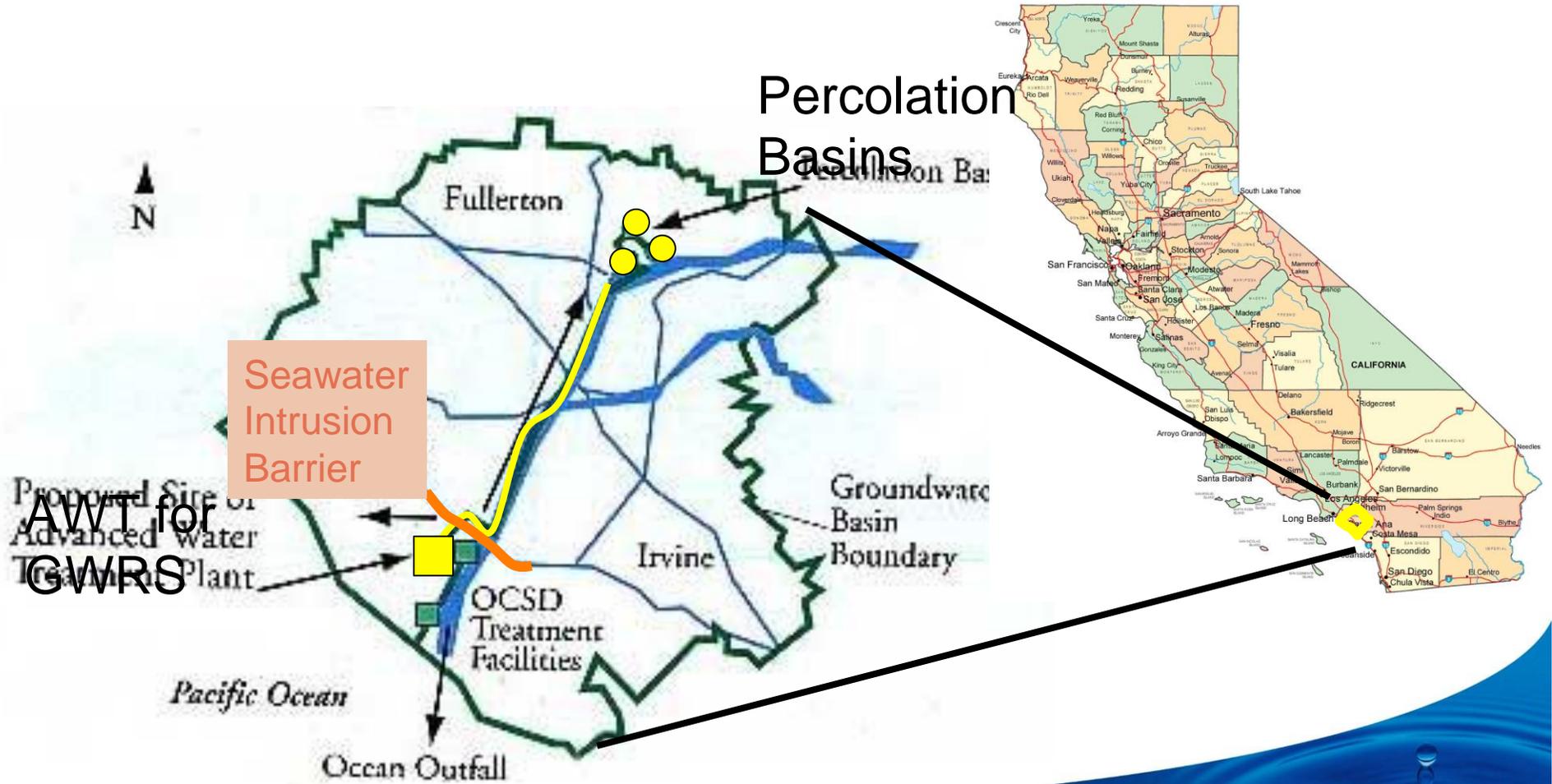


- Removes all pathogens
- Removes all organics ( $\text{TOC}_{\text{avg}} \sim 0.1 \text{ mg/L}$ )

# GWRS



# GWRS



Percolation Basins

Seawater Intrusion Barrier

Proposed Site of Advanced Water Treatment Plant

AWT for GWRS

Fullerton

Irvine

Groundwater Basin Boundary

Pacific Ocean

Ocean Outfall

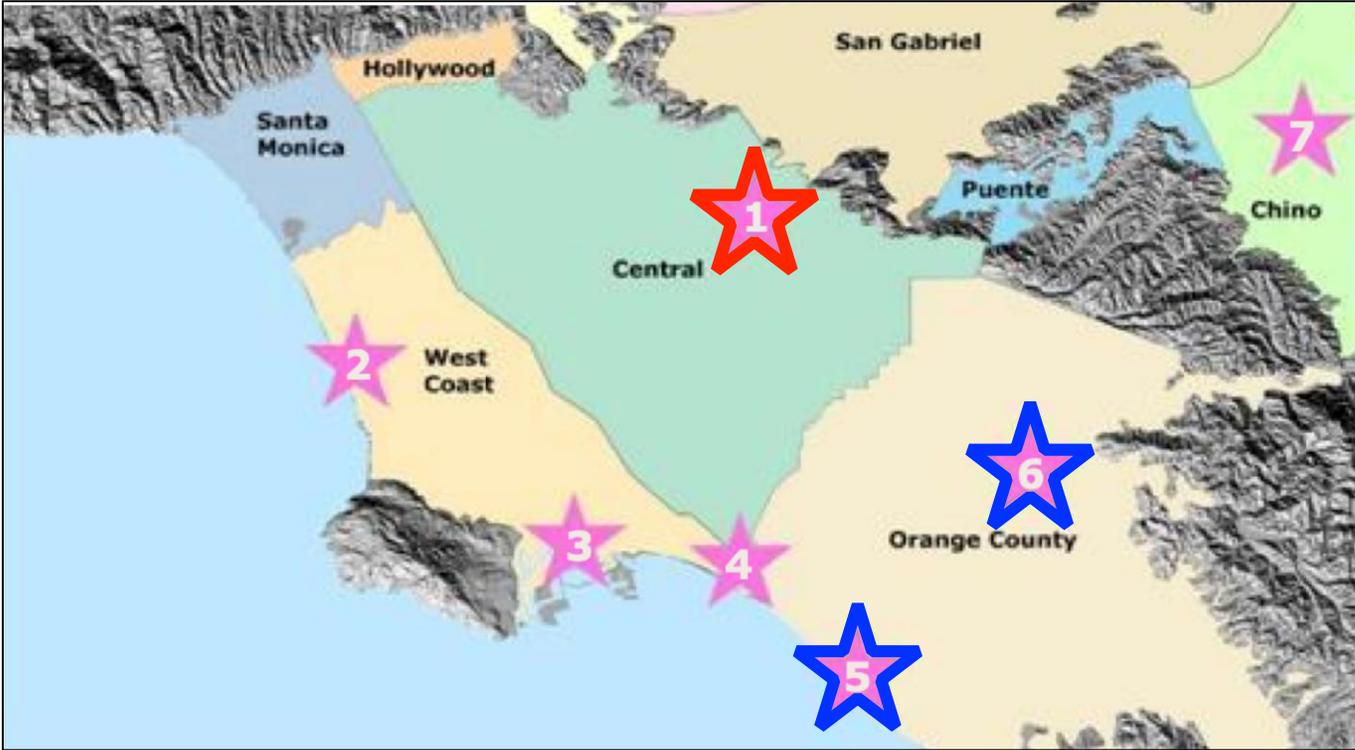
OCSD Treatment Facilities



# Orange County GWRS

- Preceded by Water Factory 21 (1978-2005)
- GWRS started operations in 2008
- Presently 70 mgd; undergoing a 30 mgd expansion
- Two recharge projects: direct injection and surface spreading

# Other Groundwater Recharge Projects



# Other Groundwater Recharge Projects



Chino Basin



# Other Groundwater Recharge Projects



# California IPR Overview

Facility	Technology	Production (MGD)	Production (AF/year)
Montebello Forebay	Spreading	44.6	50,000
Groundwater Replenishment System	Spreading / Injection	100	112,000
West Coast Basin Barrier	Injection	22.6	25,315
Chino Basin	Spreading	18.7	21,000
Alamitos Barrier	Injection	8	8,970
Dominguez Gap Barrier	Injection	5	5,600
<b>Totals</b>		<b>~200</b>	<b>~220,000</b>



# California IPR: Lessons Learned

- Successful history of IPR for over 50 years •
- Multiple treatments and reuse strategies for public health protection
  - Advanced treatment with injection
  - Tertiary treatment with soil aquifer treatment



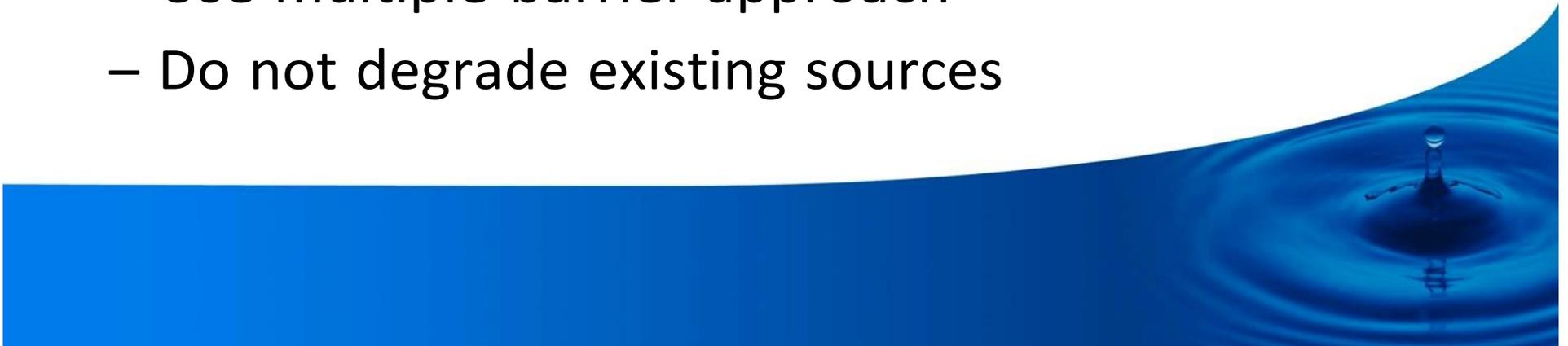
- Offsets more than 200 MGD
- Potential to provide up to 25% of drinking water needs in Southern California

# REGULATORY PERSPECTIVE



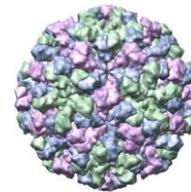
# Groundwater Recharge

- Regulatory efforts began in 1986
- Principles
  - Make good water source
  - Achieve low level of risk
  - Focus on pathogens (acute contaminants)
  - Use multiple-barrier approach
  - Do not degrade existing sources



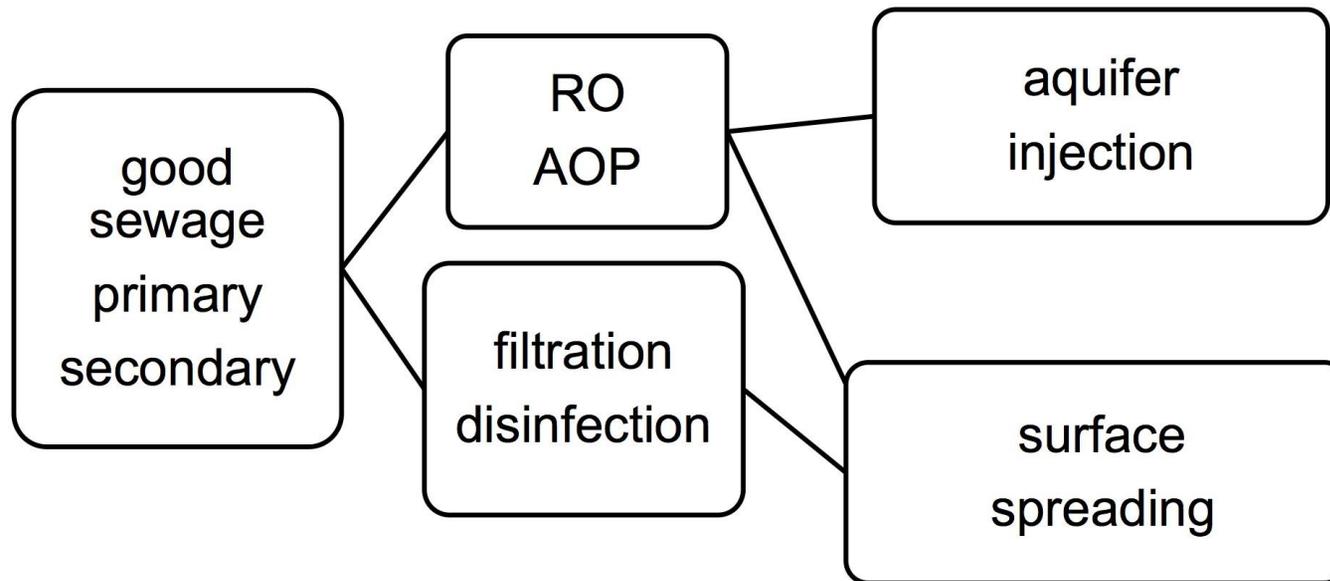
# Groundwater Recharge

- By 1994, multiple options: spreading & injection
- Pathogen control
  - 12-log virus
  - 10-log *Cryptosporidium* and *Giardia*
- Chemical control
  - TOC as surrogate for CECs, unregulated chemicals
  - Recharge volumes limited by organics removal
- Requires time to detect and respond to failures



# Groundwater Recharge

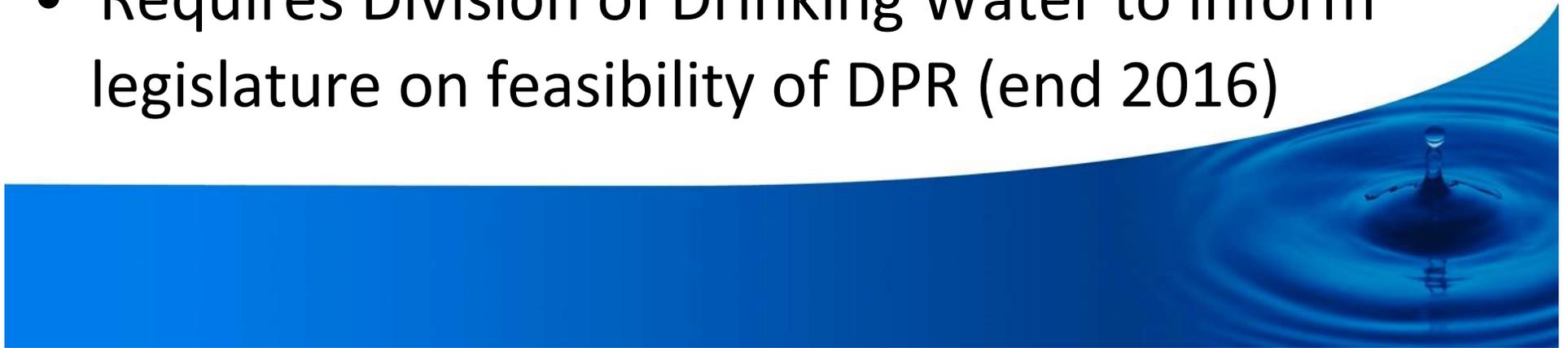
- Regulations finalized in June 2013
- Permitted schemes



# Future Potable Reuse Regulations

- Senate Bill 918 important driver for additional regulations
- Set deadlines for potable reuse criteria
  - Groundwater recharge: end of 2013
  - Reservoir augmentation: end of 2016

- Requires Division of Drinking Water to inform legislature on feasibility of DPR (end 2016)



# DIRECT POTABLE REUSE





# DPR Drivers

- High reliability
- Less expensive
- Lower energy & greenhouse gas production
- Water supplies decreasing/demand increasing
- Environmental buffers not available in all locations
- Technologically feasible



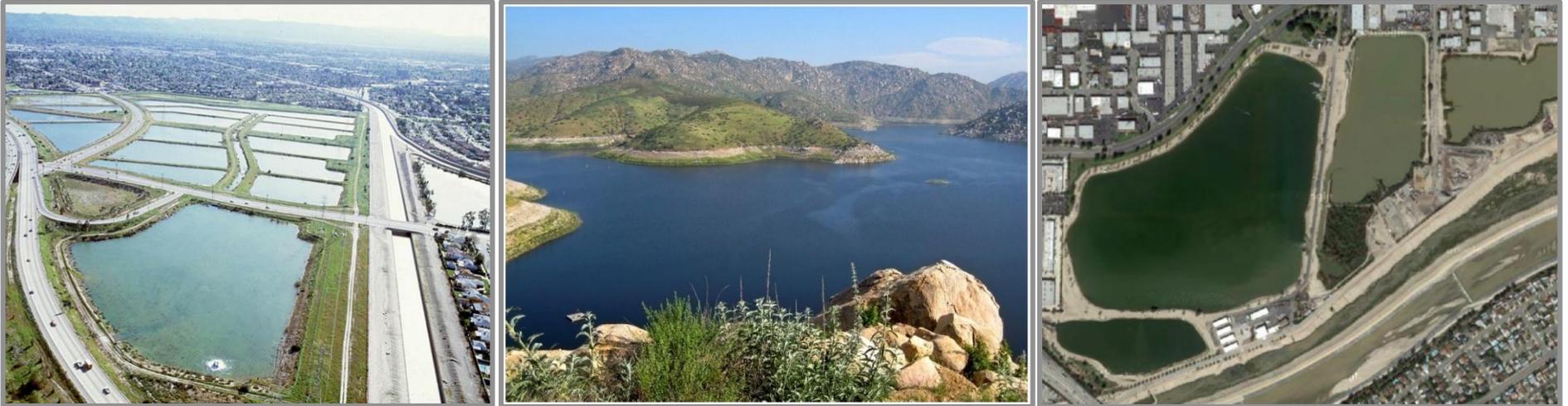
# Role of environmental buffer in IPR



- Contaminant removal
- Dilution / blending
- Storage capacity
- Time to detect & respond to failures



# Role of environmental buffer in IPR



- Contaminant removal
- Dilution / blending
- Storage capacity
- Time to detect & respond to failures

*How do maintain these protections without an environmental buffer?*

*What are the key issues?*



# DPR Research and Next Steps

- DPR Expert Panel
  - Evaluate research, state of science
  - Provide technical guidance for CA regulators
- California DPR Initiative
  - WateReuse: \$6M effort to develop data for DDW
- Key WRRF research studies:
  - 11-02: public health criteria/treatment evaluation
  - Others: enhanced monitoring, engineered storage buffers, communication plans



# DPR of Reliable Potable Reuse

- City of San Diego



- Treatment
  - Redundancy
  - Robustness
- Monitoring



# Conclusions

- Potable reuse can be done safely
- Multiple solutions should be sought
  - Non-potable reuse
  - Indirect potable reuse
  - Direct potable reuse
- Need to ensure public health protection
- Public acceptance is critical



# Acknowledgements

- Rhodes Trussell
- Shane Trussell



*End*