THE FINANCIAL BENEFITS OF WATER CONSERVATION: THE TUCSON STORY

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TUCSON WATER

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BUSINESS PROCESS IMPROVEMENT

PIMA COUNTY REGIONAL WASTEWATER RECLAMATION

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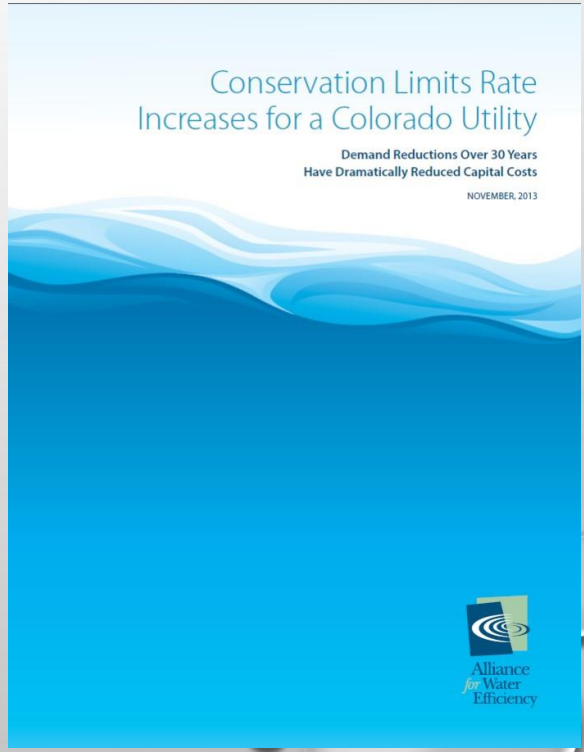
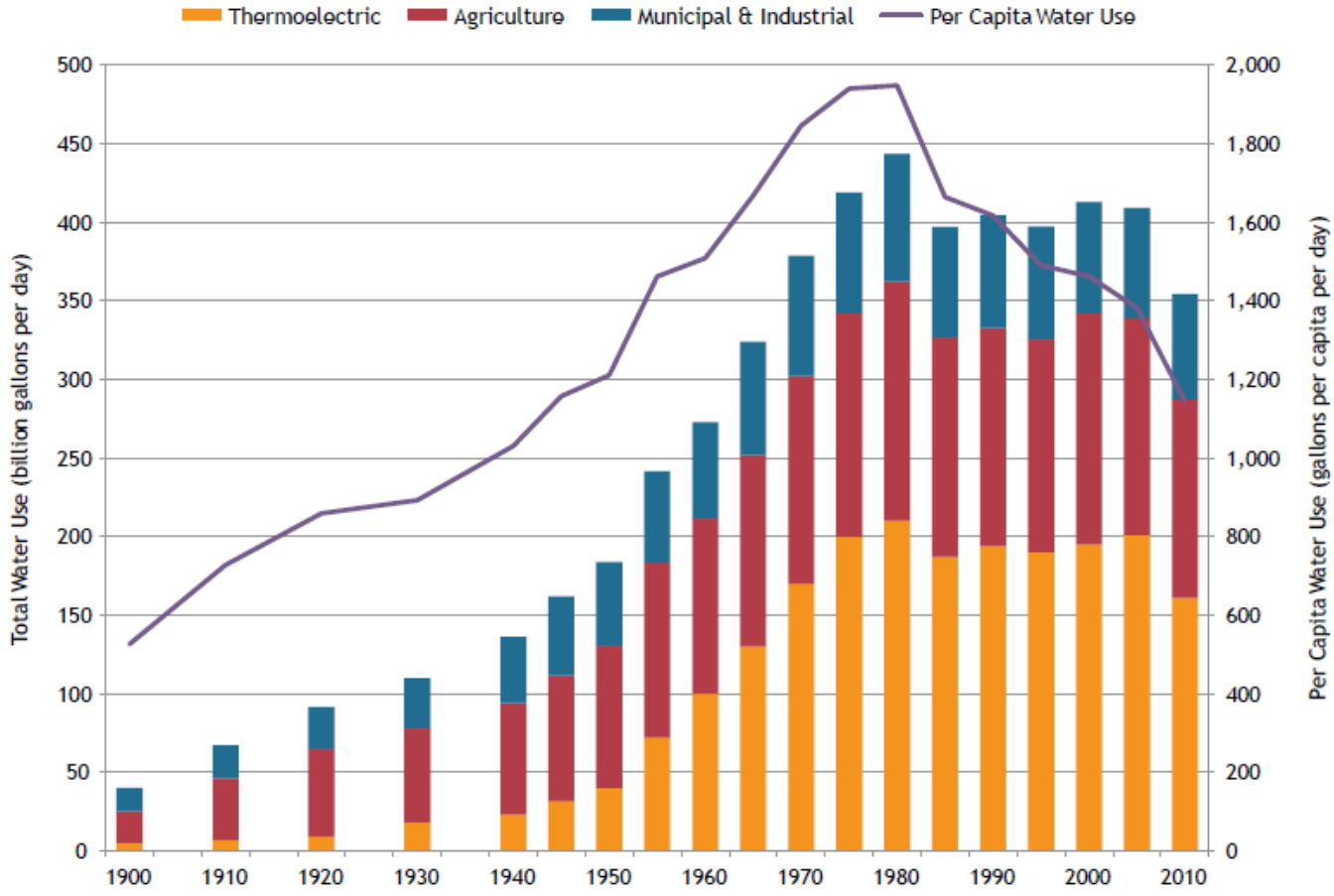
WaterDM

AWE AVOIDED COST STUDY

- Alliance for Water Efficiency grant funds from Walton Family Foundation focused on Colorado River Basin Initiative
- WaterDM and City of Westminster Study
- Tucson, AZ and Gilbert, AZ selected to participate
- Goal of the study is to examine the impact of increased water use efficiency on customer rates

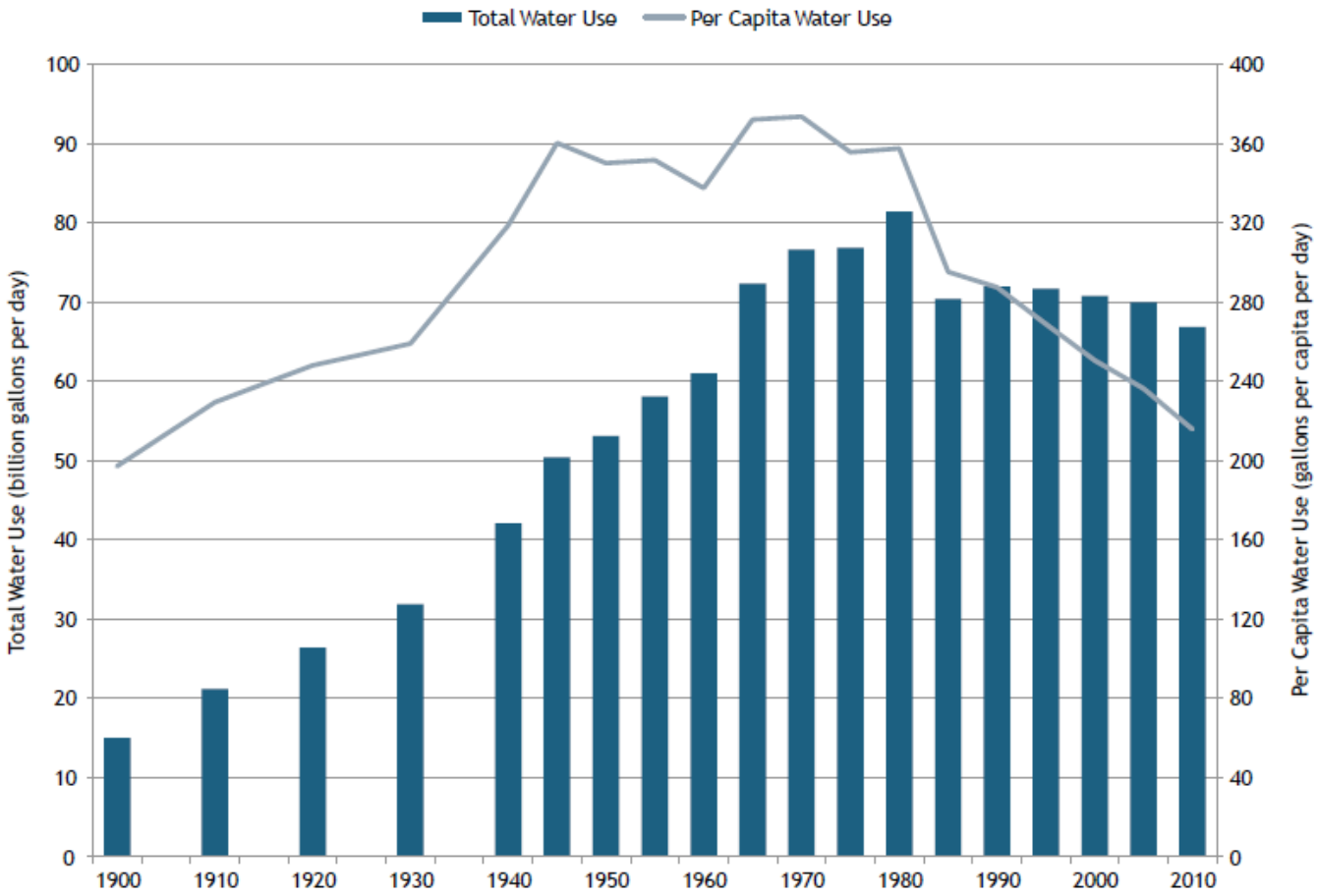


WATER USE IN THE US, 1900 - 2010



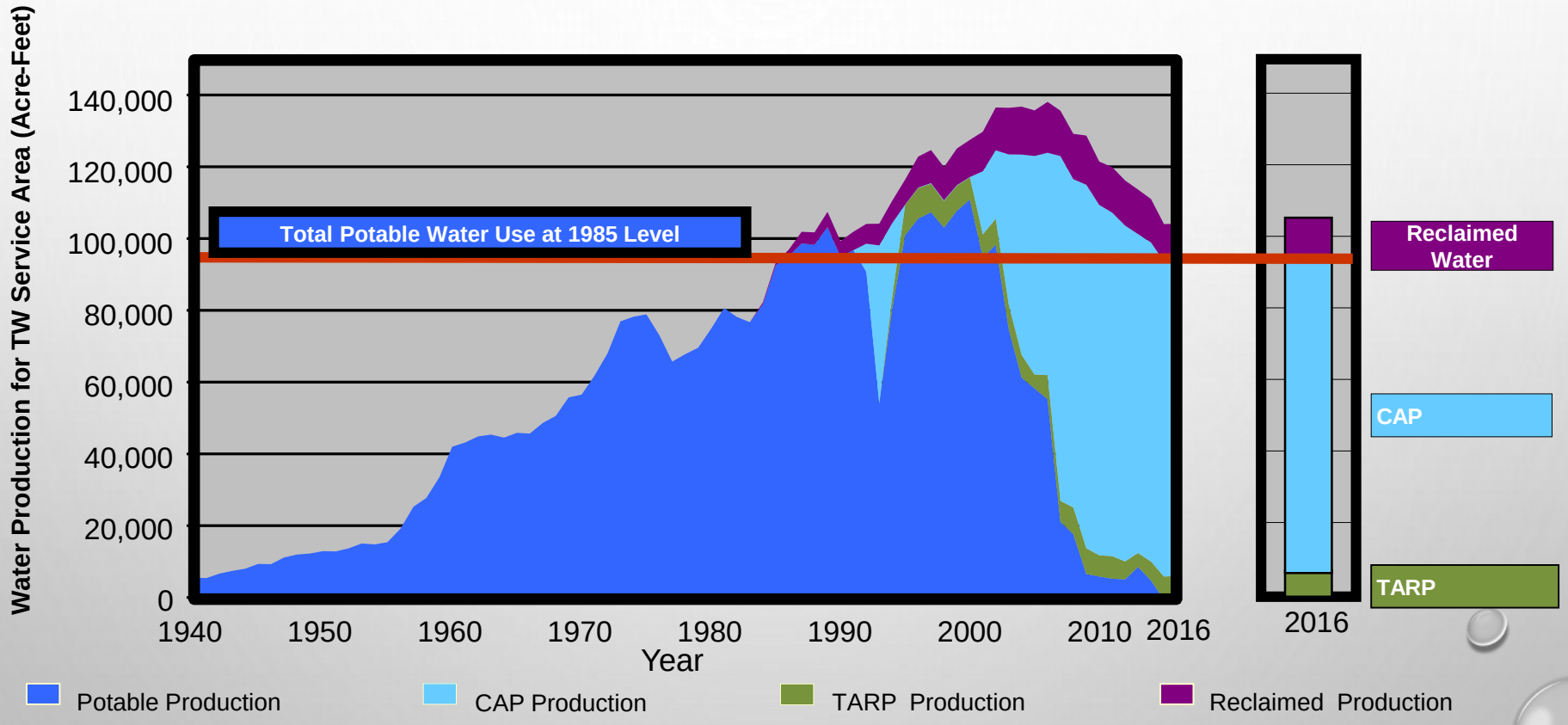
Includes fresh and saline water. Source USGS and Pacific Institute 2015

M&I WATER USE IN THE US, 1900 - 2010



Source USGS and Pacific Institute 2015

TUCSON WATER ANNUAL PRODUCTION (1940-2016)



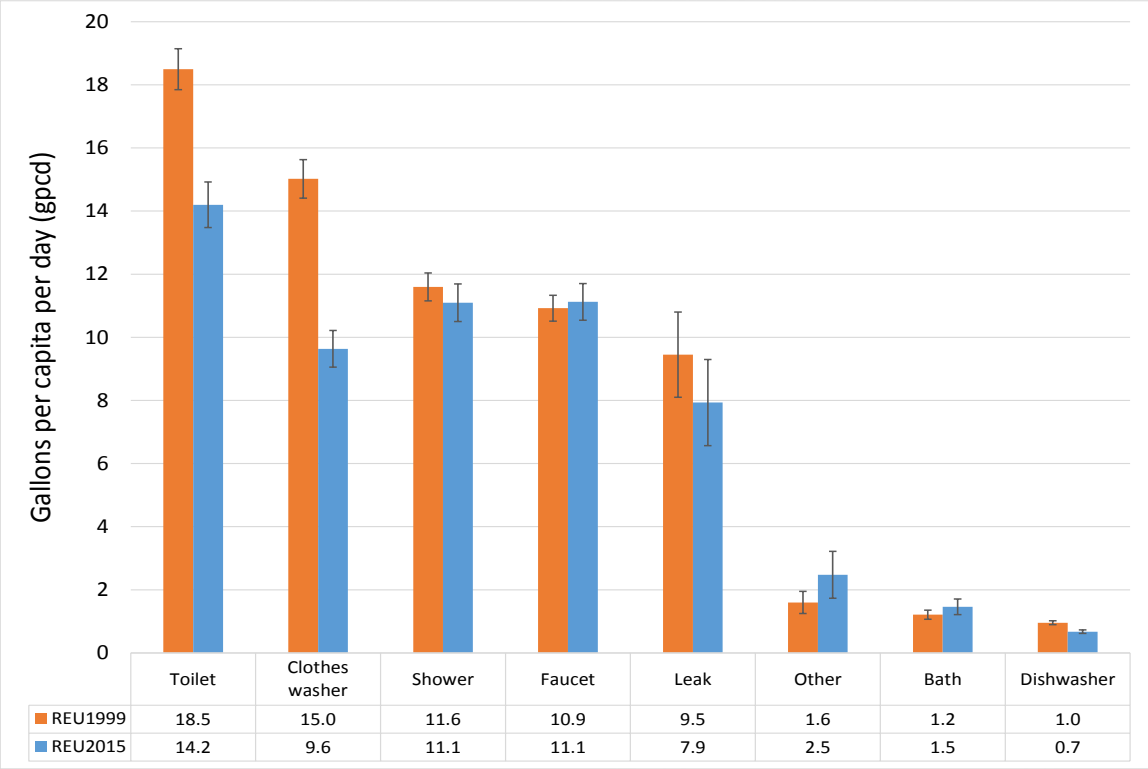
RESIDENTIAL INDOOR GPCD

Source: Water Research Foundation (2016) Residential End Uses of Water Update – #4309. Denver, CO.

1999 vs. 2016 = 15.4% reduction

2016 vs. HE = 37.4% reduction

INDOOR GPCD COMPARISON



	Toilet	Clothes washer	Shower	Faucet	Leak	Other	Bath	Dishwasher
REU1999	18.5	15.0	11.6	10.9	9.5	1.6	1.2	1.0
REU2015	14.2	9.6	11.1	11.1	7.9	2.5	1.5	0.7

Statistically significant reductions in:

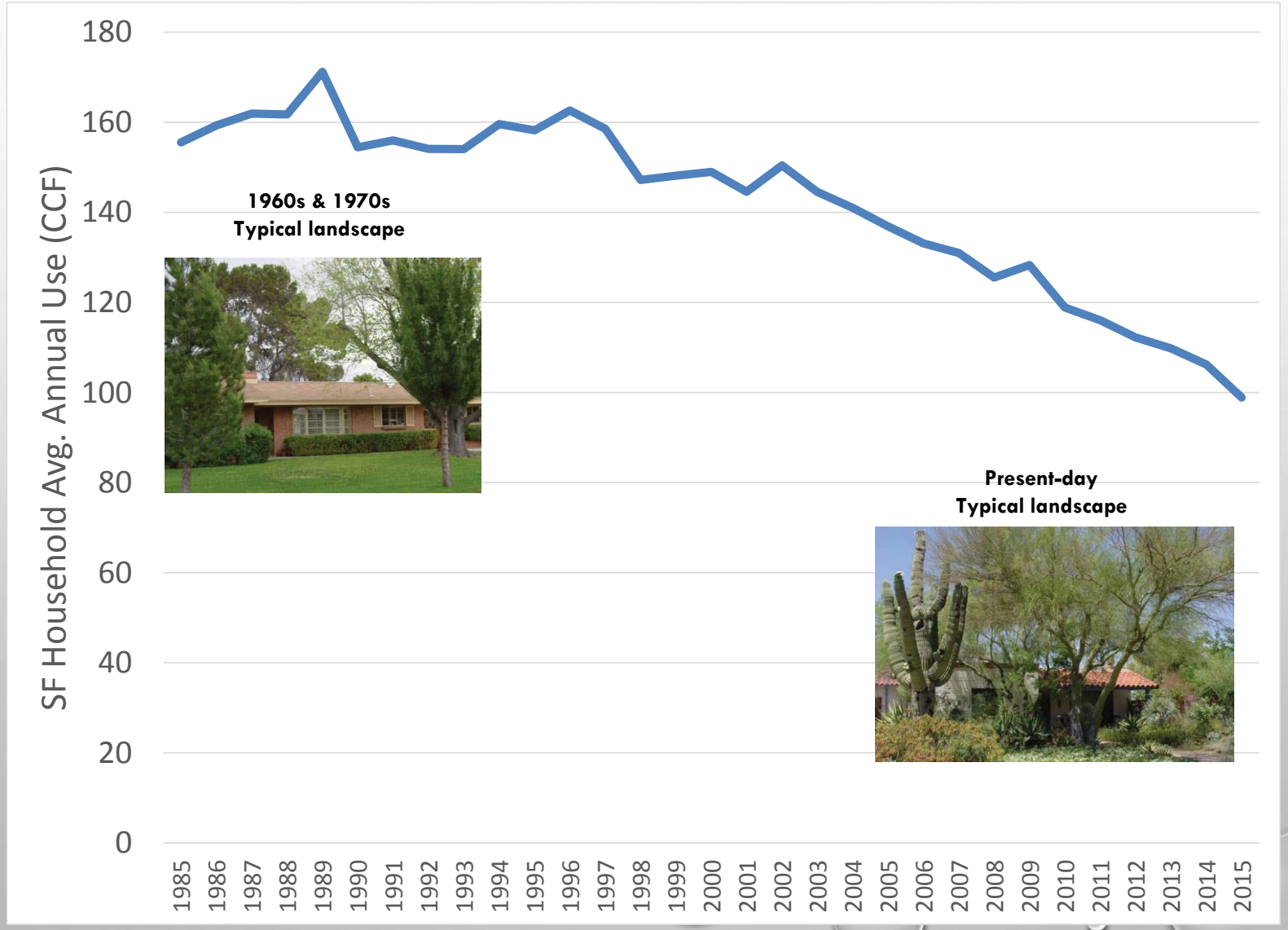
- Clothes washer
- Toilet
- Dishwasher

Source: Water Research Foundation (2015) Residential End Uses of Water Update – #4309. Denver, CO.

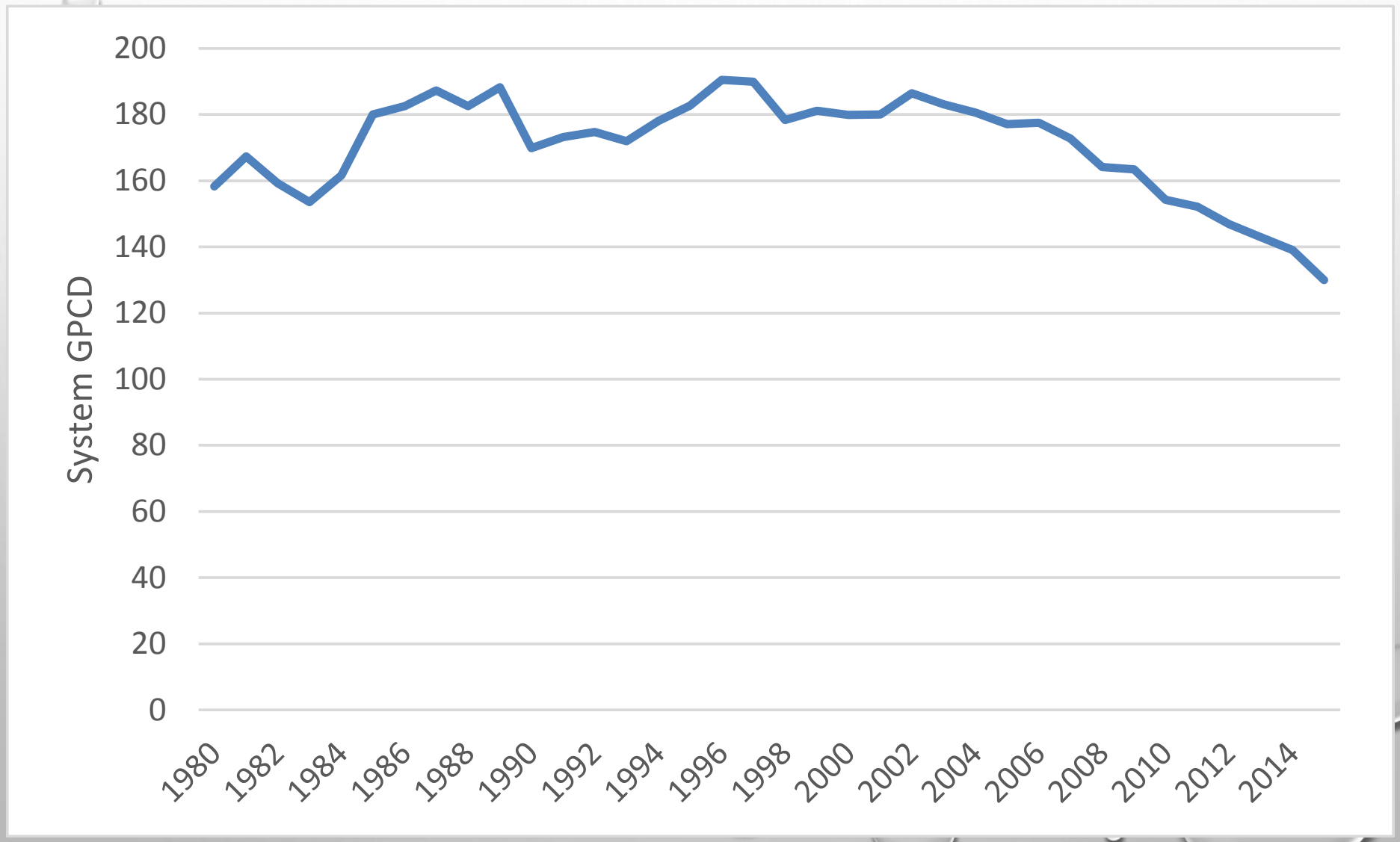
WATER EFFICIENCY IS NOT ONE, BUT MANY APPROACHES

- Utility-sponsored conservation & education programs
  - Rebates, Youth & Professional Education
- Community outreach campaigns: Pete the Beak; Water Reliability
- Increasing block rate structures
  - 4-Tier structure: $1.55,1-7 ccf; $3.00, 8-15 ccf; $7.48, 16-30 ccf; $11.75 > 30 ccf
- Local ordinances: Xeriscape Landscaping (1991), Water Waste (1984) & Comm. Rainwater Harvesting (2008)
- International Plumbing Code → Tucson Plumbing Code
- National Policy that drives Innovation & technology improvements
  - Energy Star (2002) & WaterSense (2006)

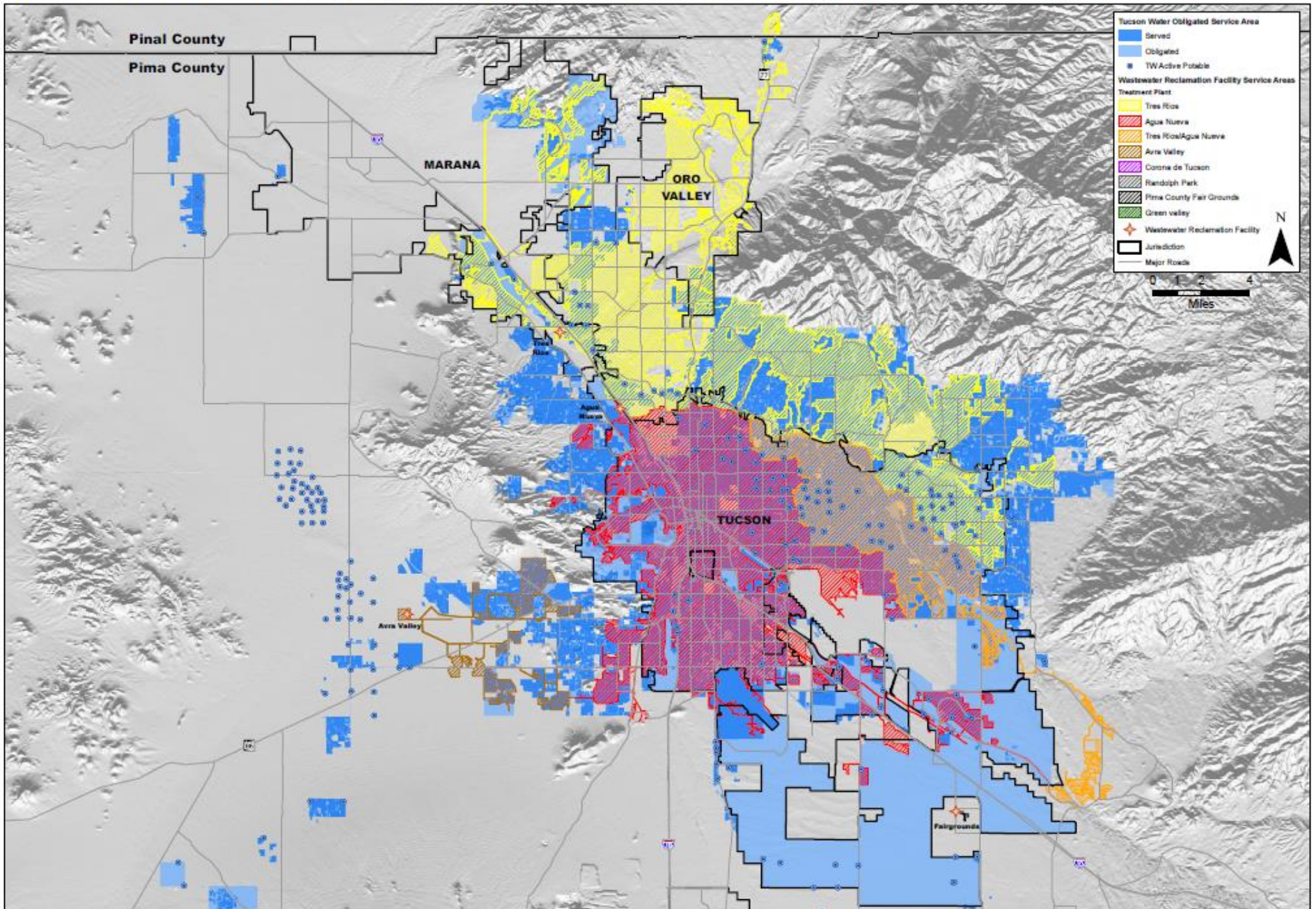
SINGLE FAMILY AVG. ANNUAL USE 1985 - 2015



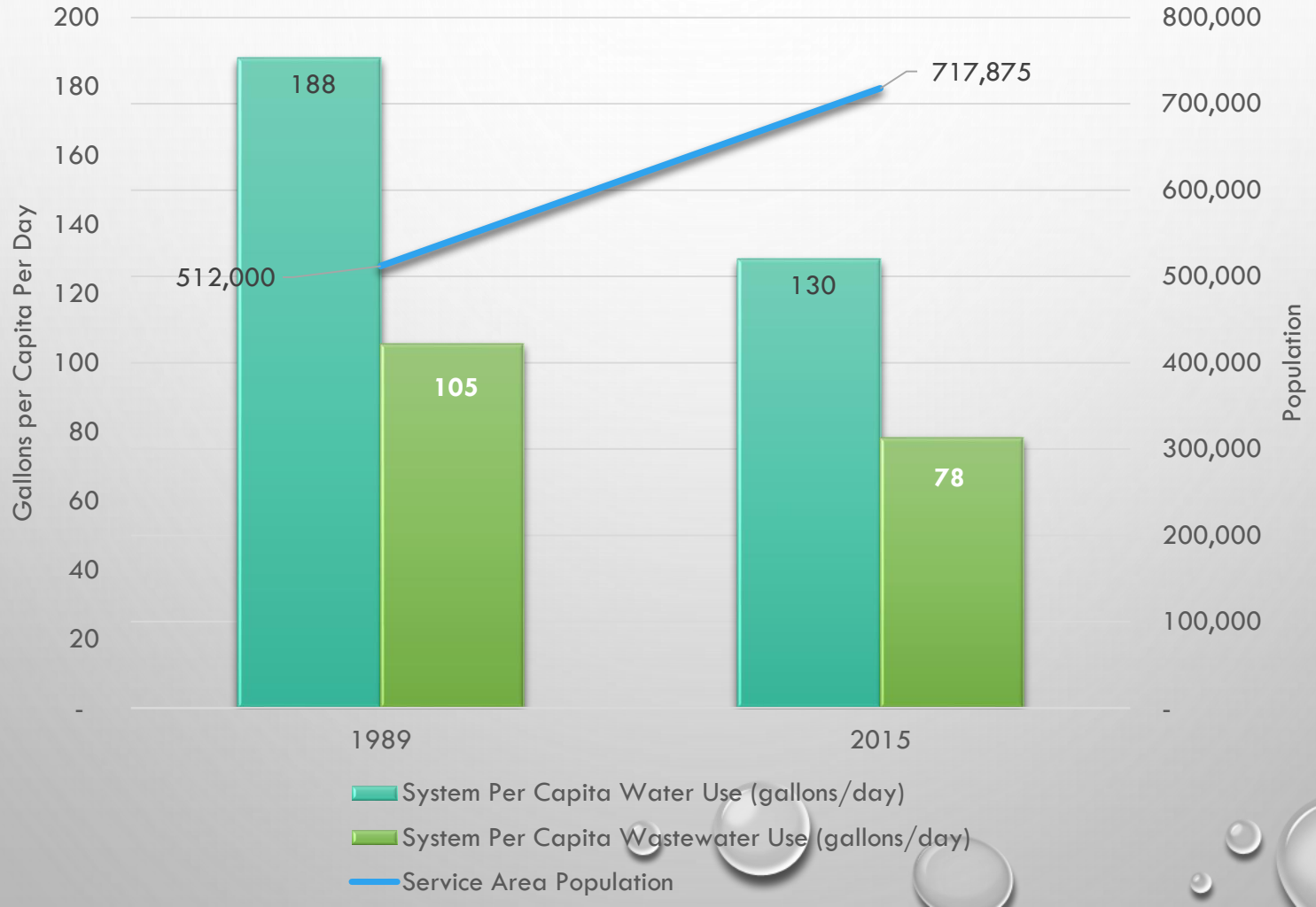
TOTAL SYSTEM GPCD
1980 - 2015



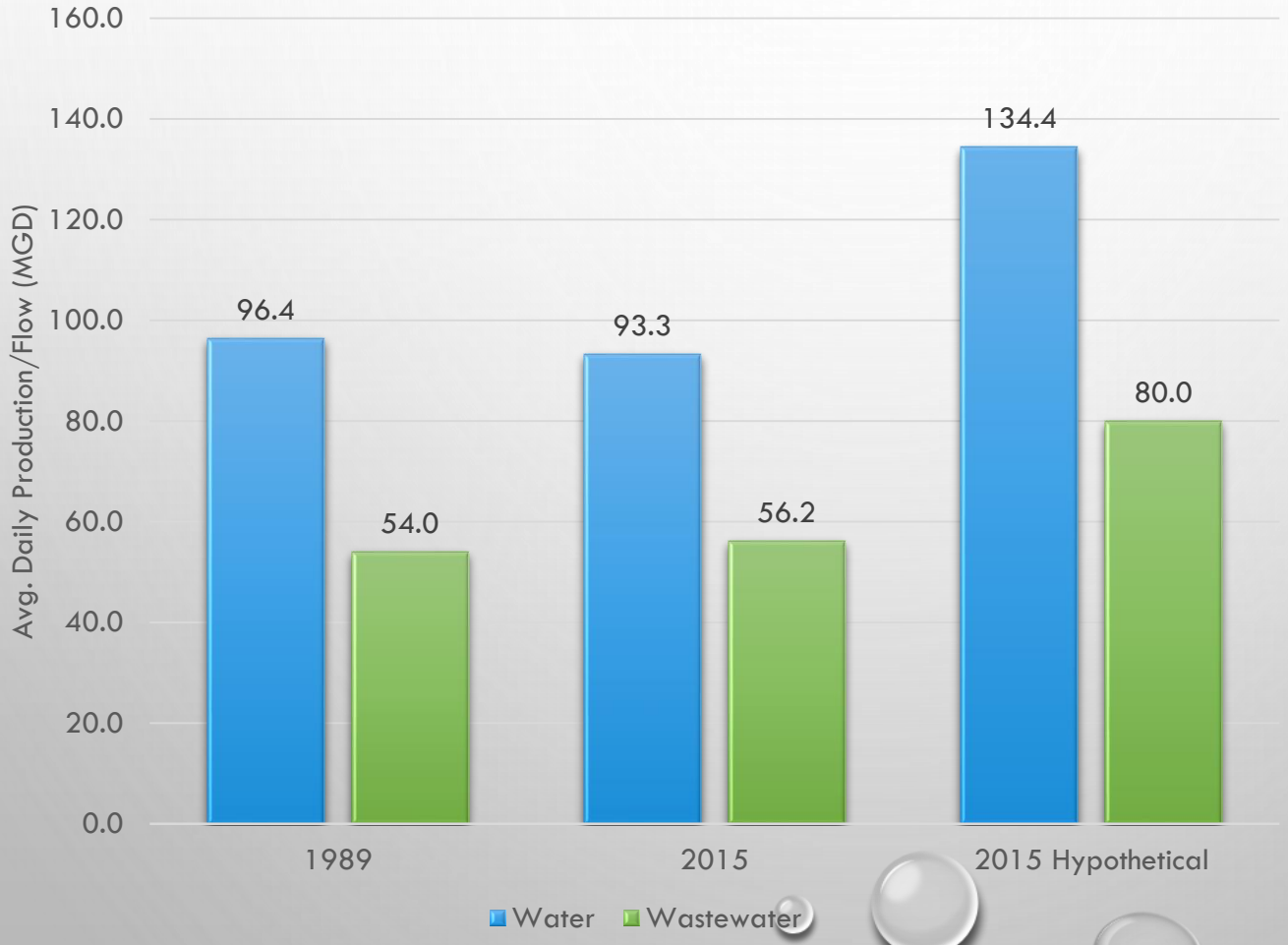
Tucson Water / Pima County Regional Wastewater Reclamation Department Service Areas



POPULATION AND PER CAPITA WATER AND WASTEWATER USE



HYPOTHETICAL, NON-CONSERVING WATER DEMAND



Daily Water Production & Wastewater Flows:
-1989 actual
- 2015 actual
- 2015 hypothetical

1989: 188 / 107 gpcd
Pop. 512,000

2015: 130 / 79 gpcd
Pop. 717,875

- Due to conservation, per capita water use in Tucson has dropped 45% and wastewater by 35% since 1989.
- Yet…. costs to customers continue to increase.
- Some customers are confused and frustrated.
- What is the impact on water and wastewater rates due to conservation?

"WHY ARE MY RATES GOING UP AGAIN WHEN I KEEP CONSERVING WATER?!"

WATER SYSTEM AVOIDED COSTS

- Water Treatment Infrastructure
  - Pumping & transmission expansion
- Water Resources
- Operating Costs

How Much Additional Cost to Tucson Water meet non-conserving, hypothetical demand of 134 mgd?

WASTEWATER SYSTEM AVOIDED COSTS

- 2015 Avg. Daily Flow ~ 56.2 MGD
- Hypothetical Non-Conserving Avg. Daily Flow ~ 80 MGD
- Current System Max. Treatment Ability ~ 95 MGD
- In this analysis, wastewater treatment capacity water increased to 107 MGD to meet Hypothetical Non-Conserving Daily Flow range

What additional wastewater system infrastructure and costs to meet 80 mgd avg. daily flow?

ADDITIONAL COSTS OF MEETING A NON-CONSERVING DEMAND… THAT HAVE BEEN AVOIDED

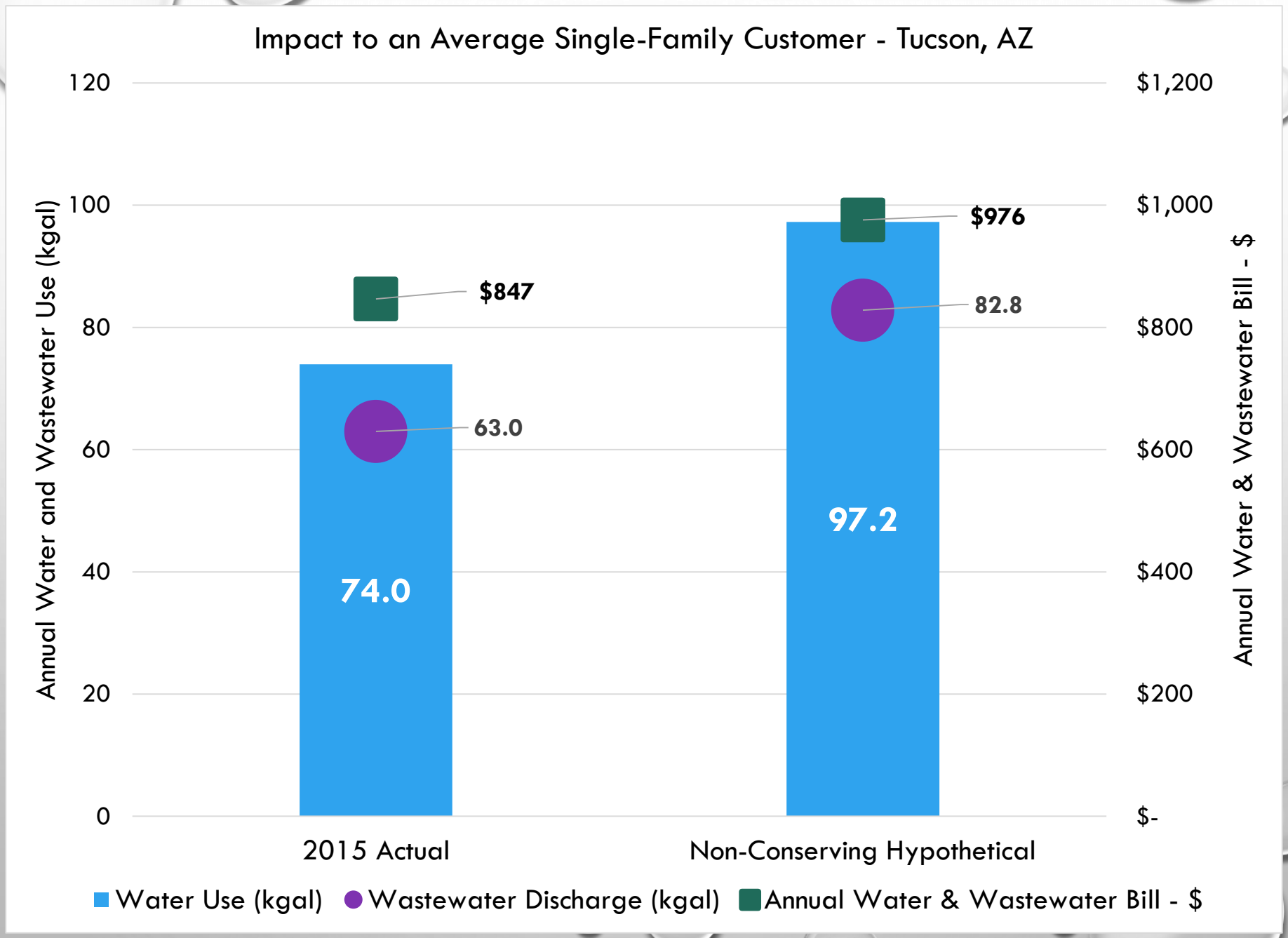
- Additional $22 million per year for water system O&M
- $140,000,000 for new Avra Valley Transmission Main CIP
- $15 million for new 7 MGD recycled water facility

- Additional $6.4 million per year for wastewater treatment O&M
- $195,000,000 for additional 12 MGD of wastewater capacity, financed over time

CUSTOMER RATE IMPACT

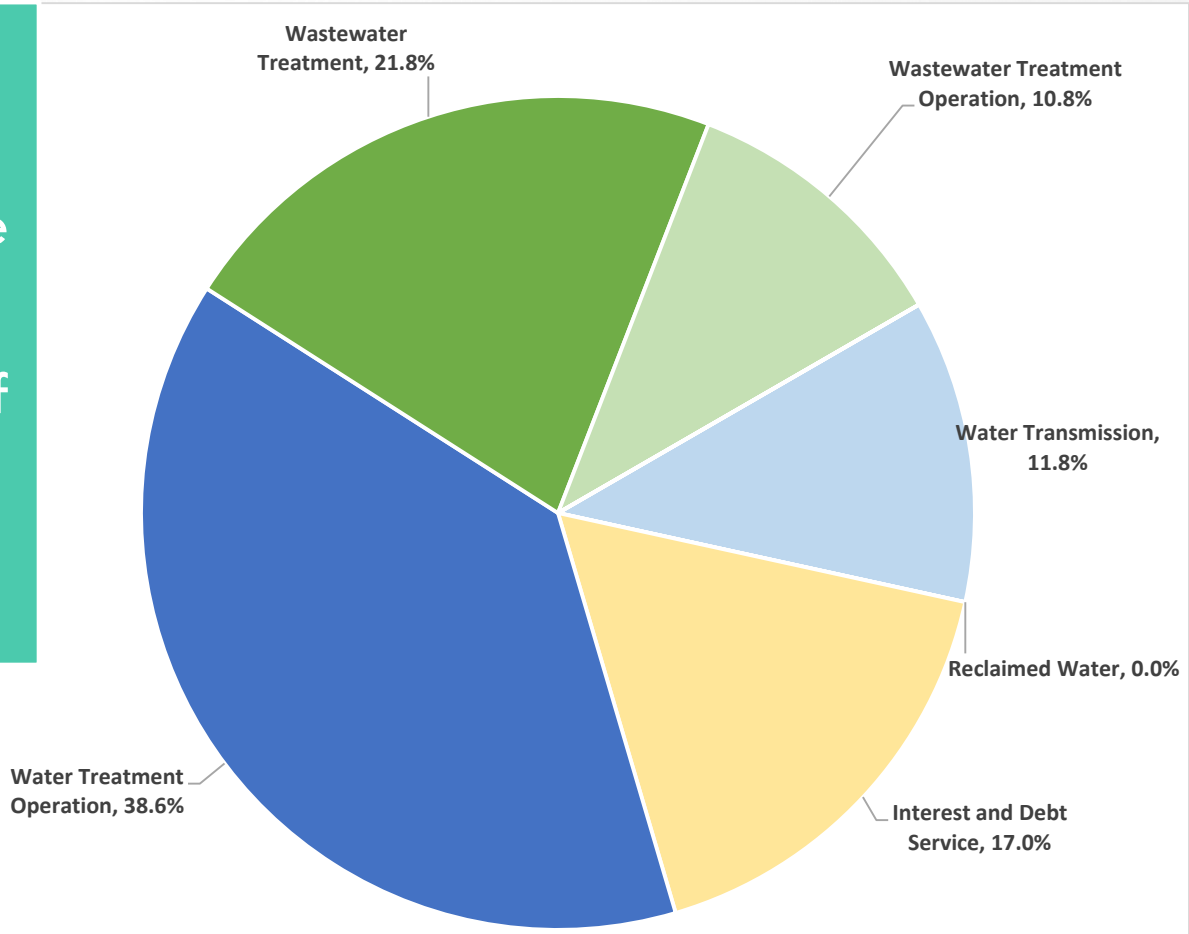
- Current avg. single-family, water customer uses **98.9 ccf/year,** and pays for **84 ccf/year** of wastewater treatment.
- At current water rates, the avg. single-family customer pays $847 per year for water and sewer.
- Under the non-conserving scenario (assuming 188 gpcd) the average single-family customer would pay $976 per year for water and sewer.

Due to water efficiency, rates today are nearly 15.3% LOWER than otherwise necessary.

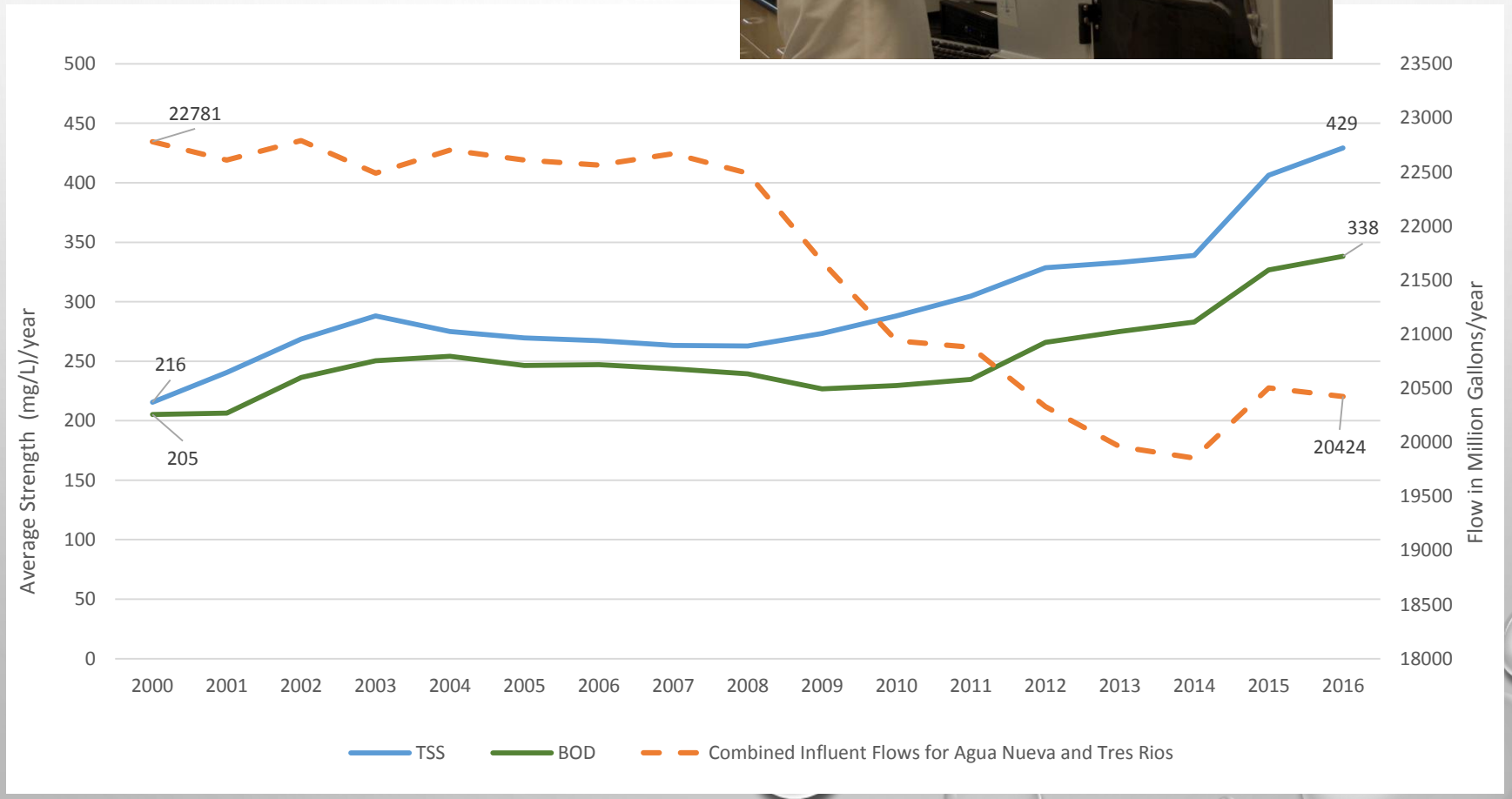

Impact to an Average Single-Family Customer - Tucson, AZ
120
100
80
60
40
20
0
$1,200
$1,000
$800
$600
$400
$200
$-
Annual Water and Wastewater Use (kgal)
Annual Water & Wastewater Bill - $
$847
$976
63.0
82.8
74.0
97.2
2015 Actual
Non-Conserving Hypothetical
Water Use (kgal)
Wastewater Discharge (kgal)
Annual Water & Wastewater Bill - $

BREAKDOWN OF AVOIDED COSTS

Tucson Water rates are **22.3% lower today** and Pima County WR rates are **7.8% lower today** than otherwise necessary if per capita water demand had not been reduced.



STRENGTH OF SEWER FLOWS



IMPACT TO THE SEWER PIPES

- Scour velocities may take longer to attain in newer developments with lower flows
- Flushing of pipes may be required
- Potential for more odors in pipes
- Potential for corrosion in pipes
- Terminal ends may require steeper slopes
- Cost goes up for deeper sewers

FLUSHING THE PIPES

PIPE MAY REQUIRE STEEPER SLOPES

Table 5.1
Minimum Slopes for Gravity Sewer Lines

Pipe Diameter (inches)	Minimum Slope (ft/ft)	*Full-Flow Velocity (ft/sec)
6 (terminal reach)	0.0110	3.0
8 (terminal reach)	0.0100	3.5
8 (non-terminal reach)	0.0044	2.3
10	0.0025	2.0
12	0.0019	2.0
15	0.0014	2.0
18	0.0011	2.0
24	0.0008	2.0
*Manning's (n) value of 0.013 used		

ODORS AND CORROSION

- Water and wastewater rates have increased because of the increasing costs of providing 24/365 service, while maintaining and improving infrastructure to meet regulatory treatment requirements.
- Decreasing demands are a balancing act: Revenue v. Resources
- **The typical Tucson single-family customer pays 15% less today, than they would need to be if water efficiency had not been achieved.**

Bottom Line: When Everyone Conserves, Everyone Saves

QUESTIONS & DISCUSSION
THANK YOU!

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WaterDM DEMAND MANAGEMENT

Alliance for Water Efficiency

CITY OF TUCSON

TUCSON WATER

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