

A dynamic splash of water against a blue gradient background, with many droplets suspended in the air.

# *Optimizing Reuse to Head Off Climate Change*

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# Presentation Topics

1

Supply vs  
Demand

2

Climate  
Change  
Impacts

3

Adaptation  
Strategies

4

Water  
Reuse  
Alternatives

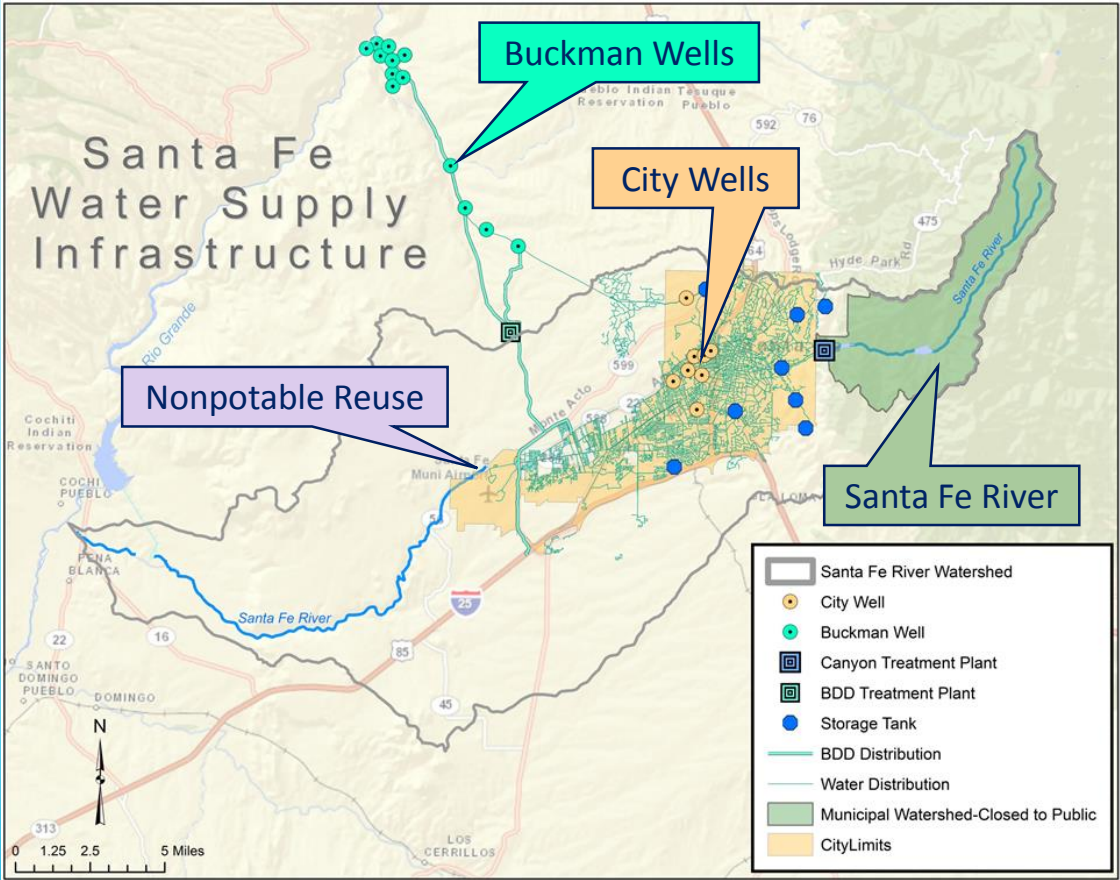
5

Water  
Reuse  
Challenges

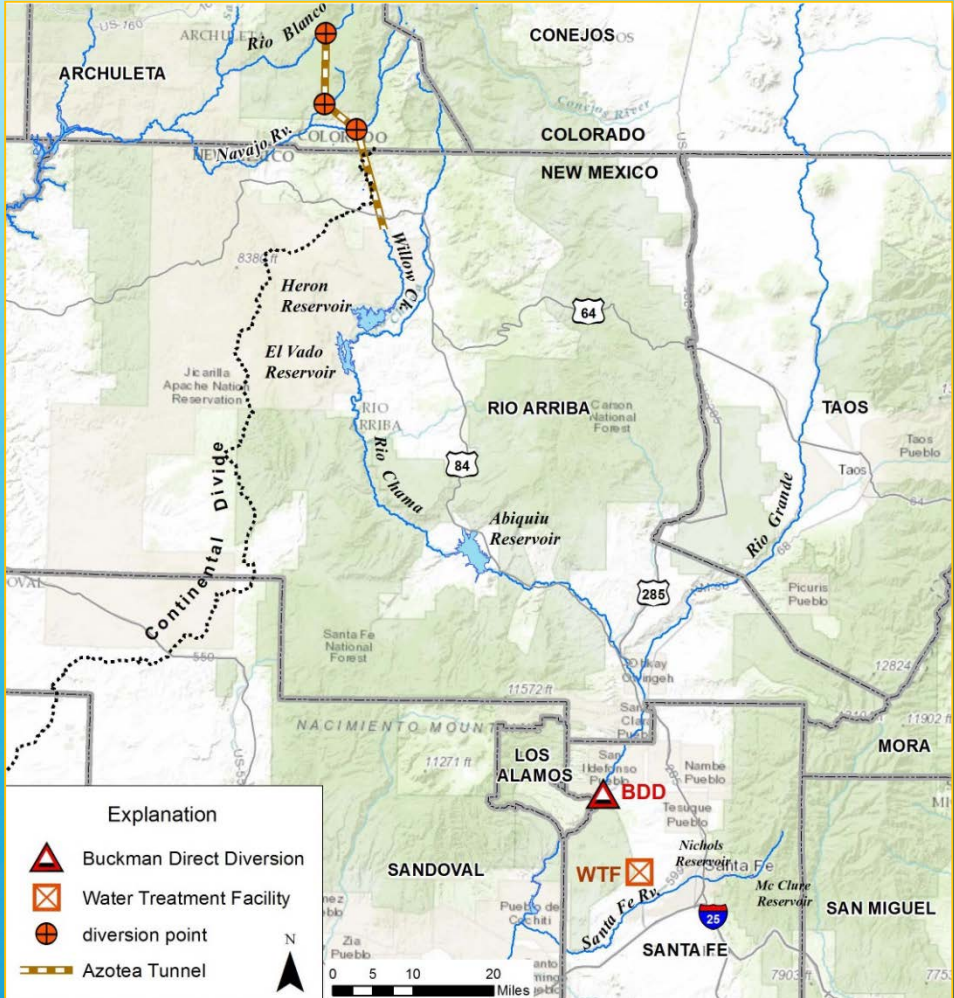




# Santa Fe Water Supply



Local Surface Water, Groundwater, and Water Reuse



Interbasin Transfer San Juan Chama Project





# Surface Water Sources: Renewable Supply



**Santa Fe Watershed: 5,040 AFY**  
(maximum water rights)



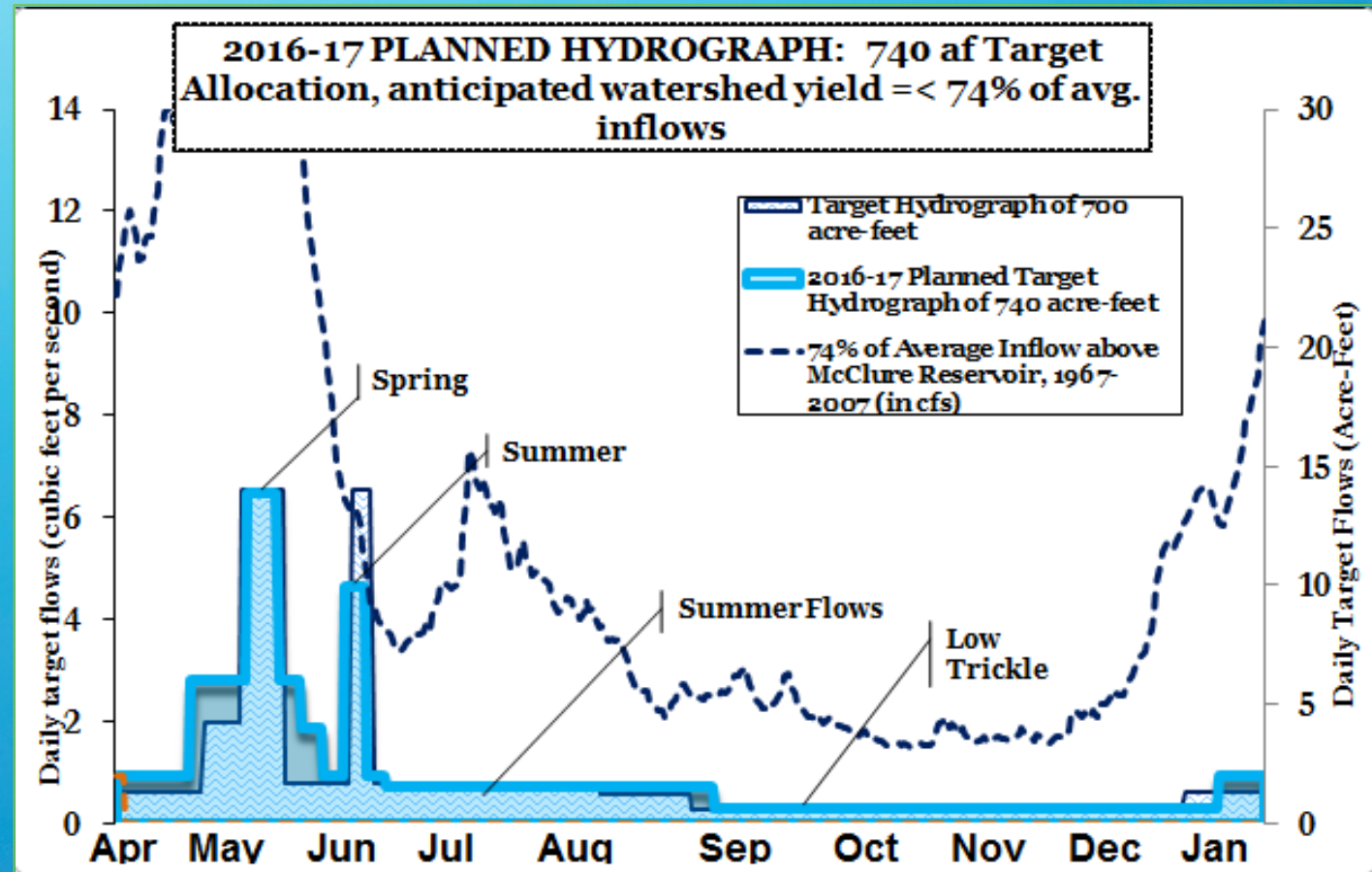
**Buckman Direct Diversion: 5,230 AFY**  
(maximum water rights)





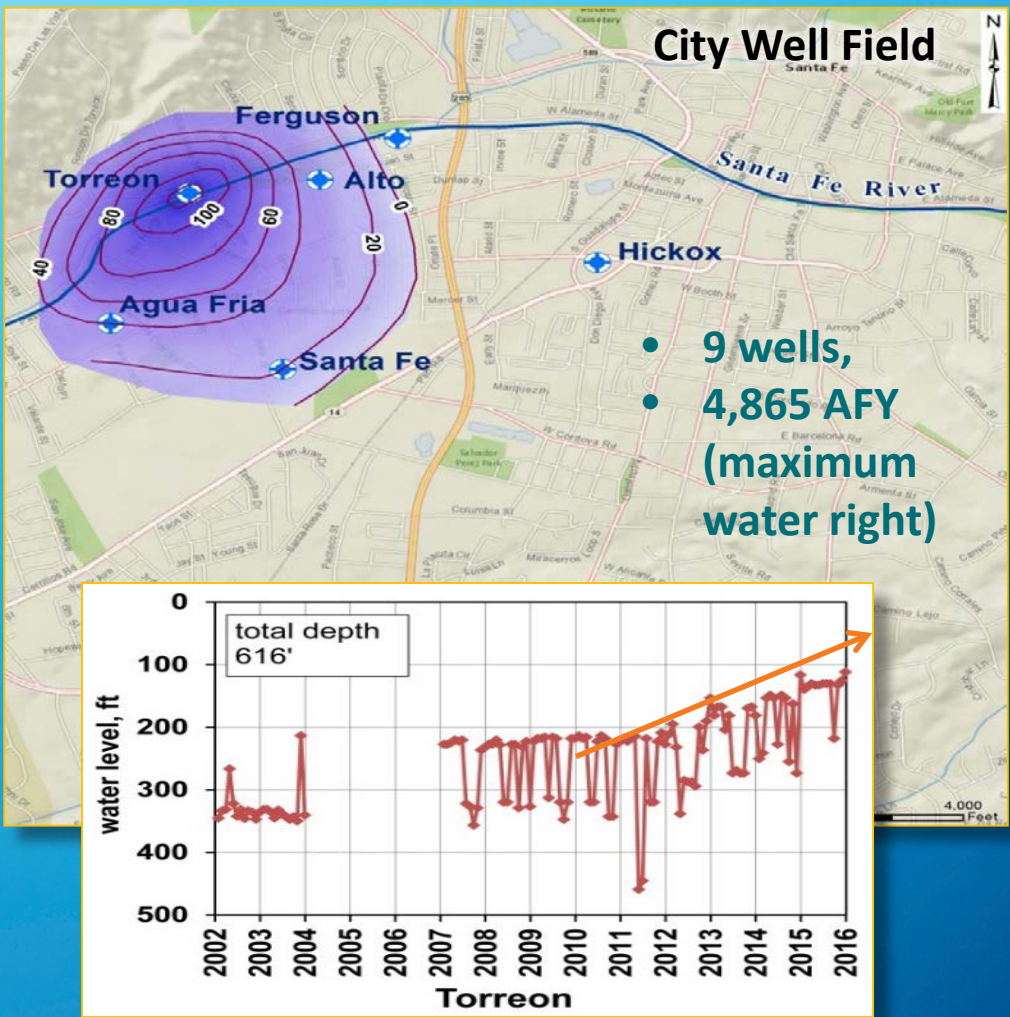
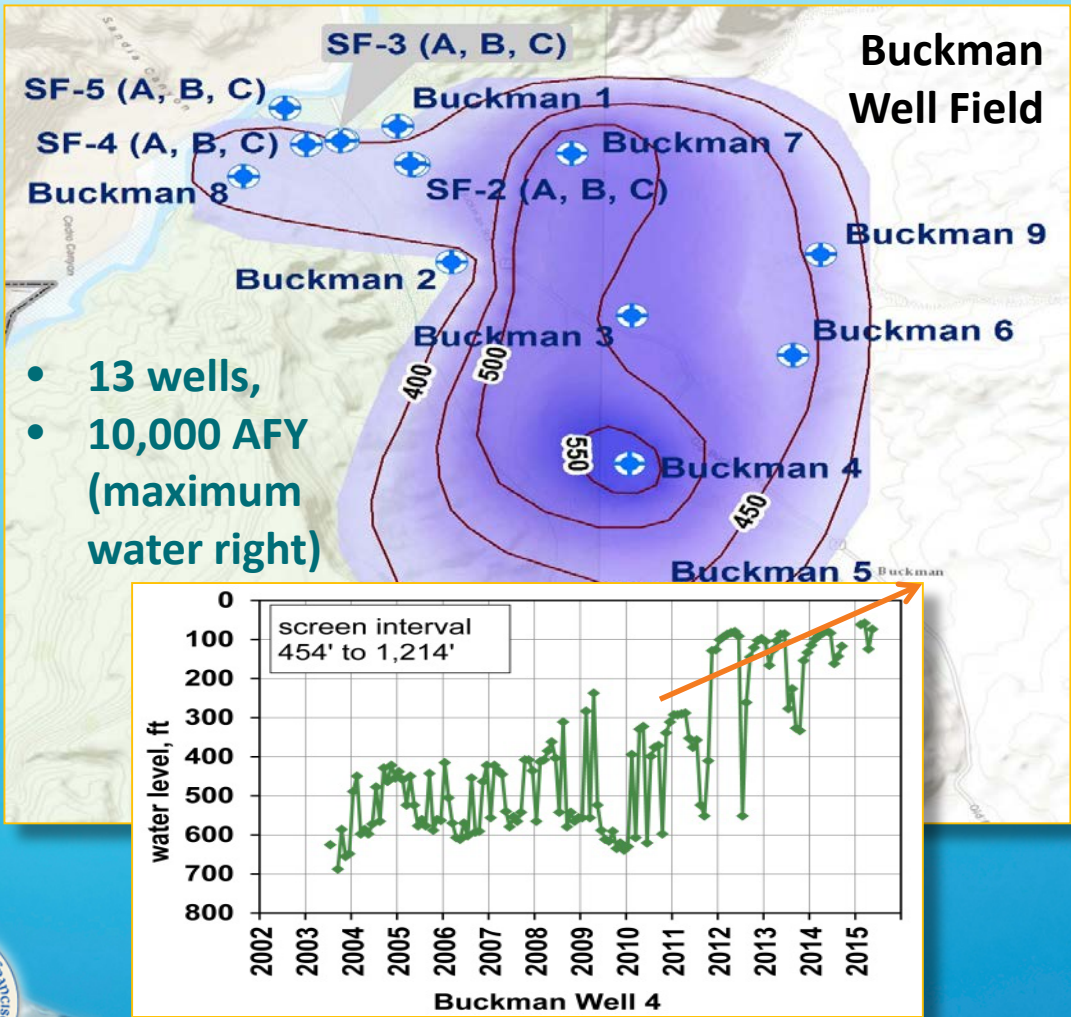
# Santa Fe: Living River

- Re-establish Link between City and River
- Environmental and societal benefit
- Improved aquifer recharge
- By Pass flow up to 1,000 AFY



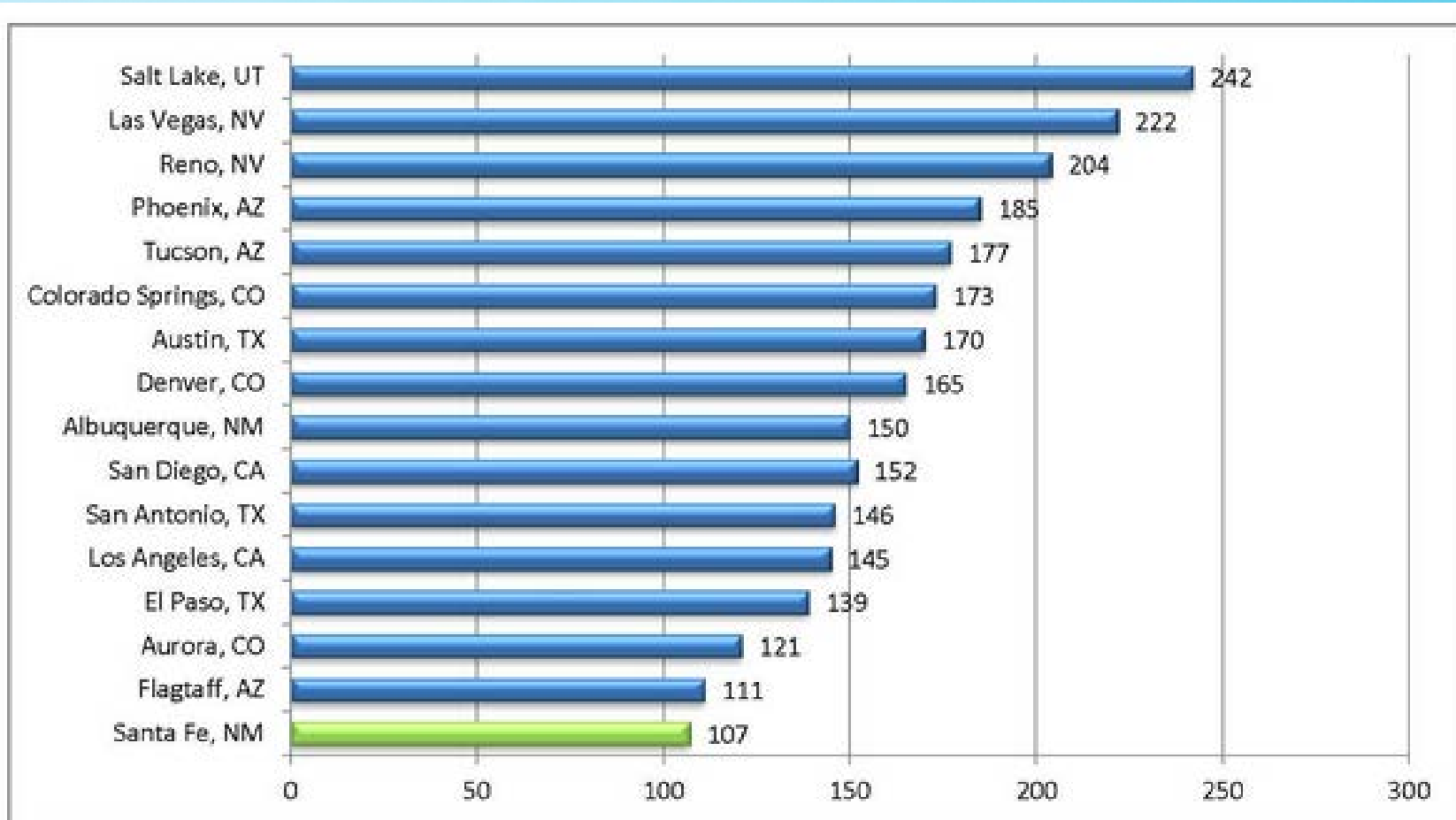


# Groundwater Supply: Drought Reserve Sources





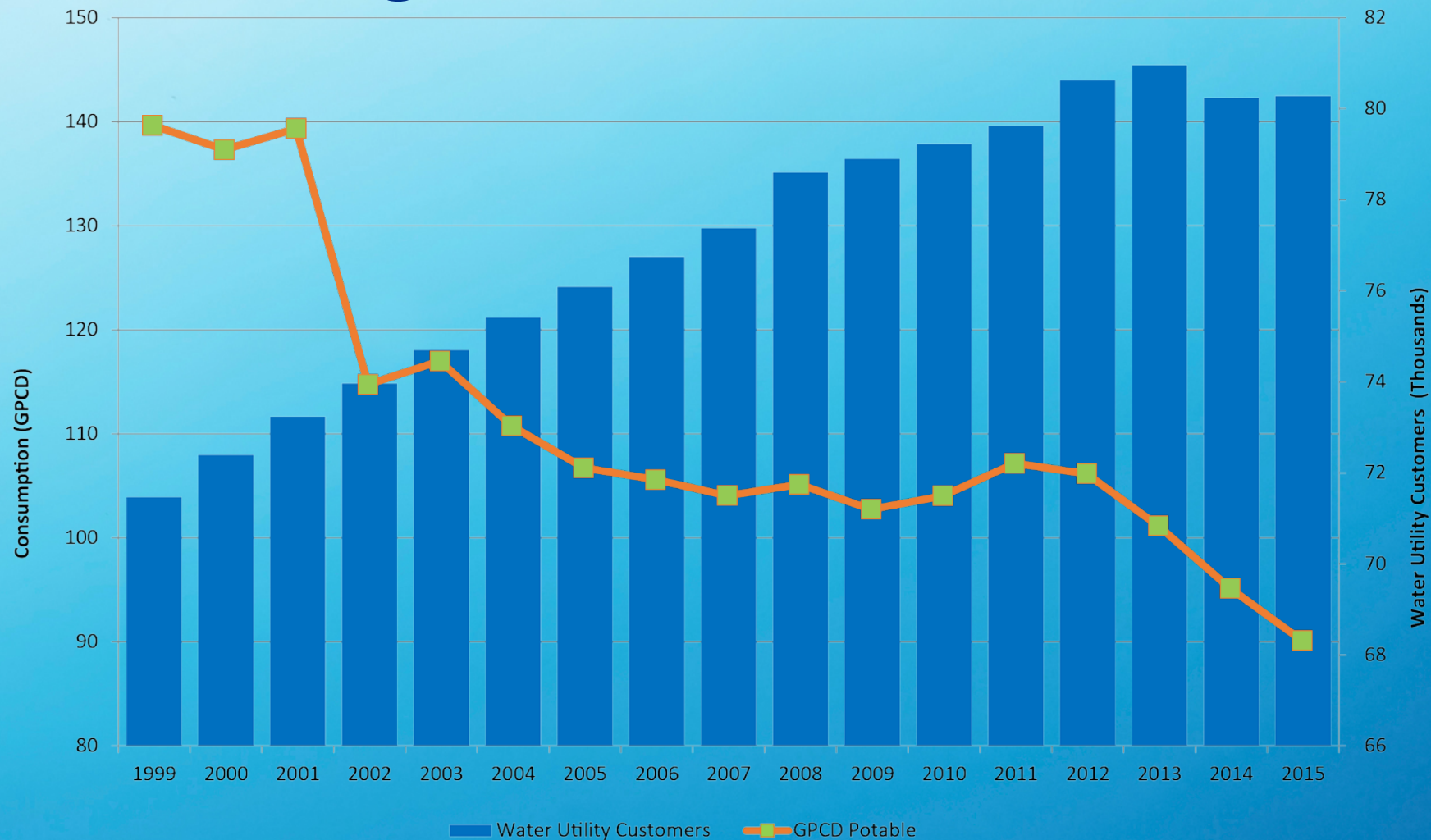
# Conservation: Driving Down Demand



*Gallons of Water Used Per Person Per Day (GPCD) for Select Western Cities*

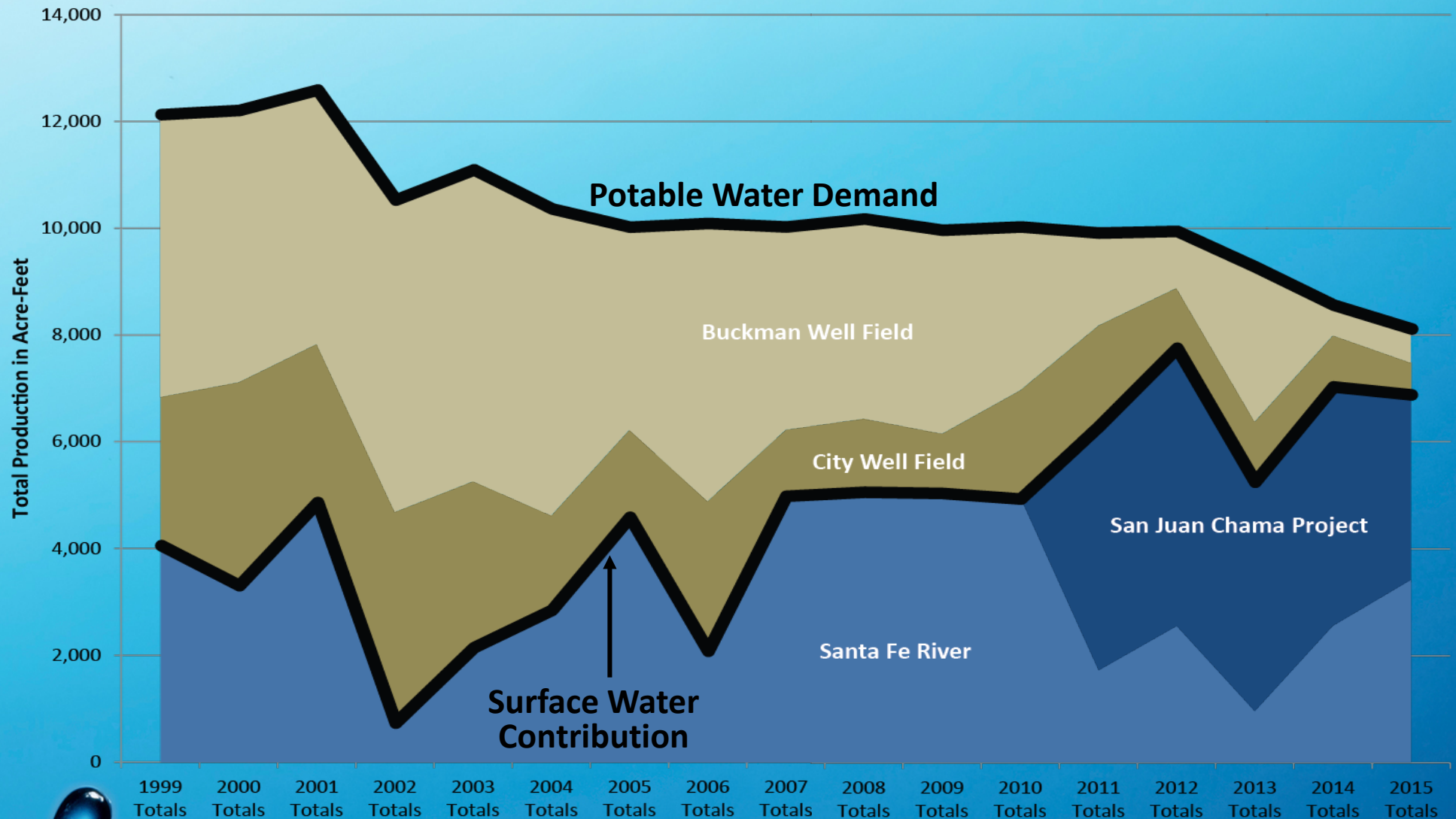


# Conservation Program





# Demands are Down, Sustainable Use is Up





# Basin Study: Santa Fe City/County Climate Change Impacts 2055

**RECLAMATION**  
*Managing Water in the West*

## Santa Fe Basin Study

Adaptations to Projected Changes in  
Water Supply and Demand

Santa Fe Basin, New Mexico



U.S. Department of the Interior  
Bureau of Reclamation  
Upper Colorado Region  
Albuquerque Area Office



City of Santa Fe  
Water Division  
Water Resources and  
Conservation Section



Santa Fe County  
Utilities Division

August 2015

Climate  
Models

Hotter/Drier  
Climate

River Flows  
**25%**

Demand  
and ET

**Projected water supply shortfalls**

**Losing our gains from conservation  
and sustainable groundwater use**



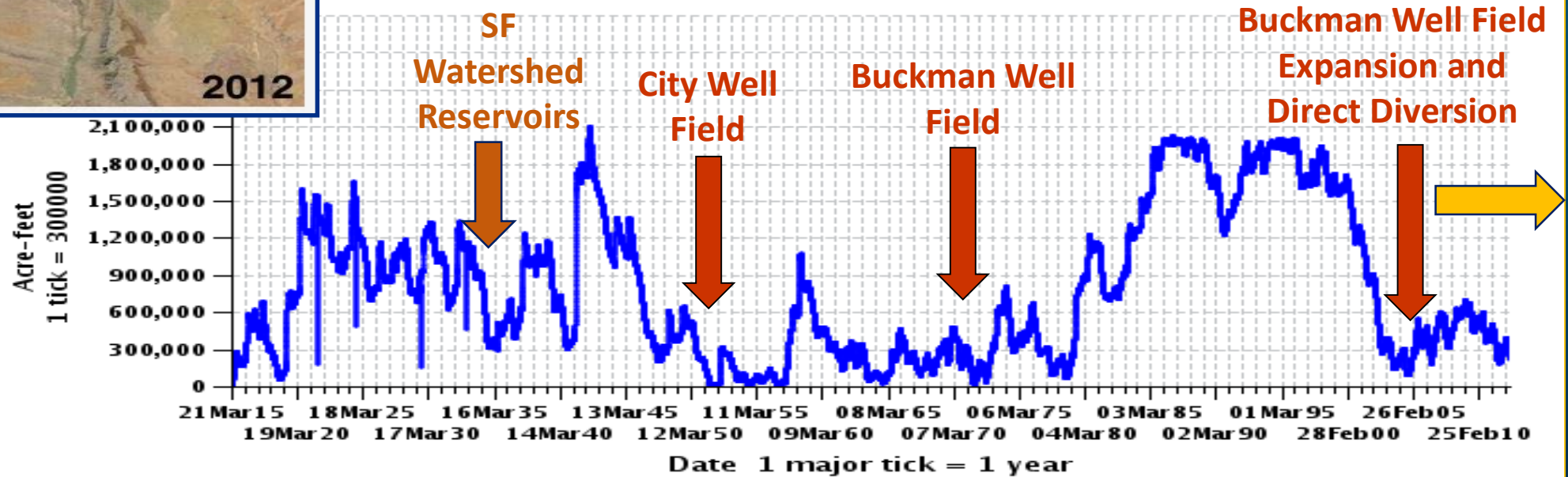


# 100 Year Climate Variability along Rio Grande

Elephant Butte & Caballo Lake

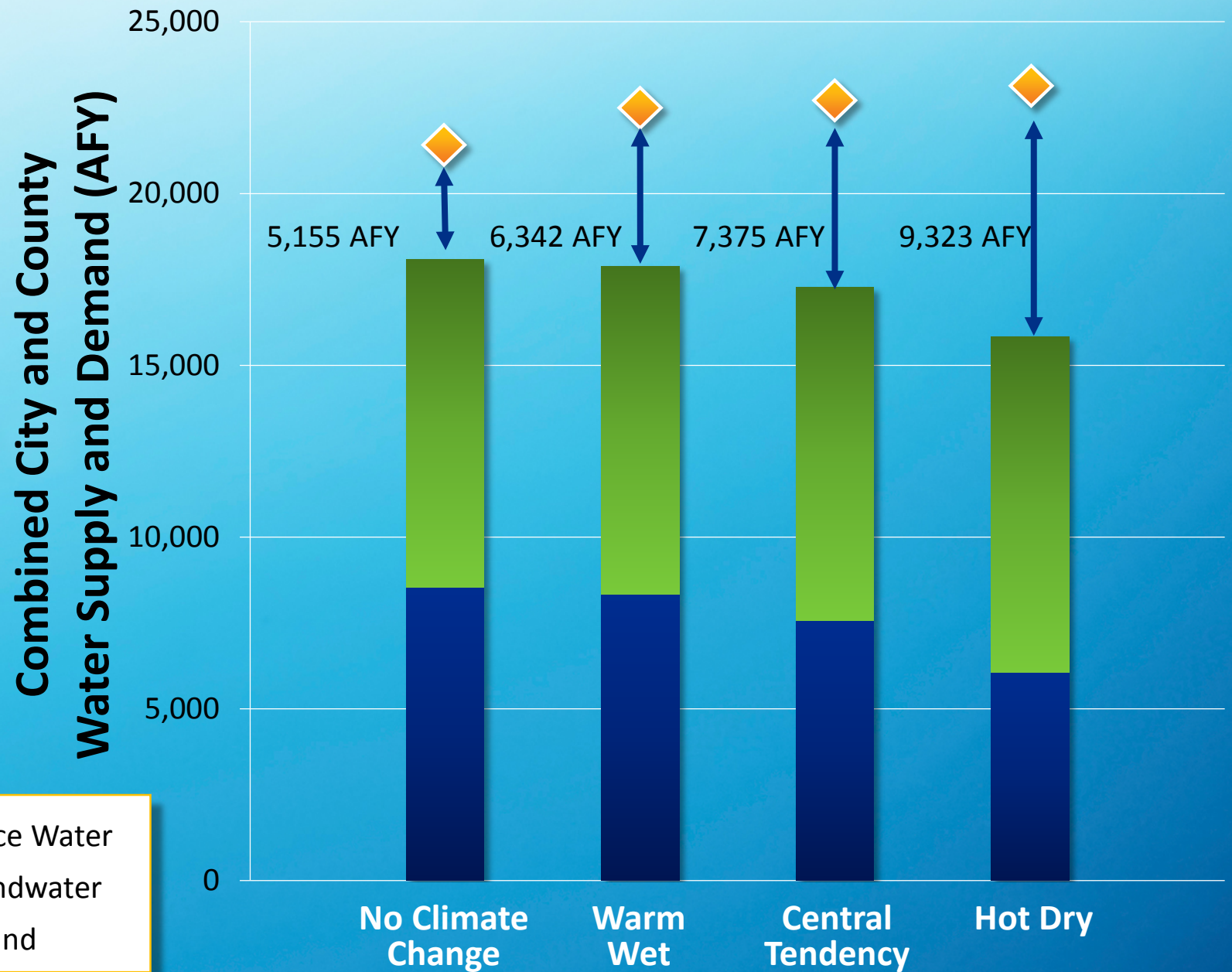


“Remember- Hydro-illogical?”





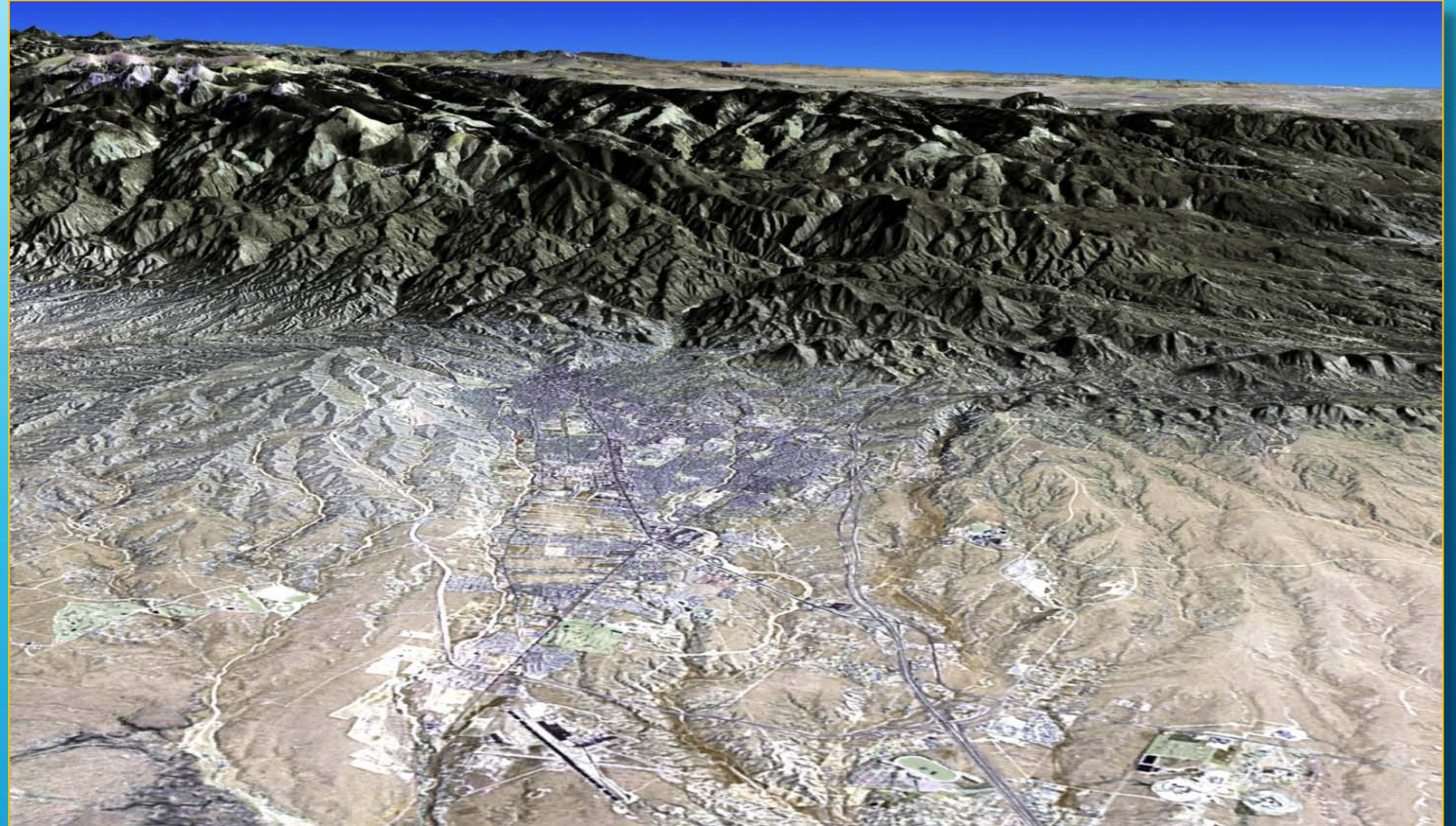
# Basin Study: City/County Water Supply Gap 2055





# Adaptation Strategies to Offset Climate Change

- More Conservation
- Stormwater Management /
- Purchase Surface Water Rights
- Expanded Water Reuse
  - DPR/IPR





# Testing Adaptation Strategy “Portfolios” using WaterMAPS Decision Model

## ADAPTATION STRATEGIES

Preliminary Assessment

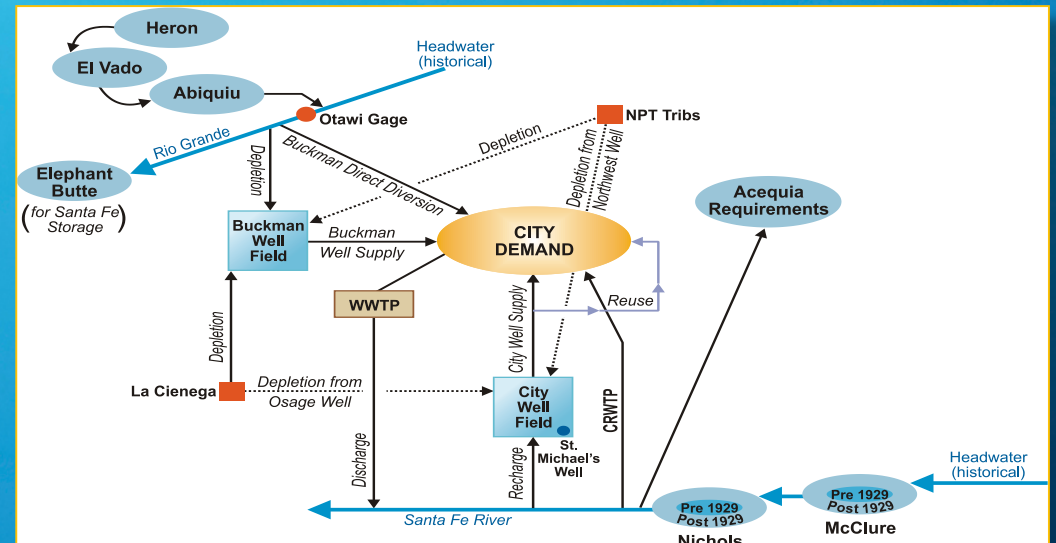
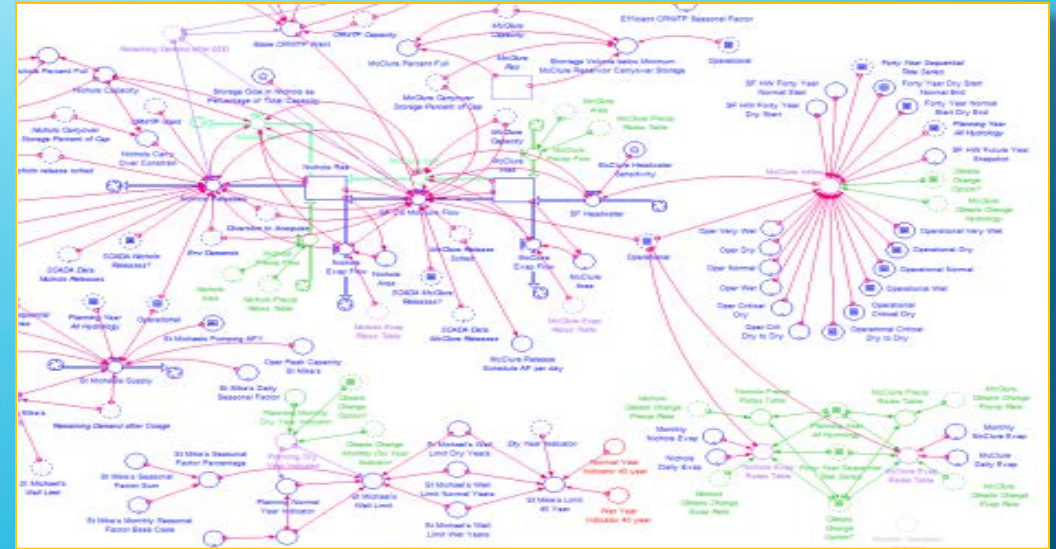
## RELIABILITY SCREENING

System Constraints

Fill Supply Gaps  
Sustainable Groundwater Pumping  
Annual Deficit less than 2000 AF  
90% of years, deficits are less than 100 AFY

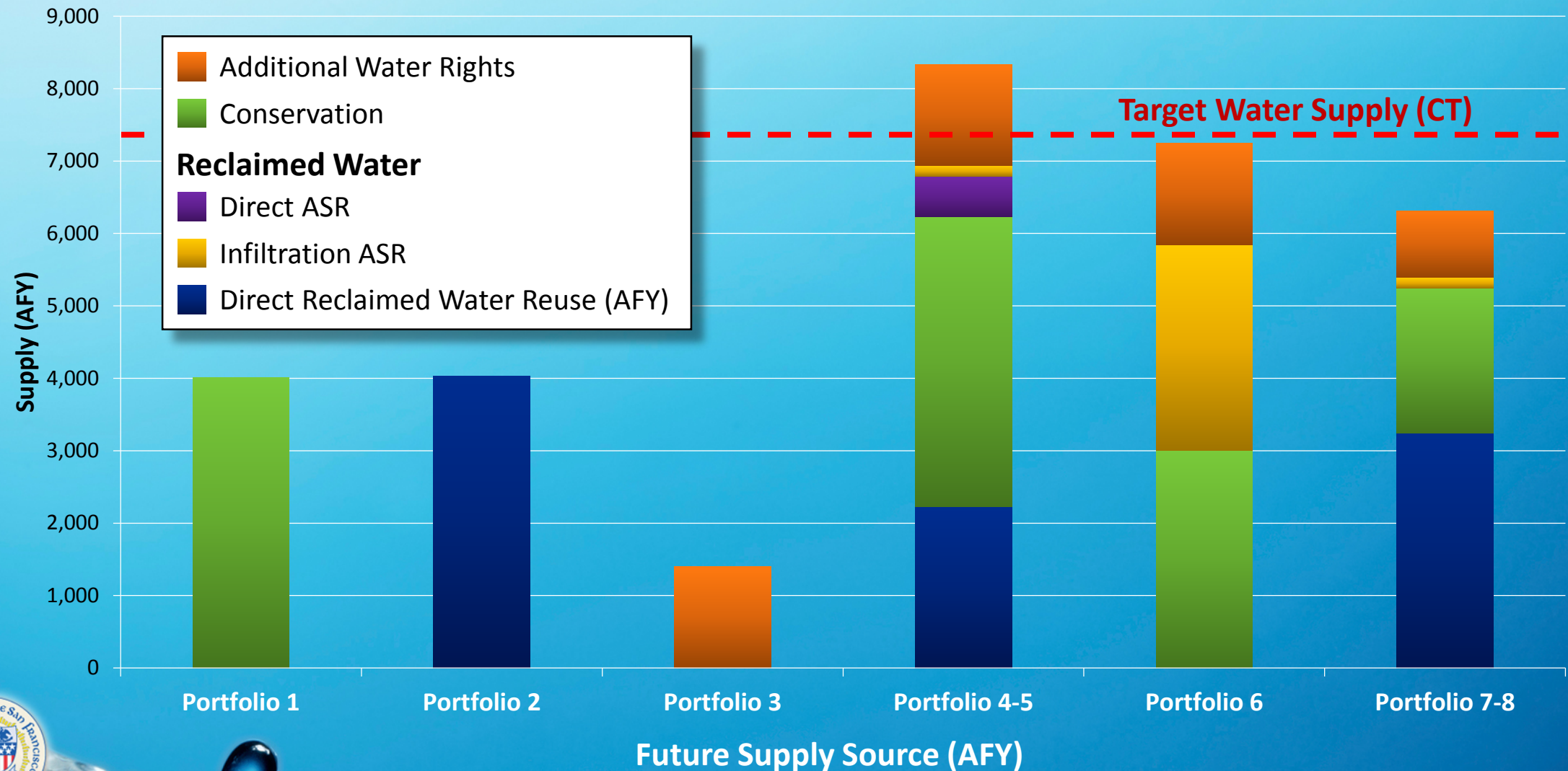
## PERFORMANCE SCREENING

Weighted Criteria and Scoring





# Adaptation Portfolios: No Silver Bullet





# Expanding Water Reuse is a Key Element of Addressing Santa Fe's Climate Change Gap



## **Title XVI** **Water Reclamation & Reuse**



## **Santa Fe** **Water Reuse** **Feasibility Study** **2015-2016**





# FS Reuse Alternatives Limit Diversions to 3 MGD

Always satisfies  
discharge goals for  
Lower SF River  
*Environmental  
Pumping Offsets*



Avoids peaking off  
potable reuse, and  
associated  
infrastructure  
sizing/costing  
capital



Avoids having more  
than ~50% of winter  
supply from potable  
reuse source

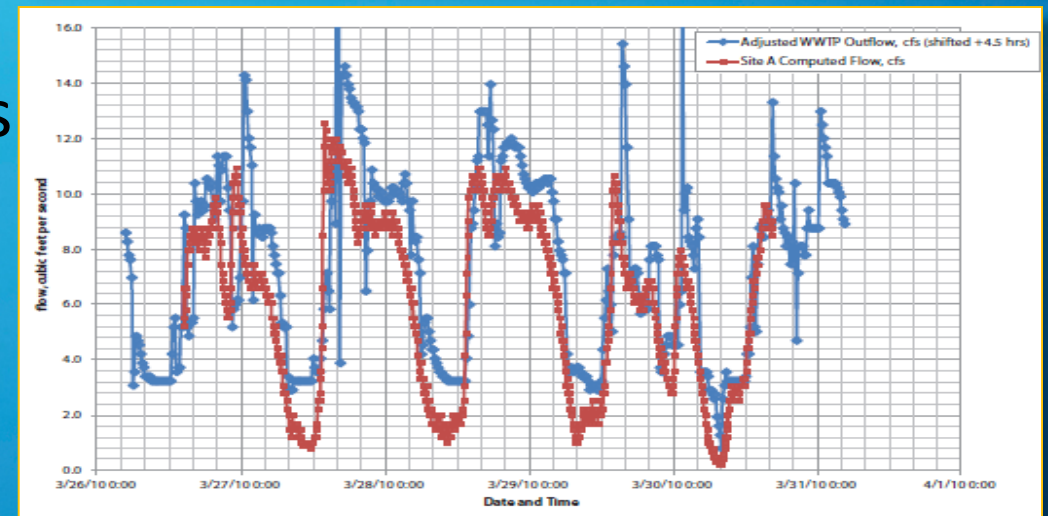
Not all available effluent is used





# Lower Santa Fe River Below Wastewater Plant

- Effluent is primary source of surface water
- Ag-Rural, culturally rich
- Environmental restoration underway
- Over-allocated
- WWTP keeping hydrologic system whole
- City NOT intending to divert all WWTP flows

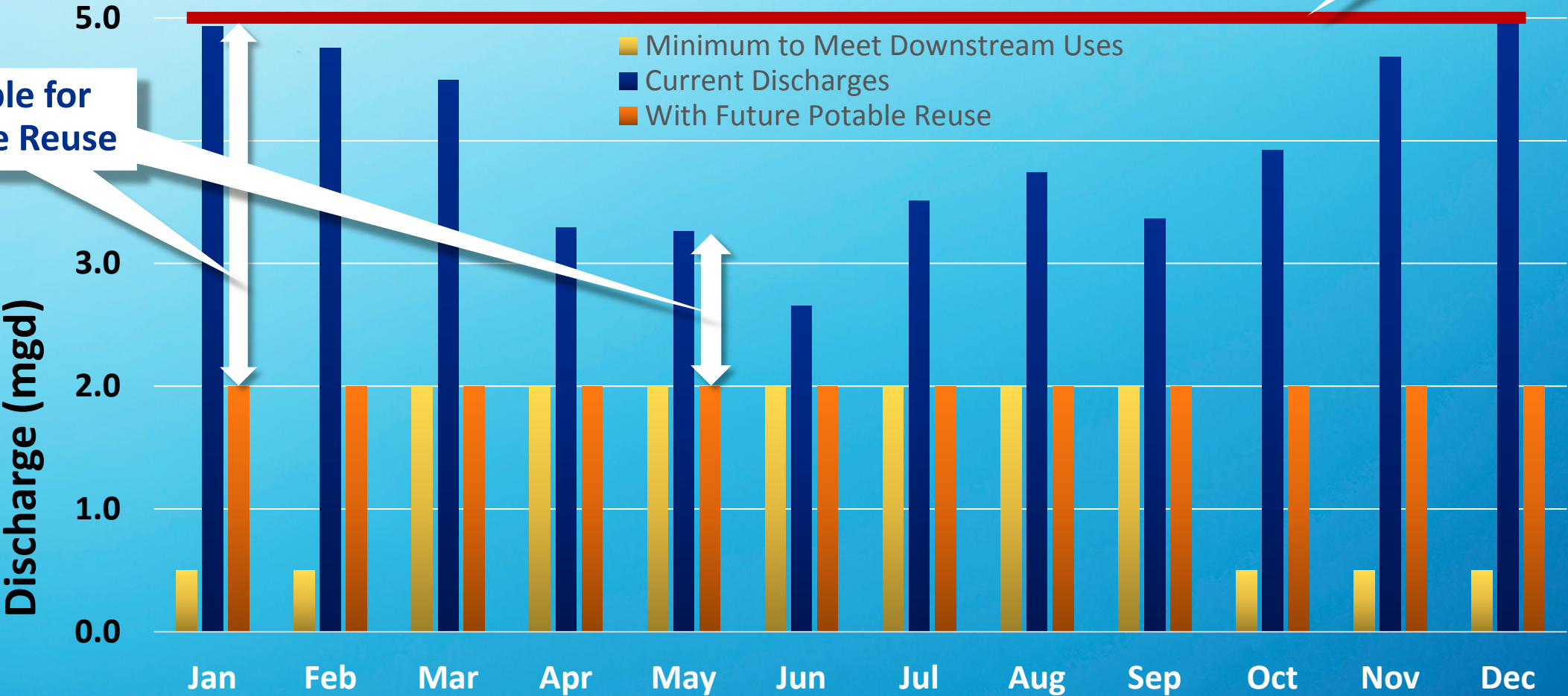




# Water Reuse Potential

Available for  
Potable Reuse

5 mgd Total  
Plant Flow





# Water Reuse: 7 Feasibility Study Alternatives



Expand  
Non-  
Potable  
Reuse

Conveyance



Return Flow  
Credits /  
Exchange

Conveyance



Indirect or  
Direct  
Potable  
Reuse

Conveyance

Advanced Water  
Purification  
Facility

- Recharge Upper Santa Fe River & Aquifer / Living River
- Recharge Lower Santa Fe River & Aquifer
- Buckman Wells ASR
- Augment Nichols Reservoir
- Direct Potable Reuse

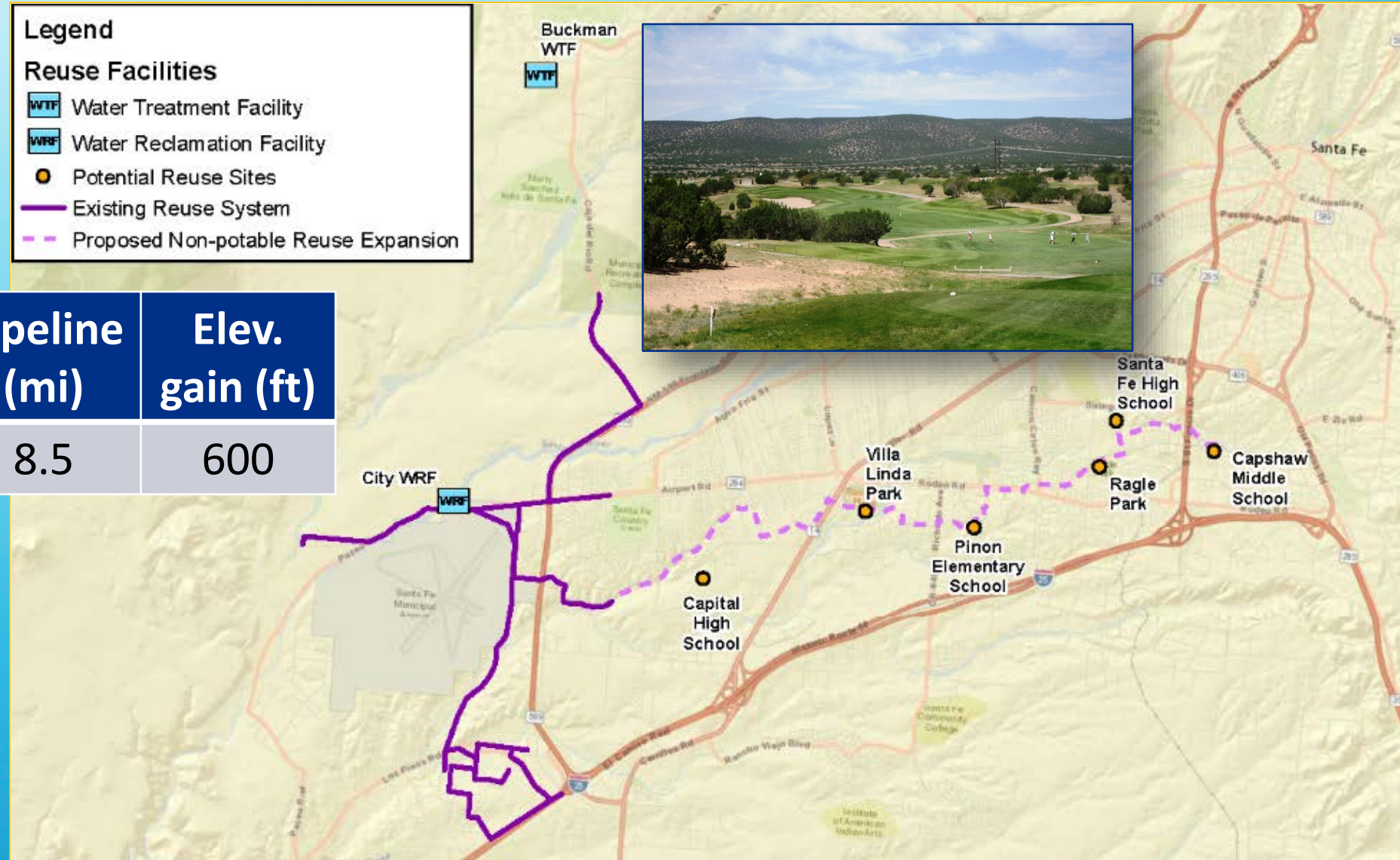




# FS Alternative 1 Expand Non-potable Reuse



Yield (AFY)	AWPF?	Pipeline (mi)	Elev. gain (ft)
~ 100	No	8.5	600





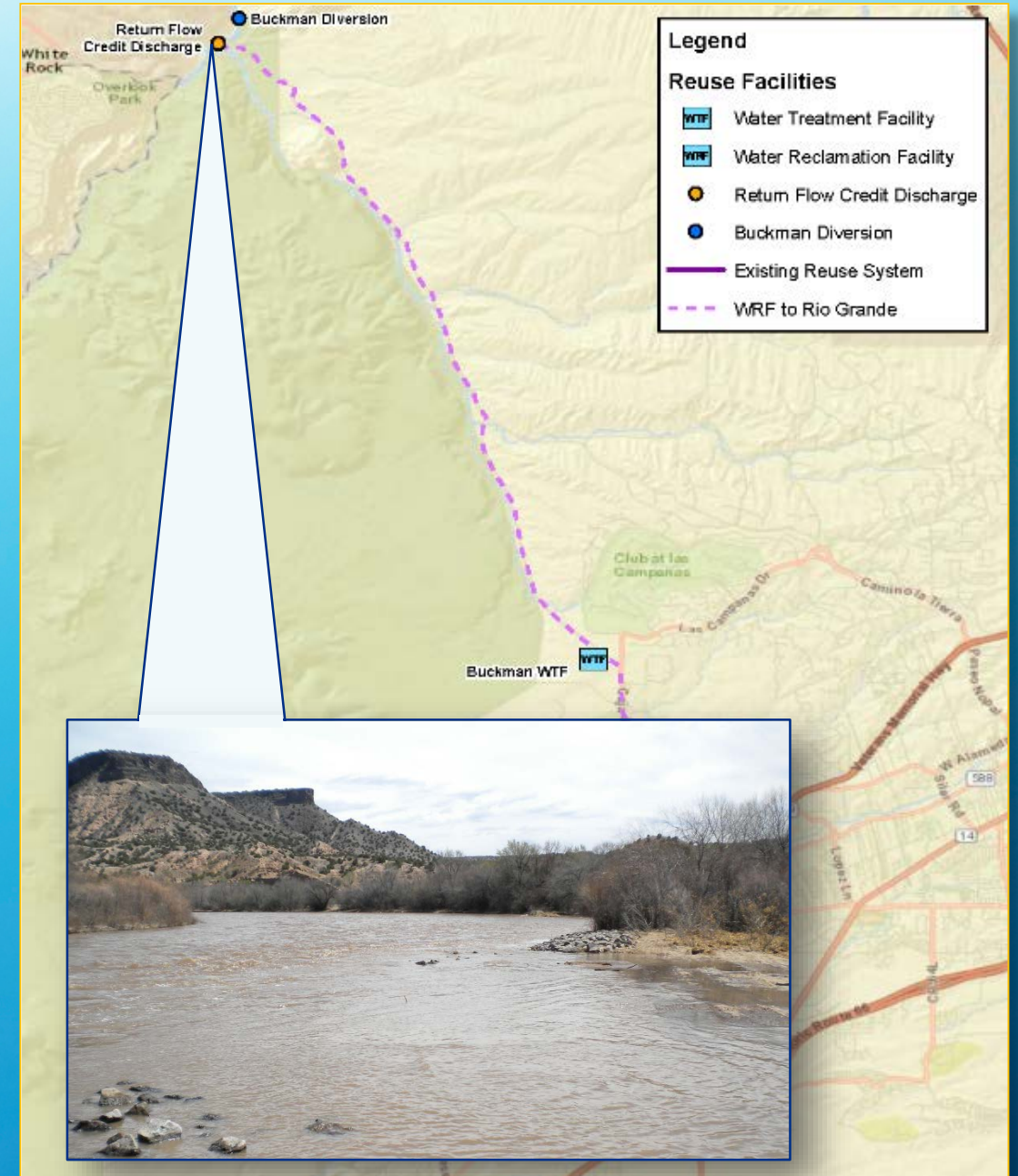
# FS Alternative 2

## Rio Grande Return Flow Credits/Exchange

### Albuquerque, NM Example

- *Reroute WWTP discharge to Rio Grande*
- *Exchange for Rio Grande water*
- *Divert through BDD*

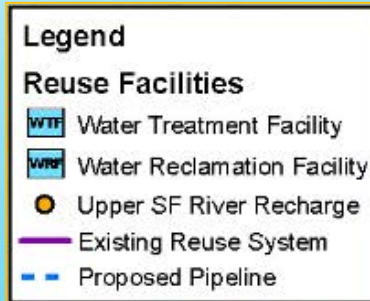
Yield (AFY)	AWPF?	Pipeline (mi)	Elev. gain (ft)
2,334	No	17.7	250





# FS Alternative 3 Upper Santa Fe River Recharge

- *Discharge to Upper Santa Fe River*
- *Living River*
- *Divert via City Wells*



Yield (AFY)	AWPF?	Pipeline (mi)	Elev. gain (ft)
1,840	Yes	12.2	1,010





# Pima County, AZ

## Example

- Legend**

**Reuse Facilities**

  - WTF Water Treatment Facility
  - WRF Water Reclamation Facility
  - Lower SF River Recharge
  - Existing Reuse System
  - - - Proposed Pipeline

Pipeline (mi)	Elev. gain (ft)
6.3	450

The map displays the project area around Santa Fe, New Mexico. Key locations include Buckman WTF, City WRF, AWPF, and the Lower SF River Recharge point. The proposed pipeline (dashed blue line) runs from the City WRF area towards the Lower SF River Recharge. The existing reuse system is shown as a solid purple line. The inset photo shows a dry, arid landscape with sparse vegetation and a dirt road, illustrating the need for water recharge.

A wide, unpaved dirt road winds through a dry, desert landscape under a clear blue sky. The road is flanked by sparse, low-lying shrubs and a few scattered trees. In the distance, a range of mountains is visible on the horizon.



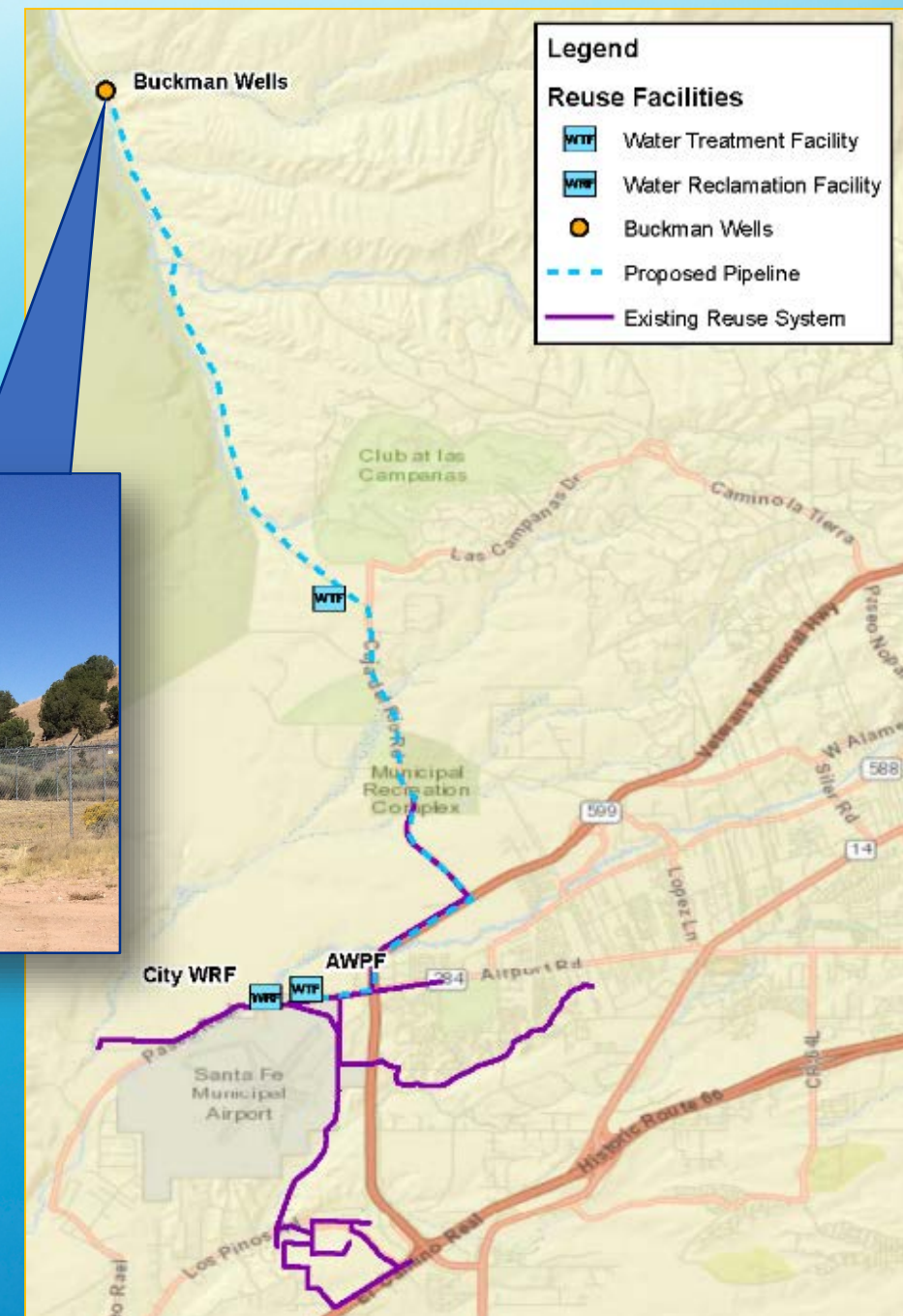
# FS Alternative 5 Buckman Wells Aquifer Storage and Recovery

## Orange County, CA Example

- *Discharge through deep wells*
- *Recover from same wells*



Yield (AFY)	AWPF?	Pipeline (mi)	Elev. gain (ft)
2,070	Yes	12.2	220



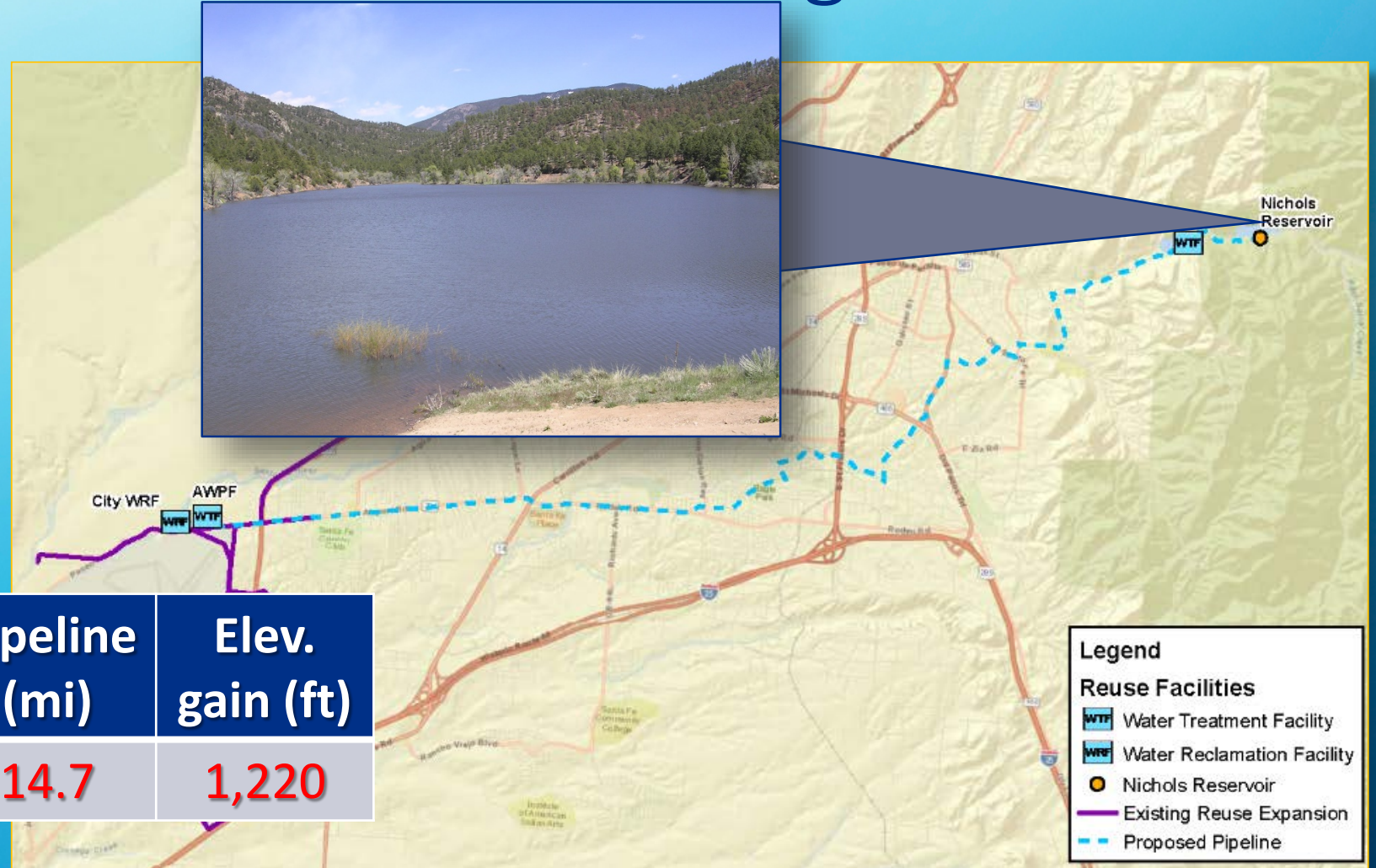


# FS Alternative 6 Nichols Reservoir Augmentation

## San Diego Example

- *Pump to reservoir*
- *Recover via Canyon Rd. WTF*

Yield (AFY)	AWPF?	Pipeline (mi)	Elev. gain (ft)
2,300	Yes	14.7	1,220





# FS Alternative 7

## Direct Potable Reuse

### Big Spring, TX Example

- *Advanced Water Purification Facility*
- *Pump to BDD WTF for blending & further treatment*

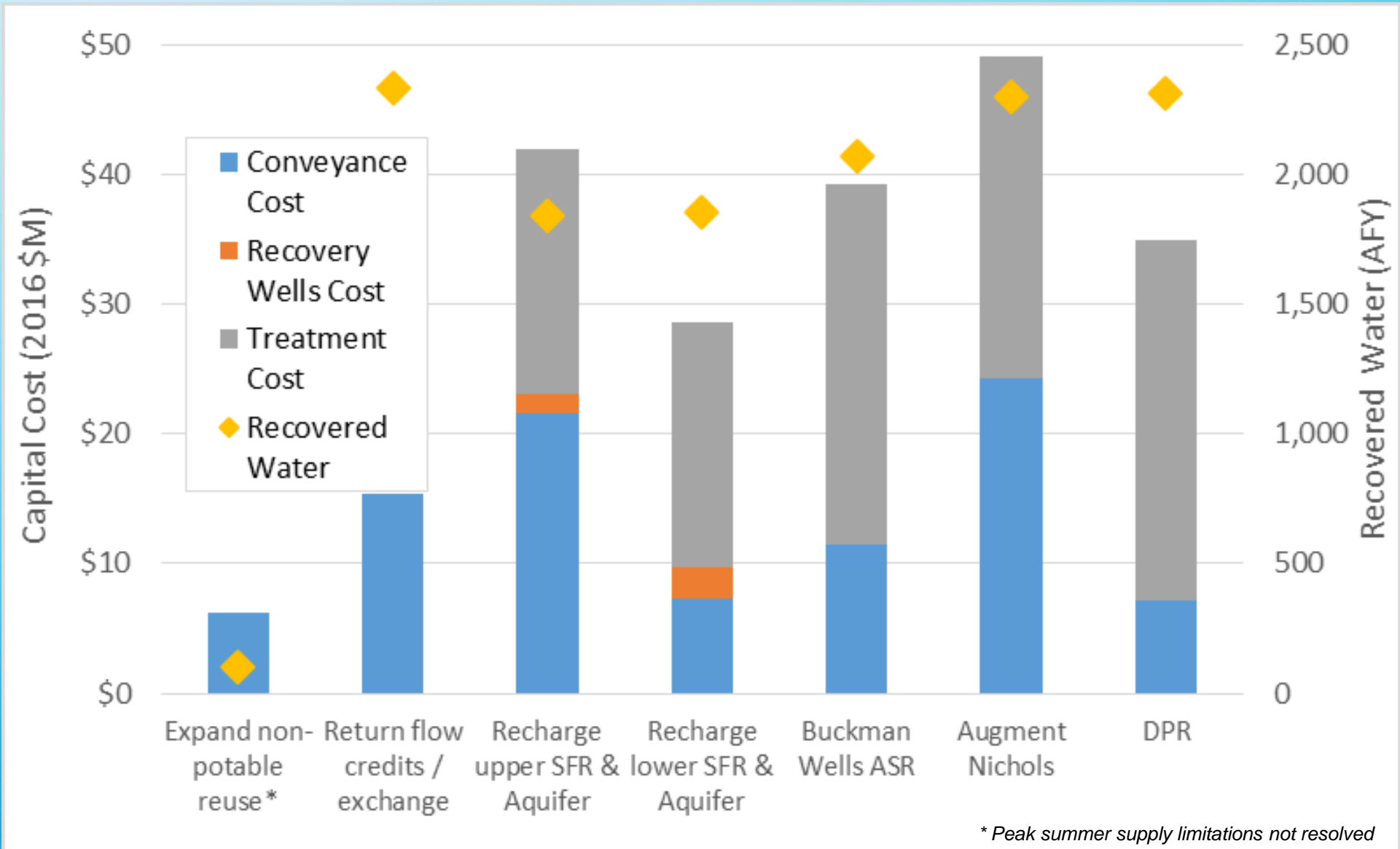


Yield (AFY)	AWPF?	Pipeline (mi)	Elev. gain (ft)
2,310	Yes	6.1	220





# Cost vs. Cost-Effectiveness

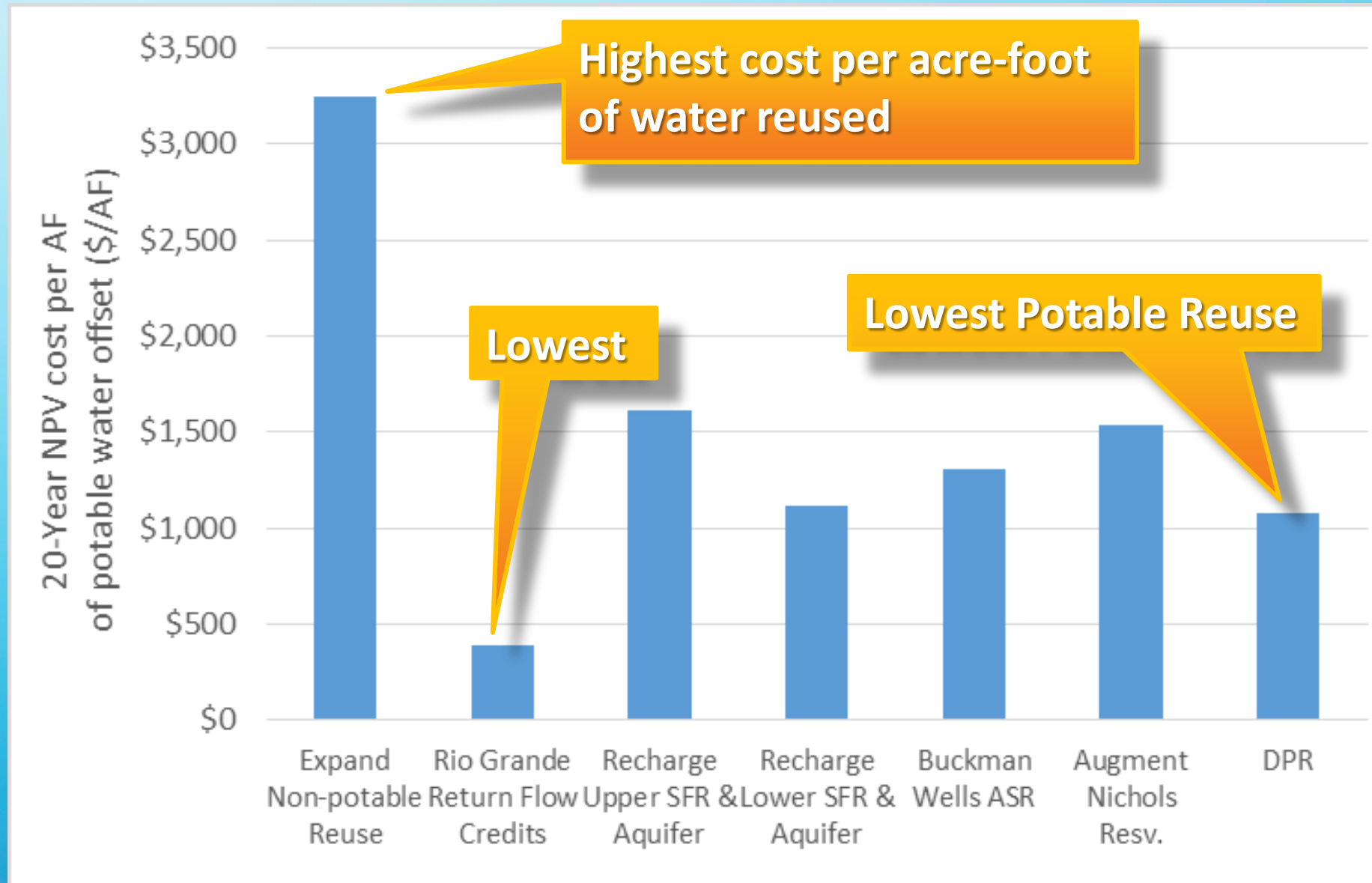


\* Peak summer supply limitations not resolved



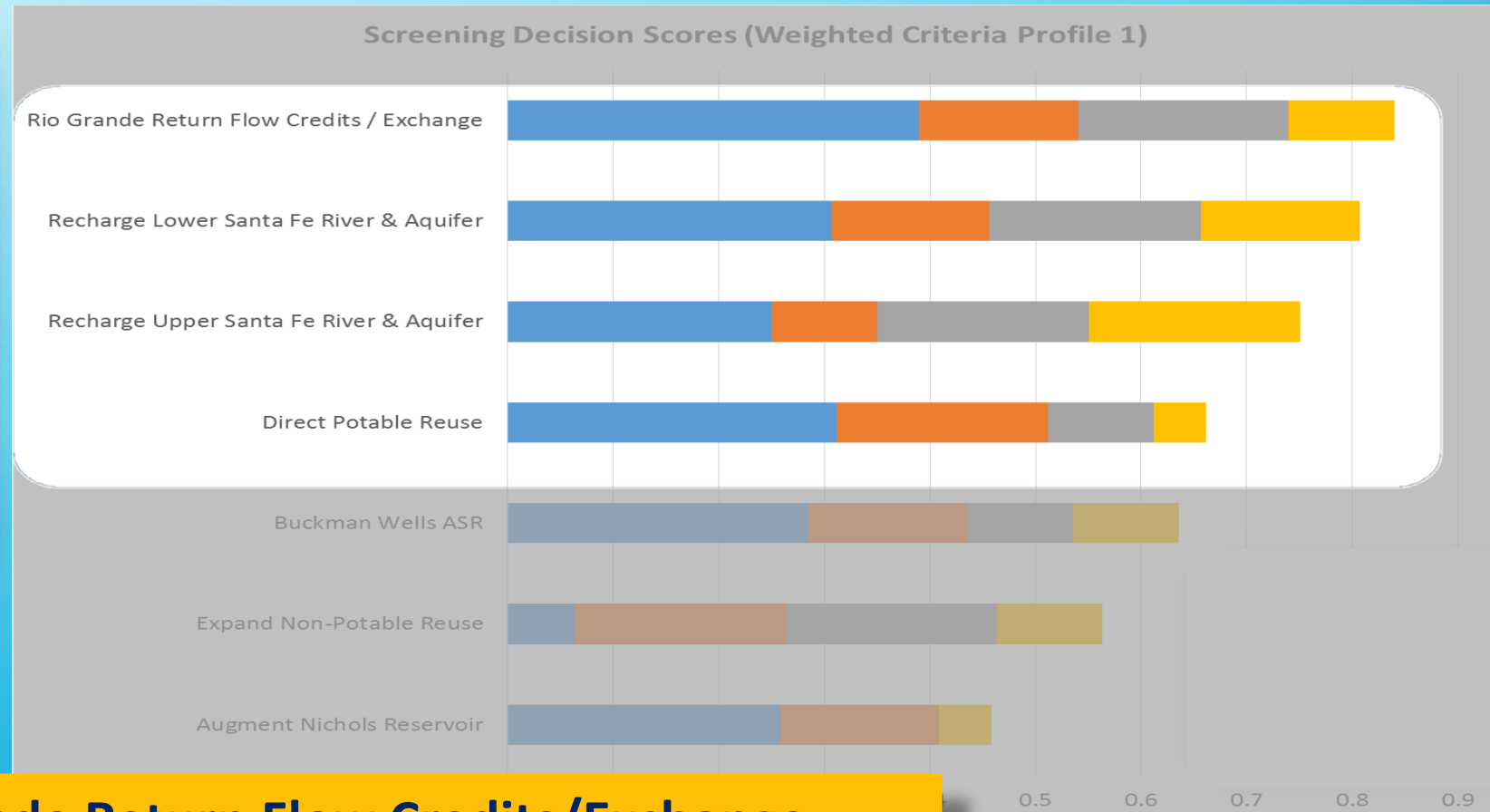
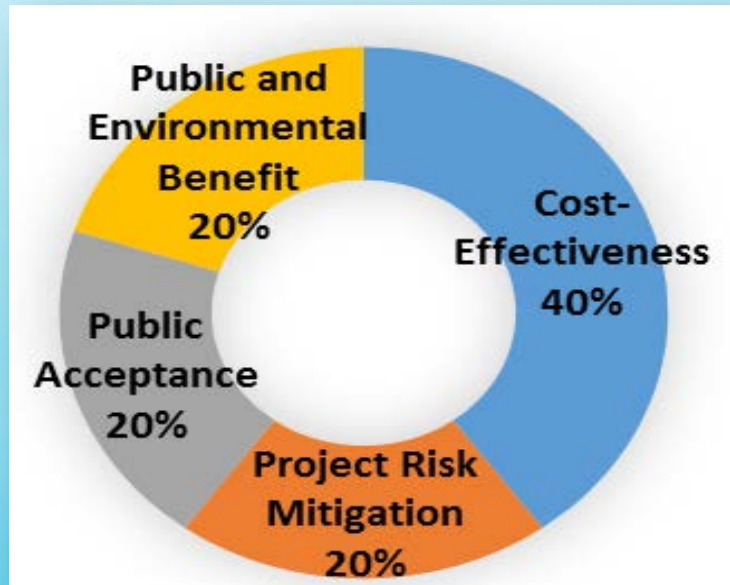


# Cost vs. Cost-Effectiveness





# Preliminary Alternatives Screened to Four



- ✓ Rio Grande Return Flow Credits/Exchange
- ✓ Recharge Lower Santa Fe River & Aquifer
- ✓ Recharge Upper Santa Fe River & Aquifer
- ✓ Direct Potable Reuse





# Triple Bottom Line Assessment of the Best Four Alternatives



Subcriteria and performance measures further define each criterion

Weighted criteria decision model  
illustrates tradeoffs with sensitivity analyses





# Water Reuse Challenges

## Rio Grande Return Flow Credits/Exchange



- **Permitting challenges/delays**
- Susceptible to low flow and/or WQ issues on Rio Grande

## Recharge Lower Santa Fe River & Aquifer



- **Permitting challenges/delays**
- Recapture of water discharged, available land

## Recharge Upper Santa Fe River & Aquifer



- **Permitting challenges/delays**
- Challenging pipeline route, potential water quality (algae), Recapture of water

## Direct Potable Reuse



- **Permitting challenges/delays**
- Advanced monitoring and treatment
- Public outreach and acceptance



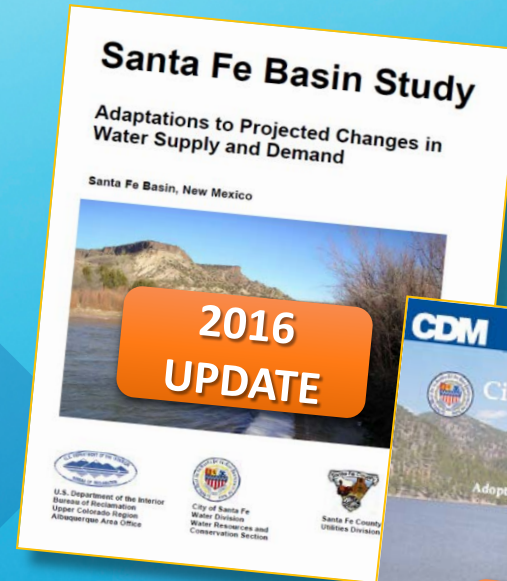


# Planning for a Secure and Sustainable Future

- *What year will climate-induced shortages begin?*
- *When should we implement additional reuse?*
- *What if reuse doesn't fill the gap?*

Reuse Feasibility Study

Supplemental Water  
Supply Strategies





A dynamic splash of water against a blue gradient background, with many droplets suspended in the air.

# *Optimizing Reuse to Head Off Climate Change*

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