

# Why Demand Matters

Eight Reasons Why Studying Water Demand Is  
Critical for the City of Phoenix Water Services  
Department

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City of Phoenix

- Daily peaking characteristics of customers determines sizing and operation of facilities like boosters and reservoirs
- Monthly & annual peaking characteristics of customers determines sizing and operation of treatment plants
- Changes in indoor fixture/appliance use is affecting daily peaking
- Declines in outdoor irrigation use is dramatically reducing summer peaking and weather-related volatility

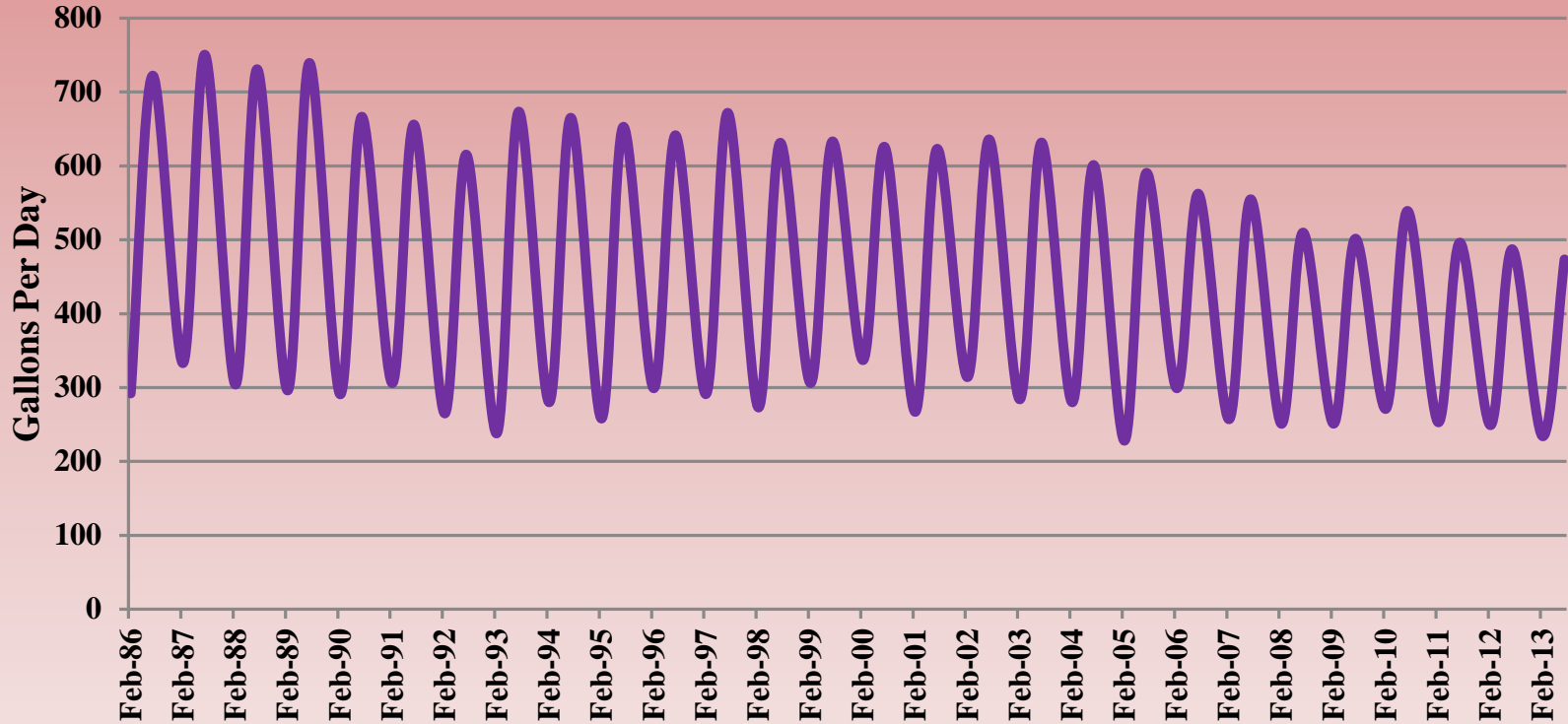
## 8. Peaking Characteristics Determine Facility Needs

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## Average Peak (July) and Off Peak (February) Water Consumption for Single Family Residences in Phoenix



Seasonal Peaking Has Been Declining:  
Difference Between Peak and Off Peak  
Demands is Shrinking (Lower Volatility)



- Developers routinely build smaller mains and sewers (12” and less pipes) and often build medium-sized facilities (transmission mains, big sewers, etc.)
- Facilities are sized based on water demand and wastewater generation factors
- Factors have been revised downwards to take account of falling fixture/appliance flows
- More changes inevitable – ADEQ scrutinizes
- Major \$ savings provided to developers and WSD

## 7. Design Guidelines Based on Development Demand

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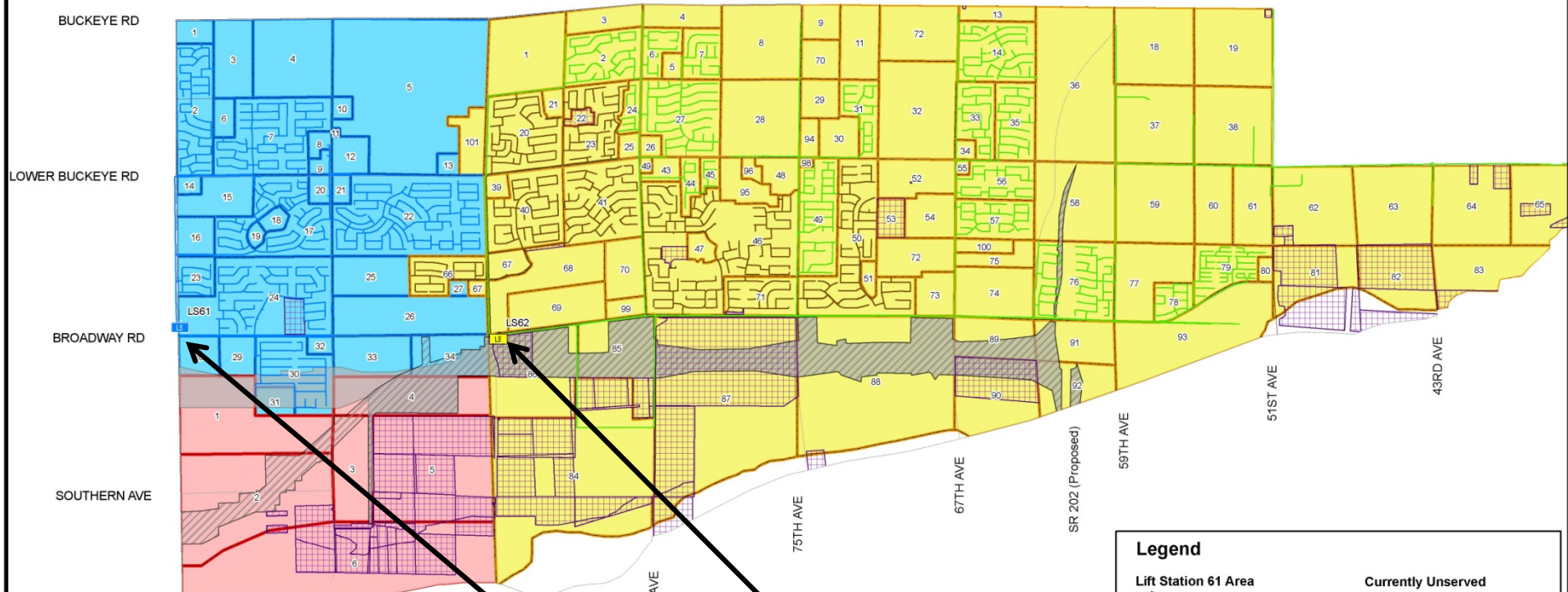


# Improved Planning – Specific Development Level: Revised Wastewater Design Standards

Land Use	Wastewater 2004 Design Standards		Wastewater Proposed Design Standards	
	Unit	Daily Flow / Unit (gal)	Unit	Daily Flow / Unit (gal)
Single Family	Dwelling	320	Dwelling	240
Multifamily	Dwelling	250	Dwelling	180
Commercial (retail / mall)	Sq-ft	.5	1000 sq-ft	75
Commercial (office)	1000 sq-ft	100	1000 sq-ft	90
Warehousing / Big Box Retail	N/A	N/A	1000 sq-ft	25
Industrial	Person	50	1000 sq-ft	50
Schools	Student	75	Student	20
Hotel / Motel (w/o restaurant)			Room	100
Hotel (w/ restaurant)	Room	130	Room	150
Resort			Room	210
Hospital	N/A	N/A	Bed	300



# Estrella Lift Station Alternative Analysis (2009)



Lower flows allow smaller lift stations to replace more expensive large lift station in plan, saving tens of \$ millions.

**Legend**

<b>Lift Station 61 Area</b>	<b>Currently Unserved</b>
Existing Lift Stations	Future Service Area
LS 61 Network	Future Service - Sub Areas
Future Service Area	<b>Proposed SR 801 Alignment</b>
Lift Station 61 - Sub Areas	North Alignment
<b>Lift Station 62 Area</b>	South Alignment
Existing Lift Stations	<b>Misc</b>
LS 62 Network	SRO Network
Future Service Area	City-Owned Property (11/19/2007)
Lift Station 62 - Sub Areas	

3,160 1,580 0 1,580 3,160 Feet

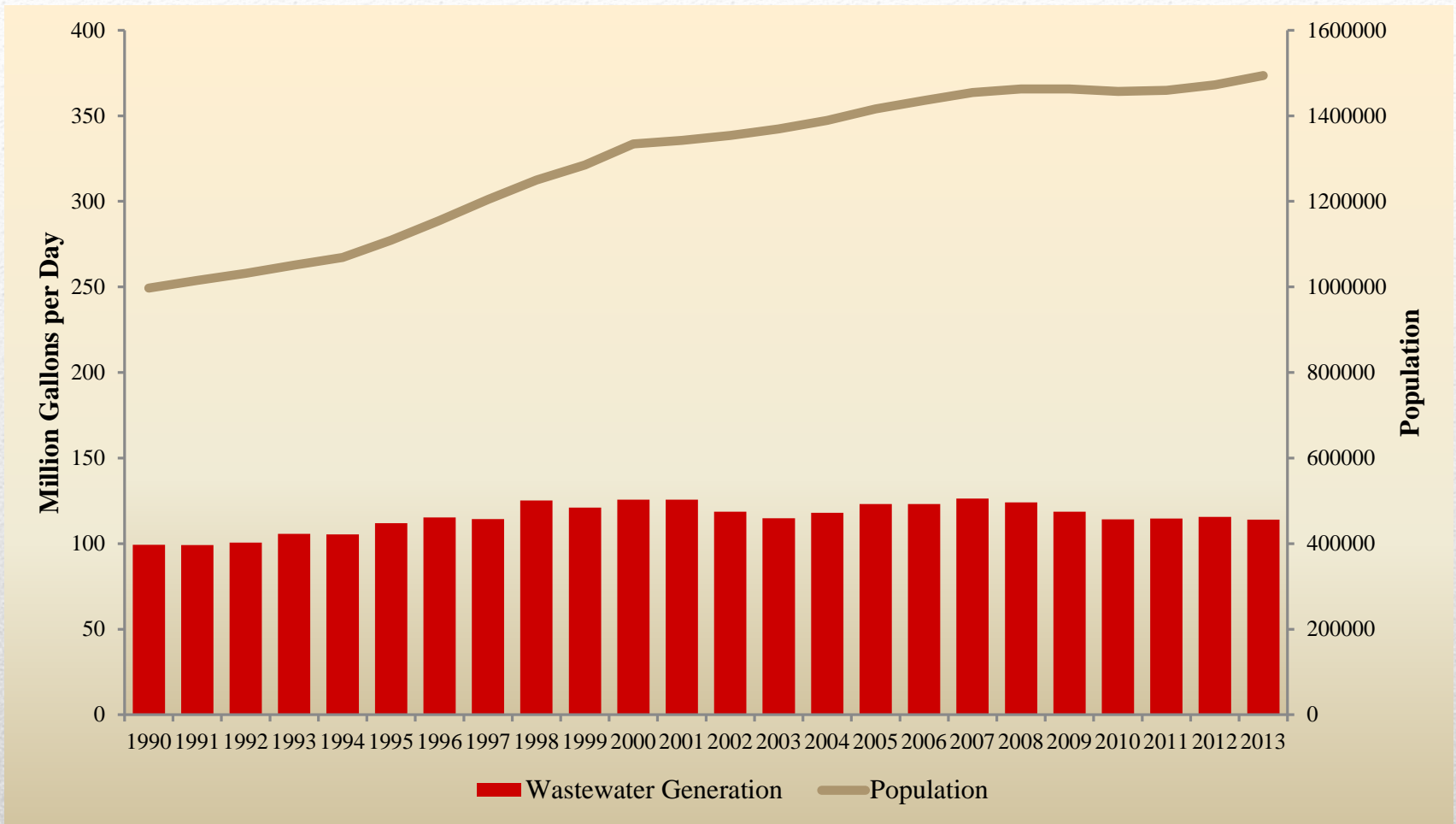


- Reclaimed water facilities entirely dependent on wastewater flows for supply
- Falling per capita and per unit wastewater flows cause aggregate flows to treatment plants to remain the same or flat line even with growth
- Wastewater flows and thus reclaimed water supplies have not increased as anticipated -> existing flows allocated
- Plans for additional future reclaimed water facilities will be scaled back because of lower flows

## 6. Wastewater Flows = Reclaimed Water Capacity

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Wastewater & Reclaimed Water Flows Have Remained Level Even With Growing Population





# Cave Creek Reclamation Plant

Plans from the 1980s and 1990s anticipated two reclamation plants north of the CAP – probably only one will be needed now because of reduced flows.



City of Phoenix



- Common law and State Statutes require detailed analysis of demand by different customer classes for infrastructure and water resources
- Development community scrutinizes calculations
- Impact fees have provided over a half billion dollars worth of infrastructure and water resources ('96-'13)
- When development occurs on large scale again, impact fees will be key to funding new infrastructure and paying down debt

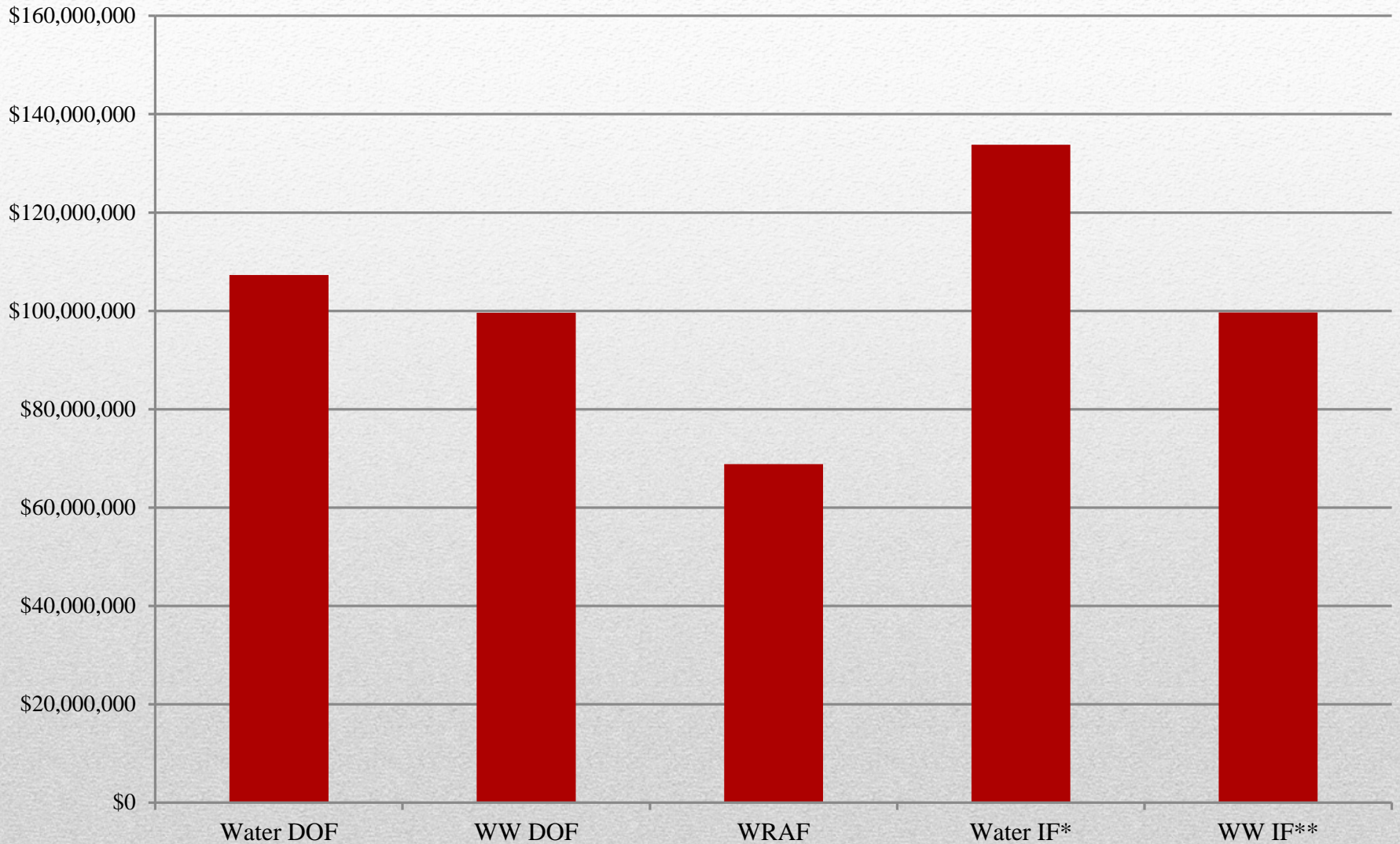
## 5. Impact Fee Calculation Requires Detailed Numbers

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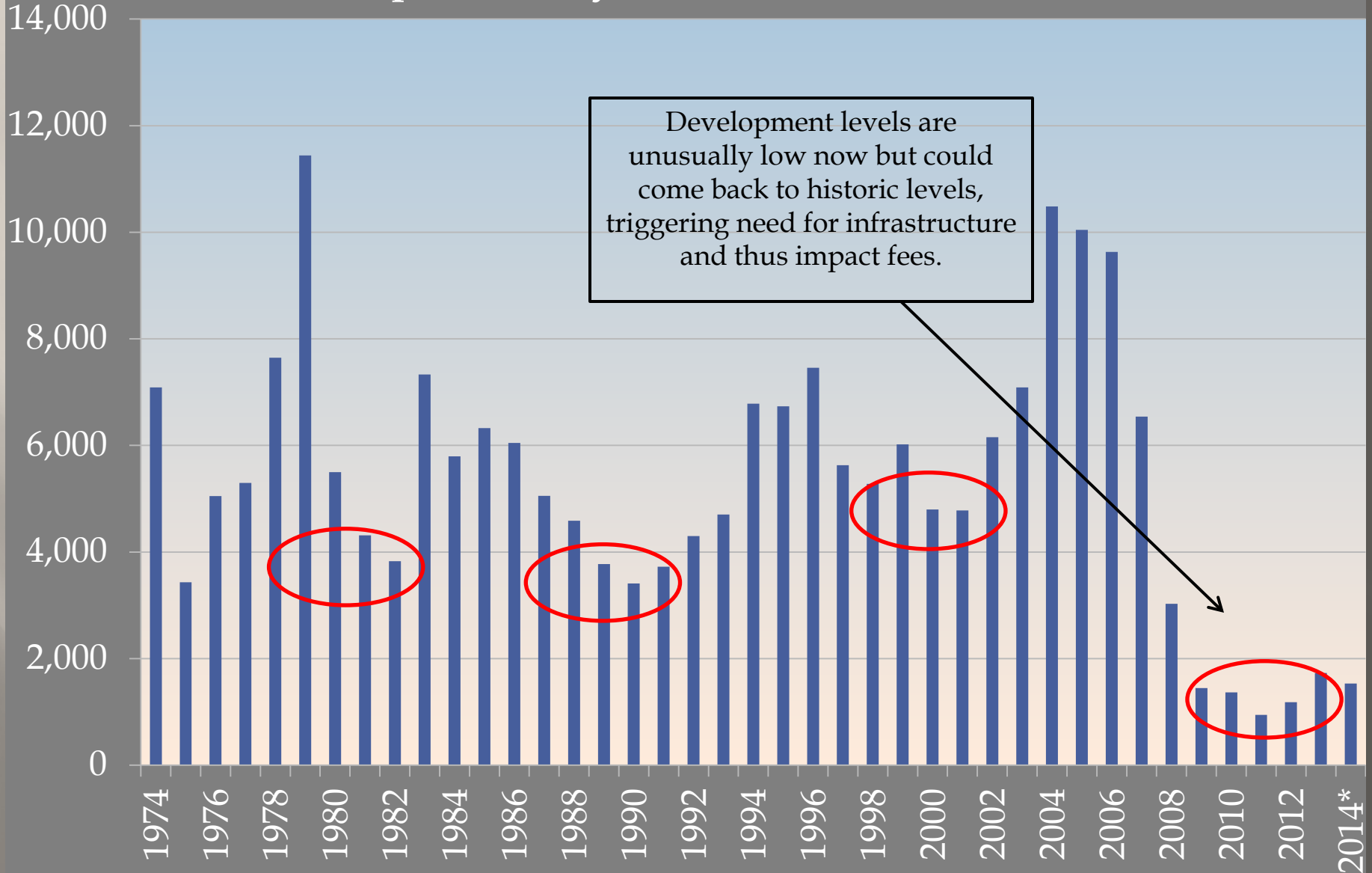




# Estimate of Value of Water-Related Impact Fees and Facilities Dedicated In-Lieu of Fees, FY 1996-97 to FY 2012-13



# Single Family Homes Served by City of Phoenix Water Services Department by Year of Construction, 1974-2014





- Reduced flows can lead to smaller capital improvement plans because of delays and cost reductions for projects
- Smaller lines, boosters, lift stations, reservoirs required
- Less capacity required at water treatment plants
- Less volume (but more solids) to wastewater plants
- Not without challenges:
  - Slower turnover in mains can lead to expensive chlorine residual issue costs
  - Low flows in sewers can lead to higher O&M/rehab costs

## 4. Flows Affect CIP and O&M Planning and Management

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Lake Pleasant Water Treatment Plant  
under construction – cost of project:  
\$220 million +



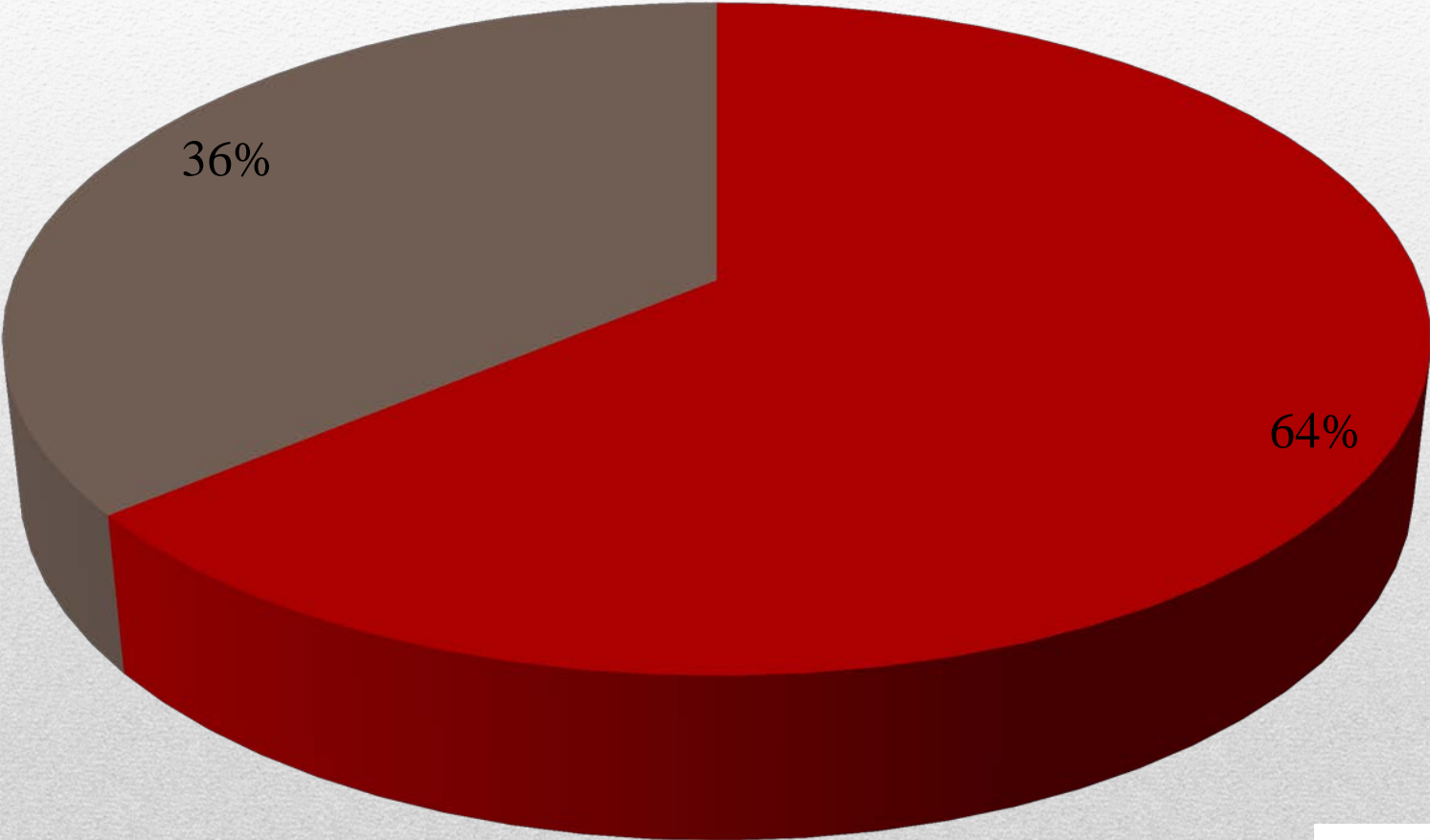
If per unit water demands had  
remained steady during the past  
twenty years an additional plant  
(Western Canal) and/or an  
expansion of Lake Pleasant would  
have also been required soon





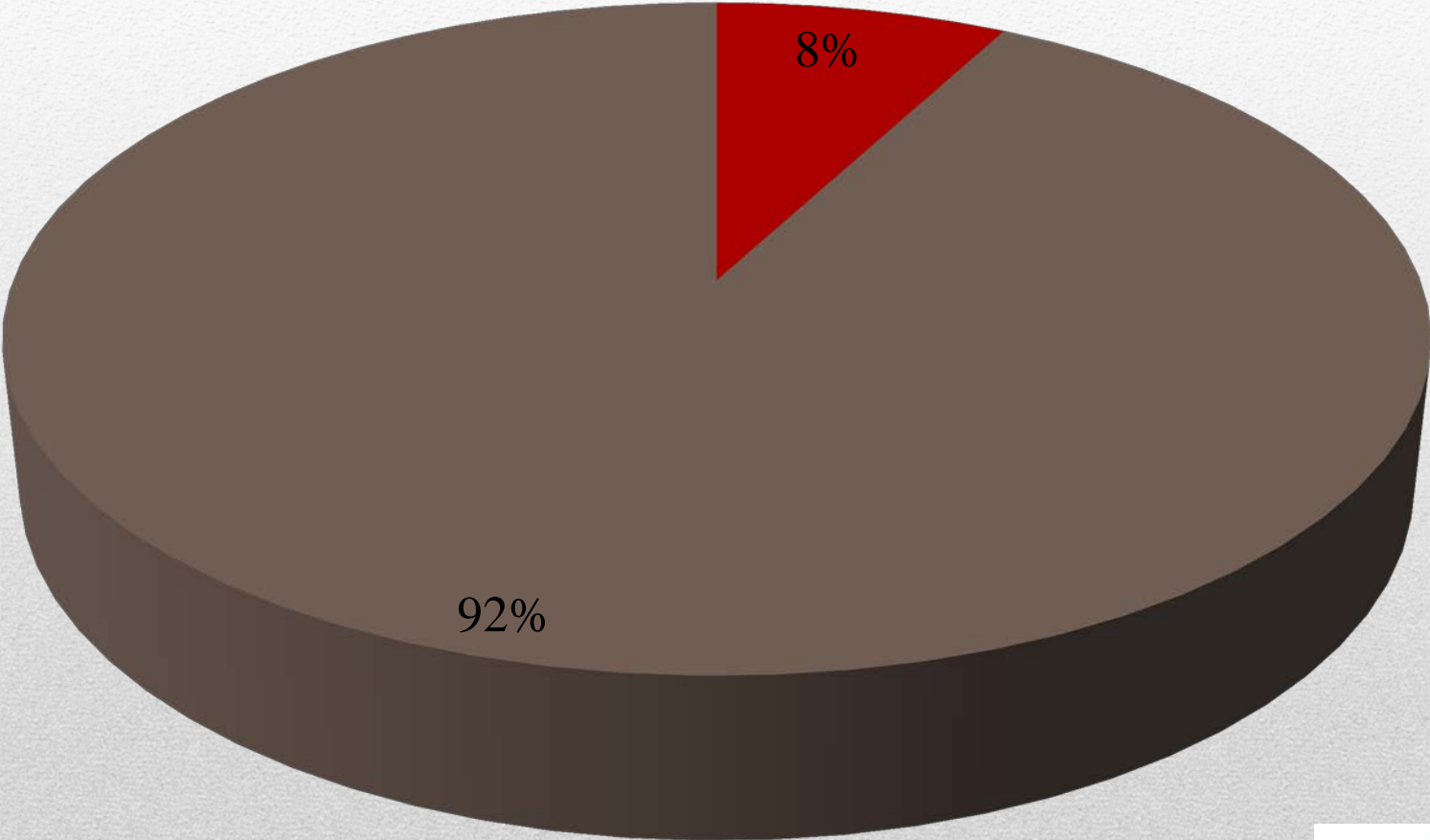
# FY 1998-2003 CIP Growth Versus Non-Growth Comparison

■ Growth ■ Non-Growth



# FY 2016-2020 CIP Growth Versus Non-Growth Comparison

■ Growth ■ Non-Growth





- Old conservation programs often followed ‘shotgun’ approach
  - Sometimes ineffectual or counter-productive
  - When successful sometimes blunt and caused irritation
- Need for future programs that can target specific customers and water uses
  - Provide most benefits to customers and WSD
  - Ensure economic development & social goals met
  - Differentiate between long and short-term objectives

### 3. ‘Smart’ Demand Management Requires Targeted Efforts





Past water efficiency initiatives have tended to focus on single family customers.



Future initiatives may focus more on promotion of efficiency efforts in the ICI sector; for example measures to accelerate adoption of new equipment or artificial turf.



**COP WSD RESEARCH WILL LEAD TO STUDIES TO  
IDENTIFY MOST COST-EFFECTIVE ‘WIN-WIN’  
POTENTIAL INTERVENTIONS**

Priority Savings From Literature Review

Metropolitan Water District of Southern California Water Conservation Market Study

Business Type	End Use	Annual Water Use AFY	Savings Potential AFY	Percent Reduction	Estimated Cost	\$/AFY
Beauty Salons	Hair Washing	5,440	2,720	50%	\$587,570	\$216
Fitness Centers	Shower	6,268	2,095	33%	\$552,060	\$264
Grocery Stores	Cooling & Heating	7,895	1,579	20%	\$462,992	\$293
Full-Service Restaurants	Toilet	7,061	1,387	20%	\$391,532	\$282
Full-Service Restaurants	Dishwashing	3,519	1,130	32%	\$1,395,125	\$1,235
Fitness Centers	Pools & Spas	4,459	1,106	25%	\$4,119,670	\$3,725
Fitness Centers	Laundry	4,180	1,084	26%	\$755,314	\$697
Limited-Service Restaurants	Toilet	5,481	1,076	20%	\$303,942	\$282
Offices of Physicians	Cooling & Heating	4,969	994	20%	\$291,377	\$293
Offices of Physicians	Toilet	4,689	921	20%	\$260,010	\$282



- Network and fixed costs remain almost same even if per unit and per capita volume declines steadily
- Falling demand usually leads to need to increase volume-based rates if full cost recovery required
- Difficult to sell public and decision-makers on rate increases for inflation; additional increases very difficult
- Critically important to understand demand and cost profiles of different types of customers
- Need to understand how different customers will be affected by rate & rate structure changes

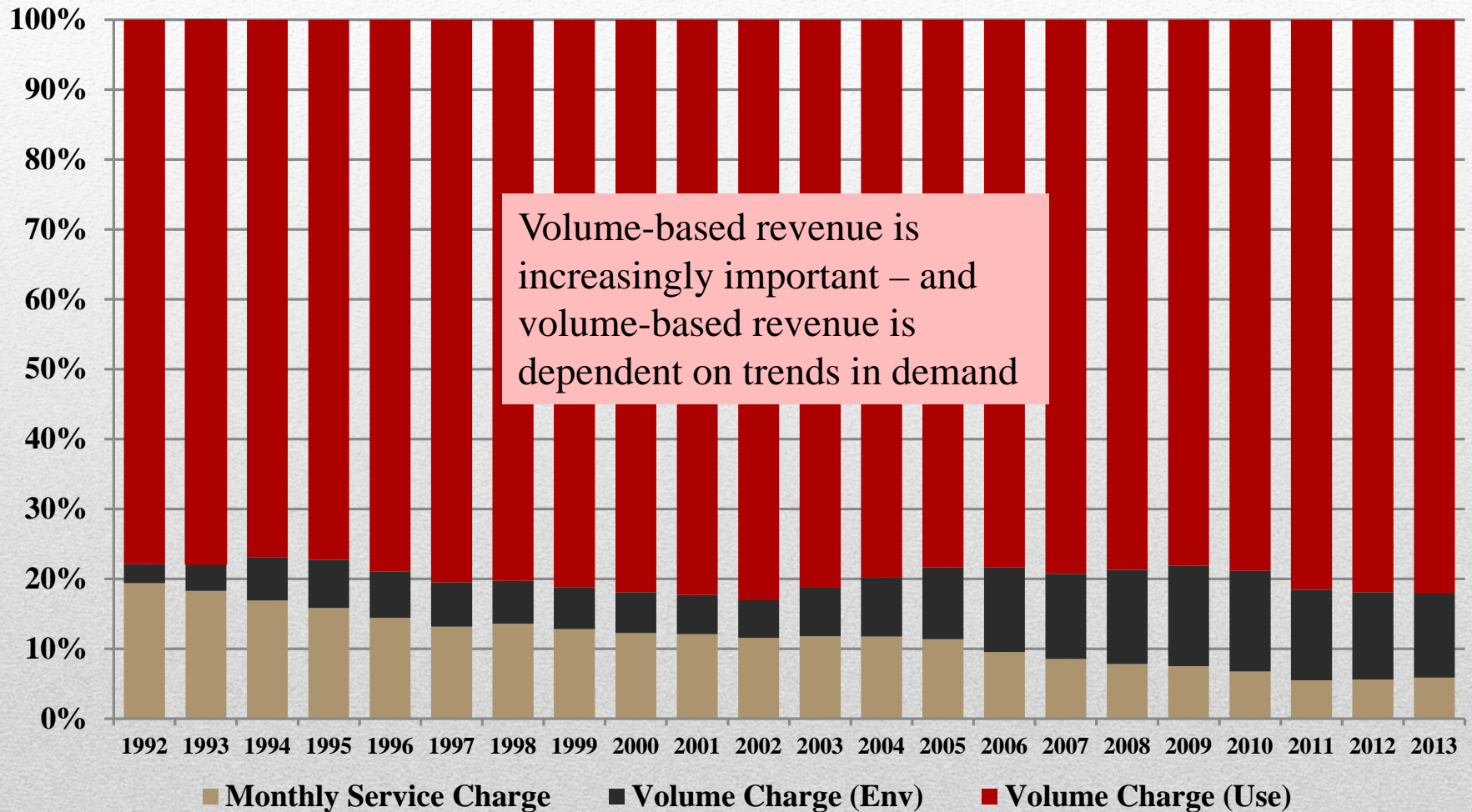
## 2. Rate Revenues & Structure Dependent on Demand

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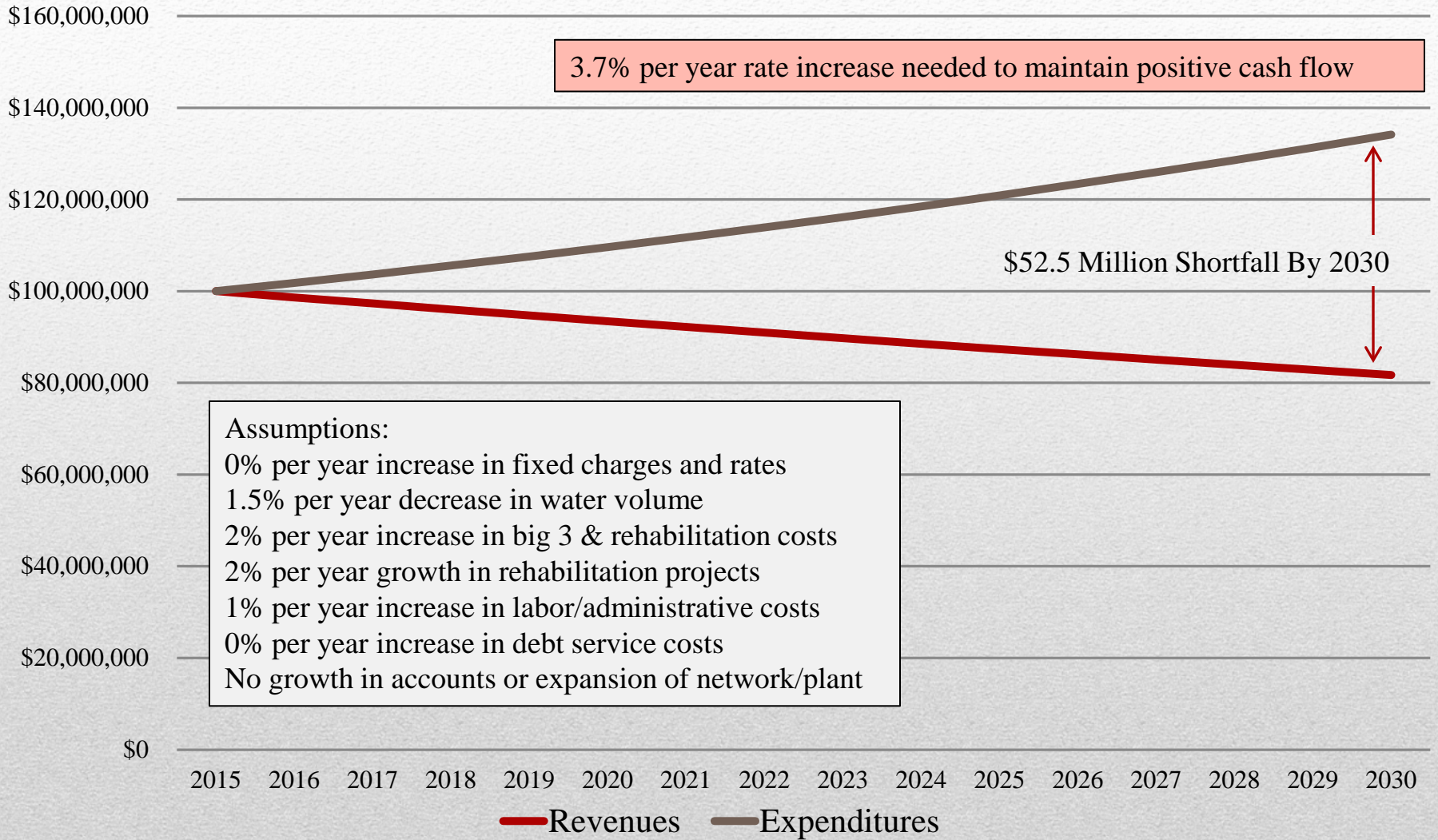




# City of Phoenix Water Services Distribution of Rate Revenue by Charge Type 1992 - 2013



# Hypothetical Utility - Falling Demand, Aging Facilities, No Rate Increases, Mild Inflation and No Growth In Accounts or Network





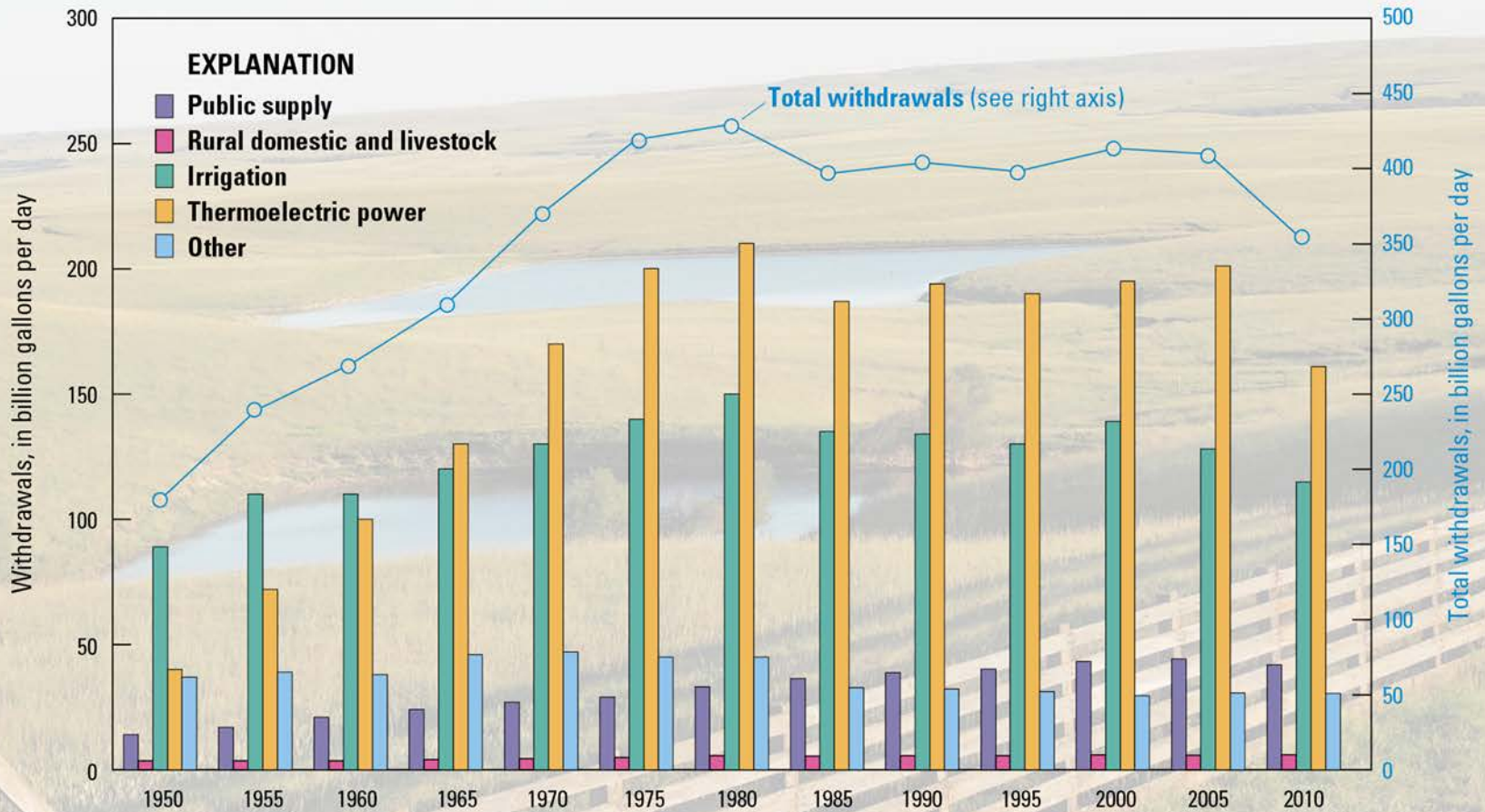
- Impossible to understand long-term supply needs without understanding long-term supply trends
- Numerous additional supply projects eliminated or deferred because of demand reductions to date
- Understanding ‘how low can you go’ key to determining long-term supply needs
- Falling demands in some cases can cause ‘hardening’ of demand and decrease margin of safety
- Shift from emphasis on new supplies to supply back-up

# 1. Demand Determines Long-Term Supply Needs

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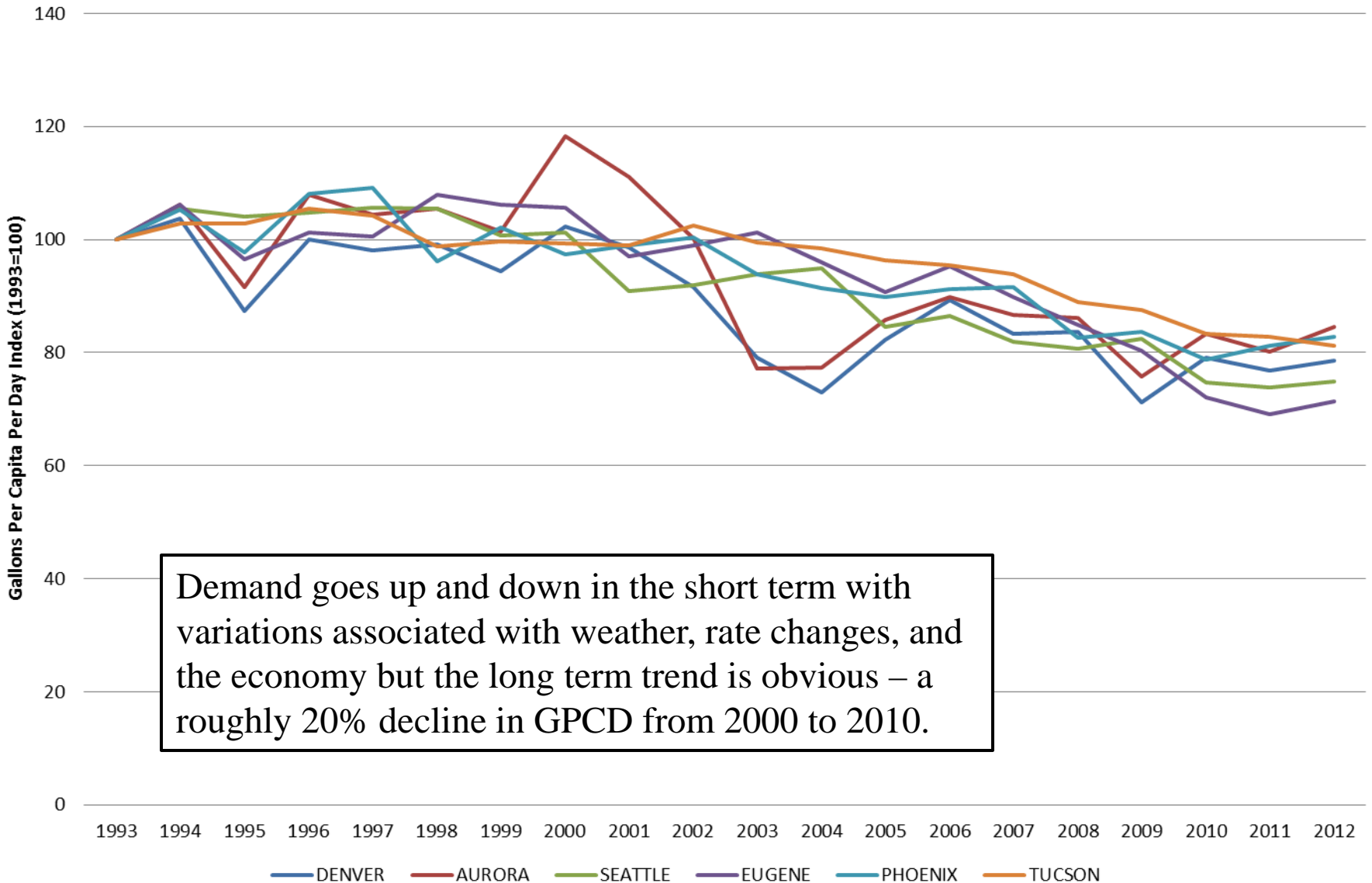
# U.S. Geological Survey: Estimated Use of Water in the United States (2010)



Note that total water demands have fallen for first time in over 50 years

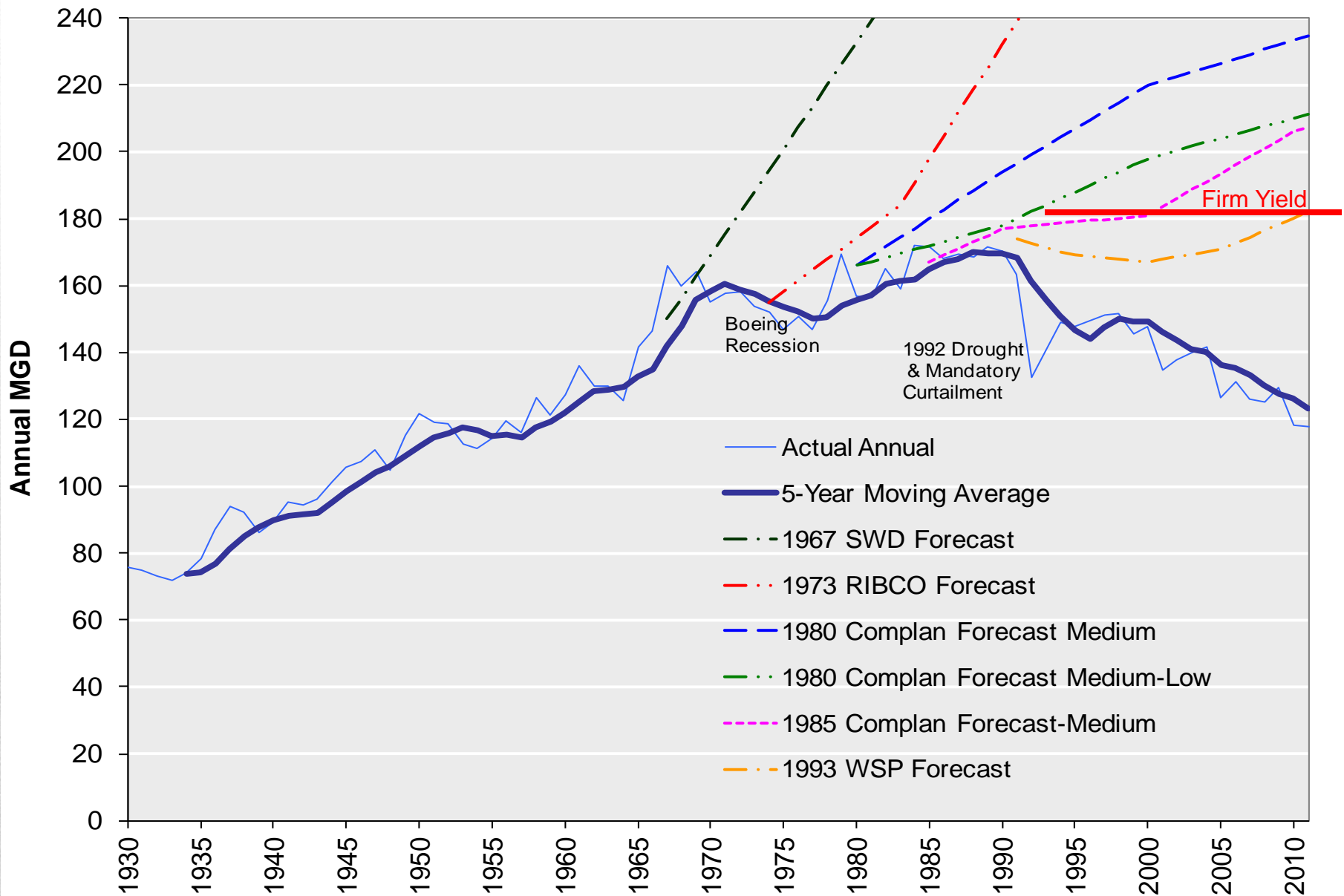


# Different Regions, Different Climates, Different City Sizes, Similar Trends - GPCD Index 1993-2012



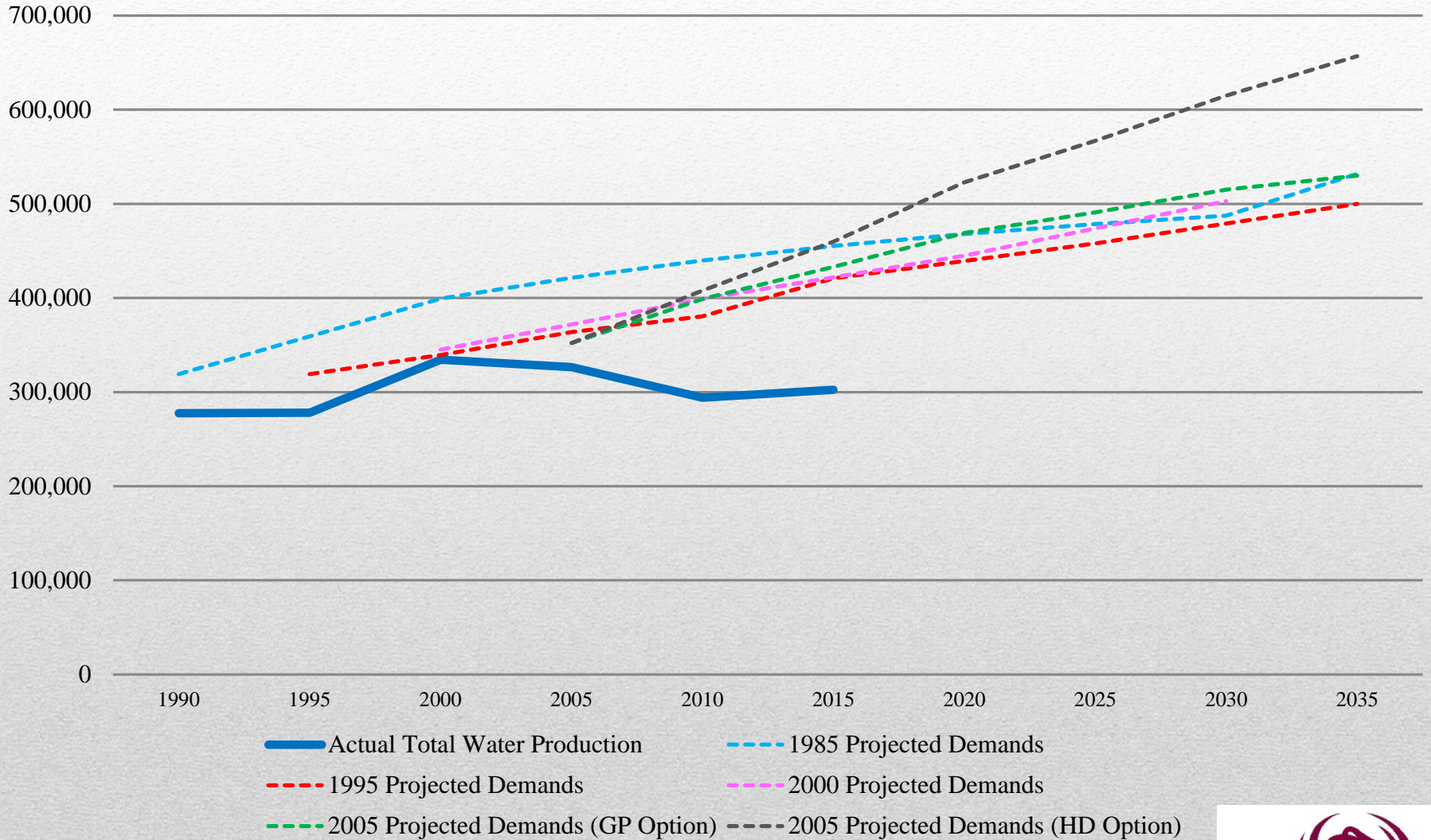
Demand goes up and down in the short term with variations associated with weather, rate changes, and the economy but the long term trend is obvious – a roughly 20% decline in GPCD from 2000 to 2010.

# SPU Water Demand & Forecasts: 1930-2011





# City of Phoenix Actual Demand Versus Water Demand Projected in Past Water Resource Plans (Acre-Feet/Year)



# Why Demand Matters

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