

THE ECONOMIC AND
FISCAL IMPLICATIONS OF
WATER POLICY
IN WASHINGTON COUNTY, UTAH

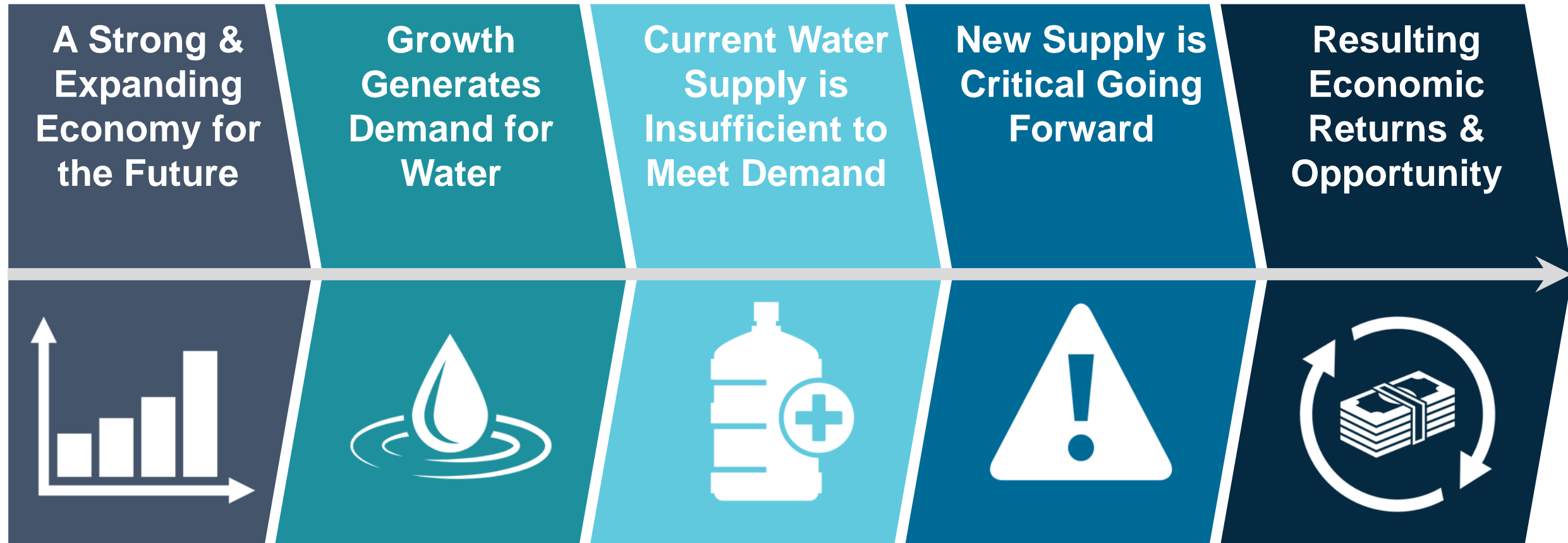
JUNE 13, 2018



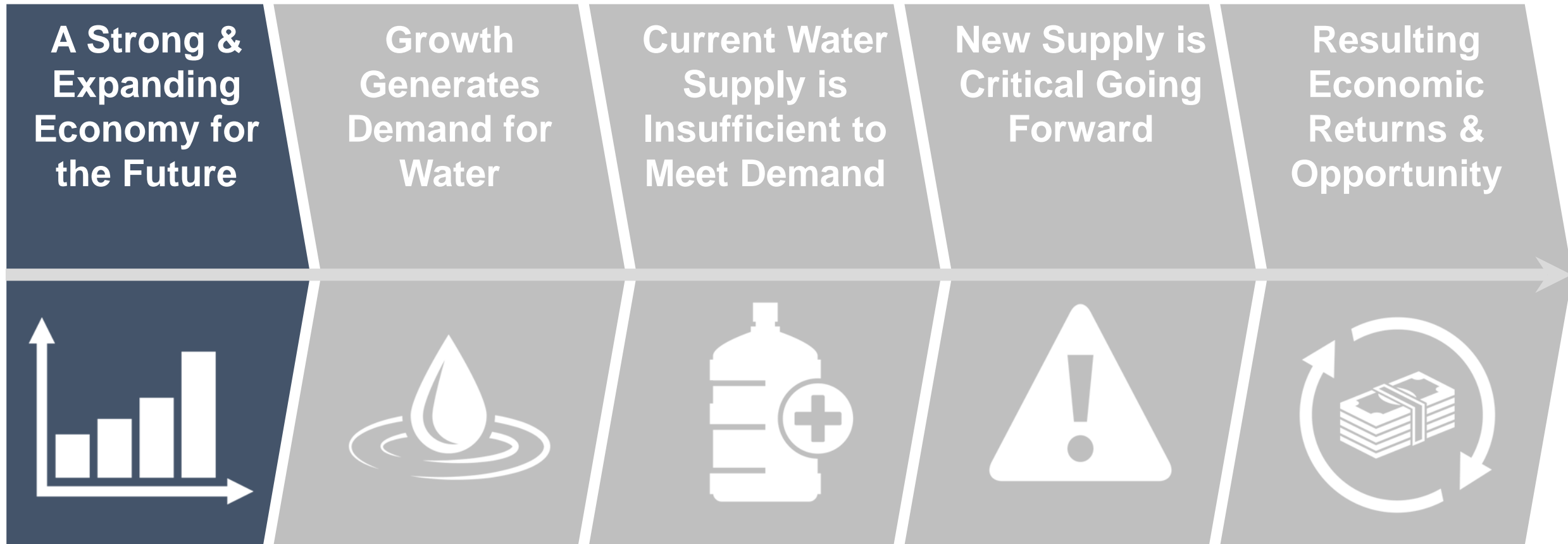
Special Note:

This analysis is a preliminary assessment of Washington County's economy, water supply-demand dynamics and the area's capital infrastructure funding capacity; it is subject to further review and revision.

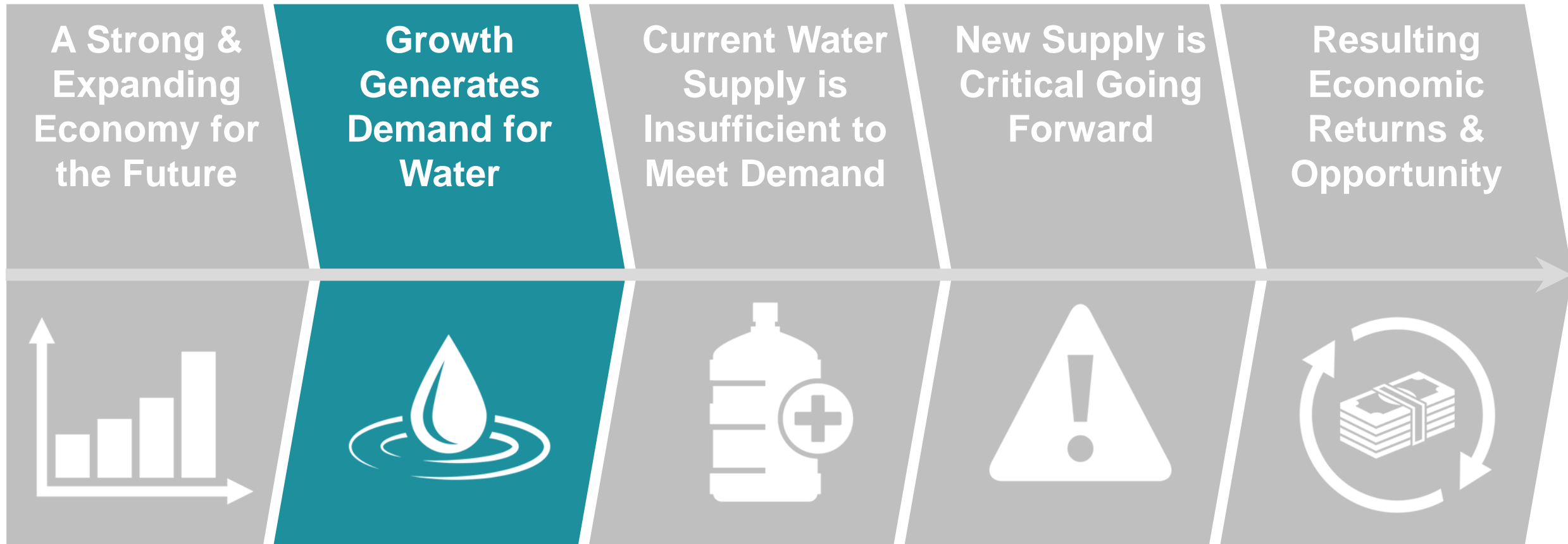
Recap of March 23, 2018 Presentation



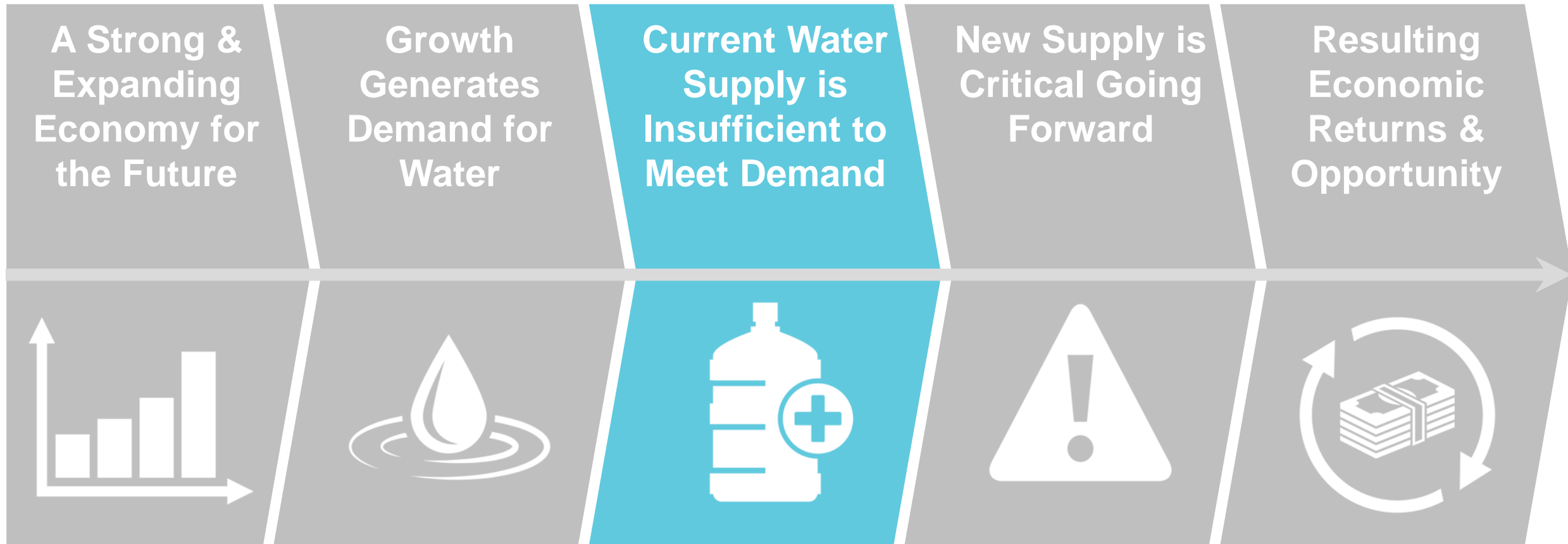
Recap of March 23, 2018 Presentation



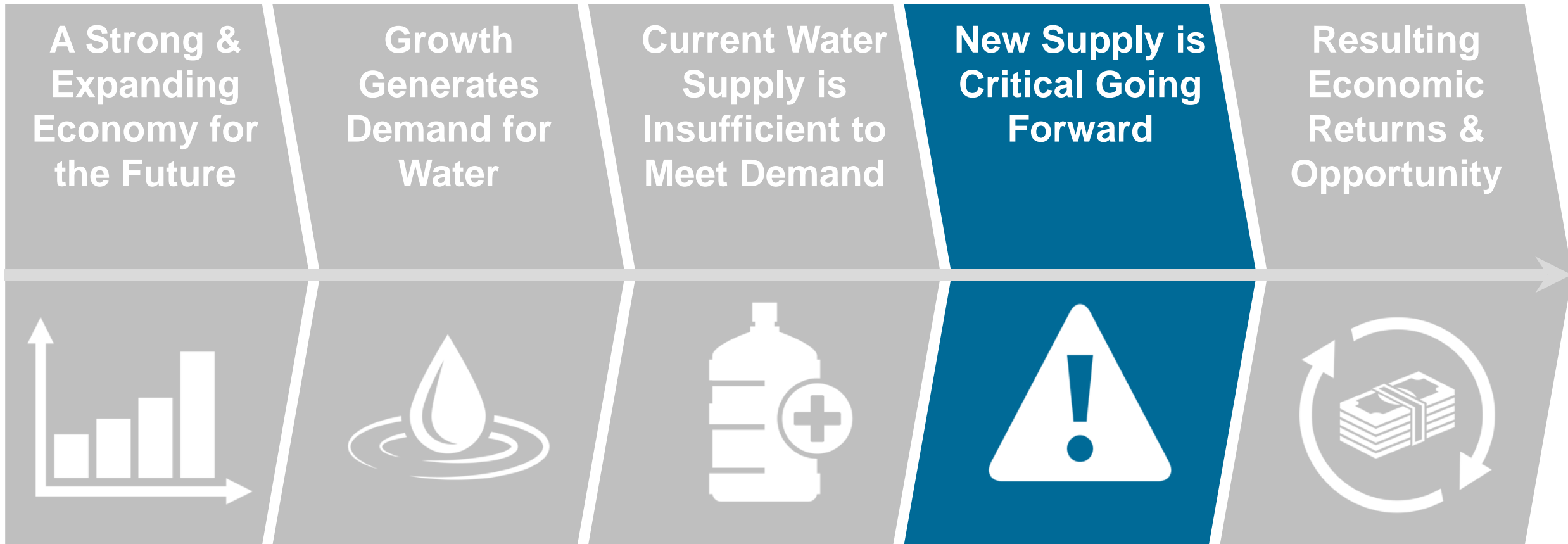
Recap of March 23, 2018 Presentation



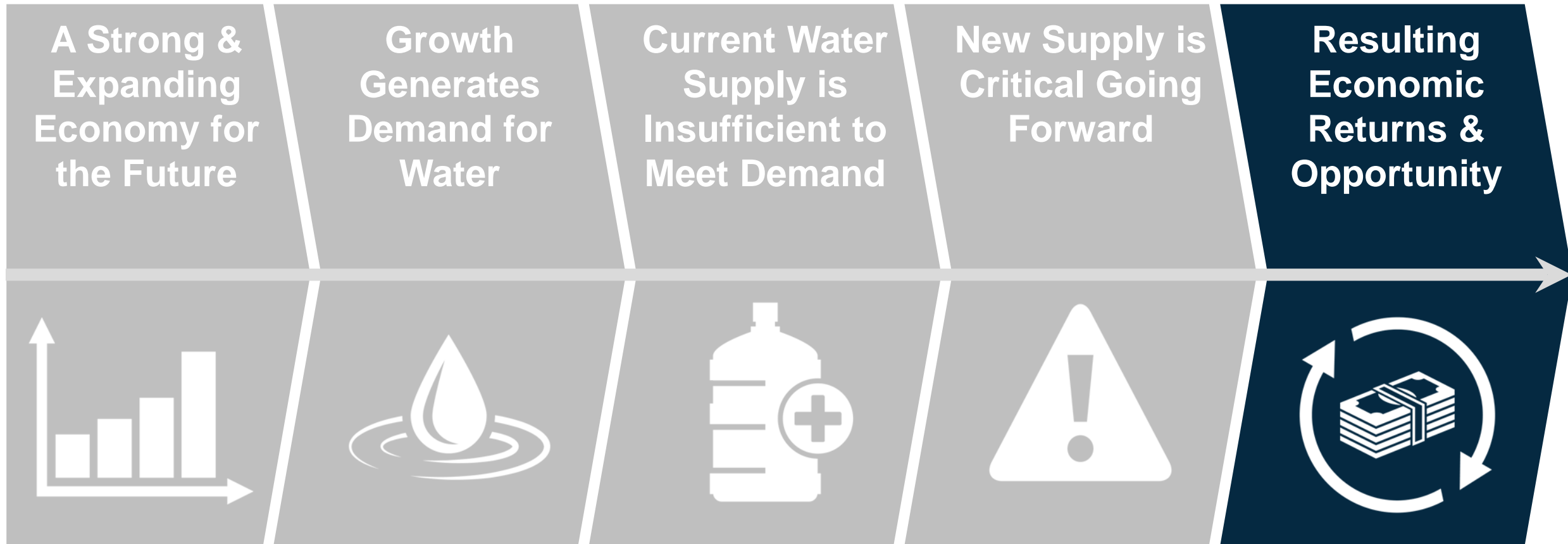
Recap of March 23, 2018 Presentation



Recap of March 23, 2018 Presentation



Recap of March 23, 2018 Presentation





What has happened since the March 23, 2018 meeting...

- 1. The Division of Water Resources released official estimates of 2015 per capita water use for every county in the State of Utah**
- 2. On-going refinement of both demand-side and supply-side assumptions**
- 3. Updated presentation and analysis by University of Utah professors relative to price elasticity considerations for water use**

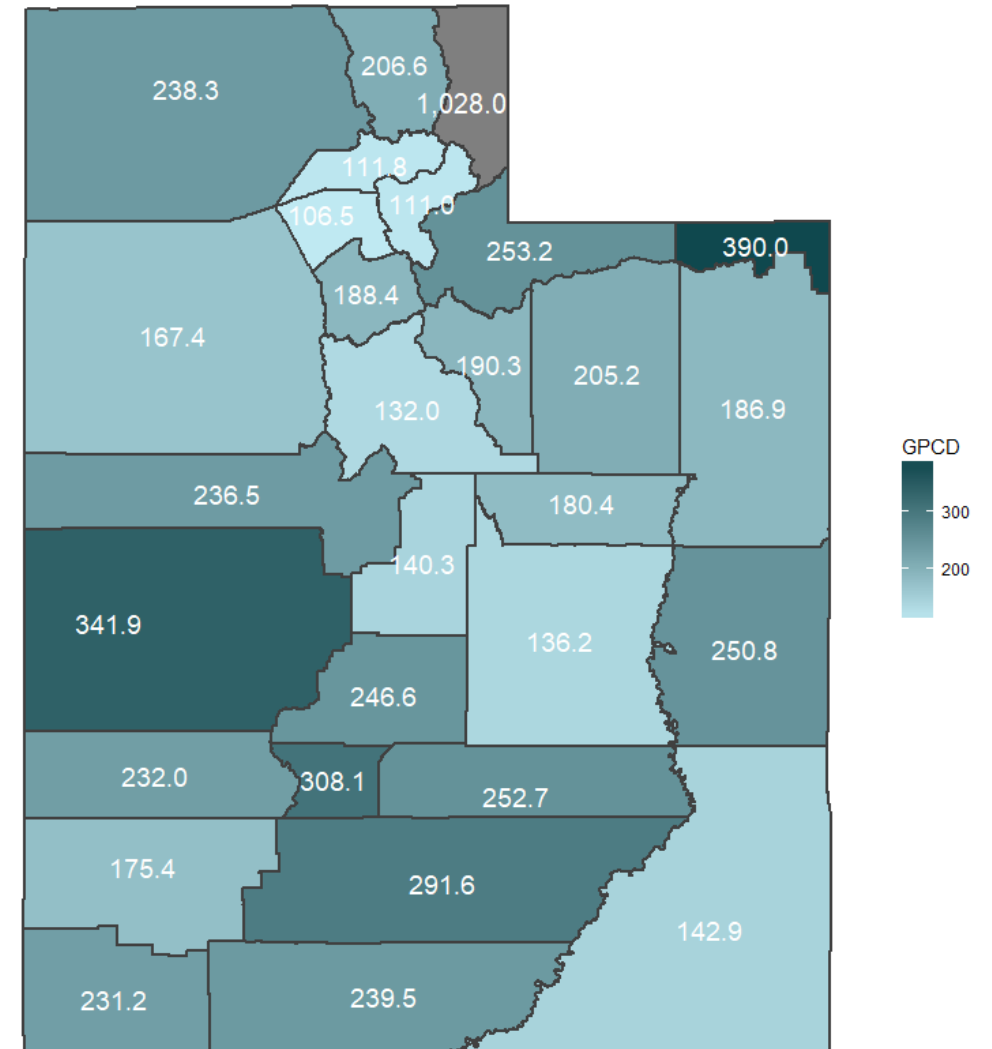


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Water Demand | Gallons Per Capita Per Day

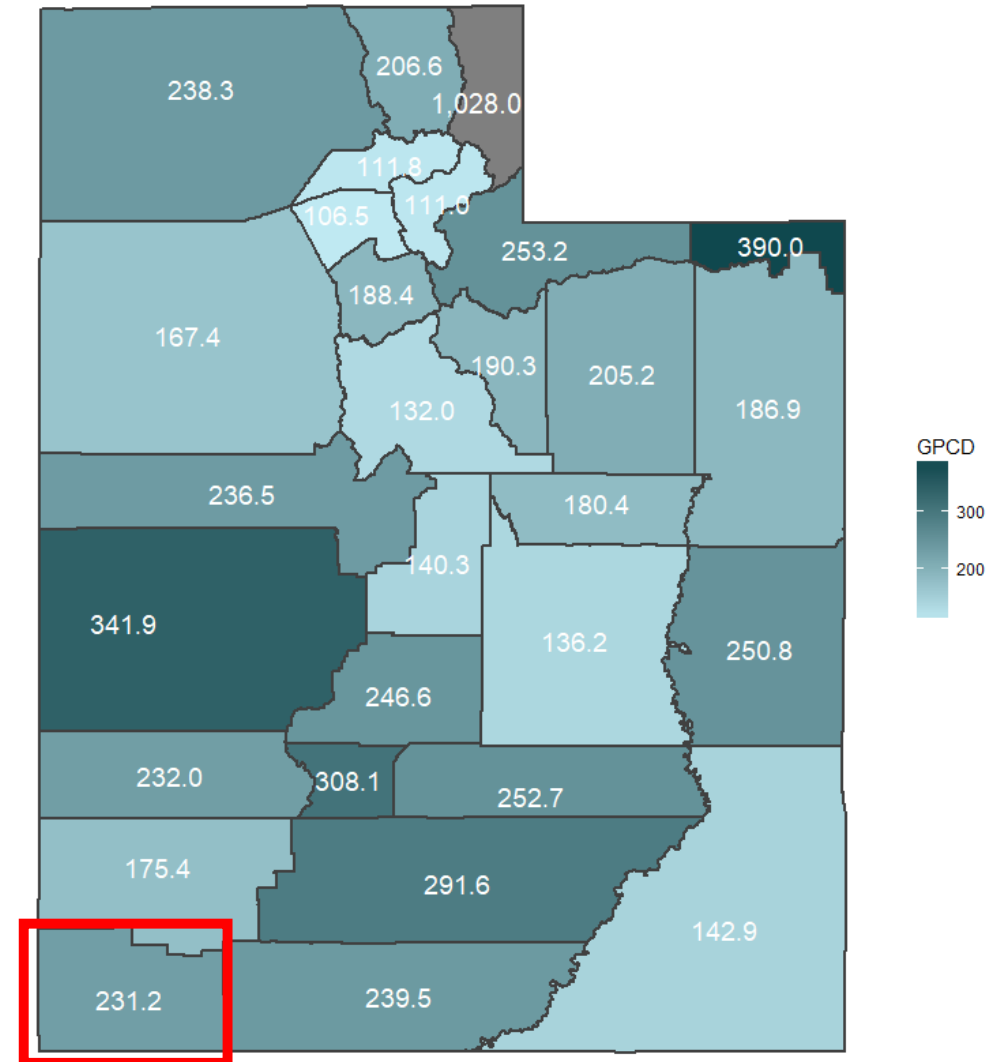
In terms of domestic public supply, Washington County ranked 16th lowest of 29 counties in per capita usage despite being located in the hottest and most arid region of the state



Source: Utah Department of Water Resources. Note: These figures are county-wide, GPCD reported elsewhere in this report refers to the Kanab/Virgin Basin

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Difference in Water Demand Figures

231.2

**Gallons Per Capita Per
Day in Washington
County**

229.6

**Gallons Per Capita Per
Day in Virgin/Kanab
Basin**

Difference in Water Demand Figures

271.4

**Gallons Per Capita
Per Day Deliveries
by WCWCD**

**Approx. 15%
Non-Revenue Water**

229.6

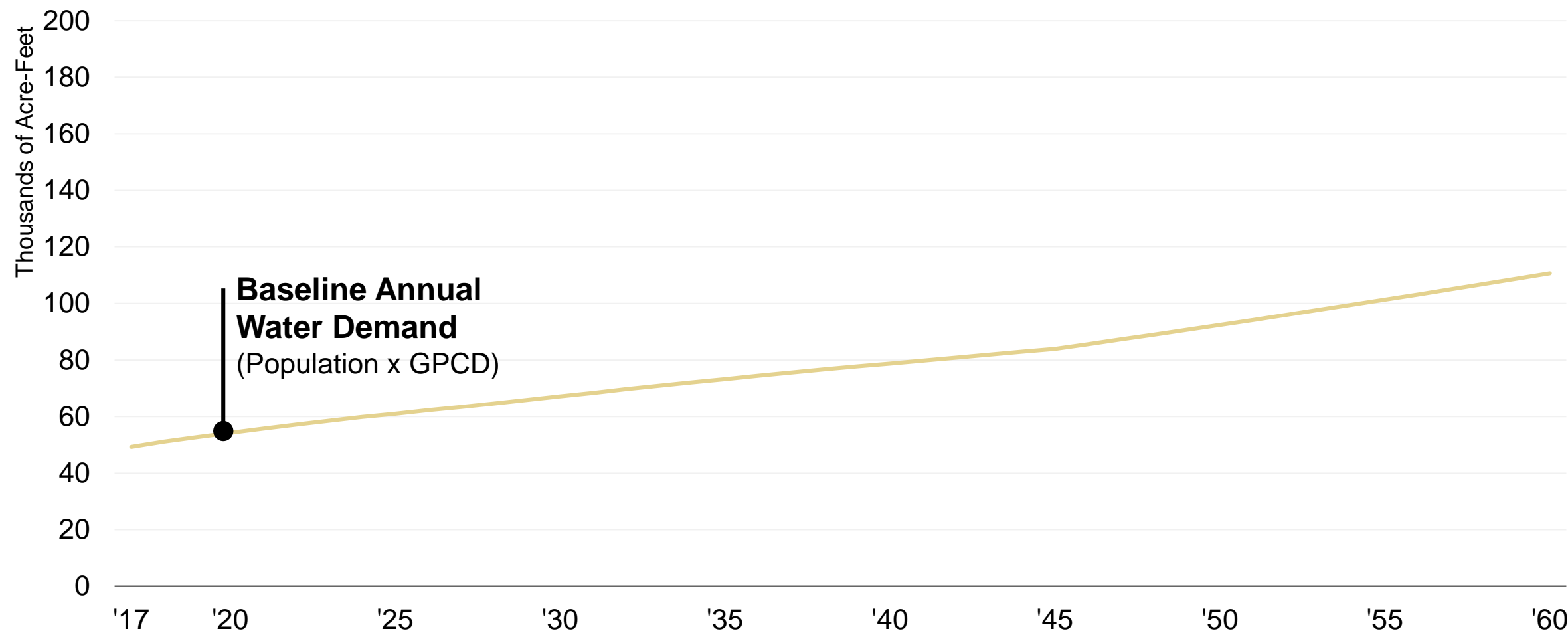
**Gallons Per Capita Per
Day Consumed in the
Virgin/Kanab Basin**



What has happened since the March 23, 2018 meeting...

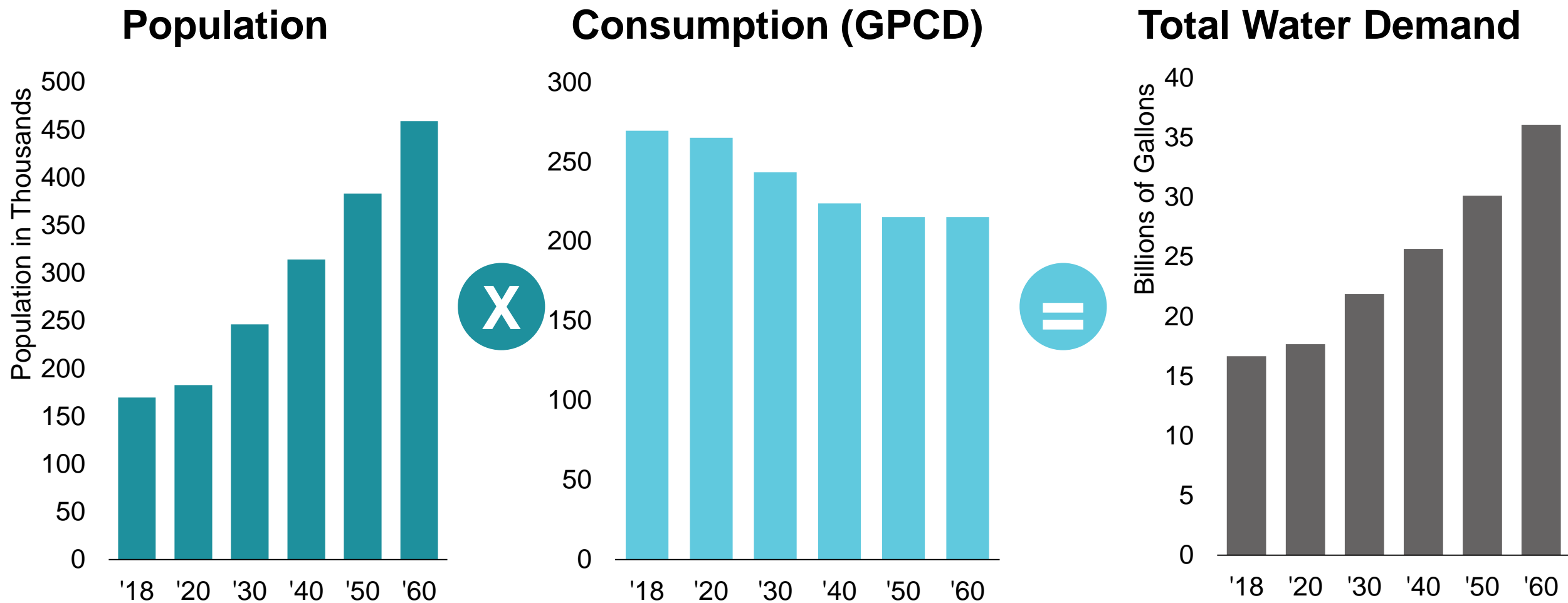
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Washington County Water Supply-Demand Balance

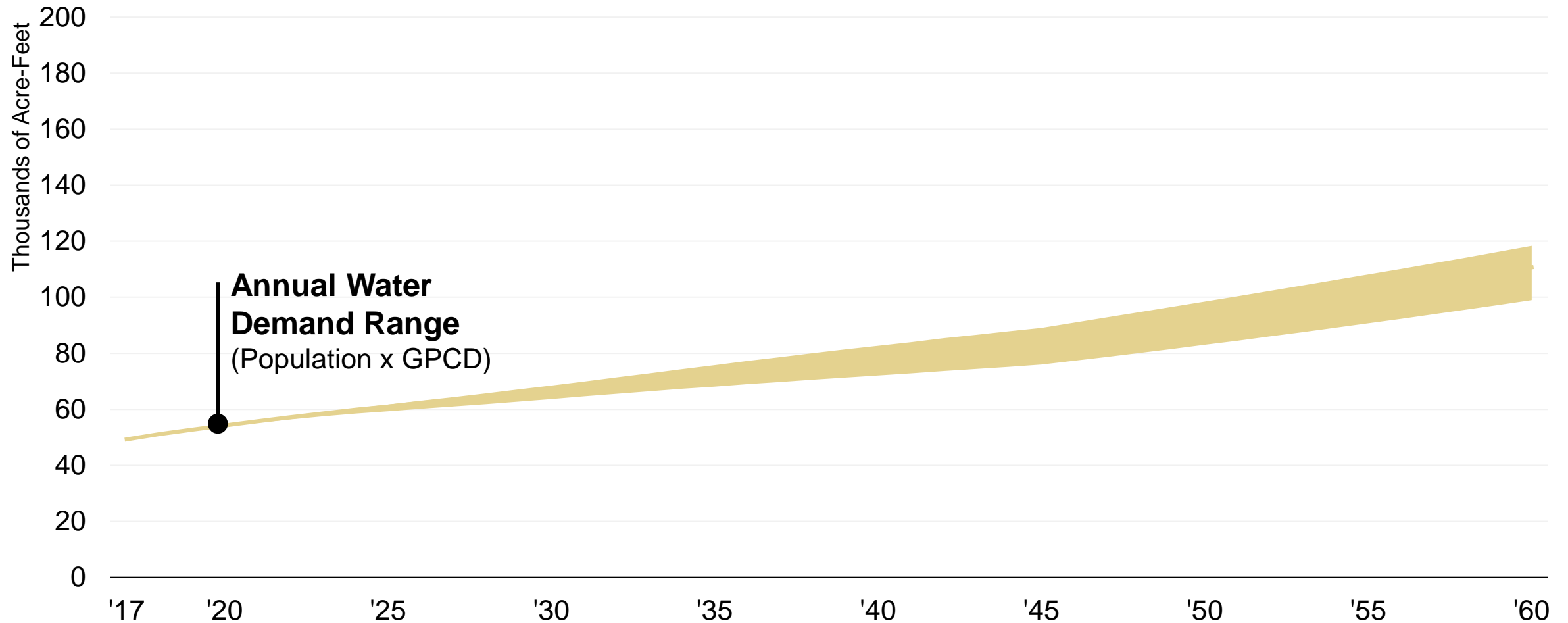


Source: Washington County Water Conservancy District.

Water Demand Calculation

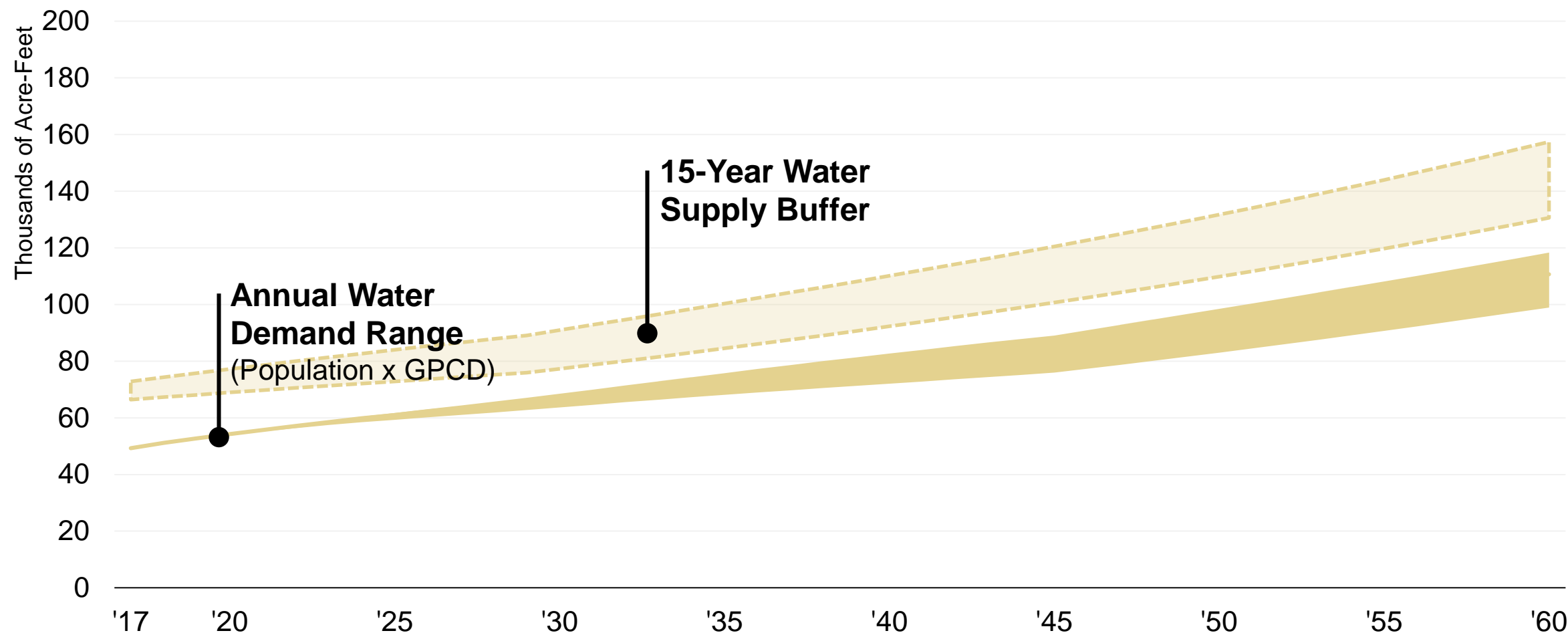


Washington County Water Supply-Demand Balance



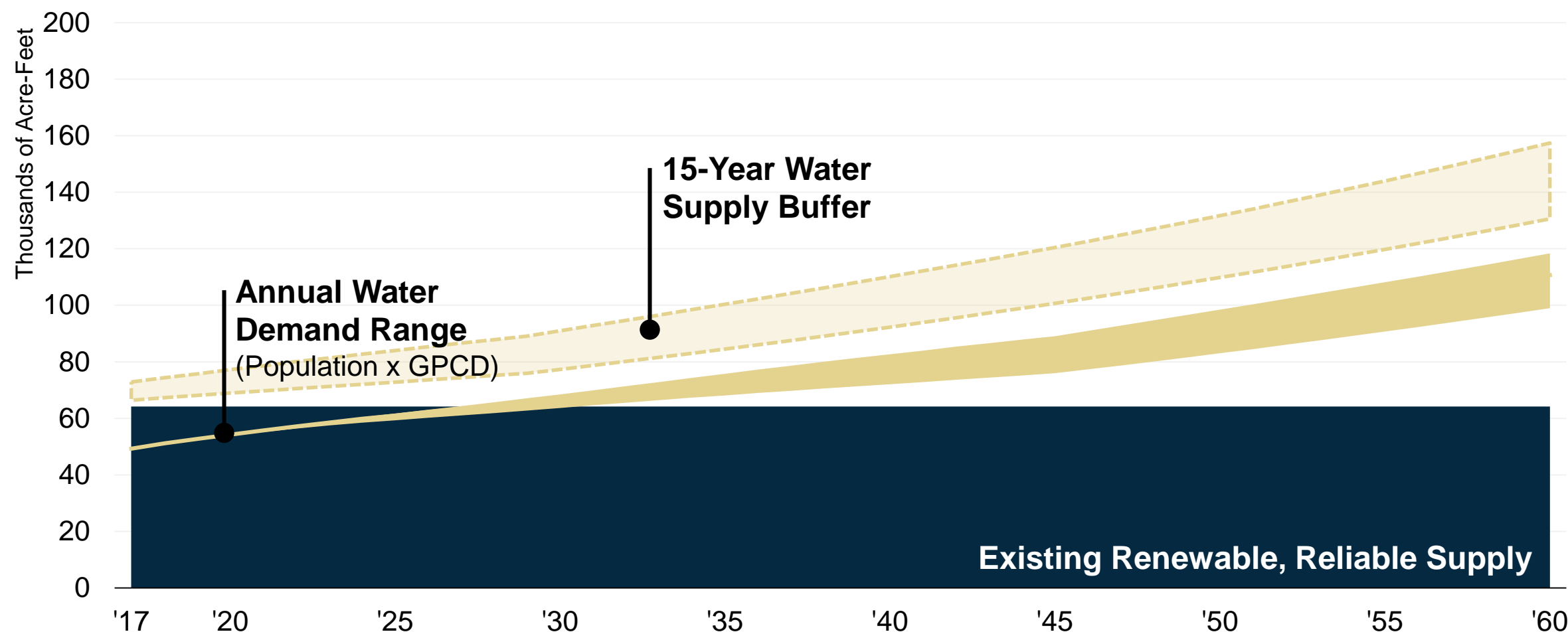
Source: Washington County Water Conservancy District.

Washington County Water Supply-Demand Balance



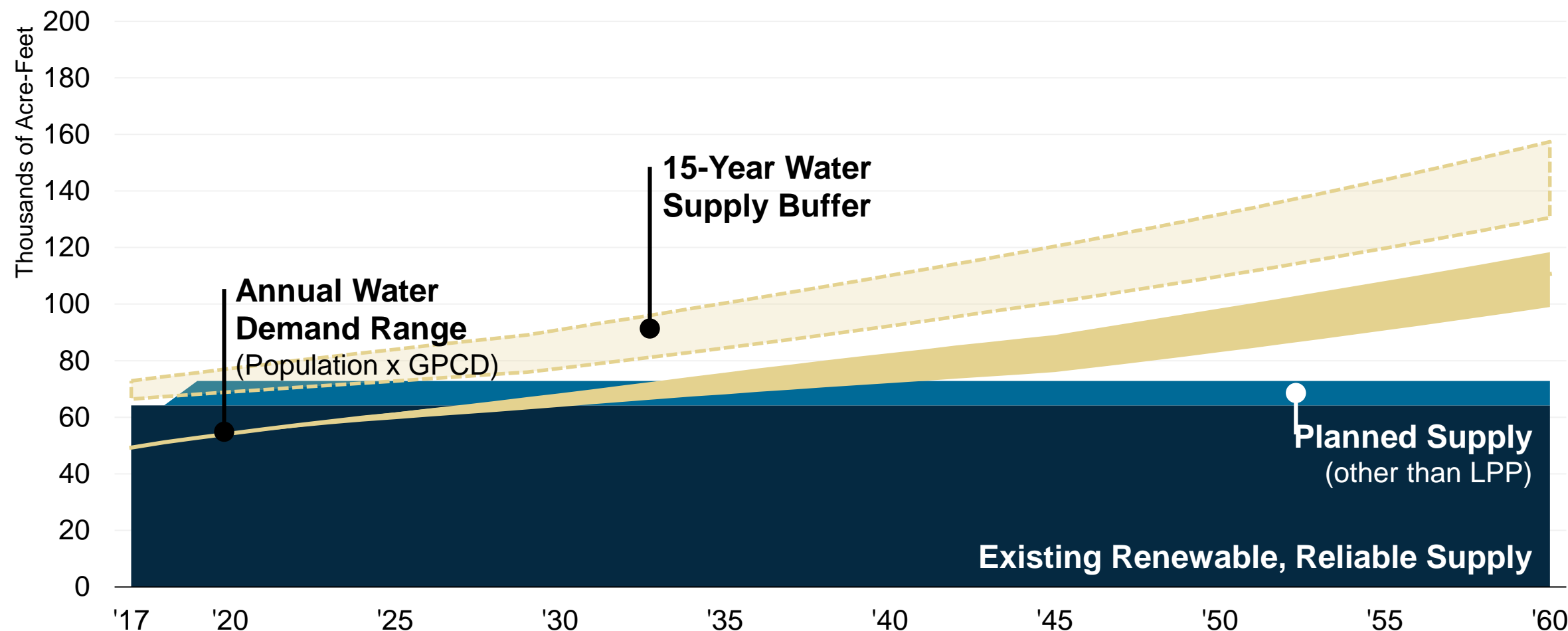
Source: Washington County Water Conservancy District.

Washington County Water Supply-Demand Balance



Source: Washington County Water Conservancy District.

Washington County Water Supply-Demand Balance



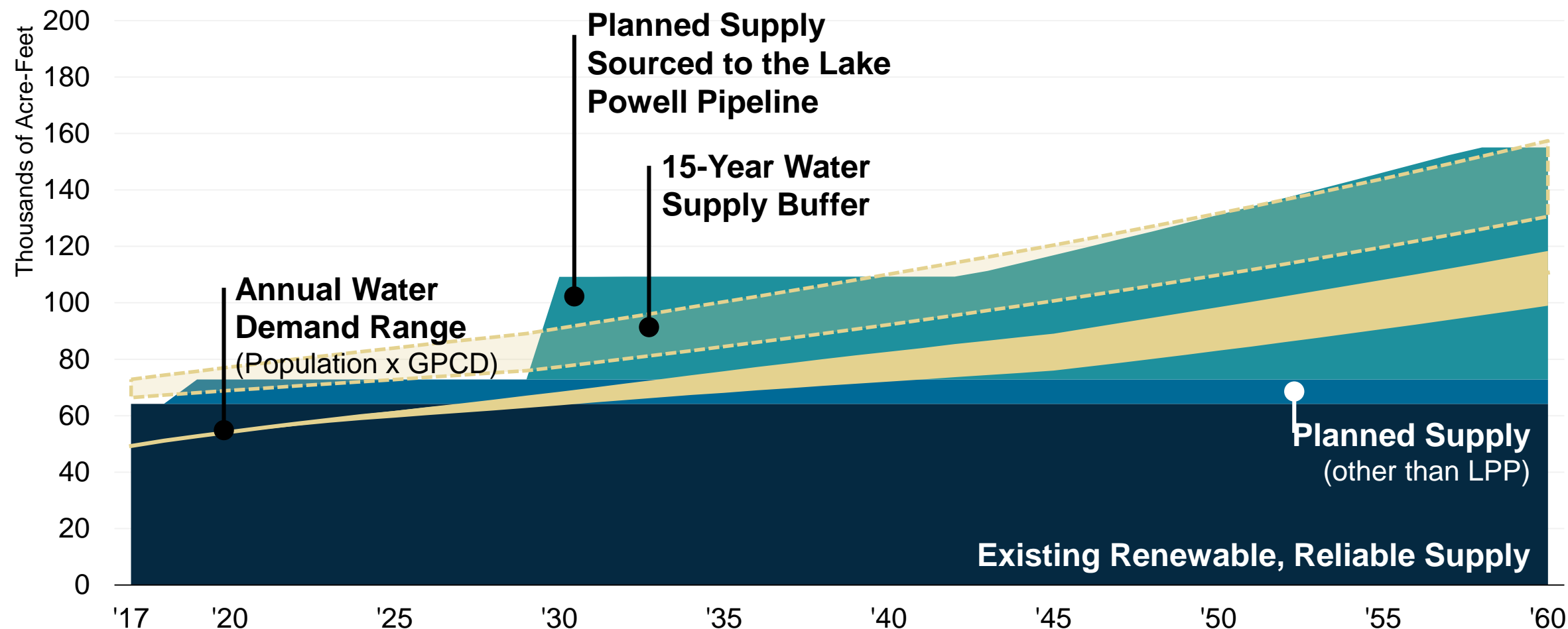
Source: Washington County Water Conservancy District.

Planned Water Resources on the Horizon

Project Name	Estimated Project Year	Reliable Yield (Acre Feet)
Ash Creek	2019	2,840
Cottam Wells	2019	600
Diamond Valley Well	2019	400
Lake Powell Pipeline (“LPP”)	2024	82,249
Pintura Well	2019	600
Quail Creek WTP – Expansion	2021	-
Quail Creek WTP – Ozone Addition	2019	-
Sand Hollow Arsenic WTP	2018	-
Sand Hollow Regional Pipeline	2018	-
Sand Hollow Wells	2019	3,000
Sand Hollow WTP	2026	-
Sullivan Wells	2019	750
Total		90,439

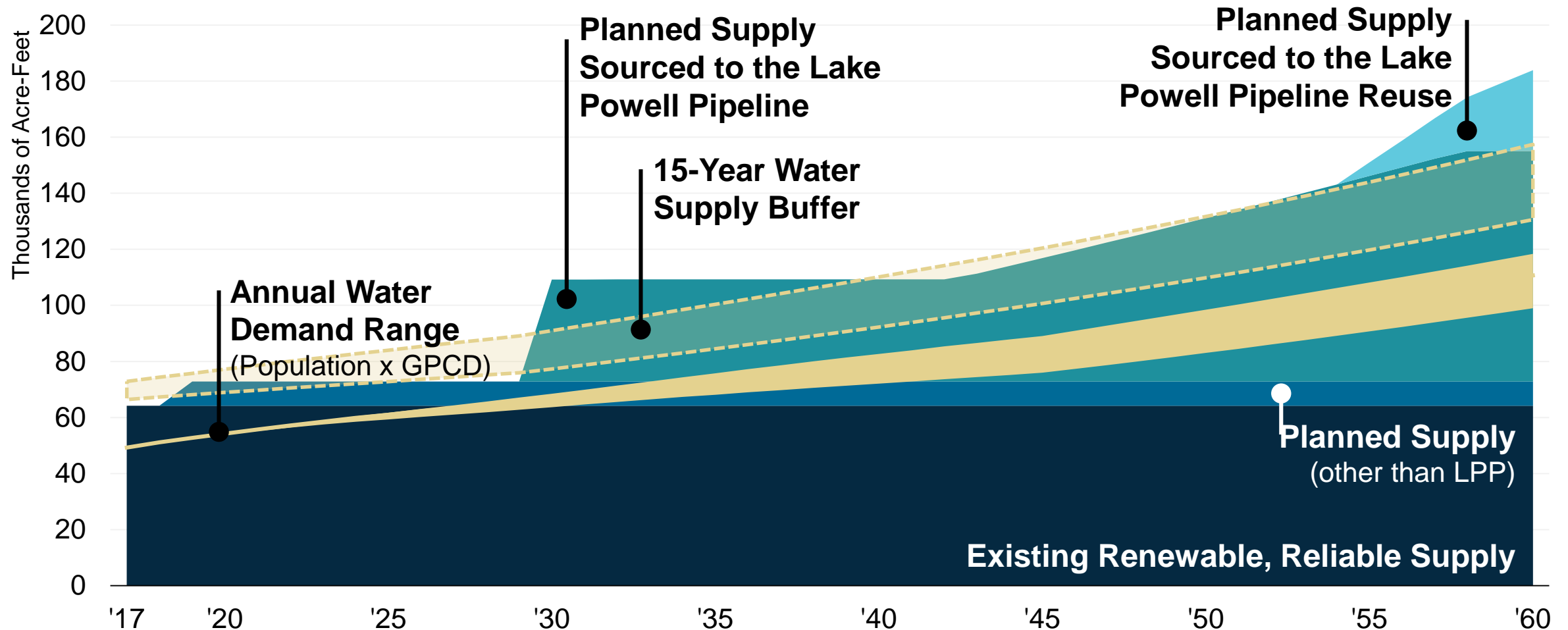
Source: 2017 Impact Fee Facilities Plan. The 2017 IFFP includes only facilities planned within the 2017-2026 planning window.

Washington County Water Supply-Demand Balance



Source: Washington County Water Conservancy District.

Washington County Water Supply-Demand Balance



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THE PRICE ELASTICITY OF THE DEMAND FOR WATER IN UTAH

AN ECONOMIST'S VIEW

Gail Blattenberger, Emeritus,
Department of Economics, University of Utah

Source: Professor Gail Blattenberger, Presentation to the Executive Water Finance Board, May 22, 2018.

EXECUTIVE SUMMARY

The purpose of this study was to estimate a range of composite, weighted-average, price elasticities of water demand for the customers of the Las Vegas Valley Water District (LVVWD). The LVVWD Finance Department management directed staff to conduct this study. The results of this study will be utilized in a LVVWD financial model to assess funding options for the operational and infrastructure requirements of the organization, with application in a Citizens' Advisory Committee.

It has been well established in the literature that water is a normal good and that the price and quantity demanded are inversely related. The inverse relationship suggests that an increase in the price of water will cause consumers to use less of it. As a result, it is important for the LVVWD to conduct this study when examining changes in water rates. In fact, many water utilities have recognized price elasticity as a critical element in providing revenue stability and encouraging water conservation.

The goal of this study was accomplished in two parts. First, the staff conducted a comprehensive literature review of single-family water price elasticity estimates to identify an appropriate range of price elasticity used in the water industry for consideration in development of a composite price elasticity representative of all LVVWD customer classes. In addition, three prior studies have estimated water price elasticity for LVVWD single-family water users (Whitcomb, 1996, Red Oak, 2007, and Rollins et al, 2014).

Second, the staff developed demand models to estimate price elasticity of demand for the Top 2% of the customers in the LVVWD service area. The Top 2% of customers represent approximately 7,500 services and they account for approximately half of LVVWD water sales, after linking all related services for these customers the total increases to 14,500. These large customers exhibit an important role in any change in the quantity of water demanded that may be related to adjusting rates. The combination of statistical modeling for the Top 2% customers were based on the LVVWD data for the period January 2006 thru December 2015. The LVVWD data set was supplemented with data from external sources.

This study was completed with the oversight of an independent Project Advisor and a Peer Review Committee of subject matter experts. The Project Advisor and Peer Review Committee provided feedback on an ongoing basis during all phases of this study. In addition, staff provided a survey to the Project Advisor and the Peer Review Committee to obtain additional feedback on the overall study. This feedback provided valuable insights benefiting the Study and input for consideration in future research that may be of value to LVVWD.

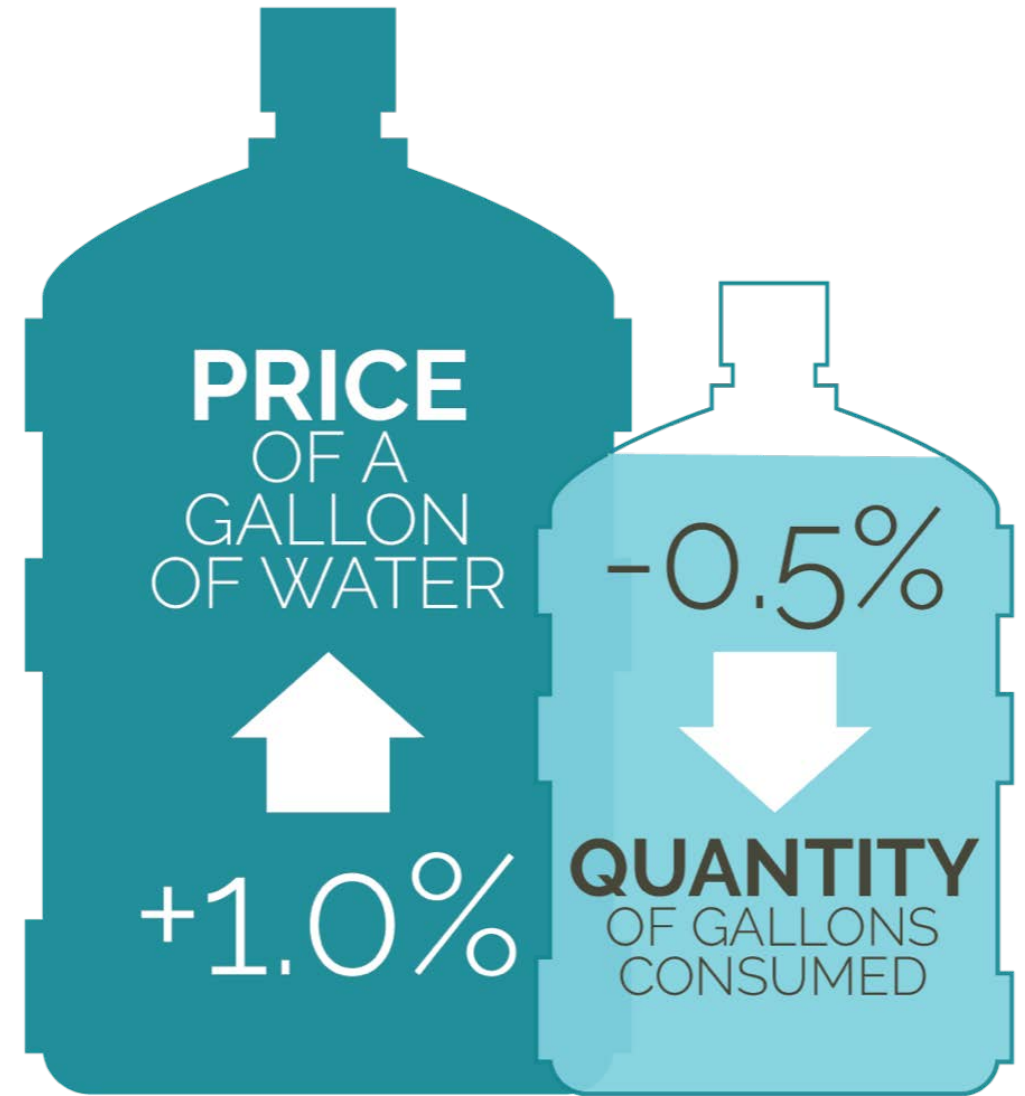
The output of this study is a range of composite price elasticity estimates calculated based on a weighted average of estimates for three customer groups: single-family, multi-family, and non-residential water users. This range of estimates is applicable to all LVVWD customers, excluding golf courses. The composite price elasticity recommended in this study ranges from -0.44 to -0.58 with midpoint of -0.51. This range indicates that the LVVWD water demand is inelastic, suggesting that a 1% change in price will cause a less than 1% change in water

...midpoint of -0.51

Price elasticity assumptions have been integrated into the WCWCD's supply-demand estimates since 2016

Assumptions designed to be conservative

Additional study is needed on the sustainability of consumption behavior changes



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DIFFERENCES AMONG STUDIES

- PRICE VARIABLE
- INDIVIDUAL / AGGREGATE
- SEASONAL / ANNUAL
- LONG RUN / SHORT RUN
- INCLUDE INCOME
- INCLUDE RAINFALL
- LOCATION (SOUTHWEST U.S)

Source: Professor Gail Blattenberger, Presentation to the Executive Water Finance Board, May 22, 2018.



Questions presented today...

- 1. Assumptions and sensitivities of WCWCD supply-demand water models**
- 2. Water use per capita and future demand projections**
- 3. State bonding and repayment to the state, including repayment sources**
- 4. Price elasticity of demand estimates**



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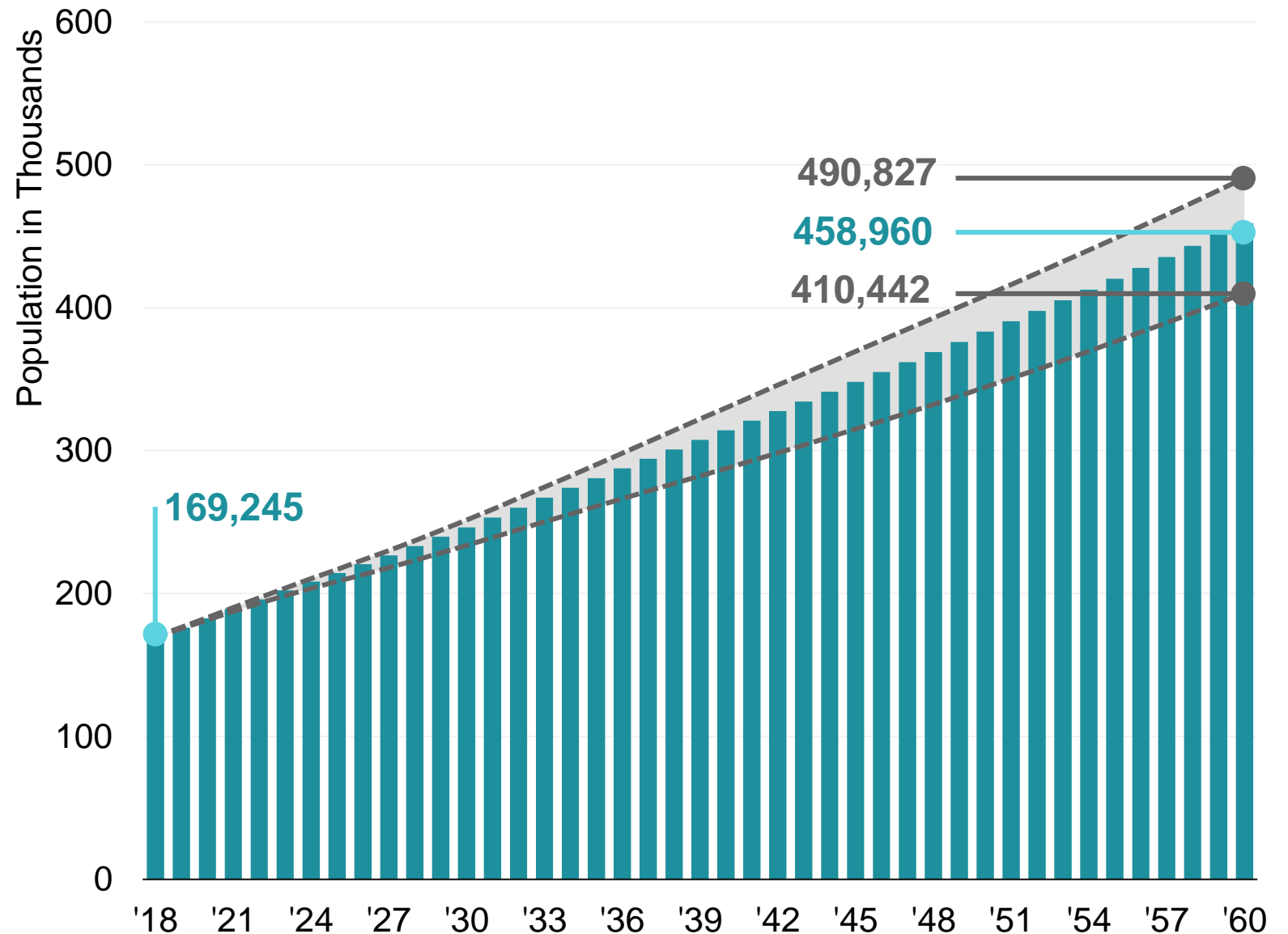
Assumptions | Sensitivity

Assumptions

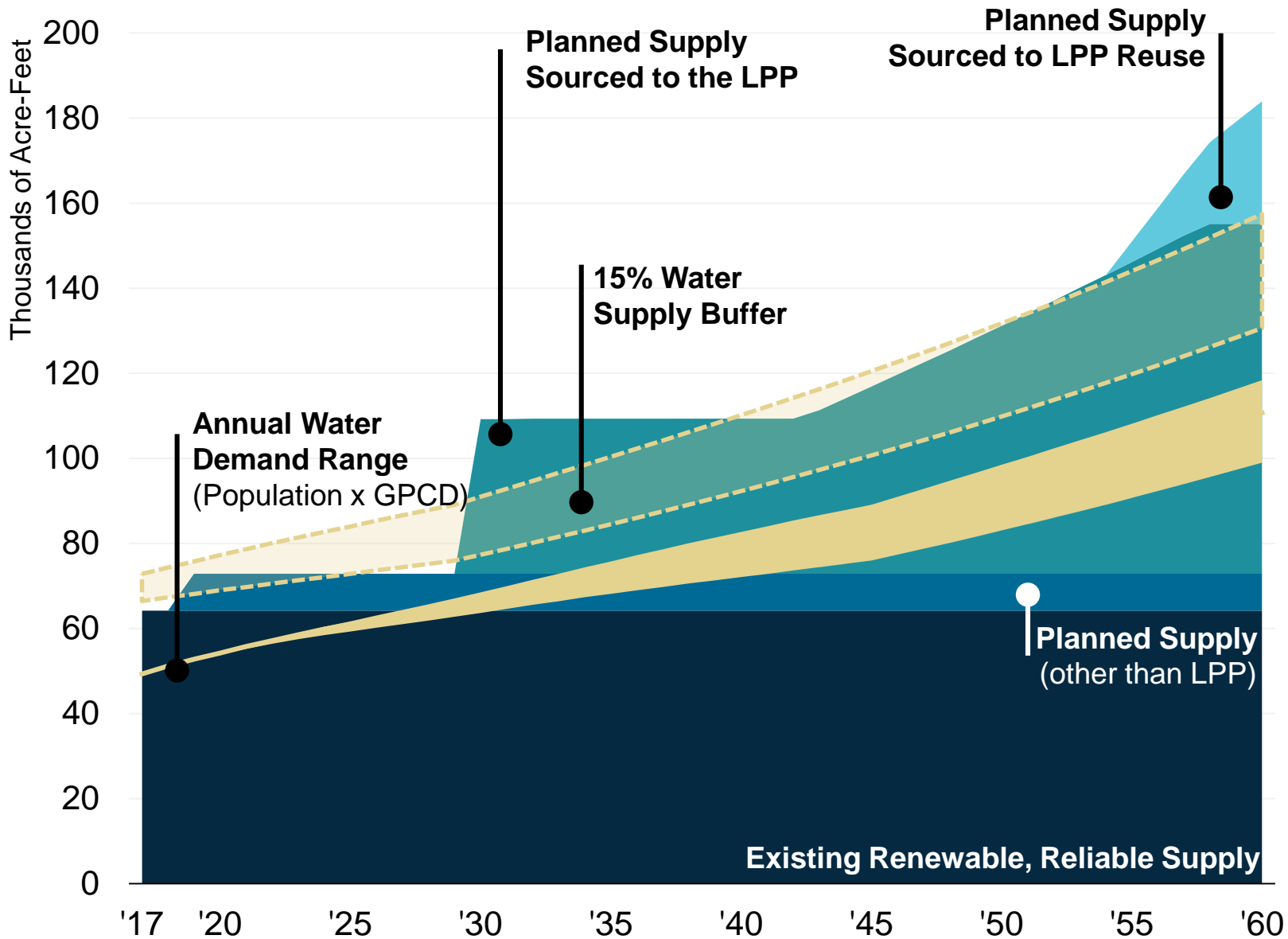
Sensitivity

Assumption #1

Washington County will experience population growth above the national average through 2060



Source: Kem C. Gardner Policy Institute



Assumption #2

Existing water supplies will be inadequate to meet demand

Note: GPCD reflects net deliveries before accounting for non-revenue water, reflecting the amount of deliveries supplied by WCWCD.

Future Demand vs. Existing Supply



Increase in population
between 2018 and 2060
according to the

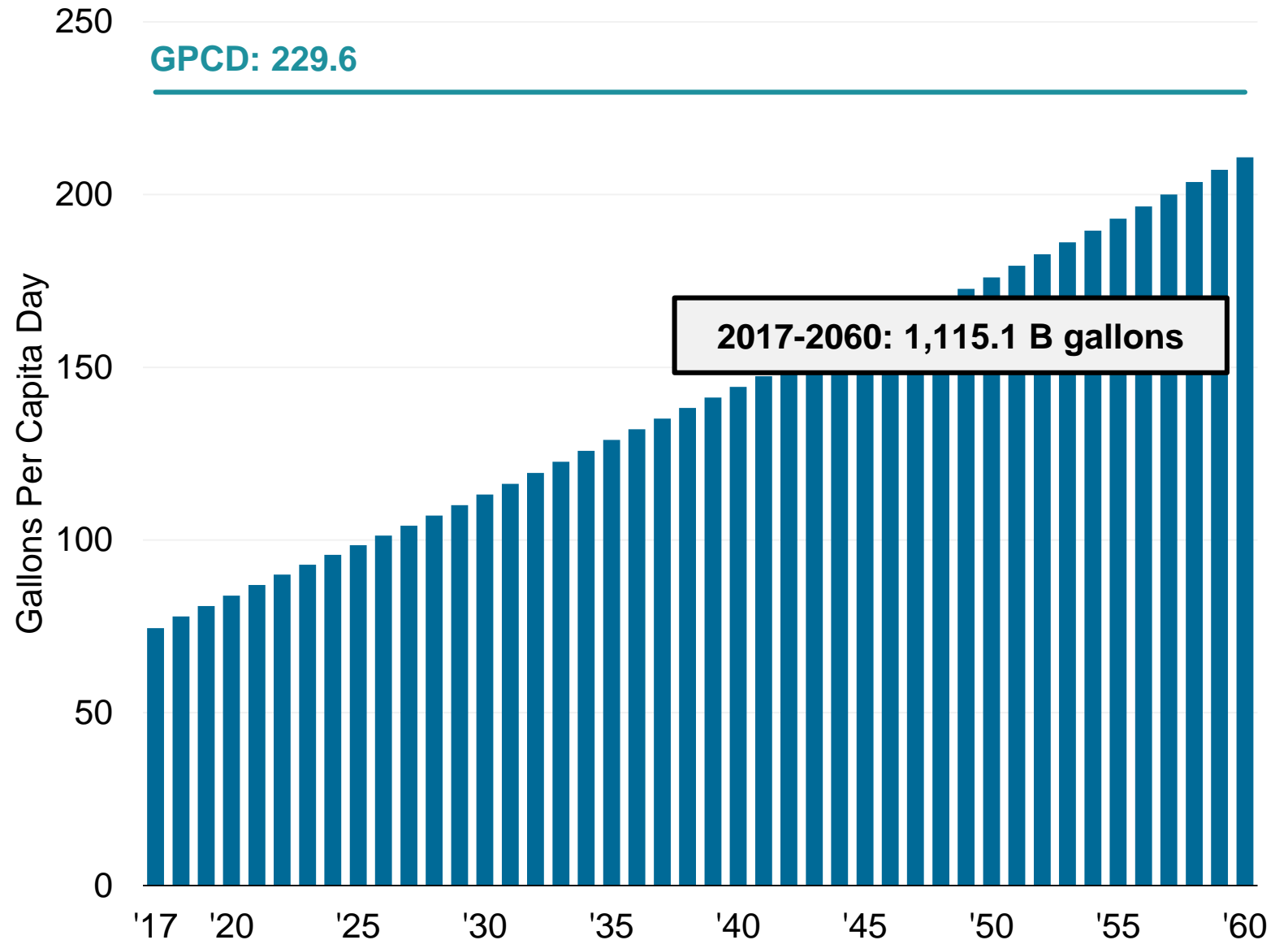
Kem C. Gardner Policy Institute



Increase in renewable, reliable water
sources being developed by WCWCD
through 2020 (excludes the LPP)

Assumption #3

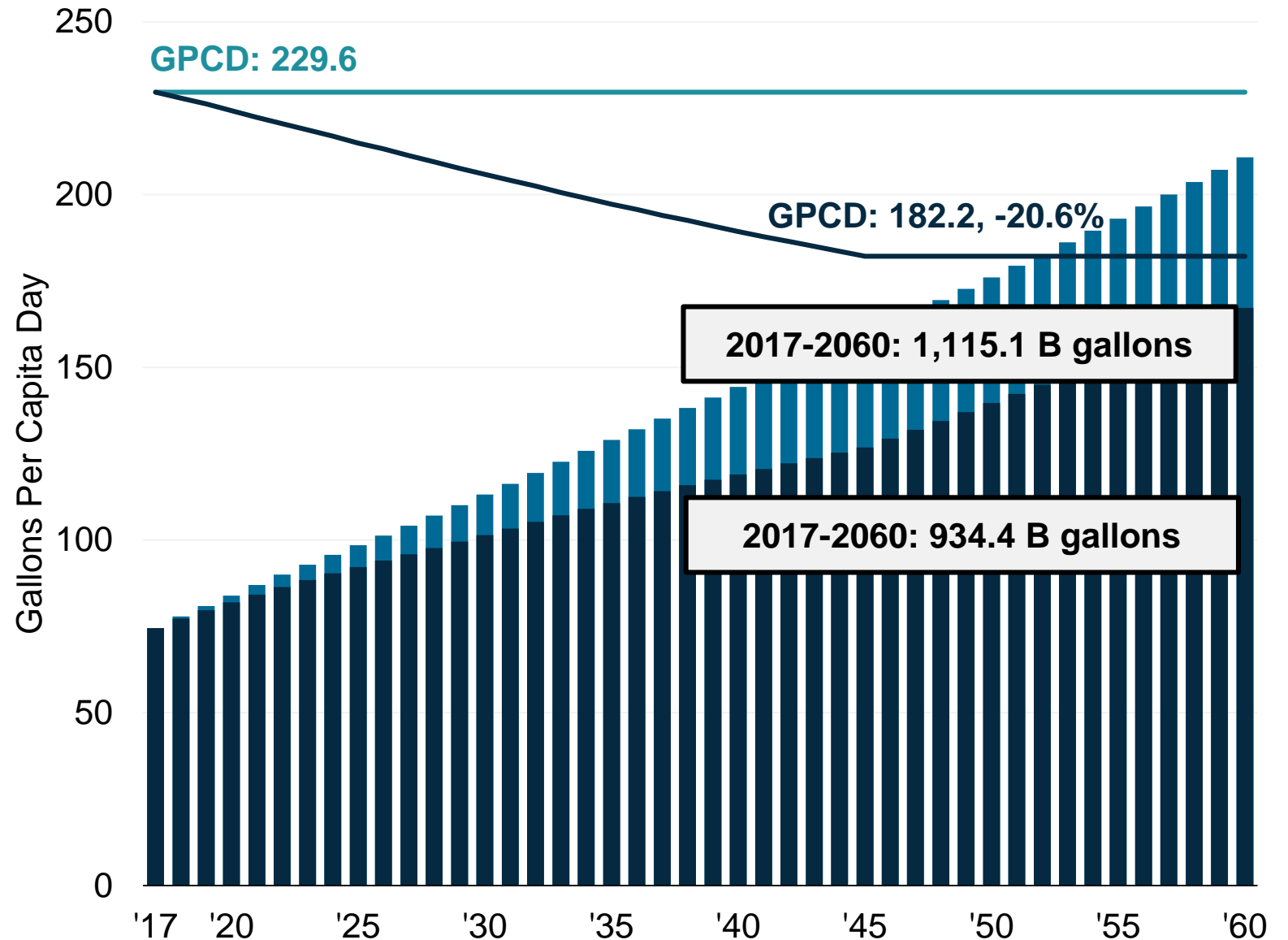
Higher water prices
will result in less
water demanded and
increase conservation



Note: GPCD reflects net deliveries after accounting for non-revenue water, reflecting the amount of deliveries consumed by water customers.

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Higher water prices
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$$\begin{array}{r} \text{—} \\ \hline 229.6 \text{ GPCD} \\ 182.3 \text{ GPCD} \\ \hline 47.3 \text{ GPCD} \\ -20.6\% \text{ Gallons/Person/Day} \end{array}$$

Note: GPCD reflects net deliveries after accounting for non-revenue water, reflecting the amount of deliveries consumed by water customers.

Assumption #3

Higher water prices
will result in less
water demanded and
increase conservation

$$\begin{array}{r} 1,115.1 \text{ Billion Gallons} \\ - 934.4 \text{ Billion Gallons} \\ \hline 180.7 \text{ Billion Gallons} \\ -16.2\% \text{ Total Water Consumed} \end{array}$$

Assumption #4

Absent sufficient water, Washington County will not meet its economic potential and existing residents and businesses will be put at risk

	Washington County Population (2016)	Metric per Acre Foot Demanded (64,172 AF)	Additional Economic Potential (82,249 AF) [4]
Population [1]	160,371	2.50	205,623
Households [1]	58,062	0.90	74,024
Employment [2]	60,188	0.94	77,143
Businesses [2]	5,371	0.08	6,884
Personal Income [3]	\$5.3 B	\$83,000	\$6.8 B
Wages & Salaries [2]	\$2.1 B	\$33,000	\$2.7 B
Gross Regional Product [3]	\$5.1 B	\$80,000	\$6.6 B

[1] Kem C. Gardner Policy Institute

[2] U.S. Bureau of Labor Statistics Quarterly Census of Employment and Wages; Washington County, Utah

[3] U.S. Bureau of Economic Analysis Regional Data: Washington County, Utah or St. George MSA

[4] Baseline estimates. Notes that the effects of conservation, advancements in construction technology and economic diversification have the potential to significantly increase the simple calculations provided.

Assumption #5

Washington County
will need to raise
additional funds to
build the Lake Powell
Pipeline and other
necessary water
infrastructure

- 1 Wholesale Water Rates**
Annual increases of \$0.10 per 1,000 gallons to \$3.00 per 1,000 gallons
- 2 Impact Fees**
Annual increases of \$1,000 per equivalent residential unit (ERU) to \$15,809 in 2025, continuing to increase as indexed to the Construction Materials Producer Price Index
- 3 Property Taxes**
Phasing in maximum allowable rate of 0.001 percent over a 10-year period

Assumption #5

Washington County
will need to raise
additional funds to
build the Lake Powell
Pipeline and other
necessary water
infrastructure

Project	Cost (2017 Dollars)	Cost (YoE Dollars)
Ash Creek Project	\$37,459,000	\$39,279,000
Cottam Wells	\$1,063,000	\$1,106,000
Diamond Valley Well	\$3,249,000	\$3,380,000
Pintura Well	\$3,350,000	\$3,485,000
Quail Creek WTP Expansion (80)	\$37,500,000	\$40,265,000
Quail Creek WTP Ozone	\$11,840,000	\$12,415,000
Sand Hollow Regional Pipeline	\$16,210,000	\$16,599,000
Sand Hollow Arsenic WTP	\$6,798,000	\$6,934,000
Sand Hollow Wells	\$8,977,000	\$9,340,000
Sand Hollow WTP	\$46,000,000	\$53,034,000
Sullivan Wells	\$2,718,000	\$2,828,000
Lake Powell Pipeline	\$1,377,609,000	\$1,514,697,000
Water Rights	\$5,000,000	\$5,000,000
Totals	\$1,557,773,000	\$1,708,362,000

Source: WCWCD Impact Fee Facilities Plan, 2017

Enrolled Copy	S.B. 27
1 LAKE POWELL PIPELINE DEVELOPMENT	
2 ACT	
3	
4	
5	Enrolled Copy S.B. 27
6	226 Section 11. Section 73-28-401 is enacted to read:
7	227 Part 4. Financing and Cost Recovery
8 LONG TITLE	228 73-28-401. Analysis of benefits and costs -- Allocation of costs.
9 General Description:	229 (1) The board shall allocate project costs based on the economic costs and benefits of
10 This bill authorizes t	230 the developed water and electricity among the following water uses:
11 project.	231 (a) municipal and industrial;
12 Highlighted Provisions:	232 (b) electricity;
13 This bill:	233 (c) public recreation; and
14 enacts the Lake P	234 (d) fish and wildlife.
15 defines terms;	235 (2) The state shall pay the nonreimbursable project costs allocated to recreation and
16 authorizes the Bo	236 fish and wildlife.
17 make rules;	237 Section 12. Section 73-28-402 is enacted to read:
18 build the Lak	238 73-28-402. Agreement for delivery -- Period for repayment of costs.
19 contract for th	239 (1) The board and each district shall establish by contract the timing and amount of
20 creates the Projec	240 developed water to be delivered to the district.
21 authorizes the bu	241 (2) If a contract was made before the project's completion, the district shall repay the
22 authorizes the wa	242 preconstruction and construction costs within 50 years from the date of:
23 establishes an en	243 (a) the delivery of developed water to the district during the first ten years after the
24 Monies Appropriated in th	244 project is completed; or
25 None	245 (b) the project's completion for any developed water delivered to the district after the
26 Other Special Clauses:	246 tenth anniversary date of the project's completion.
27 None	247 (3) If a contract was made after the project's completion date, the district shall repay
28 Utah Code Sections Affected	248 the preconstruction and construction costs within a period not to exceed 50 years from the date
29 ENACTS:	249 that the contract was made.
	250 (4) The board shall establish and charge a reasonable interest rate for the unpaid
	251 balance of reimbursable preconstruction and construction costs.
	252 Section 13. Section 73-28-403 is enacted to read:
	253 73-28-403. Water and electricity charges.
	- 9 -

Assumption #6

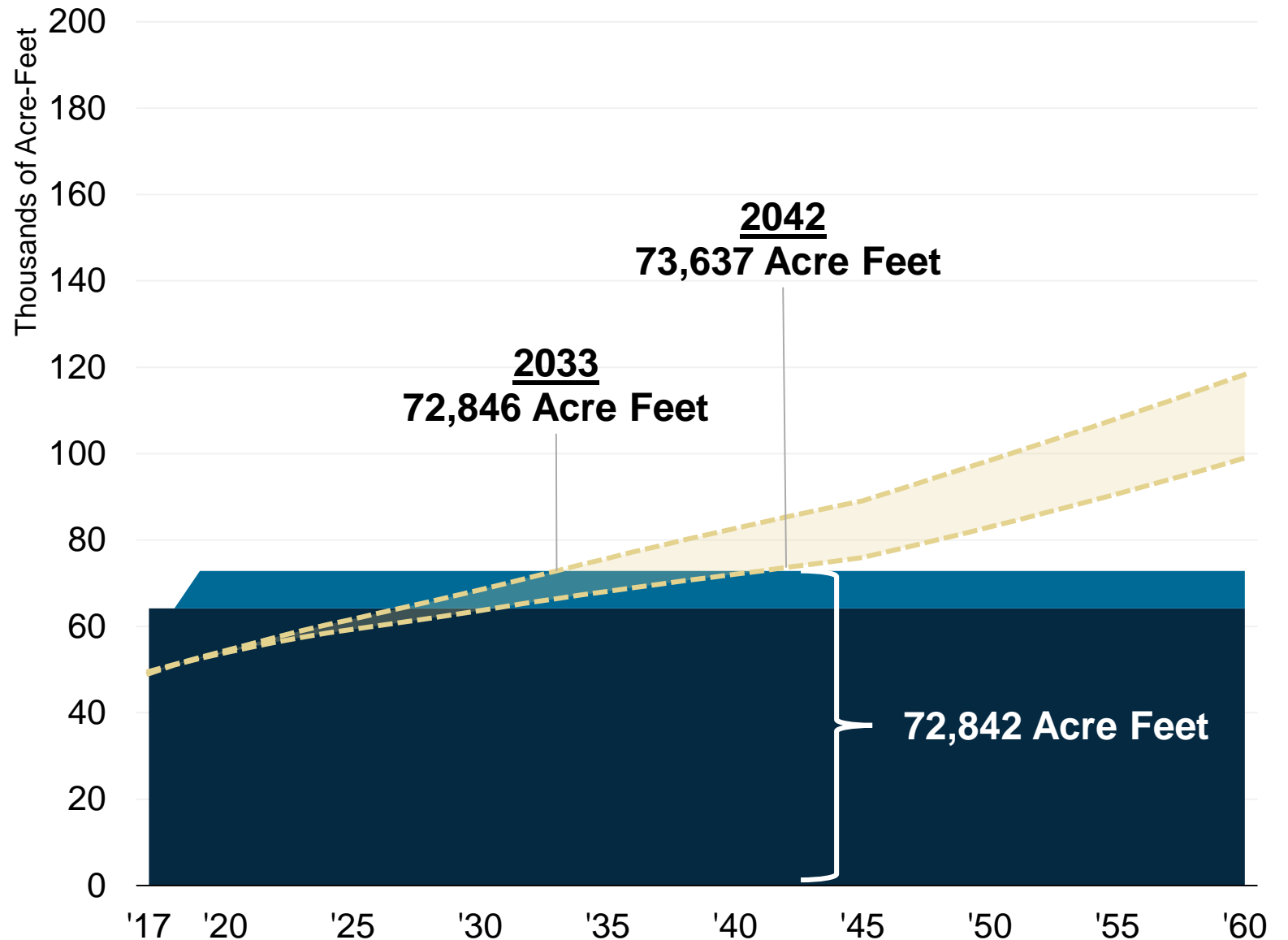
The Lake Powell Pipeline will be financed in a manner consistent with the Lake Powell Pipeline Development Act of 2006 and the Interpretation Provided by the Division of Water Resources

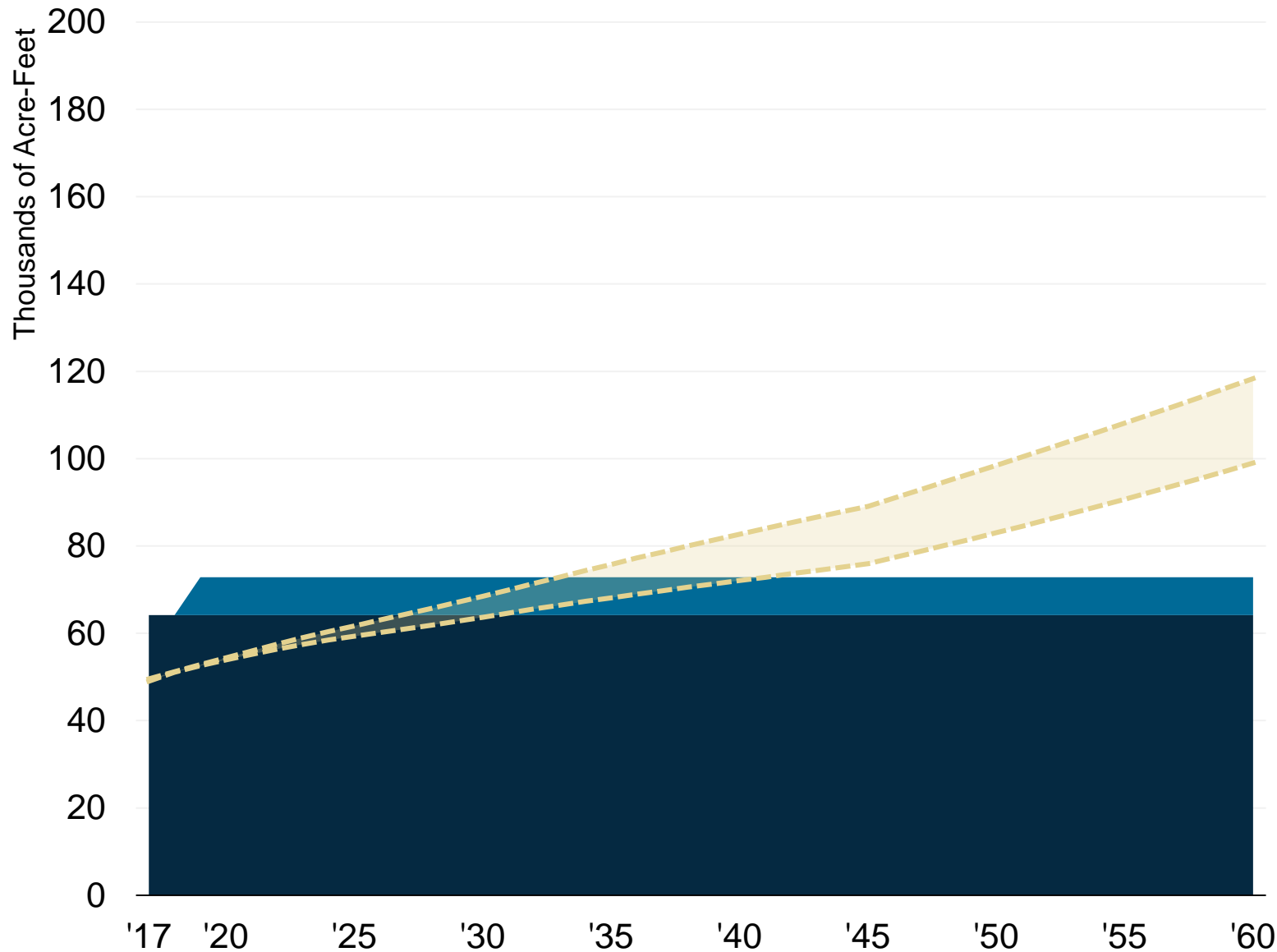
Assumptions

Sensitivity

Sensitivity #1

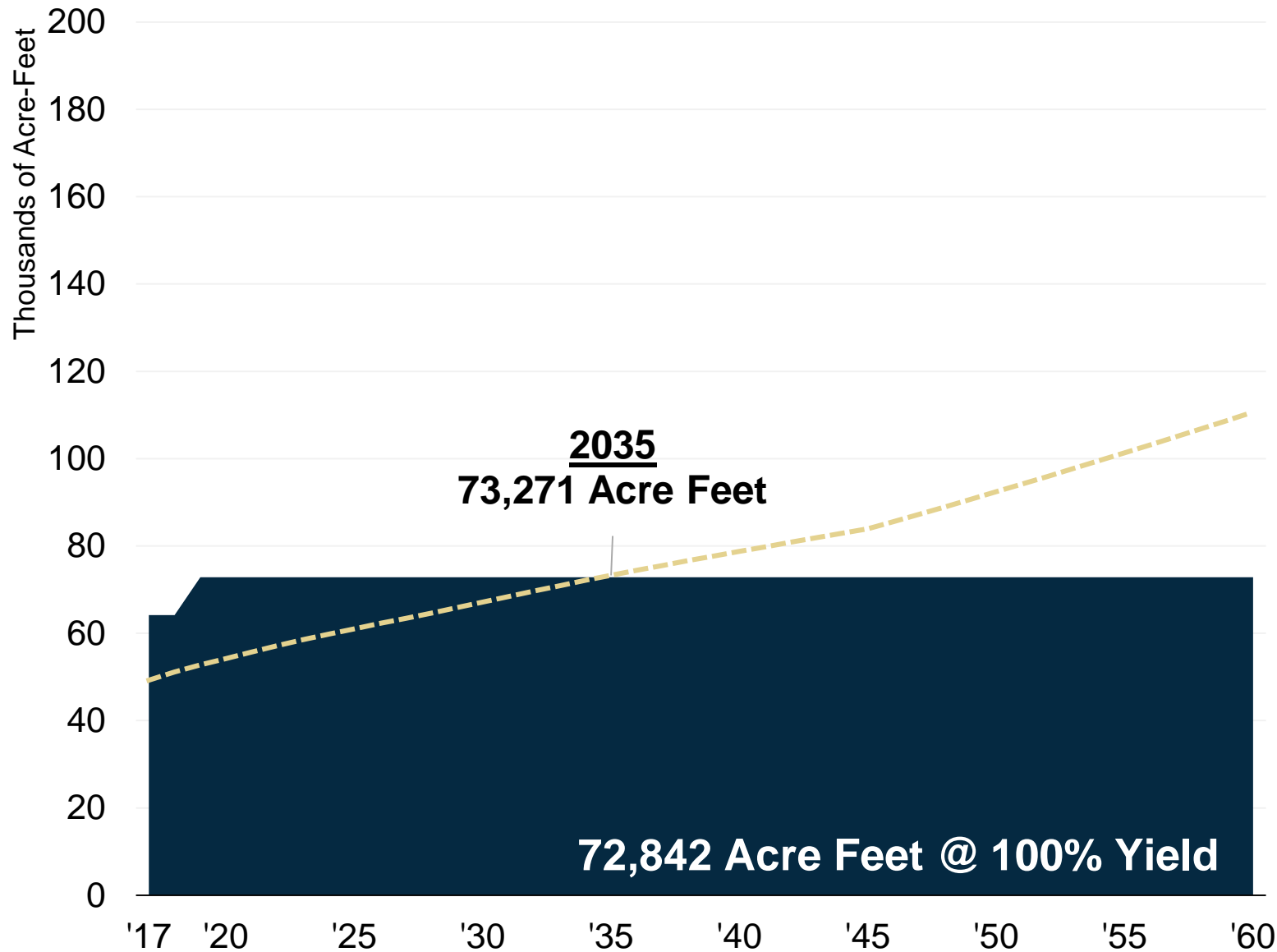
What happens if Washington County grows faster or slower than anticipated?





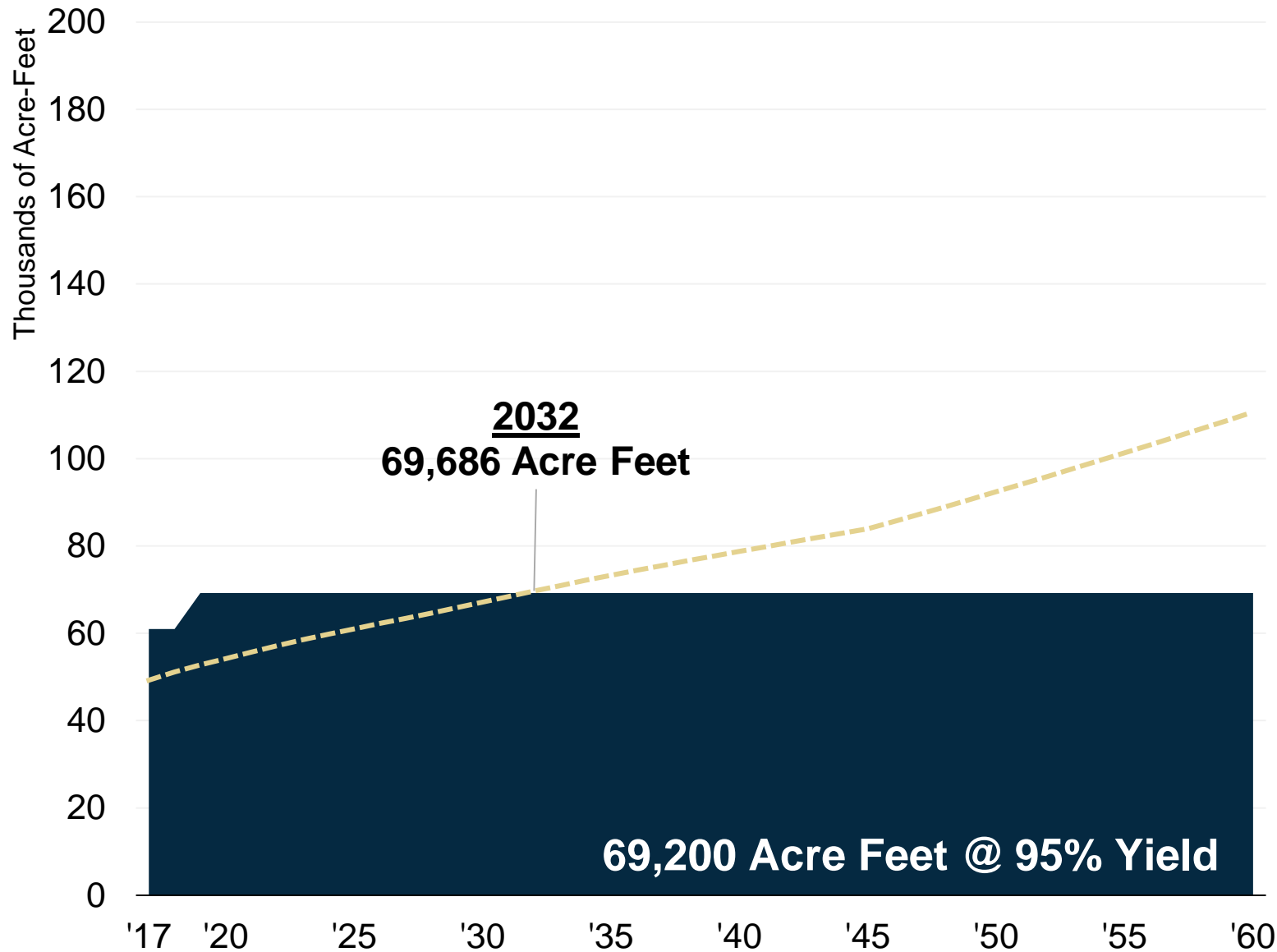
Sensitivity #2

What if existing water supplies prove less robust than anticipated due to worsening drought conditions?



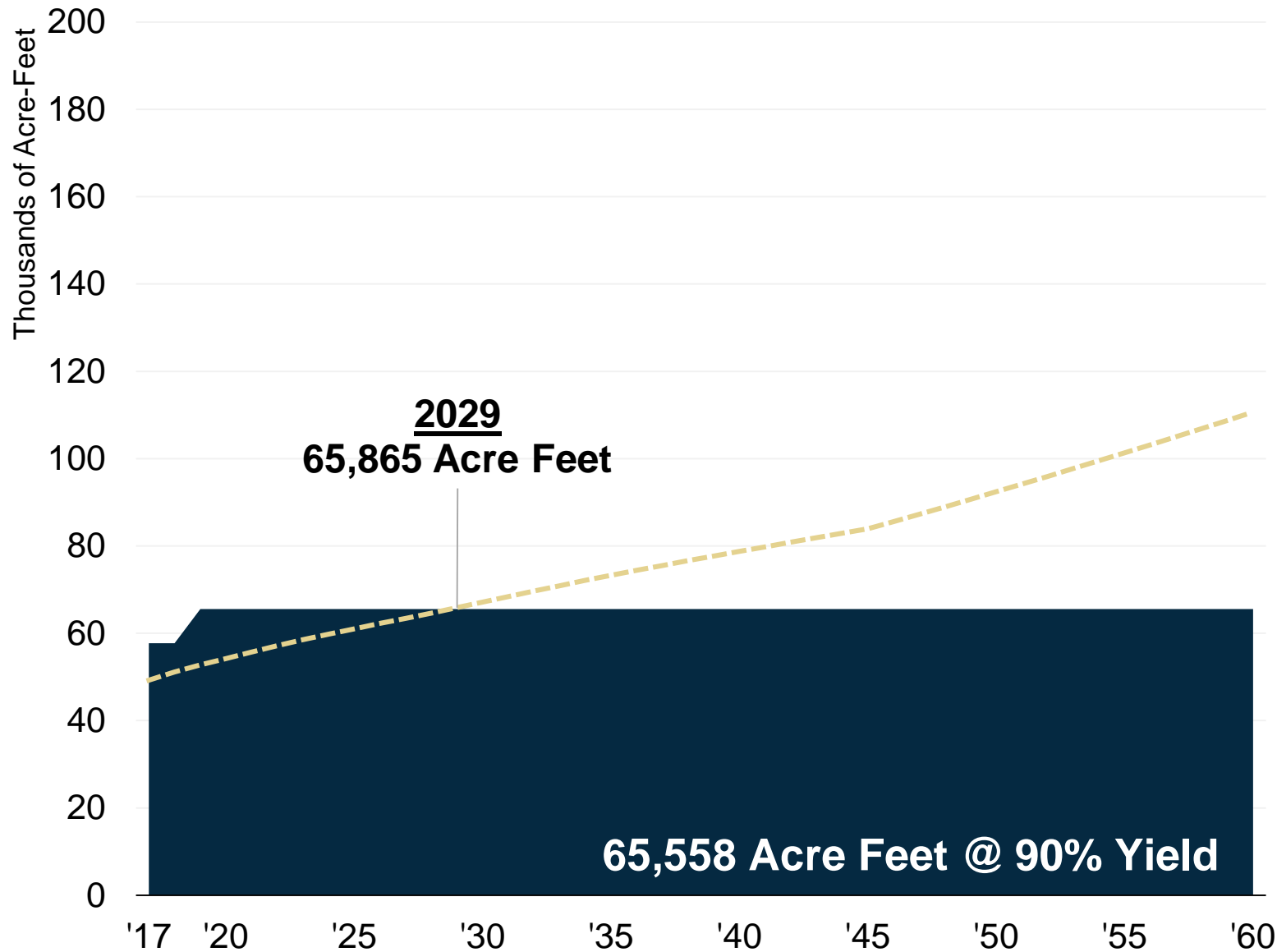
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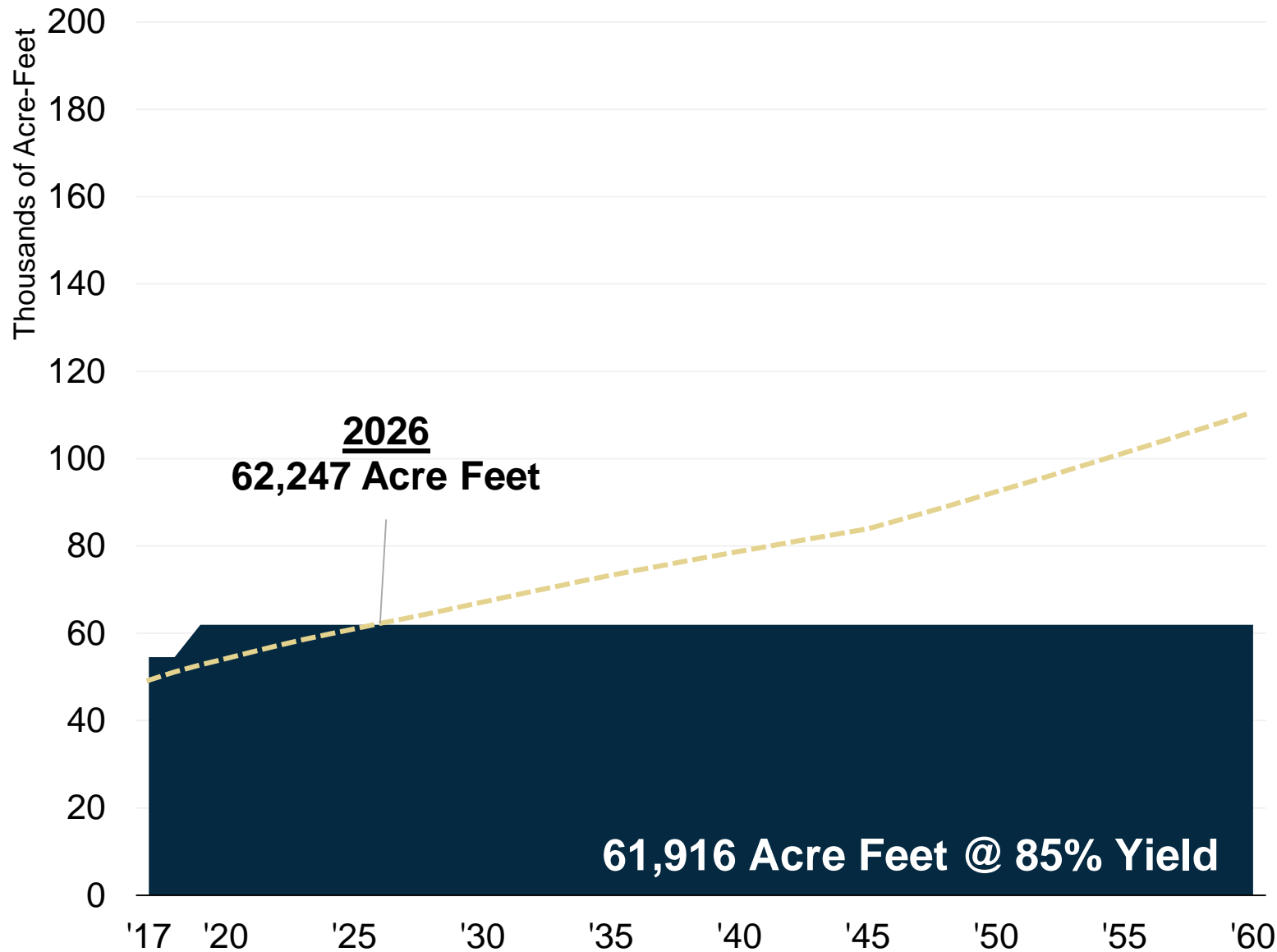
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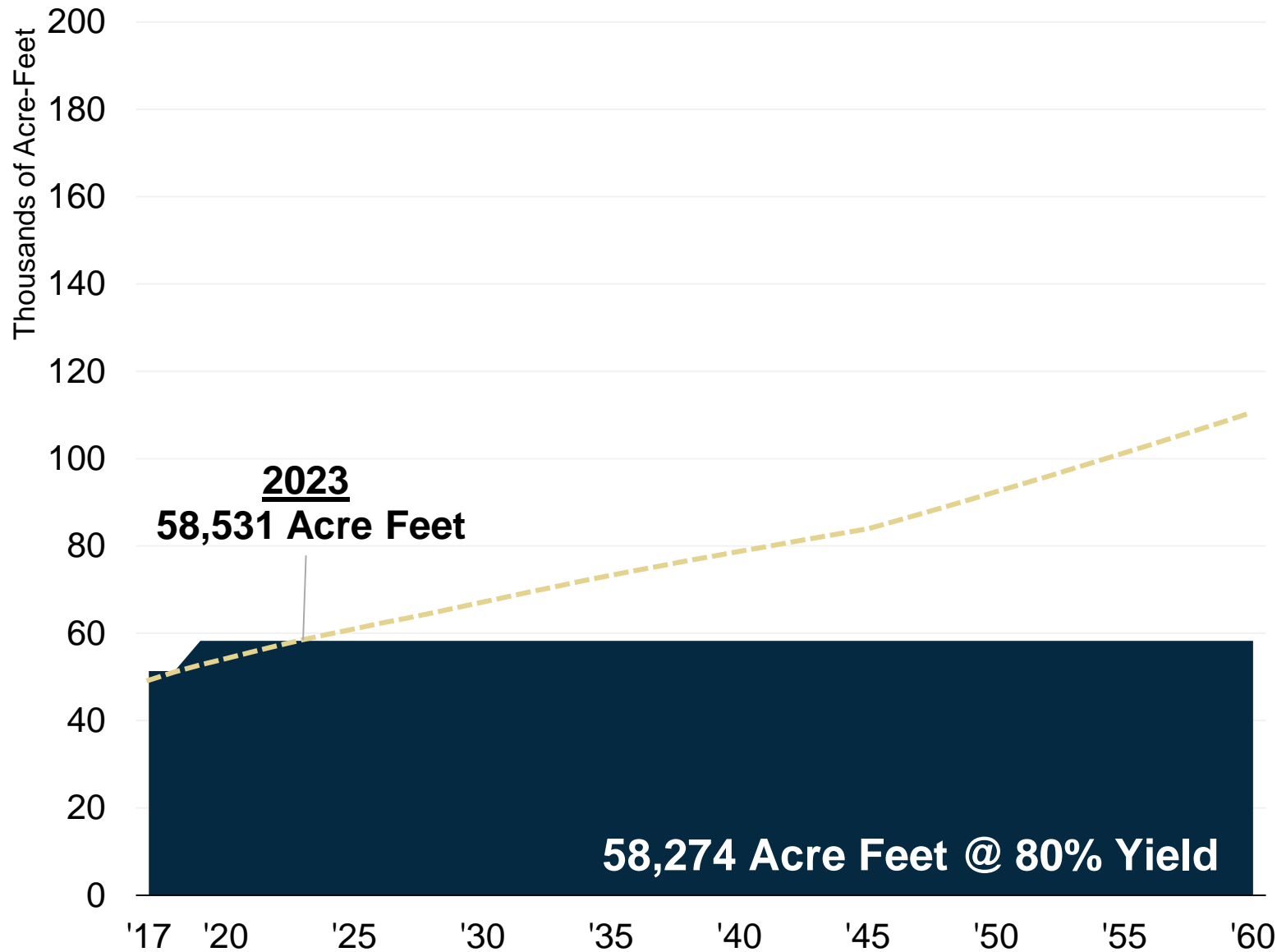
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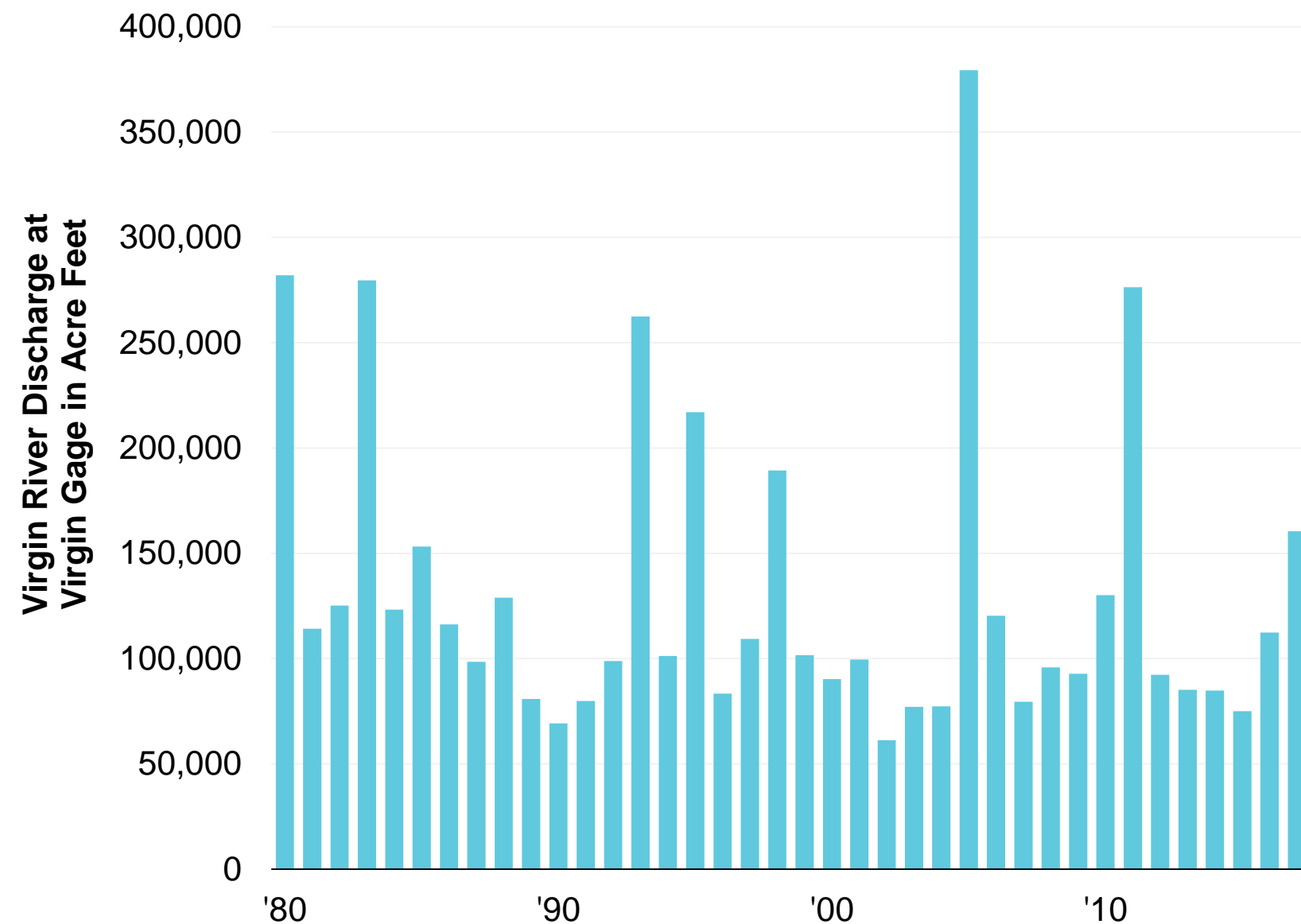
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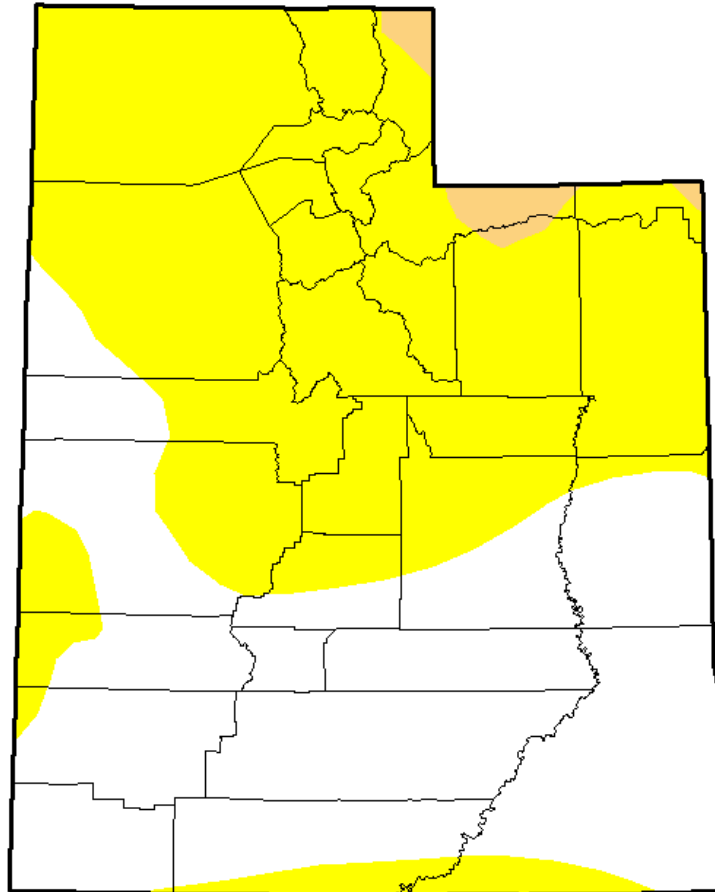
Sensitivity #2

What if existing water supplies prove less robust than anticipated due to worsening drought conditions?

Source: United States Geological Survey

U.S. Drought Monitor Utah

May 25, 2010
(Released Thursday, May. 27, 2010)
Valid 7 a.m. EST



Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Eric Luebbehusen
U.S. Department of Agriculture



<http://droughtmonitor.unl.edu/>

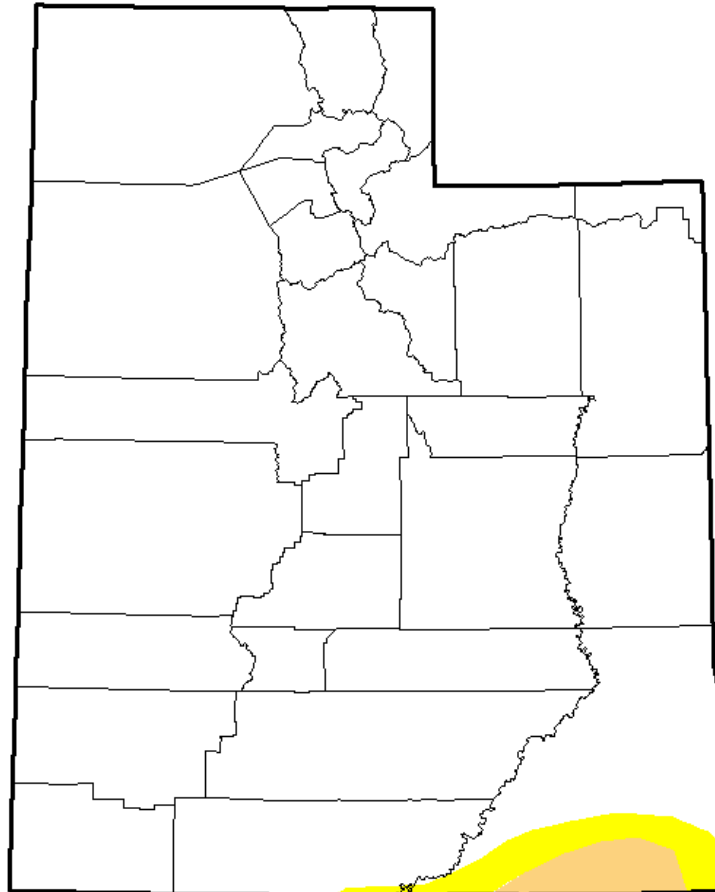
Sensitivity #2

What if existing water supplies prove less robust than anticipated due to worsening drought conditions?

Source: University of Nebraska, Lincoln and NOAA

U.S. Drought Monitor Utah

May 31, 2011
(Released Thursday, Jun. 2, 2011)
Valid 7 a.m. EST



Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

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Author:
Anthony Artusa
NOAA/NWS/NCEP/CPC



<http://droughtmonitor.unl.edu/>

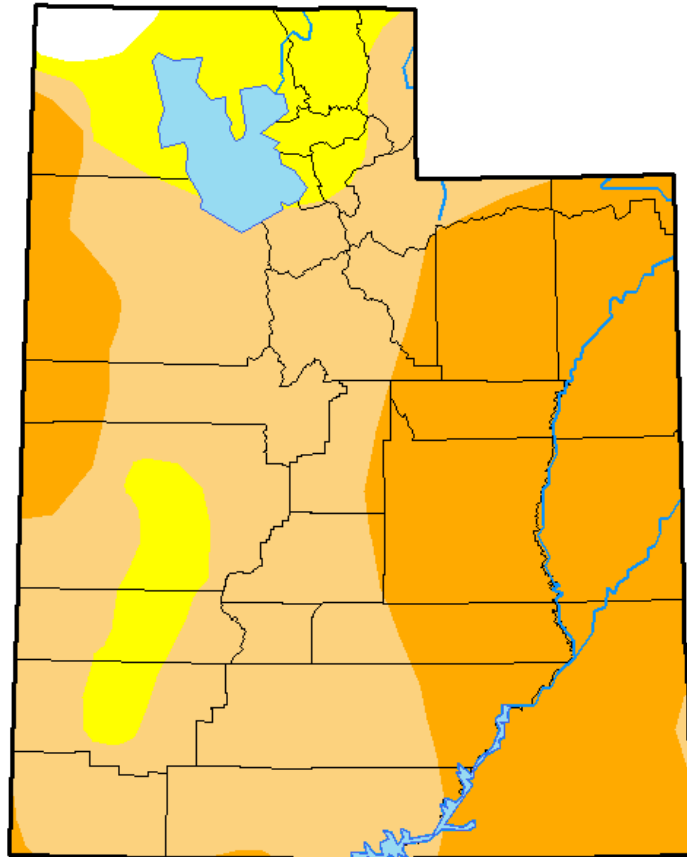
Sensitivity #2

What if existing water supplies prove less robust than anticipated due to worsening drought conditions?

Source: University of Nebraska, Lincoln and NOAA

U.S. Drought Monitor Utah

May 29, 2012
(Released Thursday, May. 31, 2012)
Valid 8 a.m. EDT



Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
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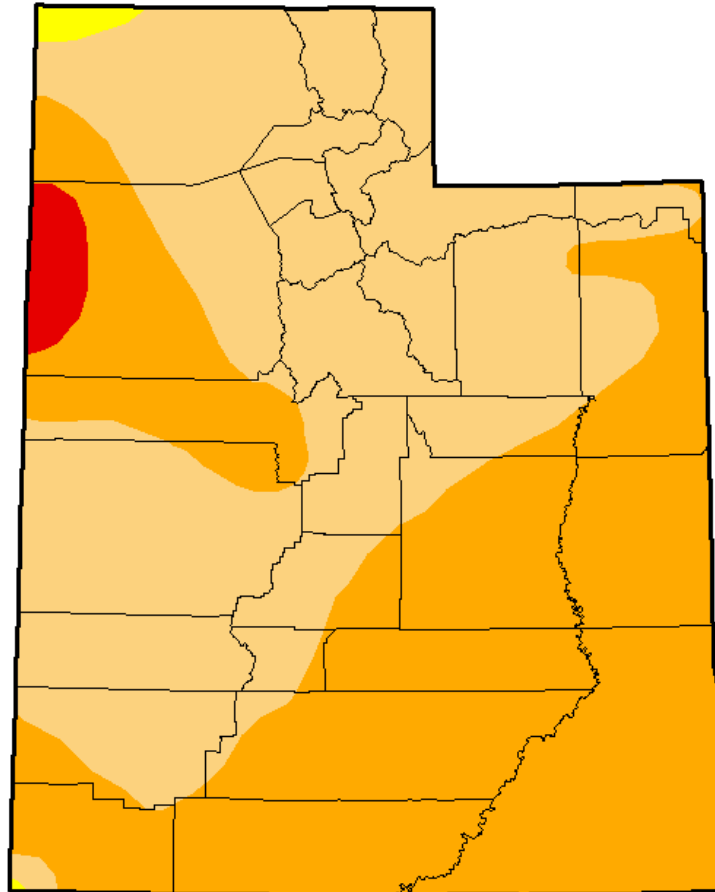
Sensitivity #2

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Source: University of Nebraska, Lincoln and NOAA

U.S. Drought Monitor Utah

May 28, 2013
(Released Thursday, May. 30, 2013)
Valid 7 a.m. EST



Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

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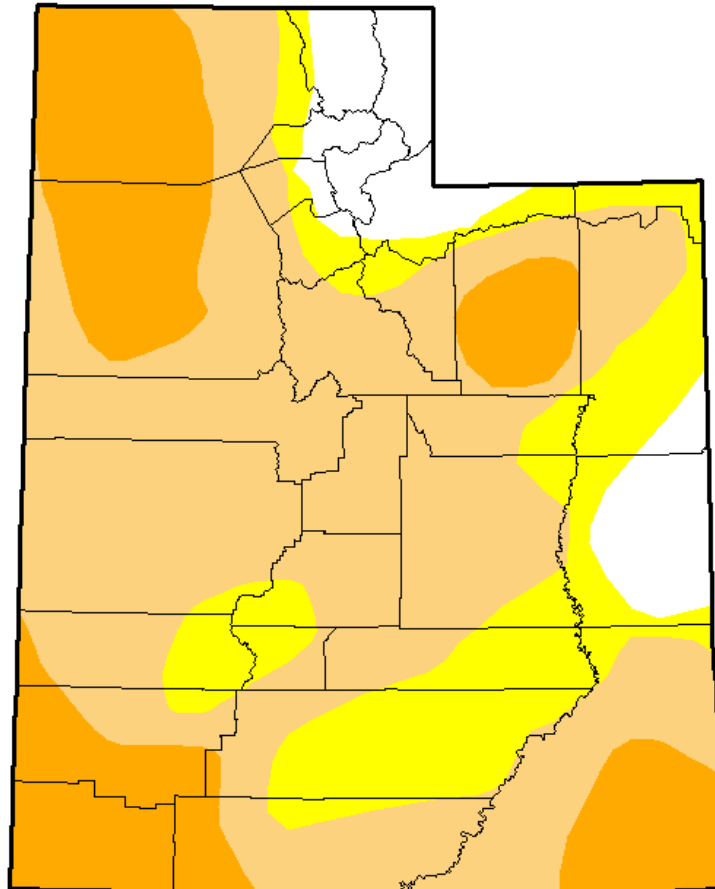
Sensitivity #2

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Source: University of Nebraska, Lincoln and NOAA

U.S. Drought Monitor Utah

May 27, 2014
(Released Thursday, May. 29, 2014)
Valid 8 a.m. EDT



Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Michael Brewer
NCDC/NOAA



<http://droughtmonitor.unl.edu/>

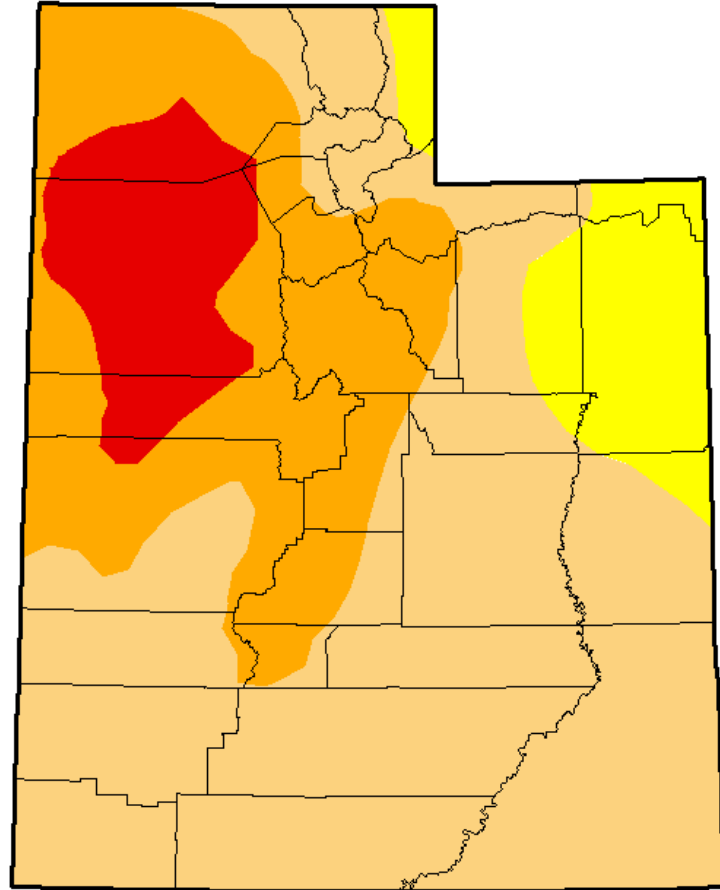
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What if existing water supplies prove less robust than anticipated due to worsening drought conditions?

Source: University of Nebraska, Lincoln and NOAA

U.S. Drought Monitor Utah

May 26, 2015
(Released Thursday, May. 28, 2015)
Valid 7 a.m. EST



Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Brad Rippey
U.S. Department of Agriculture



<http://droughtmonitor.unl.edu/>

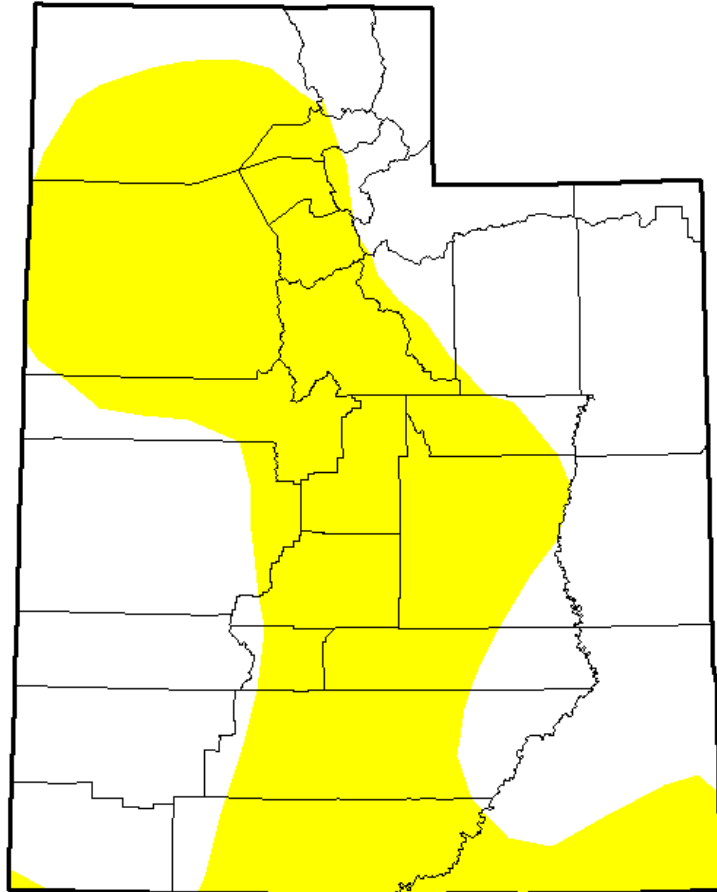
Sensitivity #2

What if existing water supplies prove less robust than anticipated due to worsening drought conditions?

Source: University of Nebraska, Lincoln and NOAA

U.S. Drought Monitor Utah

May 31, 2016
(Released Thursday, Jun. 2, 2016)
Valid 8 a.m. EDT



Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
Mark Svoboda
National Drought Mitigation Center



<http://droughtmonitor.unl.edu/>

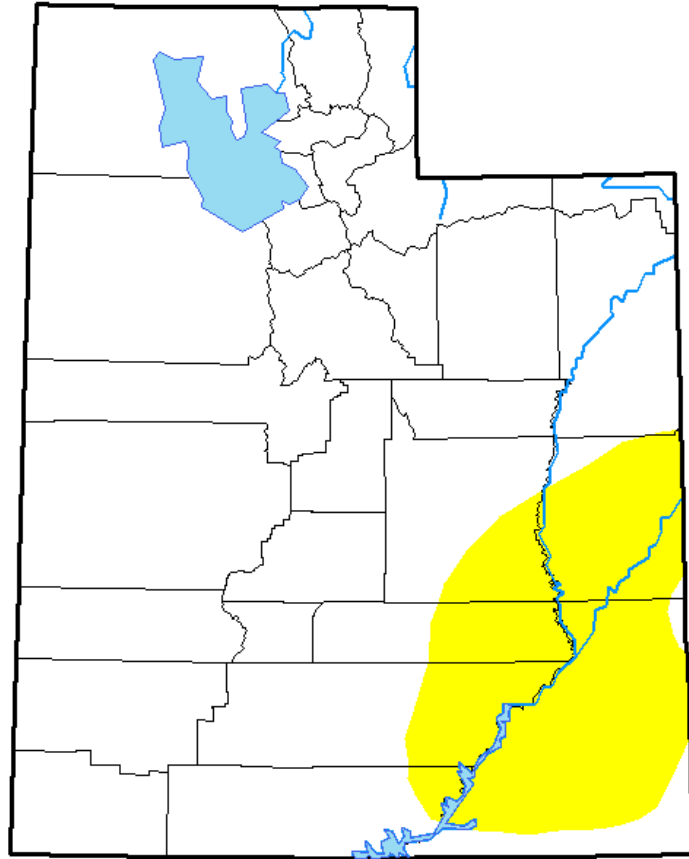
Sensitivity #2

What if existing water supplies prove less robust than anticipated due to worsening drought conditions?






Source: University of Nebraska, Lincoln and NOAA

U.S. Drought Monitor Utah

May 30, 2017
(Released Thursday, Jun. 1, 2017)
Valid 8 a.m. EDT



Intensity:

-  D0 Abnormally Dry
-  D1 Moderate Drought
-  D2 Severe Drought
-  D3 Extreme Drought
-  D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Chris Fenimore
NCEI/NESDIS/NOAA



<http://droughtmonitor.unl.edu/>

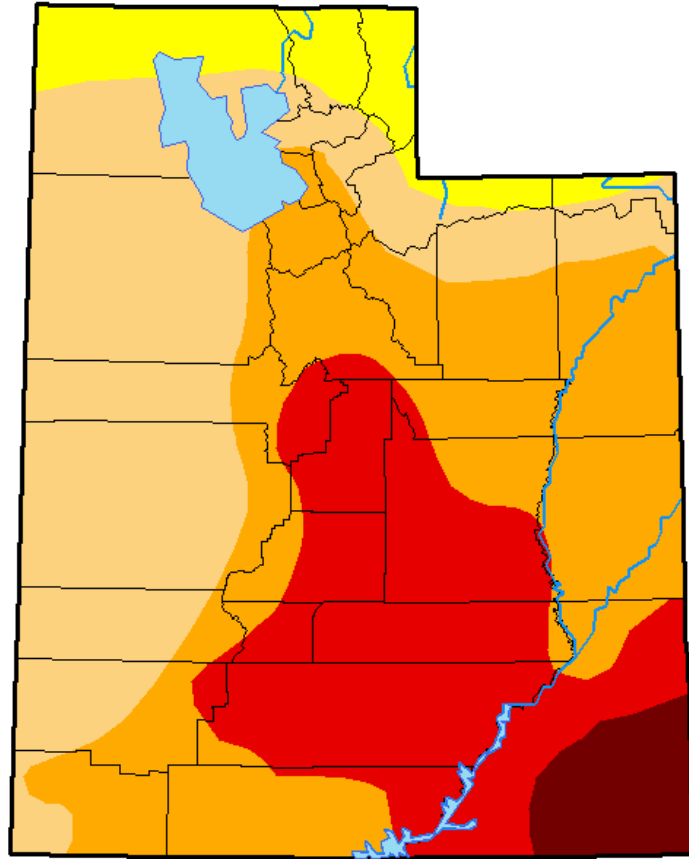
Sensitivity #2

What if existing water supplies prove less robust than anticipated due to worsening drought conditions?

Source: University of Nebraska, Lincoln and NOAA

U.S. Drought Monitor Utah

May 29, 2018
(Released Thursday, May. 31, 2018)
Valid 8 a.m. EDT



Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:

Anthony Artusa
NOAA/NWS/NCEP/CPC



<http://droughtmonitor.unl.edu/>

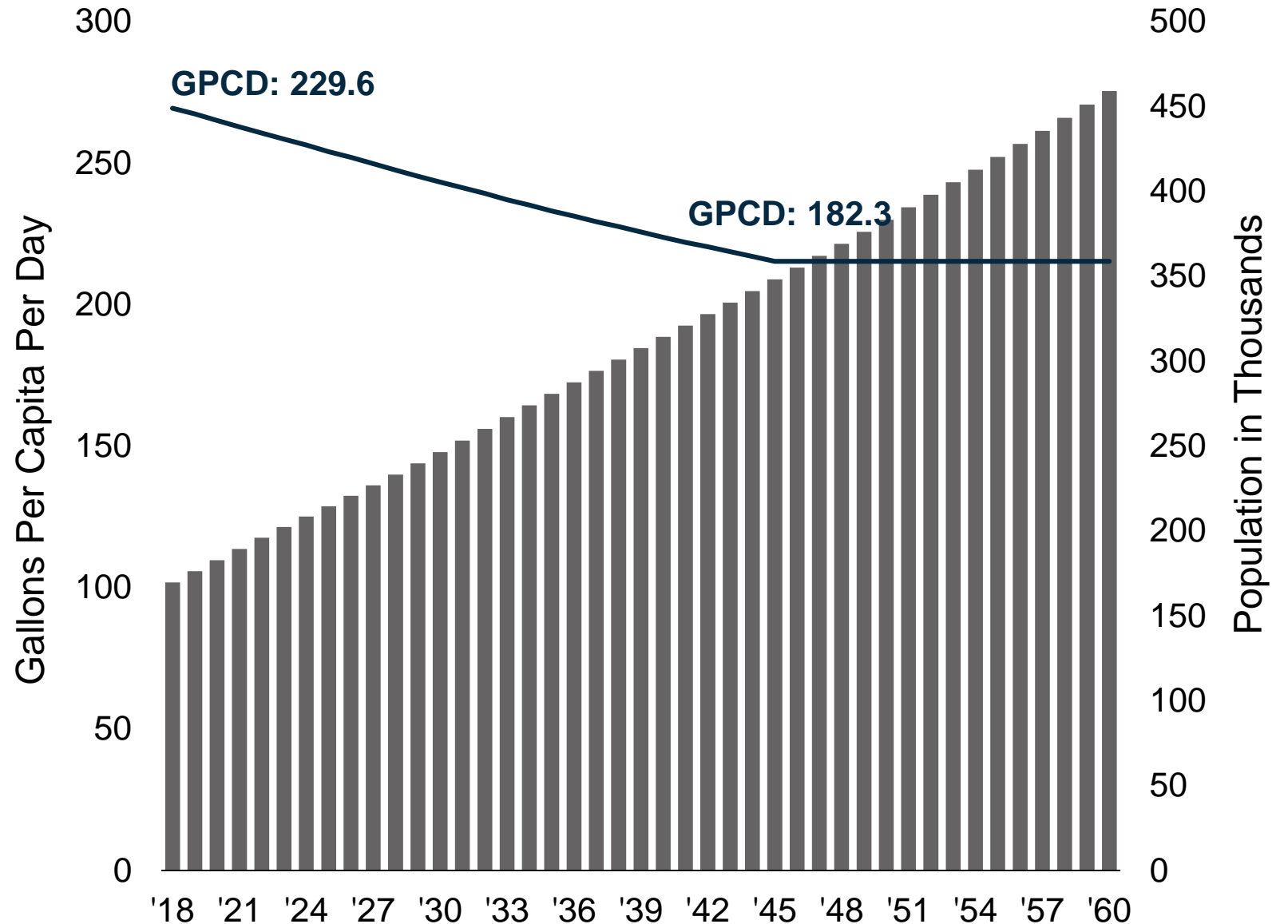
Sensitivity #2

What if existing water supplies prove less robust than anticipated due to worsening drought conditions?

Source: University of Nebraska, Lincoln and NOAA

Sensitivity #3

What is the revenue generating capacity of WCWCD considering price elasticity and conservation?



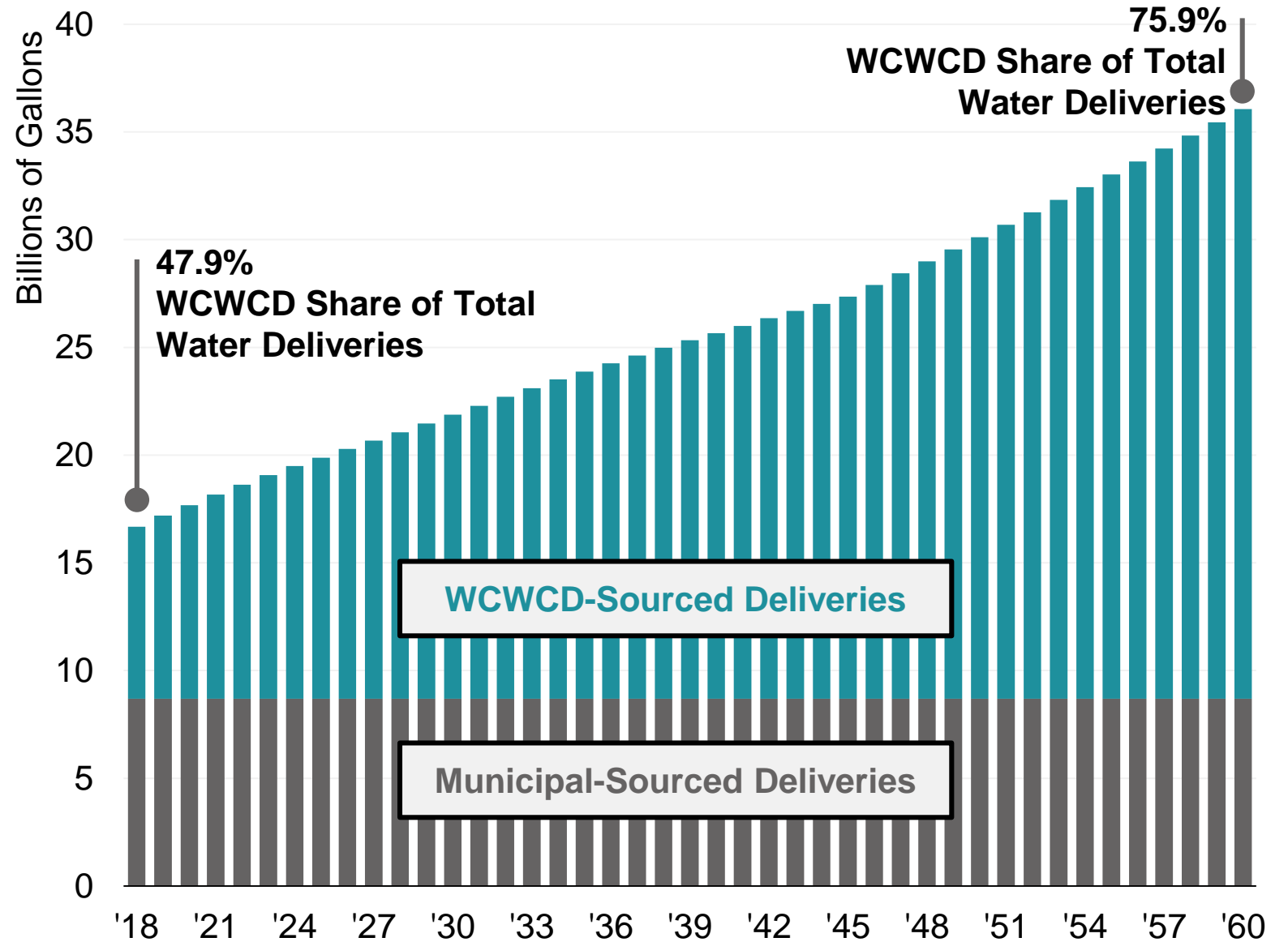
Source: Kem C. Gardner Policy Institute. Note: GPCD reflects net deliveries before accounting for non-revenue water, reflecting the amount of deliveries made by WCWCD.

Pricing Element #1

Analysis of Water Rates

Sensitivity #3

What is the revenue generating capacity of WCWCD considering price elasticity and conservation?



Note: GPCD reflects net deliveries before accounting for non-revenue water, reflecting the amount of deliveries made by WCWCD.

Water Rates

Sensitivity #3

What is the revenue generating capacity of WCWCD considering price elasticity and conservation?

Period	Current GPCD	Total WCWCD Deliveries	Wholesale Rate Increase	Capital Yield
2020	271.4	9.27 B gallons	\$0.10	\$0.93 M
2025	271.4	12.4 B gallons	\$0.10	\$1.24 M
2030	271.4	15.5 B gallons	\$0.10	\$1.55 M
2035	271.4	18.9 B gallons	\$0.10	\$1.89 M
2040	271.4	22.2 B gallons	\$0.10	\$2.22 M
2045	271.4	25.5 B gallons	\$0.10	\$2.55 M
2050	271.4	29.0 B gallons	\$0.10	\$2.90 M
2055	271.4	32.6 B gallons	\$0.10	\$3.26 M
2060	271.4	36.4 B gallons	\$0.10	\$3.64 M
2018-2060	271.4	934.2 B gallons	\$0.10	\$93.42 M

Note: GPCD reflects net deliveries before accounting for non-revenue water, reflecting the amount of deliveries made by WCWCD. Wholesale Capital Charge per 1,000 gallons.

Water Rates

Sensitivity #3

What is the revenue generating capacity of WCWCD considering price elasticity and conservation?

Period	Adjusted GPCD	Total WCWCD Deliveries	Wholesale Rate Increase	Capital Yield
2020	265.0	8.98 B gallons	\$0.10	\$0.90 M
2025	253.9	11.2 B gallons	\$0.10	\$1.12 M
2030	243.4	13.2 B gallons	\$0.10	\$1.32 M
2035	233.0	15.2 B gallons	\$0.10	\$1.52 M
2040	223.7	17.0 B gallons	\$0.10	\$1.70 M
2045	215.3	18.7 B gallons	\$0.10	\$1.87 M
2050	215.3	21.4 B gallons	\$0.10	\$2.14 M
2055	215.3	24.3 B gallons	\$0.10	\$2.43 M
2060	215.3	27.4 B gallons	\$0.10	\$2.74 M
2018-2060	232.0	730.4 B gallons	\$0.10	\$73.04 M

Note: GPCD reflects net deliveries before accounting for non-revenue water, reflecting the amount of deliveries made by WCWCD. Wholesale Capital Charge per 1,000 gallons.

Water Rates

Sensitivity #3

What is the revenue generating capacity of WCWCD considering price elasticity and conservation?

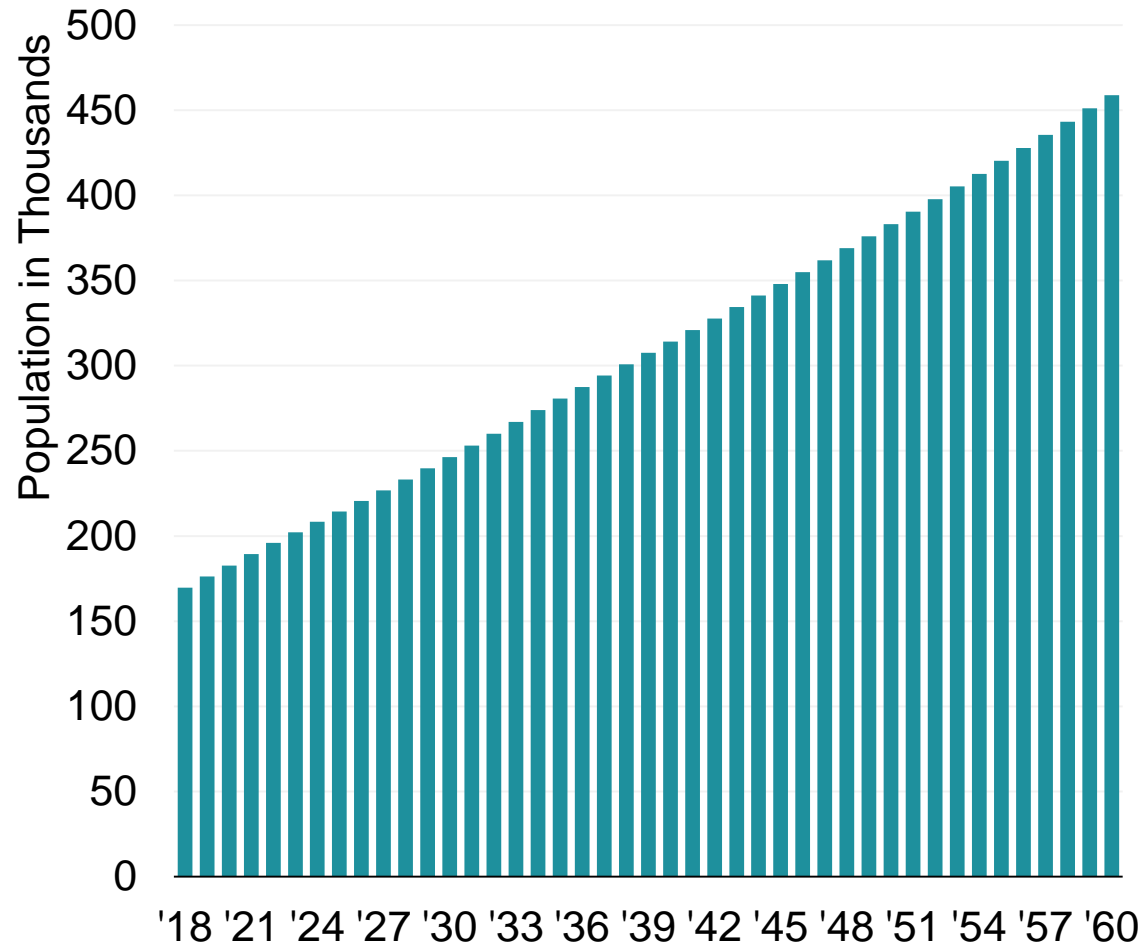
Period	Adjusted GPCD	Total WCWCD Deliveries	Wholesale Rate Increase	Capital Yield
2020	265.0	8.98 B gallons	\$0.50	\$4.49 M
2025	253.9	11.2 B gallons	\$1.00	\$11.18 M
2030	243.4	13.2 B gallons	\$1.50	\$19.77 M
2035	233.0	15.2 B gallons	\$2.00	\$30.37 M
2040	223.7	17.0 B gallons	\$2.50	\$42.41 M
2045	215.3	18.7 B gallons	\$3.00	\$55.96 M
2050	215.3	21.4 B gallons	\$3.00	\$64.25 M
2055	215.3	24.3 B gallons	\$3.00	\$72.98 M
2060	215.3	27.4 B gallons	\$3.00	\$82.10 M
2018-2060	232.0	730.4 B gallons	\$2.12	\$1,746.6 M

Note: GPCD reflects net deliveries before accounting for non-revenue water, reflecting the amount of deliveries made by WCWCD. Wholesale Capital Charge per 1,000 gallons.

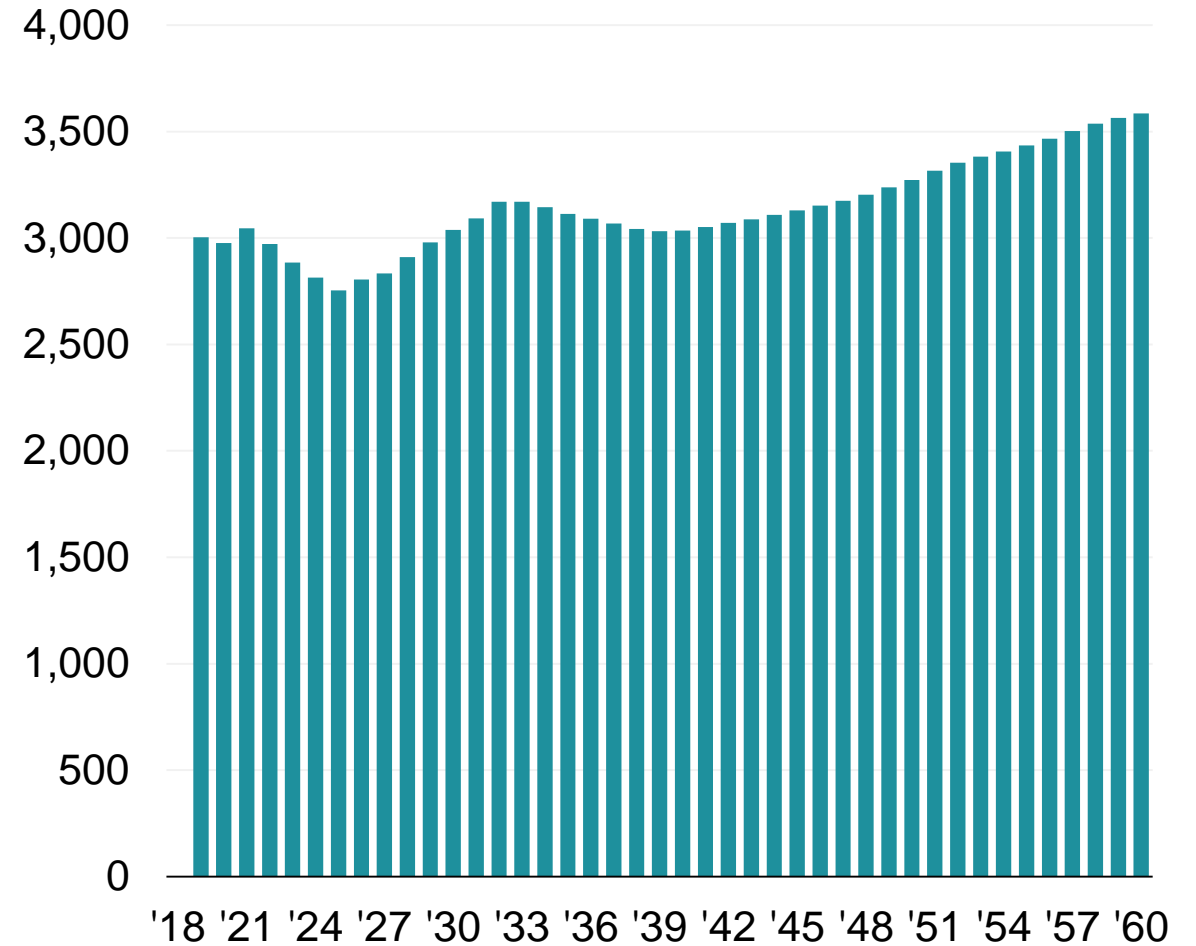
Pricing Element #2

Impact Fees

Population Growth



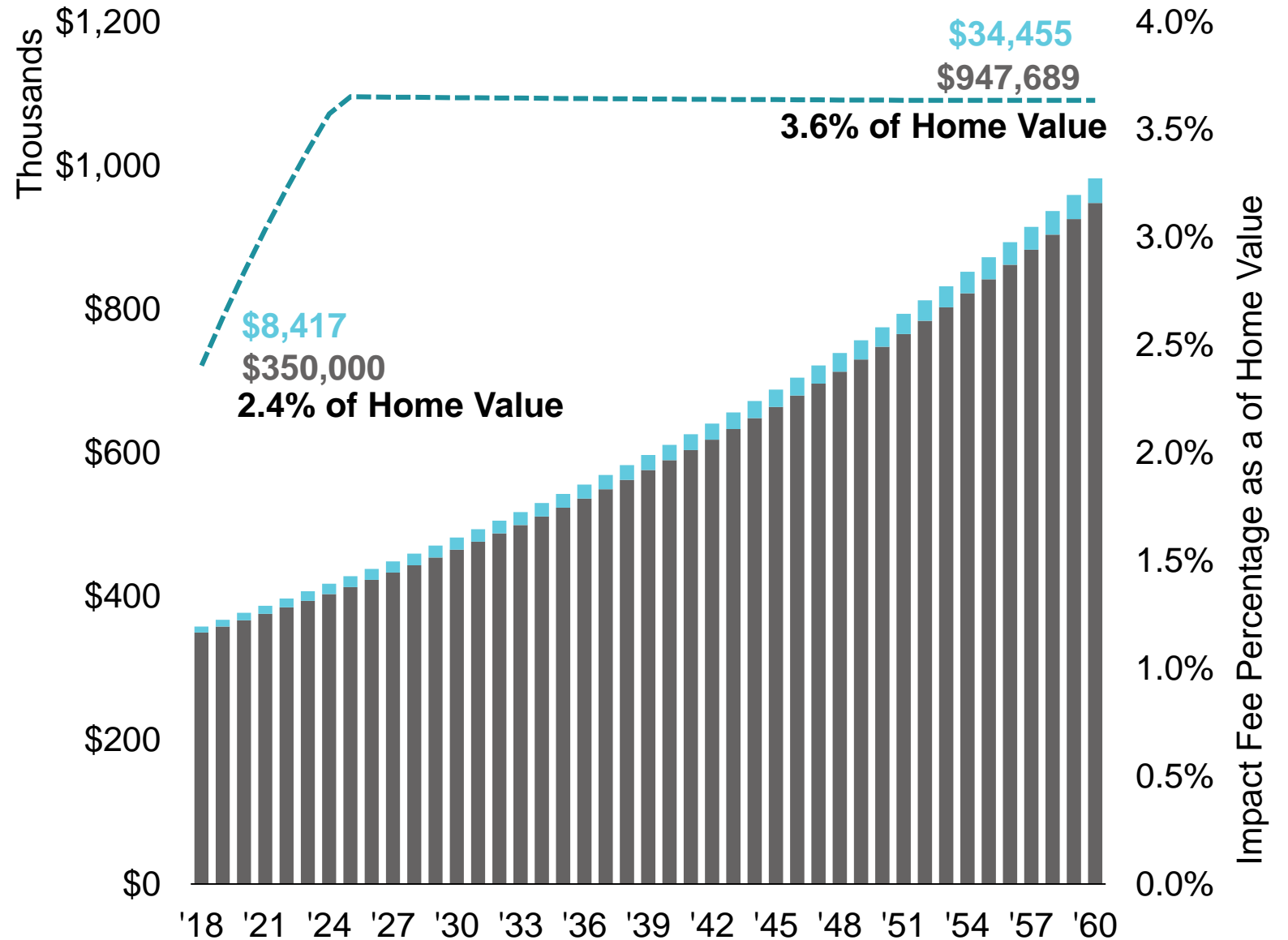
Equivalent Residential Connections



Source: Kem C. Gardner Policy Institute

Sensitivity #3

What is the revenue generating capacity of WCWCD considering price elasticity and conservation?



Sensitivity #3

What is the revenue generating capacity of WCWCD considering price elasticity and conservation?

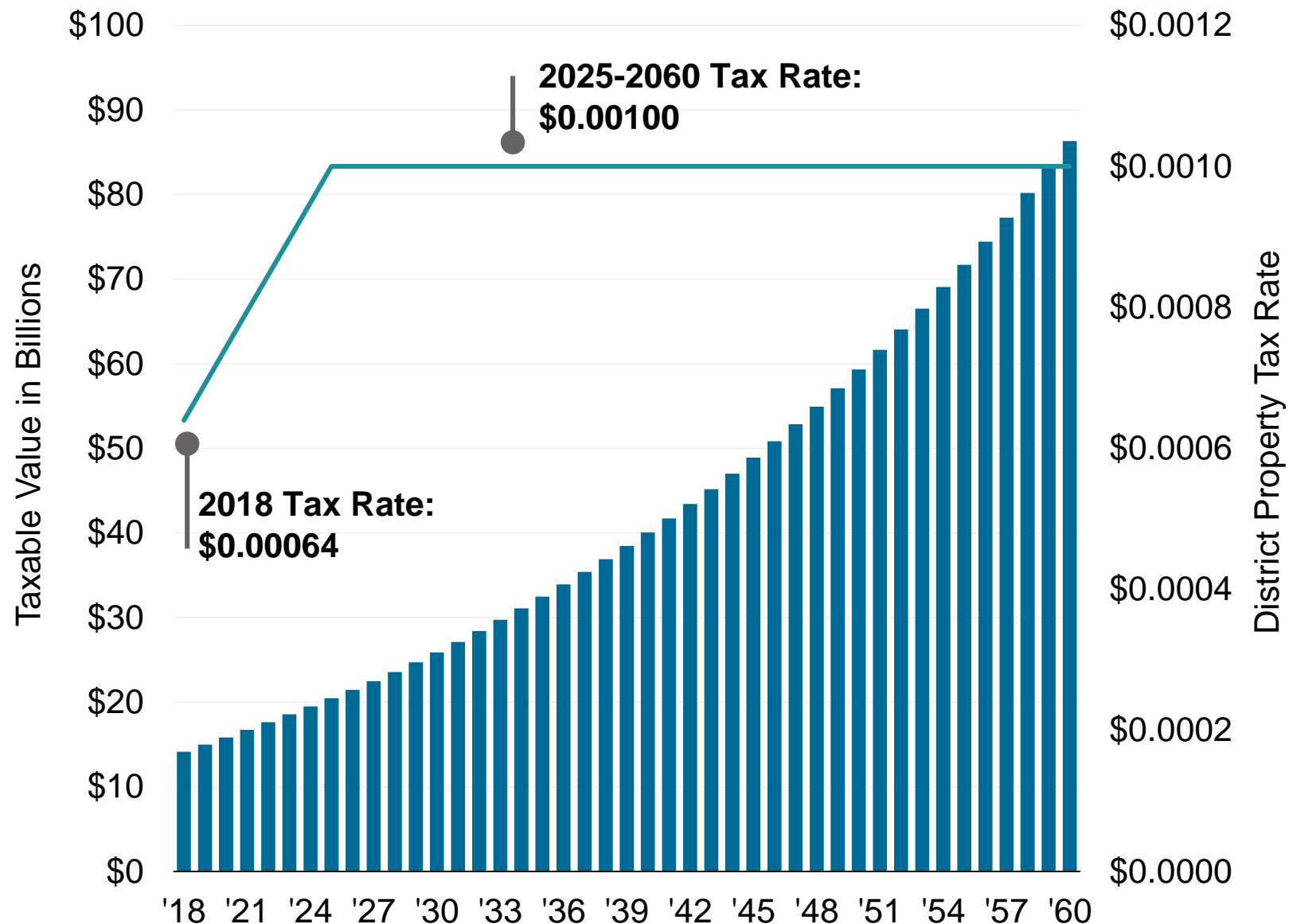
Impact Fees

Period	ERC Added	New Home Value	Impact Fee per Connection	Percent of Home Value	Impact Fee Revenue
2020	2,977	\$367,000	\$10,417	2.8%	\$31.0 M
2025	2,755	\$413,200	\$15,809	3.7%	\$41.6 M
2030	3,037	\$465,200	\$16,971	3.6%	\$51.5 M
2035	3,113	\$523,800	\$19,089	3.6%	\$59.4 M
2040	3,035	\$589,700	\$21,474	3.6%	\$65.2 M
2045	3,130	\$664,000	\$24,160	3.6%	\$75.6 M
2050	3,272	\$747,600	\$27,183	3.6%	\$89.0 M
2055	3,435	\$841,700	\$30,586	3.6%	\$105.1 M
2060	3,585	\$947,700	\$34,455	3.6%	\$123.4 M
2018-2060	138,162	\$601,200	\$21,512	3.6%	\$2,961.8 M

Pricing Element #3 Property Taxes

Sensitivity #3

What is the revenue generating capacity of WCWCD considering price elasticity and conservation?



Sensitivity #3

What is the revenue generating capacity of WCWCD considering price elasticity and conservation?

Property Taxes

Period	Taxable Value	WCWCD Property Tax Rate	Property Tax Revenue
2020	\$15.8 B	\$0.000743	\$11.8 M
2025	\$20.5 B	\$0.001000	\$20.5 M
2030	\$25.9 B	\$0.001000	\$25.9 M
2035	\$32.5 B	\$0.001000	\$32.5 M
2040	\$40.1 B	\$0.001000	\$40.1 M
2045	\$48.9 B	\$0.001000	\$48.9 M
2050	\$59.3 B	\$0.001000	\$59.3 M
2055	\$71.7 B	\$0.001000	\$71.7 M
2060	\$86.3 B	\$0.001000	\$86.3 M
2018-2060	\$1,851.2 B	\$0.000969	\$1,821.9 M

1 **LAKE POWELL PIPELINE DEVELOPMENT**
2 **ACT**
3 2006 GENERAL SESSION
4 STATE OF UTAH
5 **Chief Sponsor: Thomas V. Hatch**
6 House Sponsor: David Clark
7
8 **LONG TITLE**
9 **General Description:**
10 This bill authorizes the Board of Water Resources to build the Lake Powell Pipeline
11 project.
12 **Highlighted Provisions:**
13 This bill:
14 ▶ enacts the Lake Powell Pipeline Development Act;
15 ▶ defines terms;
16 ▶ authorizes the Board of Water Resources to:
17 • make rules;
18 • build the Lake Powell Pipeline project; and
19 • contract for the sale of developed water and operation of the project;
20 ▶ creates the Project Management Committee;
21 ▶ authorizes the building of hydroelectric generating works;
22 ▶ authorizes the water districts to use, exchange, or sell developed water; and
23 ▶ establishes an enterprise fund for the operation and maintenance of the project.
24 **Monies Appropriated in this Bill:**
25 None
26 **Other Special Clauses:**
27 None
28 **Utah Code Sections Affected:**
29 ENACTS:

Sensitivity #4

What happens if the State
changes its interpretation
of the Lake Powell
Pipeline Act?

Sensitivity #5

What happens in the event that population grows slower than expected, conservation is greater than expected, and Washington County builds the Lake Powell Pipeline Project on the current timeline?

Build It, and They Don't Come Scenario...

	Baseline Scenario (2026 Completion)	Alternate Scenario (2026 Completion)
Average Annual Population	309,419	284,860
2060 Population	458,960	410,442
Average Annual Water Consumption	25.7 B gallons	20.5 B gallons
2060 Water Consumption	36.1 B gallons	28.1 B gallons
Average GPCD	196.3	170.0
Consumption > Supply	2035	2051
Total Project Cost	\$2.1 B	\$2.1 B
Water Rate Revenue	\$1.7 B	\$1.2 B
Impact Fee Revenue	\$3.0 B	\$2.5 B
Property Tax Revenue	\$1.8 B	\$1.6 B
Total Revenue Capacity	\$6.5 B	\$5.3 B

Note: GPCD reflects net deliveries after non-revenue deliveries, reflecting the amount of deliveries consumed by water customers.

Sensitivity #6

What happens in the event that population grows faster than expected, conservation is less than expected, and Washington County delays building the Lake Powell Pipeline Project five years?

Don't Build It, and They Come Anyway Scenario...

	Baseline Scenario (2026 Completion)	Alternate Scenario (2031 Completion)
Average Annual Population	309,419	324,141
2060 Population	458,960	490,827
Average Annual Water Consumption	25.7 B gallons	30.5 B gallons
2060 Water Consumption	36.1 B gallons	43.7 B gallons
Average GPCD	196.3	223.2
Consumption > Supply	2035	2027
Total Project Cost	\$2.1 B	\$3.2 B
Water Rate Revenue	\$1.7 B	\$2.2 B
Impact Fee Revenue	\$3.0 B	\$3.3 B
Property Tax Revenue	\$1.8 B	\$1.9 B
Total Revenue Capacity	\$6.5 B	\$7.4 B

Note: GPCD reflects net deliveries after non-revenue deliveries, reflecting the amount of deliveries consumed by water customers.

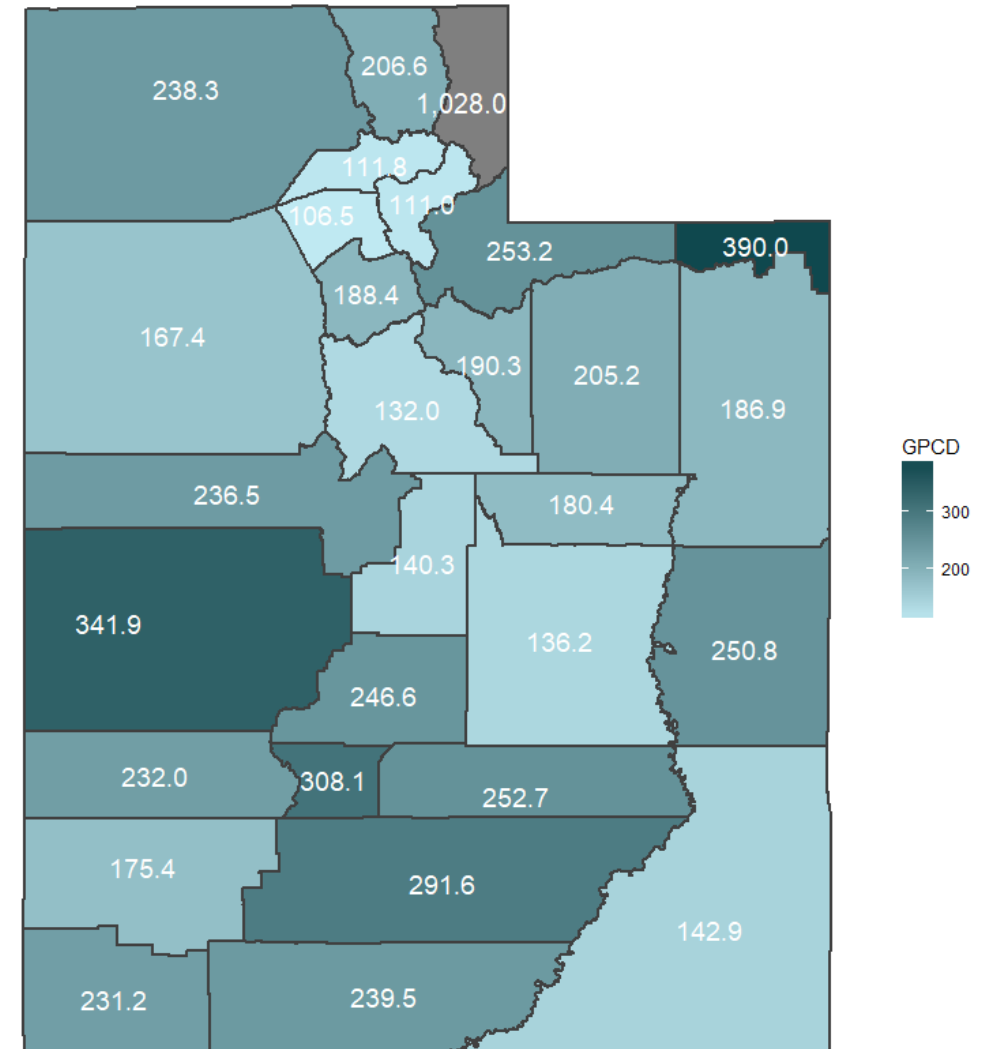


Questions presented today...

1. Assumptions and sensitivities of WCWCD supply-demand water models
2. **Water use per capita and future demand projections**
3. State bonding and repayment to the state, including repayment sources
4. Price elasticity of demand estimates

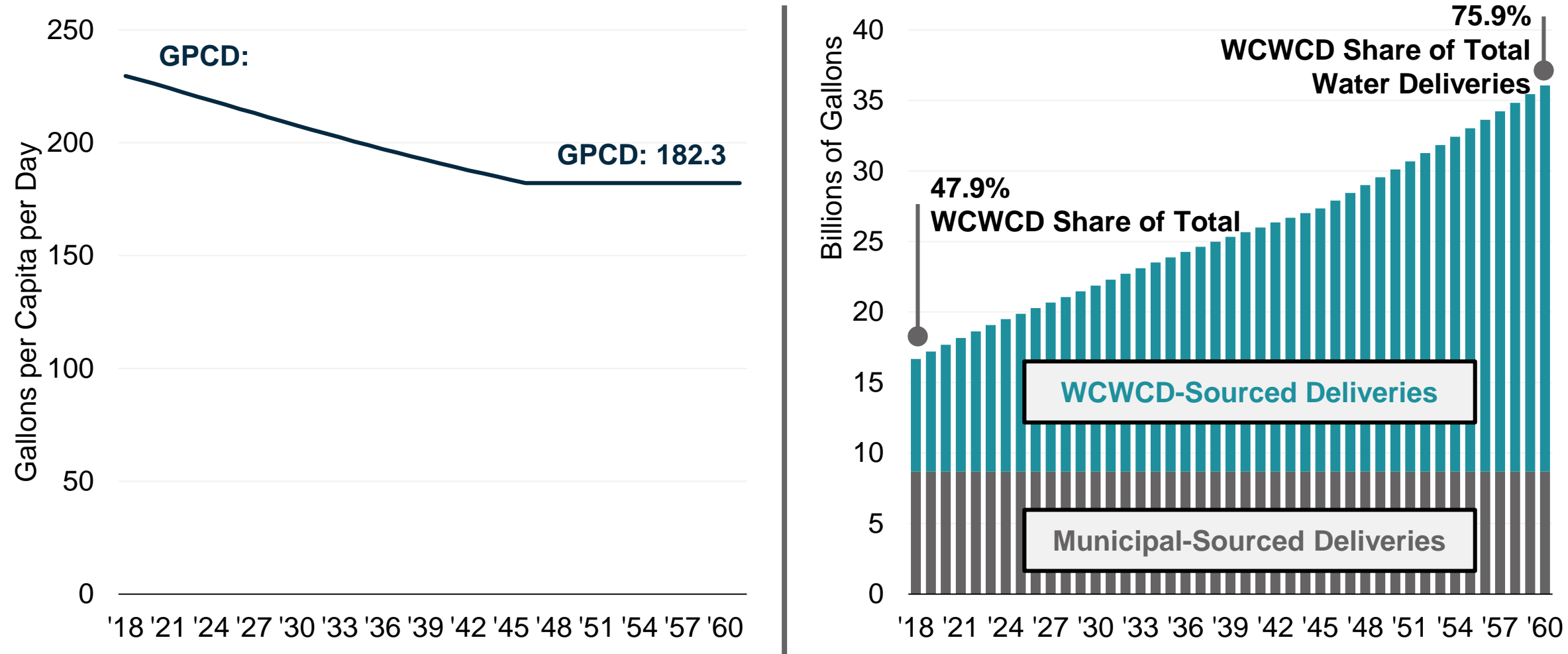
Water Demand | Gallons Per Capita Per Day

In terms of domestic public supply, Washington County ranked 16th lowest of 29 counties in per capita usage despite being located in the hottest and most arid region of the state



Source: Utah Department of Water Resources. Note: These figures are county-wide, GPCD reported elsewhere in this report refers to the Kanab/Virgin Basin

Gallons Per Capita Per Day and Total Water Demand



Note: GPCD reflects net deliveries after non-revenue deliveries, reflecting the amount of deliveries consumed by water customers.



Questions presented today...

1. Assumptions and sensitivities of WCWCD supply-demand water models
2. Water use per capita and future demand projections
3. **State bonding and repayment to the state, including repayment sources**
4. Price elasticity of demand estimates

LAKE POWELL PIPELINE DEVELOPMENT

ACT

2006 GENERAL SESSION

STATE OF UTAH

Chief Sponsor: Thomas V. Hatch

House Sponsor: David Clark

LONG TITLE

General Description:

This bill authorizes the Board of Water Resources to build the Lake Powell Pipeline project.

Highlighted Provisions:

This bill:

- ▶ enacts the Lake Powell Pipeline Development Act;
- ▶ defines terms;
- ▶ authorizes the Board of Water Resources to:
 - make rules;
 - build the Lake Powell Pipeline project; and
 - contract for the sale of developed water and operation of the project;
- ▶ creates the Project Management Committee;
- ▶ authorizes the building of hydroelectric generating works;
- ▶ authorizes the water districts to use, exchange, or sell developed water; and
- ▶ establishes an enterprise fund for the operation and maintenance of the project.

Monies Appropriated in this Bill:

None

Other Special Clauses:

None

Utah Code Sections Affected:

ENACTS:

Lake Powell Pipeline Development Act Scenario...

1

State of Utah issues bonds for the construction of the Lake Powell Pipeline

2

Washington County takes down blocks of water, as needed, incurring the cost of each block when it is taken down

3

Washington County pays for each block of water it takes down using pay-go funds (impact fees) to the extent available, financing the balance, utilizing water rates and property taxes, at terms consistent with Act



How Might This Look from the State of Utah's Perspective?

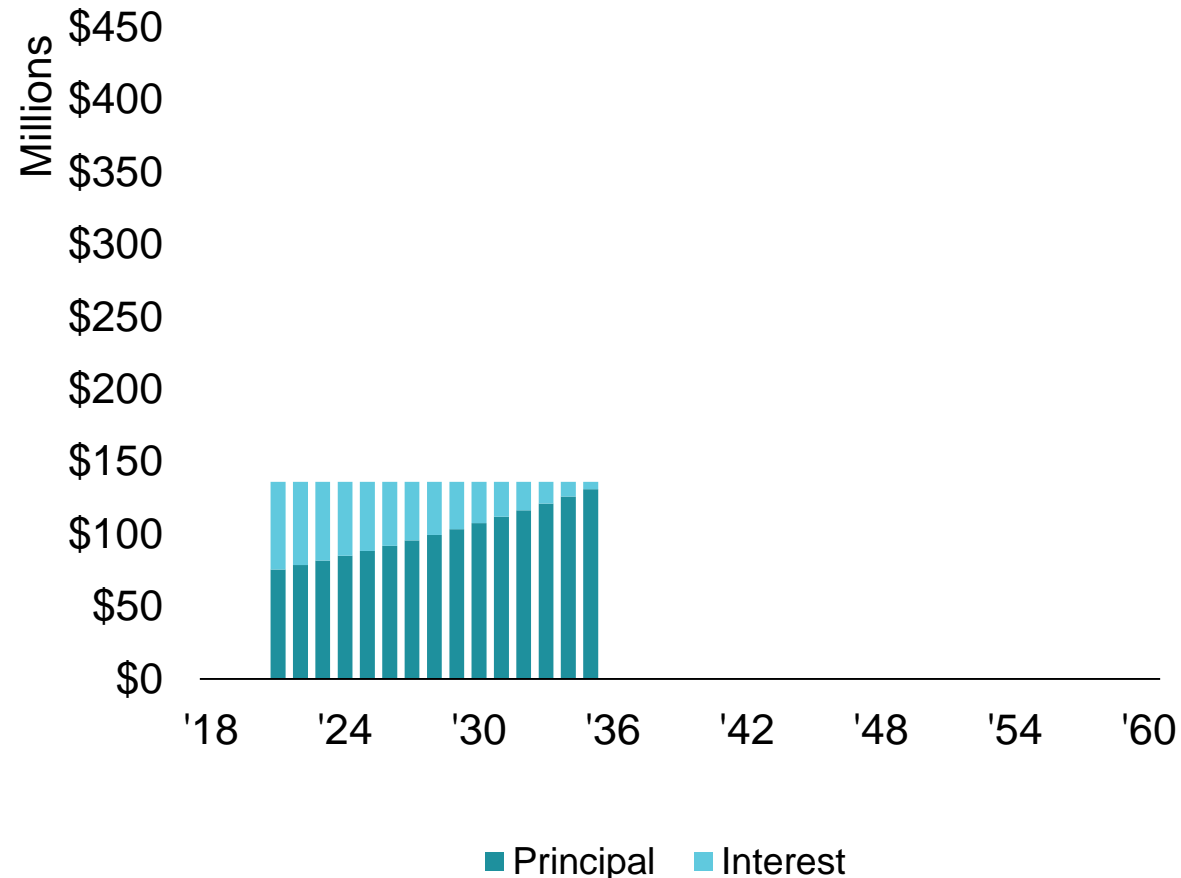
Project Cost:	\$1,377,609,000 <i>(2017 Dollars)</i>
	\$1,514,697,000 <i>(2021 Dollars; At Bond Issuance)</i>
Assumed Term:	15 Years
Assumed Interest Rate:	4.0%
Structure:	Fully Amortizing
Annual Debt Service:	\$136,233,525 <i>(Principal and Interest)</i>
Total Debt Service:	\$2,043,502,877 <i>(\$136.2 Million x 15 Years)</i>

Note: The modeled financing scenario is for illustrative purposes and does not attempt to account for a premium/discount structure, issuance costs, debt service reserve requirements, coverage or other bonding considerations. Estimates reflect principal and interest based on the total project cost. Annual cost escalations of 2.4 percent are assumed, along with a 2021 bond issuance timeframe.

How Might This Look from the State of Utah's Perspective?

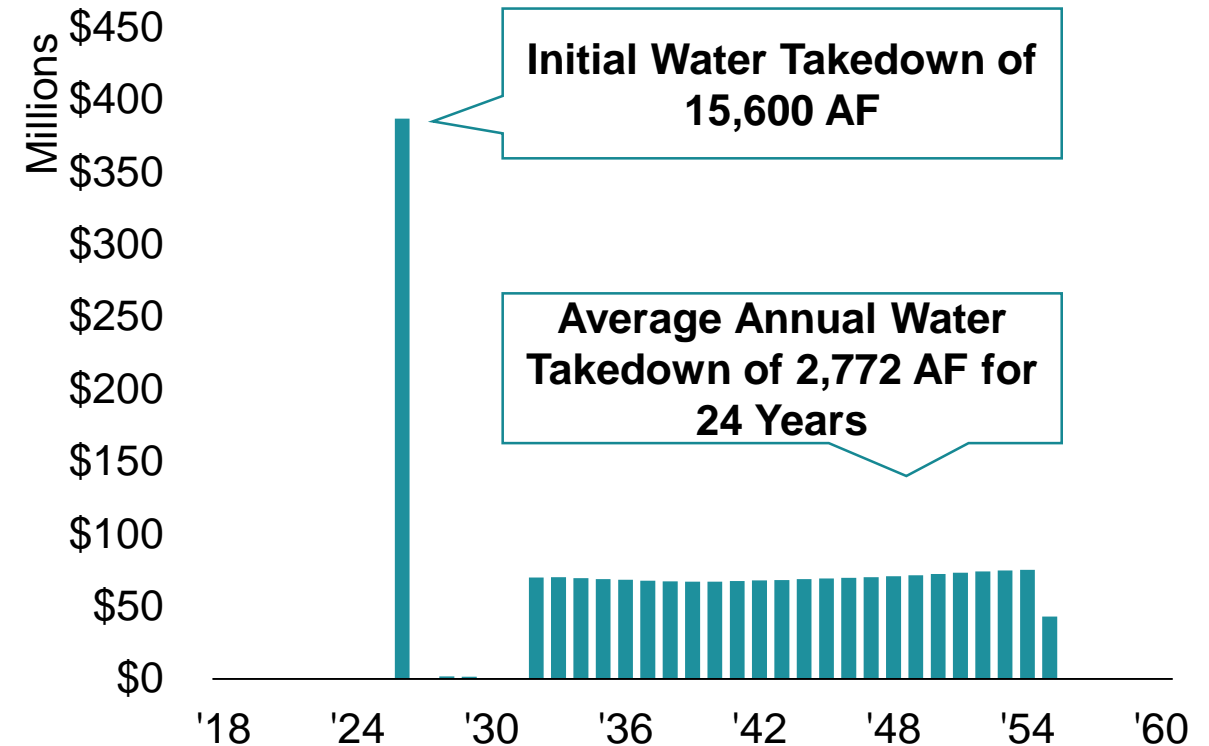
Debt Service by the State of Utah

Annual \$136.2 Million | Cumulative \$2.0 Billion

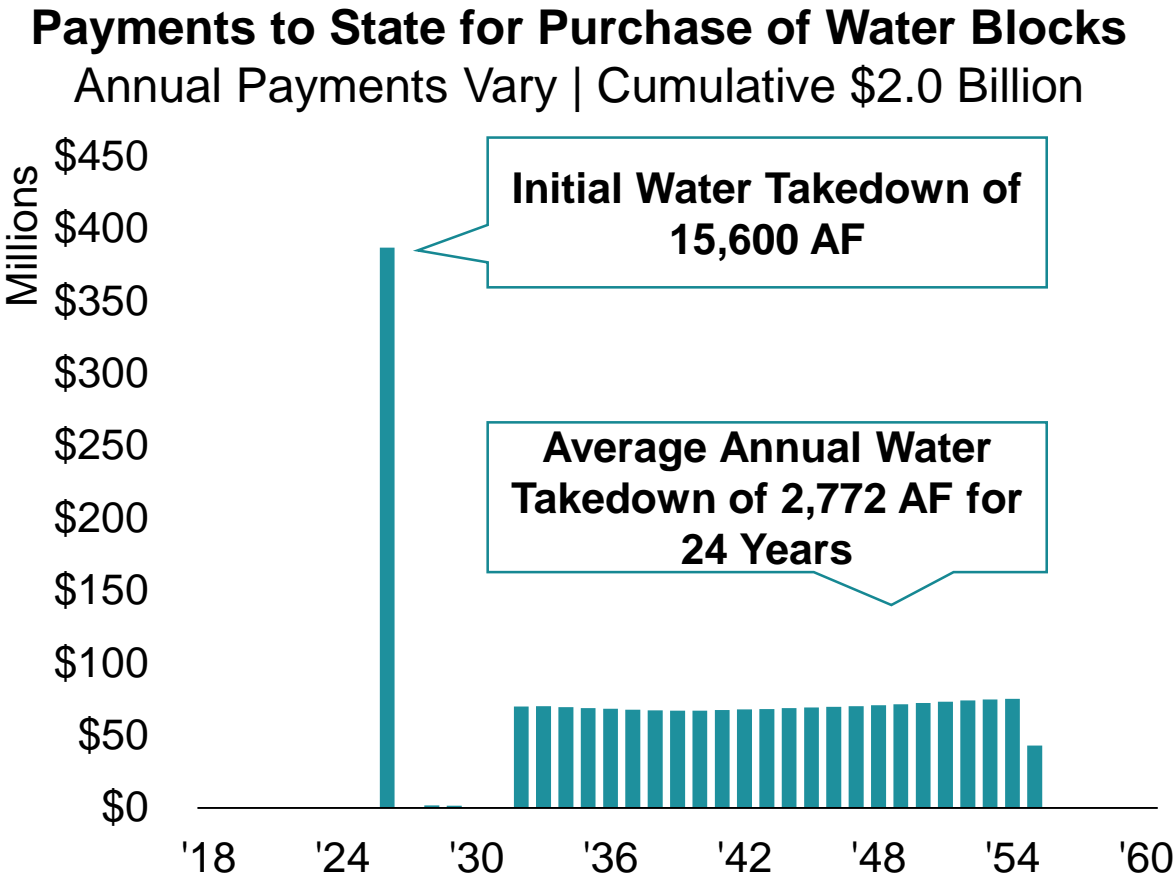
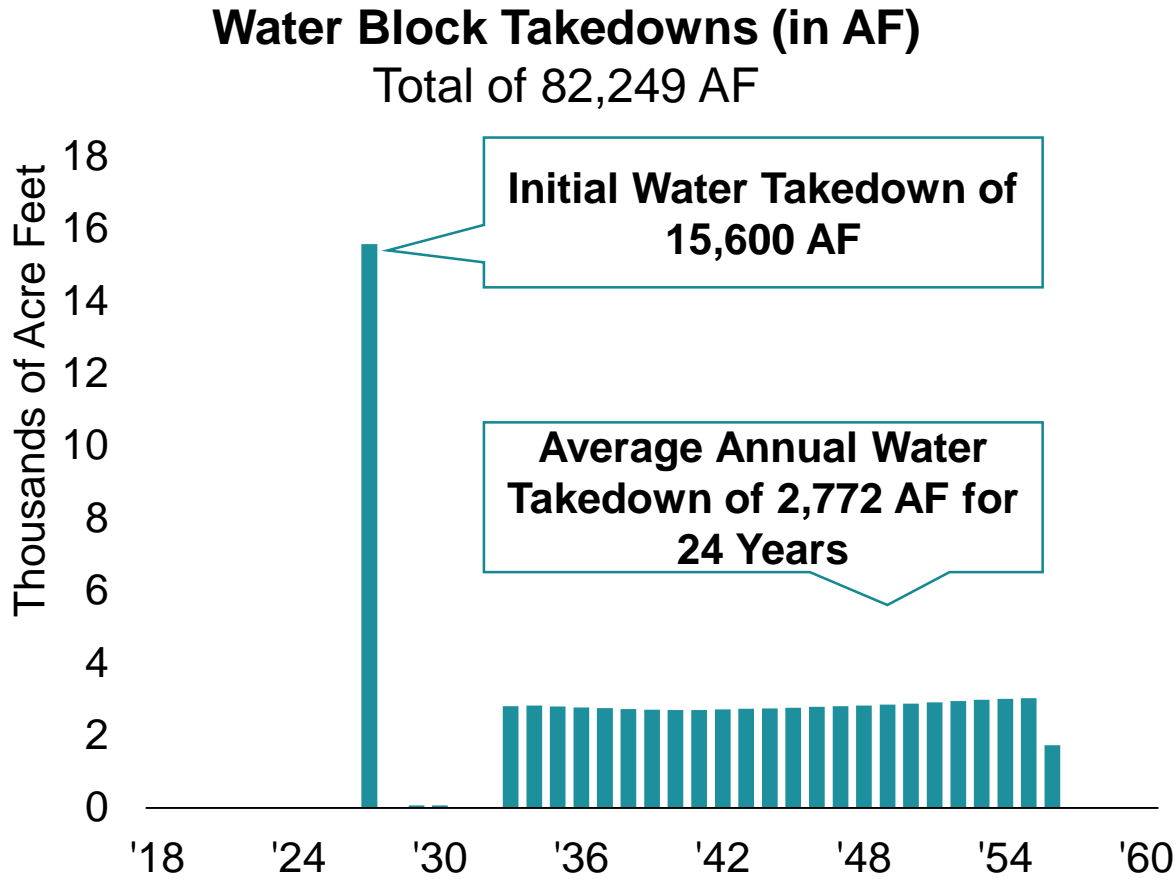


Payments from WCWCD for Purchase of Water Blocks

Annual Payments Vary | Cumulative \$2.0 Billion



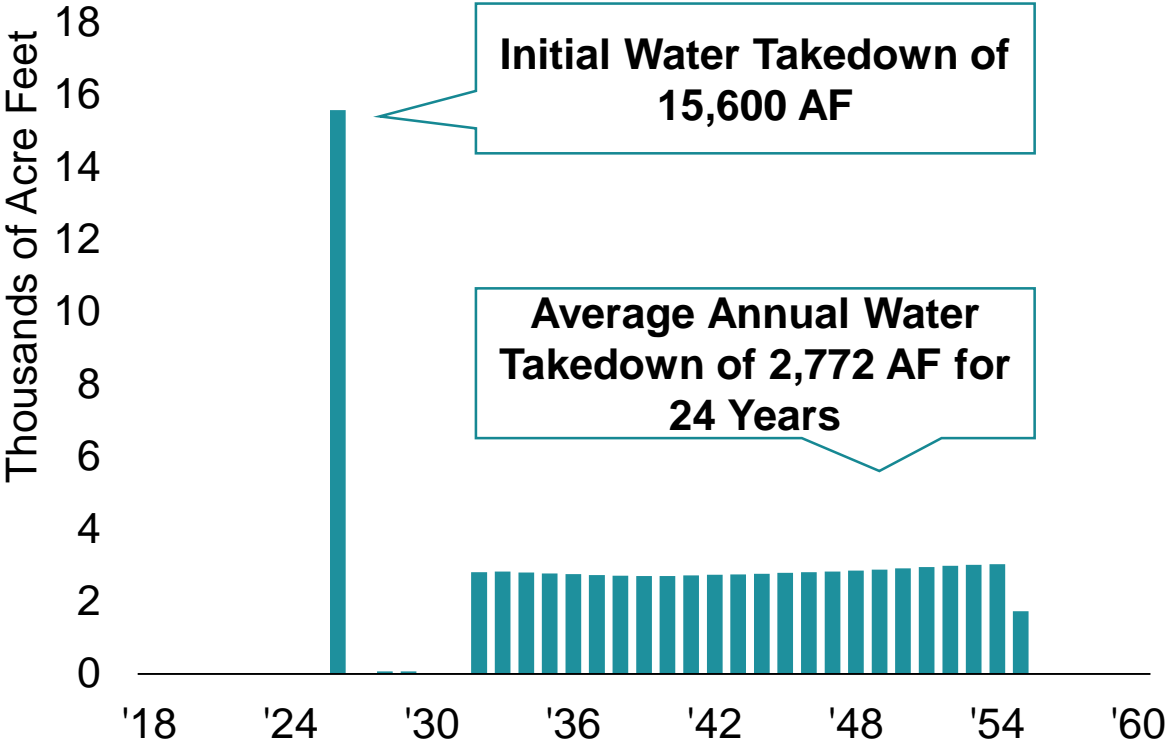
How Might This Look from WCWCD's Perspective?



How Might This Look from WCWCD's Perspective?

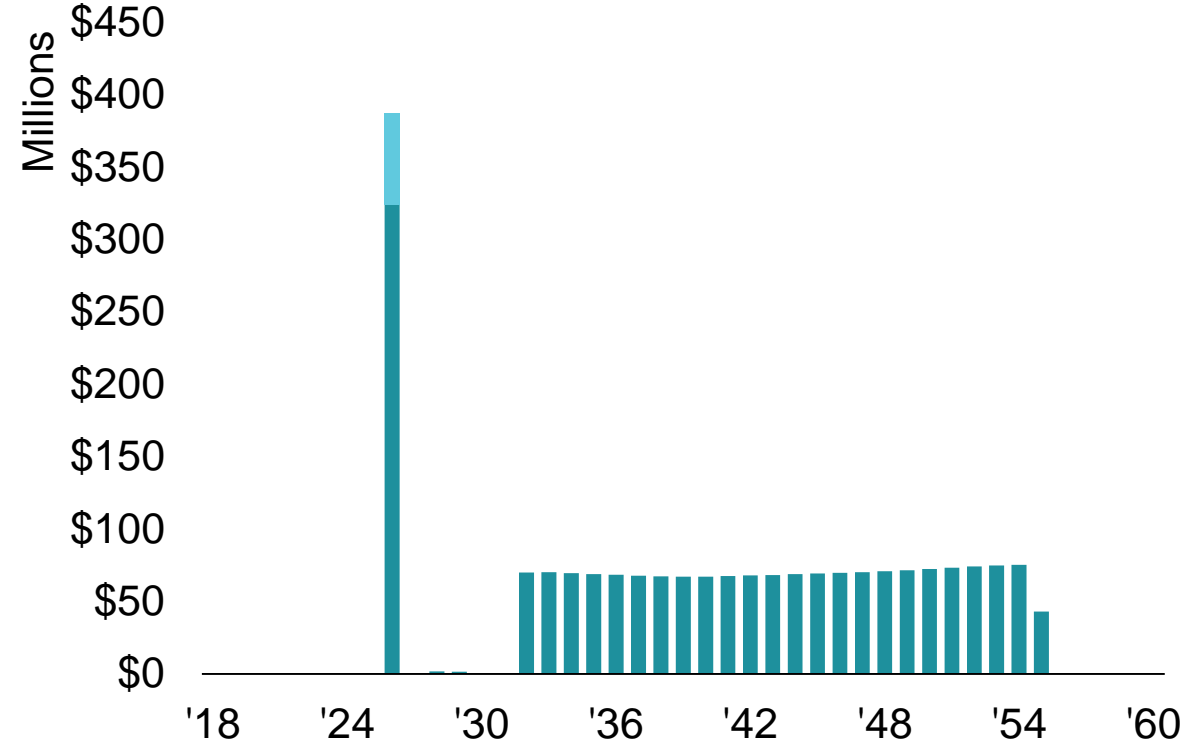
Water Block Takedowns

Total of 82,249 AF



Sources of Payments for Purchase of Water Blocks

Annual Payments Vary | Cumulative \$2.0 Billion

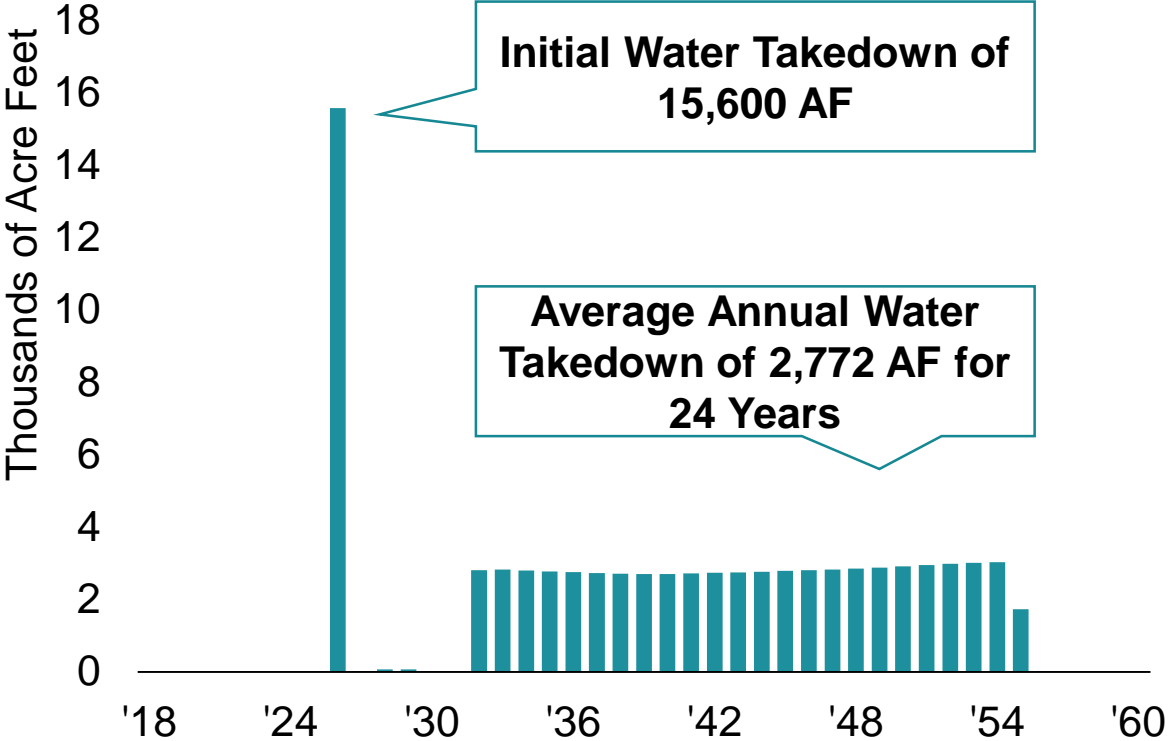


■ Impact Fees ■ Debt Financing

How Might This Look from WCWCD's Perspective?

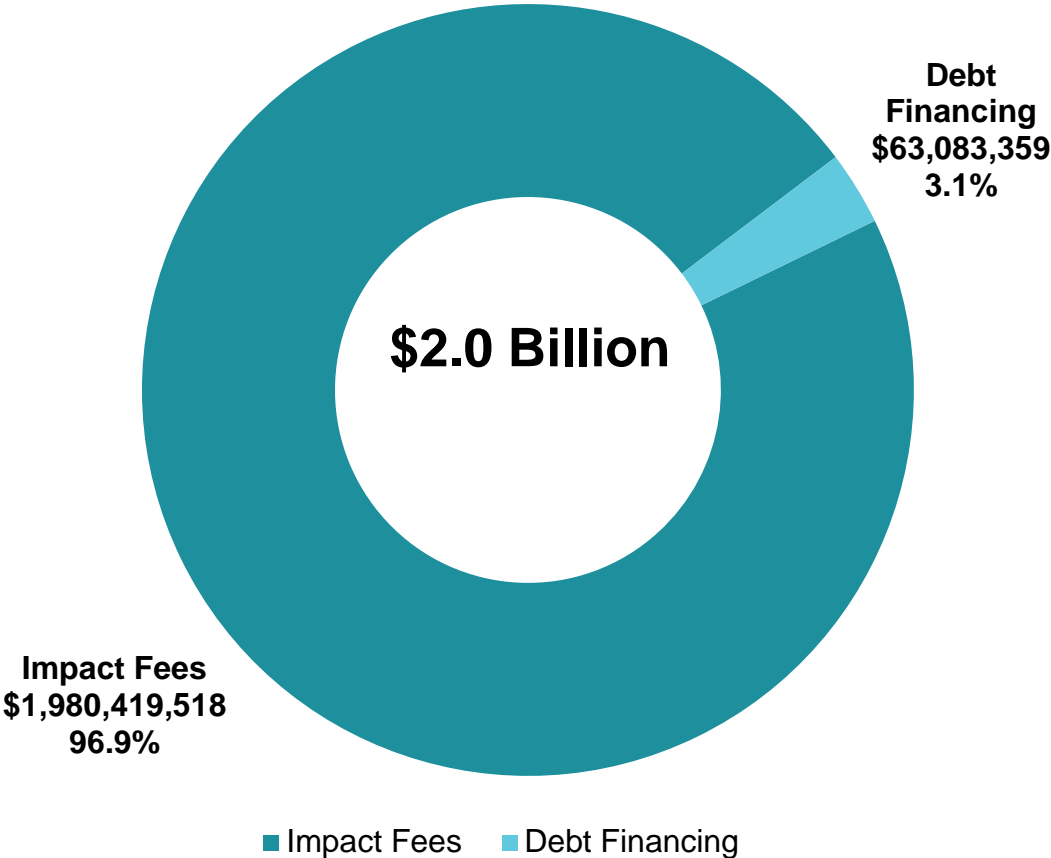
Water Block Takedowns

Total of 82,249 AF



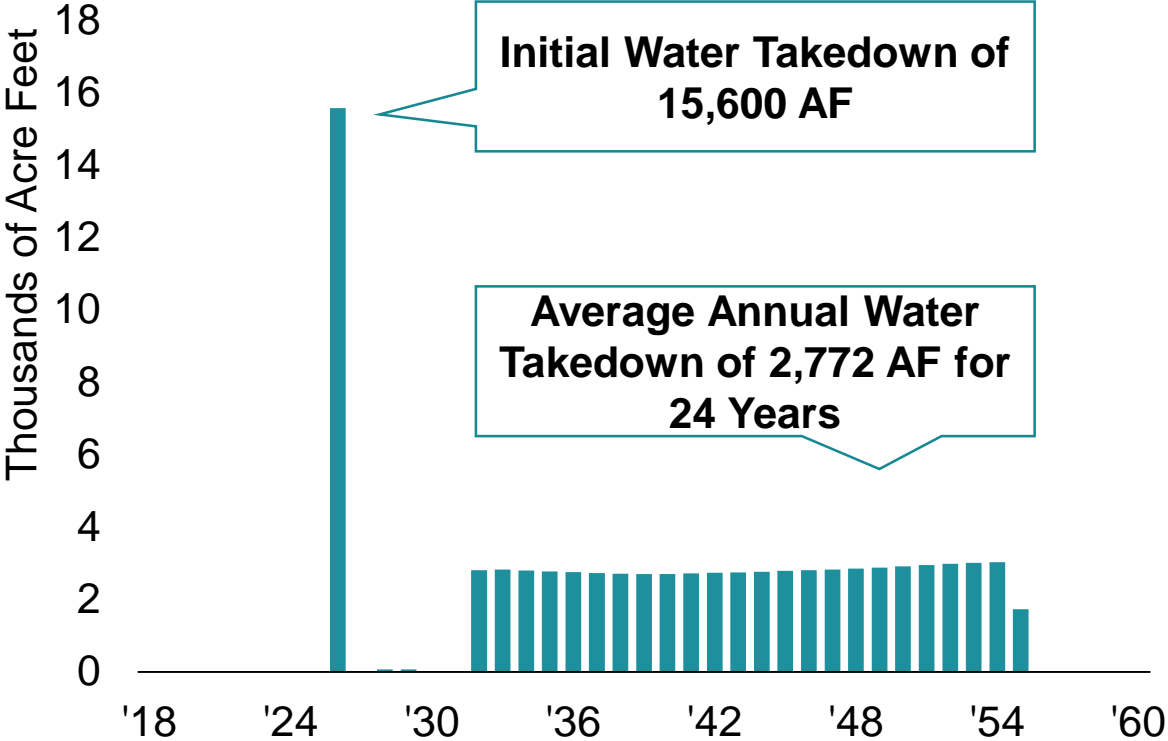
Sources of Payments for Purchase of Water Blocks

Annual Payments Vary | Cumulative \$2.0 Billion

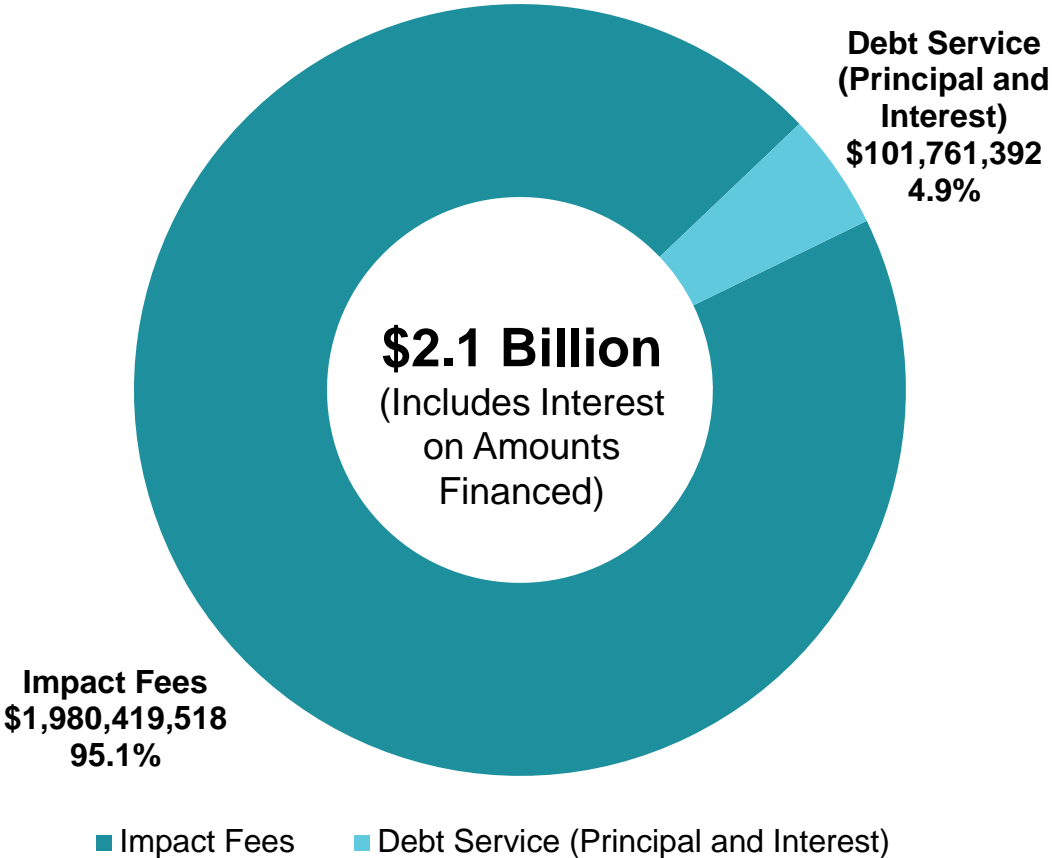


How Might This Look from WCWCD's Perspective?

Water Block Takedowns
Total of 82,249 AF



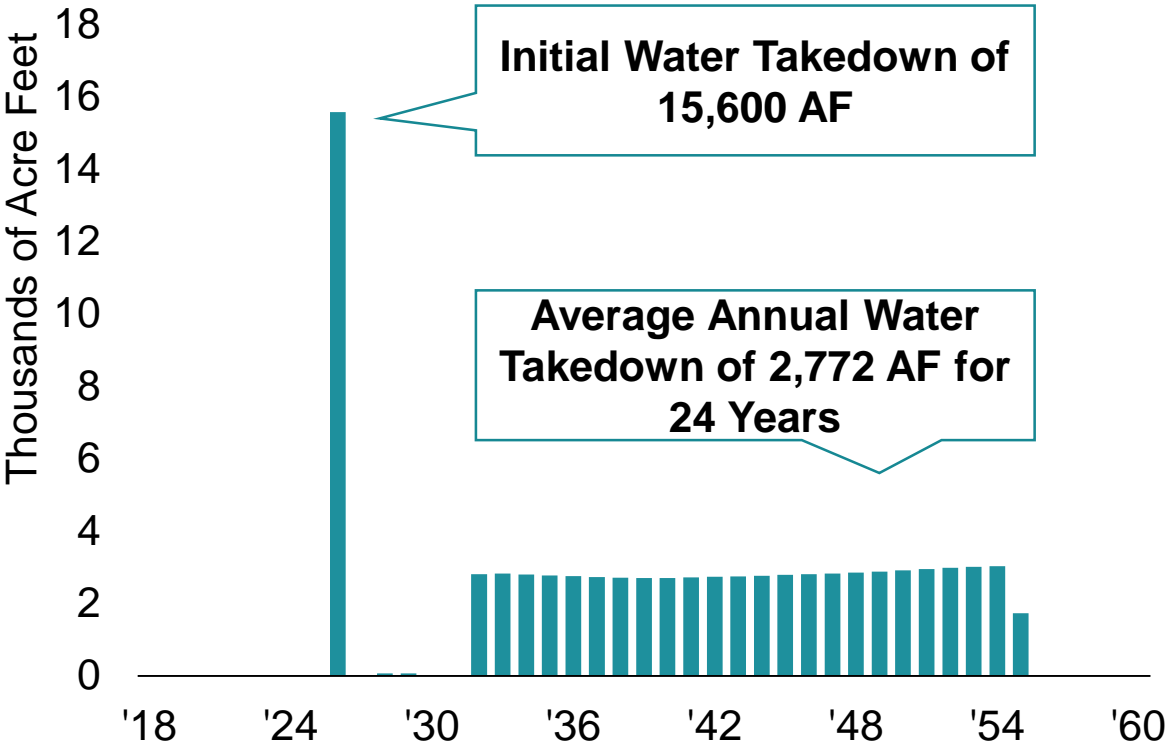
Cash Payments for Purchase of Water Blocks
Annual Payments Vary | Cumulative \$2.1 Billion



How Might This Look from WCWCD's Perspective?

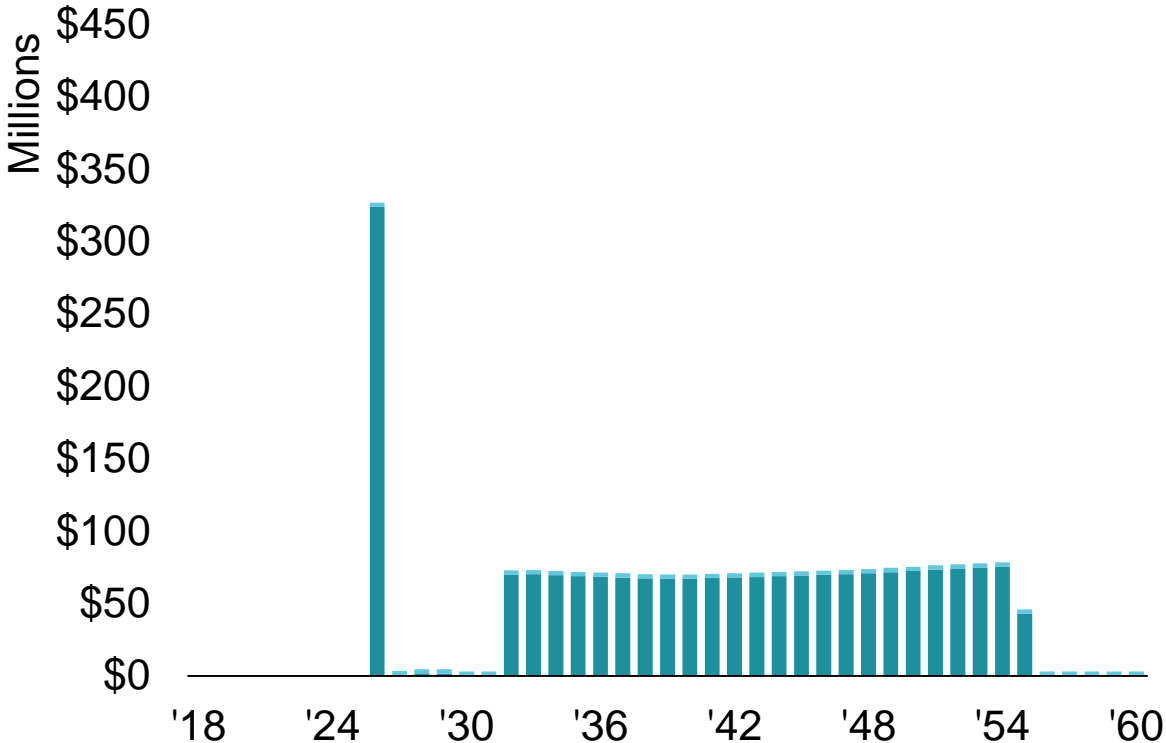
Water Block Takedowns

Total of 82,249 AF



Timing of Payments for Purchase of Water Blocks

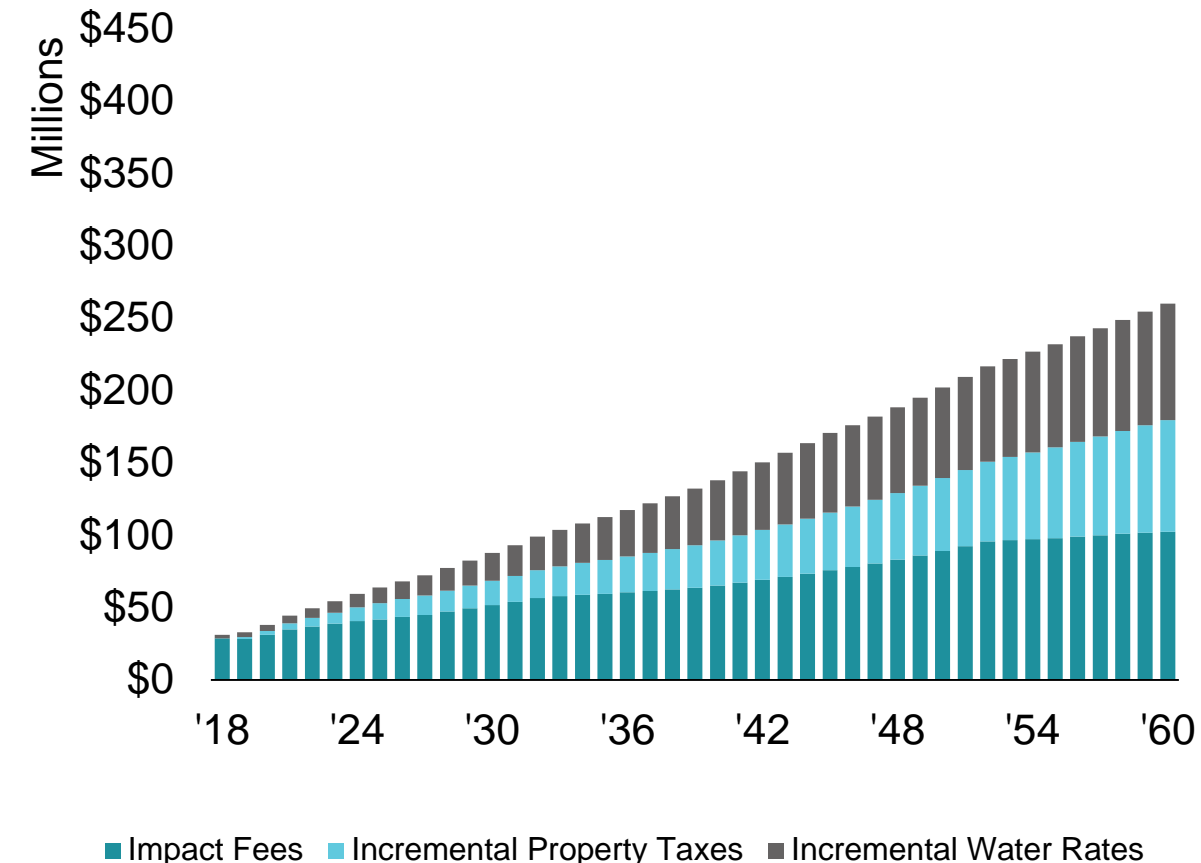
Annual Payments Vary | Cumulative \$2.1 Billion



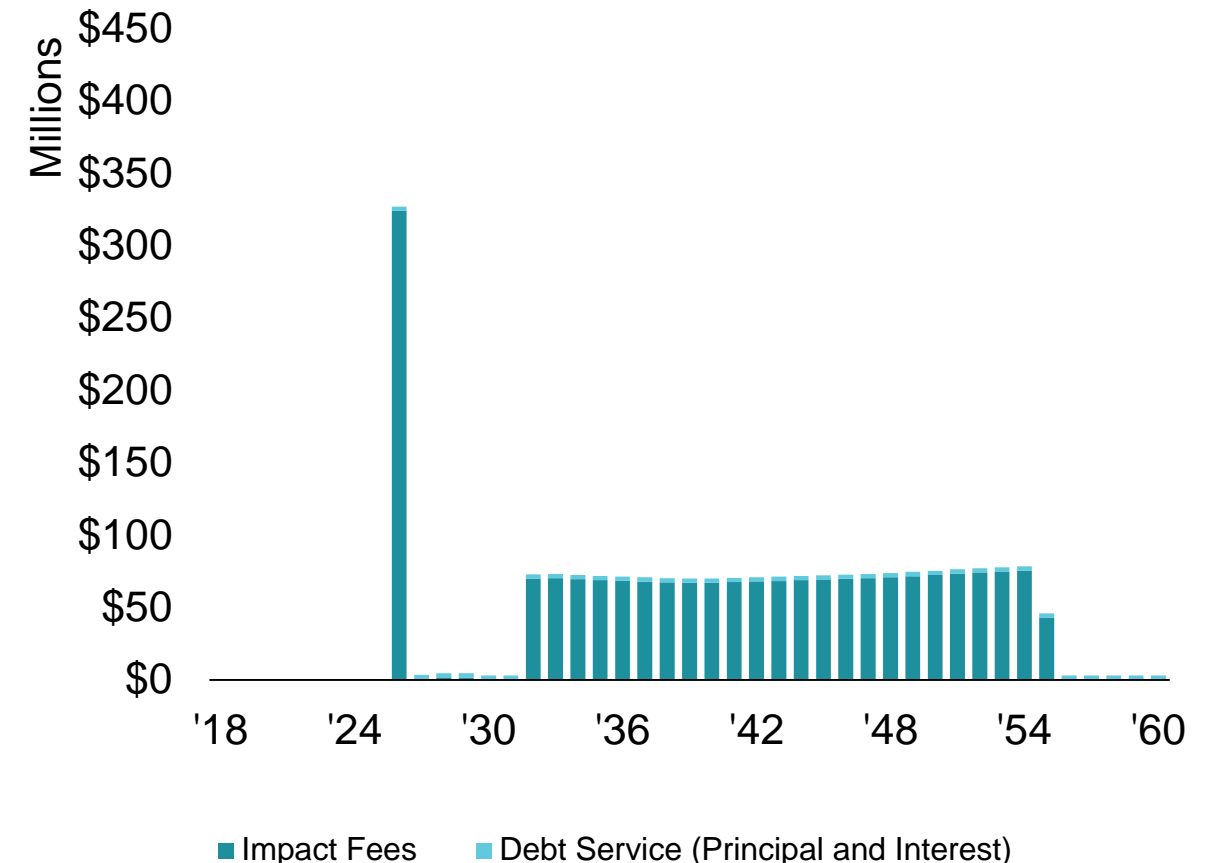
■ Impact Fees ■ Debt Service (Principal and Interest)

Would Washington County Have Sufficient Funds to Make the Required Payments?

Incremental Revenues by Source
Presented Annually

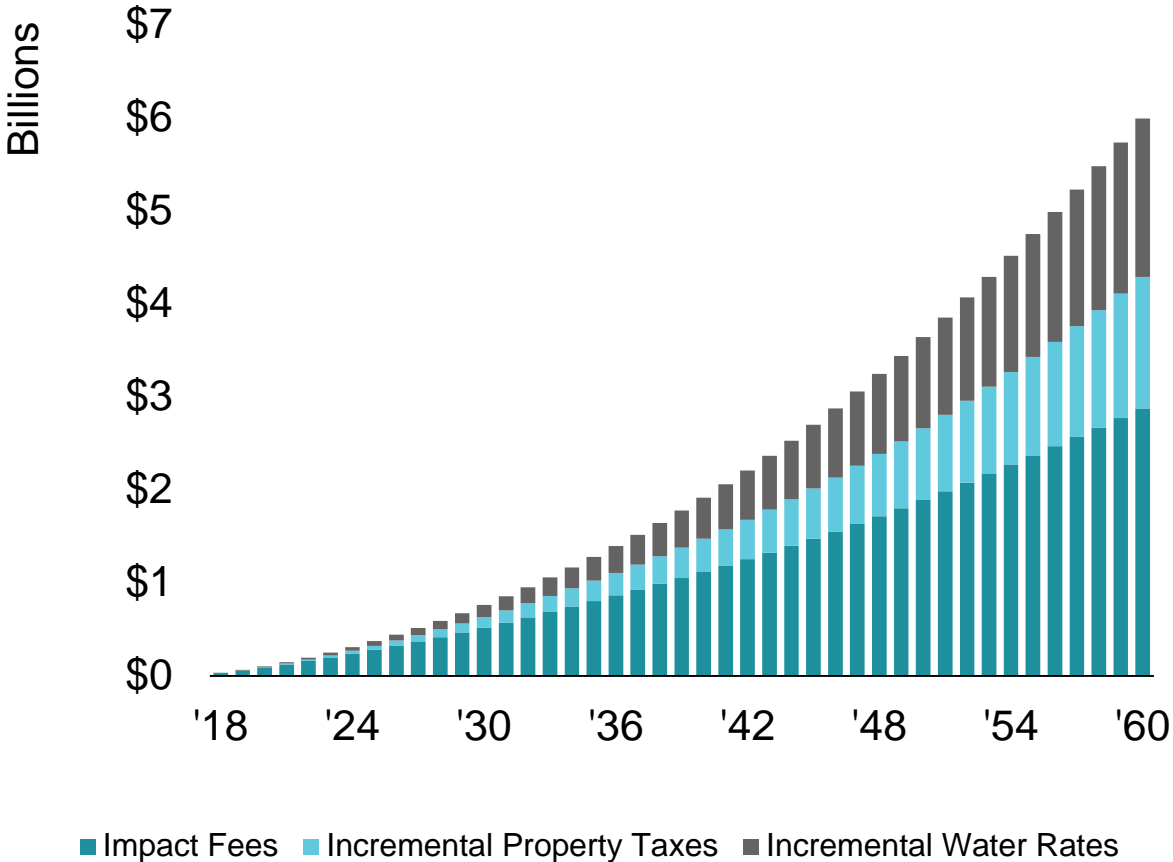


Timing of Payments for Purchase of Water Blocks
Annual Payments Vary | Cumulative \$2.1 Billion

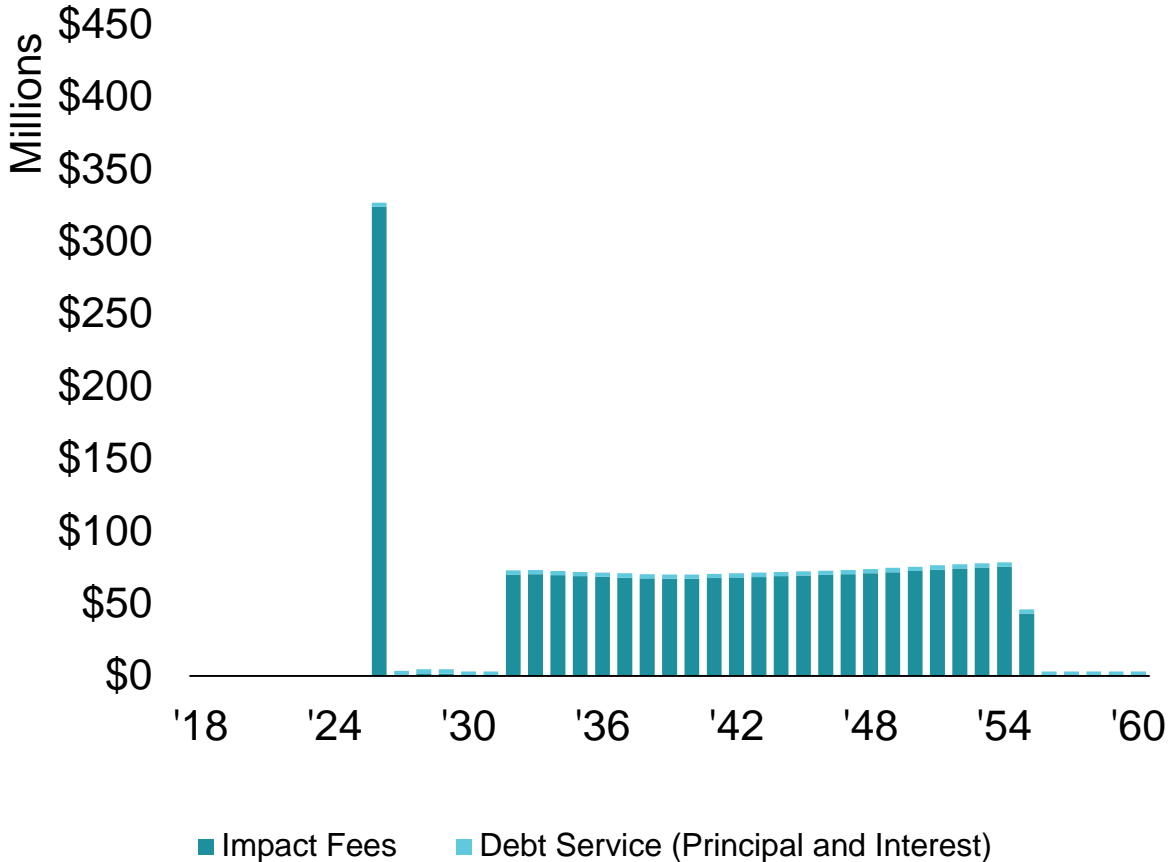


Would Washington County Have Sufficient Funds to Make the Required Payments?

Incremental Revenues by Source
Presented Cumulatively



Timing of Payments for Purchase of Water Blocks
Annual Payments Vary | Cumulative \$2.1 Billion



Notably, the Development of a Financing Model Remains Premature

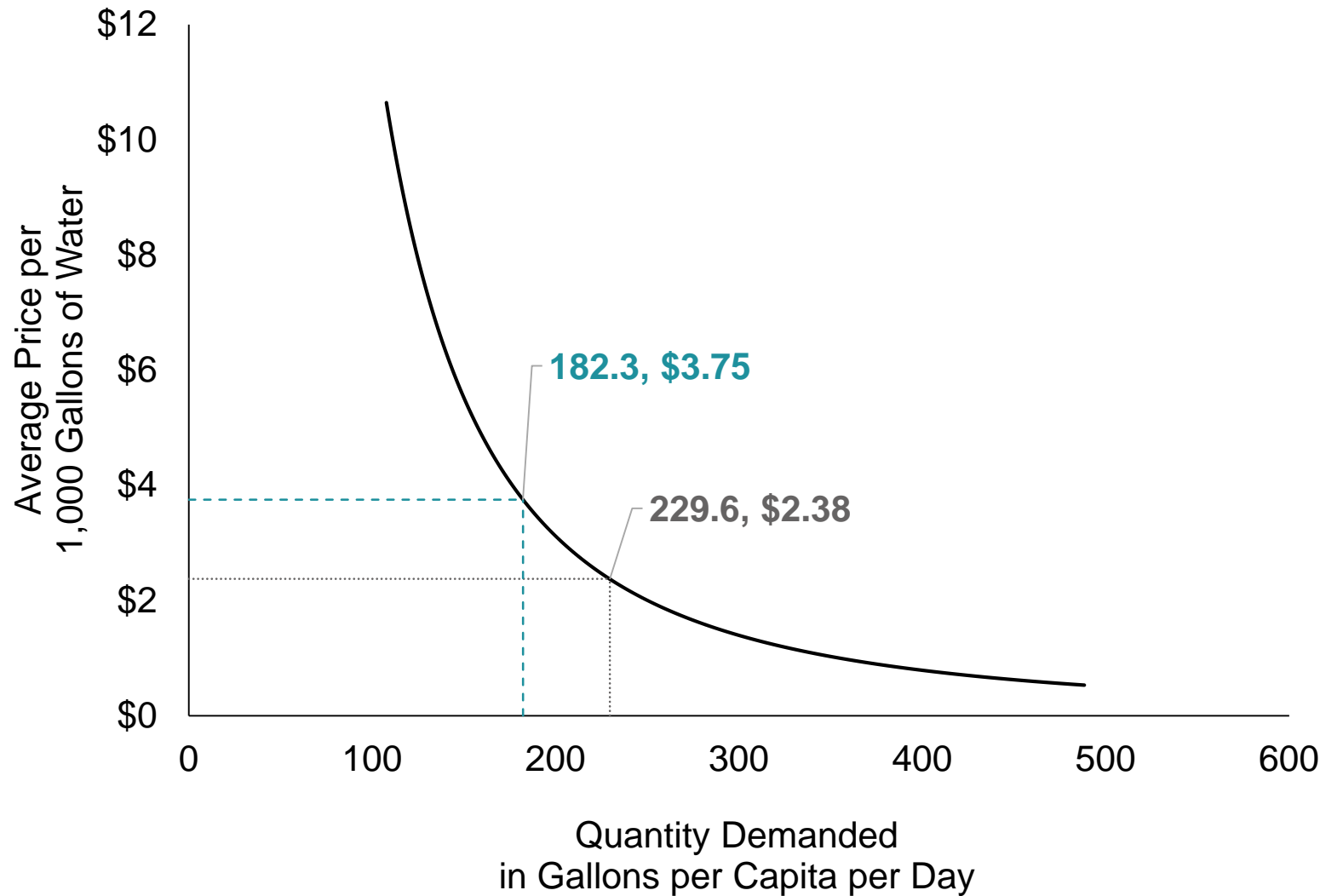
Important assumptions continue to be refined...

1. The final cost of the Lake Powell Pipeline
2. The timing of the Lake Powell Pipeline
3. The financing environment, interest rates
4. Reserve and coverage requirements
5. Financing structure of water blocks
6. Market reactions to rate increases
7. Adoption of conservation measures
8. Demographic, socioeconomic trends
9. Trends in development
10. State and federal water policy



Questions presented today...

1. Assumptions and sensitivities of WCWCD supply-demand water models
2. Water use per capita and future demand projections
3. State bonding and repayment to the state, including repayment sources
4. **Price elasticity of demand estimates**



Price Elasticity of Demand Considered in Supply-Demand Estimates

— Demand Baseline Assumptions - - - - New Assumptions

Lake Powell Pipeline Feasibility for Washington County Water District

The following summarizes concerns about the ability of the Washington County Water Conservancy District (WCWCD) to repay debt issued by the State of Utah for the WCWCD's financial obligation for participating in the proposed Lake Powell Pipeline (LPP).

1. Washington County Water District's Questionable Water Needs. Based on declining population growth, potential to convert additional agricultural water, potential water conservation savings, and previously unconsidered water sources, Washington County has ample water to serve future populations without participation in the Lake Powell Pipeline.

1a. Outdated Population Baseline Population
the year 2060, 32 the District's water pushes the support Projection with No two different pop

1b. Potential Agricultural
Plan by the Division basin had 25,600 with 87,800 acres. Much of the water systems and it is would save 2,500

As future development creates a surplus Needs Assessment agricultural water interpolation, that diversions from 2 County had 14,78

The 2015 Legislature typically approve Washington County agricultural conservancy

¹ <http://governor.utah.gov>
² <http://governor.utah.gov>
³ <http://le.utah.gov/audit>

Based on the expected growth of existing revenue streams due to population increase in the county, WCWCD's revenues can be projected over the next 50 years, as shown in Column H. The deficit schedule for the repayment period can be seen in Columns O and P. These columns show that the District's revenues fall significantly short of the District's expenses for every year of the 50-year repayment schedule (except for any initial payment-free years). Unless the District has an increase in revenues, WCWCD's cumulative debt would grow to between \$5.84–6.76 billion (cell P73) by the end of the project repayment period. Clearly, participation by the WCWCD in the LPP will require significant increases in impact fees and/or water rates.

4. Water Rate and Impact Fee Increases Required to Repay Debt

The fundamental question is whether the WCWCD can make these debt payments via an increase in revenue¹³, and if so how they will raise this revenue.

Increasing Property Taxes. According to Utah law, water conservancy districts in the Lower Colorado River Basin may not tax higher than 0.001 per dollar of taxable value of taxable property in the district.¹⁴ WCWCD currently collects property taxes at the rate of 0.00097. However, even if WCWCD increased their levy to the maximum collection rate, this only increases revenues \$301,642 and revenues would still fall short of their expenses by tens of millions of dollars each year, accumulating to a deficit of billions of dollars at the end of the 50-year repayment period. Therefore increasing water rates and/or impact fees must also be implemented by WCWCD.

Increasing Water Rates. Columns Q and R examine whether increasing water rates alone, without any impact fee increases, could repay Washington County Water District's total future debt. Although one might think the WCWCD could simply increase water rates to raise revenues, raising water rates will result in a decrease in total water demand. Because the debt is relatively large, in order for water sales to cover the debt obligations of the project, water sales revenues would need to increase by 320–358 percent, depending upon the total cost of the LPP (spreadsheet cell B10). This would still require the WCWCD to shoulder significant deficits over time, but would result in a balance of essentially zero in 2063 (Columns Q and R; cell R73).

Due to the fact that the price elasticity of demand for water is estimated to be -0.5, repayment through water sales alone would require rate increases of 1665–1995 percent (cell B12). This enormous increase in water rates would lead Washington County water users to need less water in 2060 than they used in 2010 (cells O12 and AA12 of the "Water Demand" worksheet), meaning that there would be no need for the water supplied by the LPP. In other words, if the LPP is financed only by increasing water rates, water would become so expensive that future water demand would drop below the current water demand of WCWCD,¹⁵ even if one ignores other water sources identified above.

Increases in water rates may slow the rate of population growth in Washington County, which would make the LPP both harder to pay back and less necessary. To avoid this and maintain the desirability of homes and building lots in Washington County in the face of increases in water rates, the price of that real estate would have to fall. The lower property values would decrease the

How then do we square all of this with a University of Utah report that states...

Due to the fact that the price elasticity of demand for water is estimated to be -0.5, repayment through water sales alone would require rate increases of 1665-1995 percent. This enormous increase in water rates would lead Washington County water users to need less water in 2060 than they used in 2010, meaning that there would be no need for the water supplied by the LPP.

Lake Powell Pipeline Feasibility for Washington County Water District

The following summarizes concerns about the ability of the Washington County Water Conservancy District (WCWCD) to repay debt issued by the State of Utah for the WCWCD's financial obligation for participating in the proposed Lake Powell Pipeline (LPP).

1. Washington County Water District's Questionable Water Needs. Based on declining population growth, potential to convert additional agricultural water, potential water conservation savings, and previously unconsidered water sources, Washington County has ample water to serve future populations without participation in the Lake Powell Pipeline.

1a. Outdated Population Baseline Population in the year 2060, 32 years from the District's water plan, pushes the support of the Projection with two different population scenarios.

1b. Potential Agricultural Water Plan by the Division of Water Resources basin had 25,600 acres with 87,800 acre-feet of water. Much of the water is used in agricultural systems and it is estimated that it would save 2,500 acre-feet of water.

As future development creates a surplus of water, the Needs Assessment for agricultural water interpolation, that diversions from the County had 14,780 acre-feet of water.

The 2015 Legislature typically approves Washington County agricultural conservation projects.

¹ <http://governor.utah.gov>
² <http://governor.utah.gov>
³ "A Performance Audit" <http://le.utah.gov/audit>

property taxes collected by the District, forcing water rates to go up more than anticipated and forcing real estate values to go down more than anticipated.

Increasing Impact Fees. Columns S and T examine whether increasing impact fees alone, without any additional revenue increases, could repay Washington County Water District's total future debt. Impact fees are the fees new development pays to hook up to the water system, and there has been some discussion about making debt payments through an increase in impact fees. Currently WCWCD has an average impact fee of \$6,102¹⁶ and if the District chose to repay debt just using impact fees, revenues from impact fees would need to increase by 247–276 percent (cell B15), requiring an average impact fee of between \$21,158–\$22,927 (cell B17).

The large impact fees required in Washington County would be among the highest in the nation,¹⁷ likely deterring new growth in the county or significantly lowering property values (or both). Both effects would add even more problems for WCWCD's repayment obligations: the first would lower the amount of impact fees collected, and the second would lower property values and lower the total property taxes collected by the district. Our analysis did not compensate for these factors.

Combination of Increased Water Rates and Impact Fees. The significant debt to participate in the LPP will require WCWCD to raise revenues by tens of millions of dollars every year. The District's only real flexibility in raising revenues for its debt payments comes from deciding the proportion of increased revenues, which will come from increased water rates versus from increased impact fees.

Participating in the \$1.4 billion low-cost alternative of the Lake Powell Pipeline from 2008 planning documents could require the WCWCD to raise its revenues by:

- raising impact fees 123 percent (spreadsheet cell B21), to an average of \$13,630 per connection (spreadsheet cell B22); together with
- raising water rates by 576 percent (spreadsheet cell B20); together with
- selling 1200 acres of land owned by the District; and with
- continuing to collect property taxes near the maximum levy rate allowed by state law.

Participating in the \$1.8 billion high-cost alternative of the Lake Powell Pipeline from 2011 planning could require the WCWCD to raise its revenues by:

- raising impact fees 138 percent (cell B21), to an average of \$14,514 per connection (cell B22); together with
- raising water rates by 678 percent (cell B20); together with
- selling 1200 acres of land owned by the District; and with
- continuing to collect property taxes near the maximum levy rate allowed by state law

In addition, the 576–678 percent increase in water rates means that Washington County water users would demand more than their current water demand¹⁸ but only 84–90 percent of their current water supply in 2060 (worksheet "Water Demand" cells U11 and AG11), so there would be no need for LPP water.

How then do we square all of this with a University of Utah report that states...

Funding the Lake Powell pipeline will require a 138 percent increase in impact fees, a 698 percent increase in water rate, selling 1,200 acres of owned property and increasing property taxes to the maximum extent by law

Lake Powell Pipeline Feasibility for Washington County Water District

The following summarizes concerns about the ability of the Washington County Water Conservancy District (WCWCD) to repay debt issued by the State of Utah for the WCWCD's financial obligation for participating in the proposed Lake Powell Pipeline (LPP).

1. Washington County Water District's Questionable Water Needs. Based on declining population growth, potential to convert additional agricultural water, potential water conservation savings, and previously unconsidered water sources, Washington County has ample water to serve future populations without participation in the Lake Powell Pipeline.

1a. Outdated Population

Baseline Population the year 2060, 32.4 percent of the District's water needs. The District's water needs projection pushes the supposed projection with no change in population to two different population levels.

1b. Potential Agricultural

Plan by the Division of Water Resources. The basin had 25,600 acres with 87,800 acre-feet of water. Much of the water is used in agricultural systems and it is estimated that the system would save 2,500 acres.

As future development creates a surplus of water, the Needs Assessment classifies agricultural water for interpolation, that the diversions from 2011 to 2060, Washington County had 14,781 acres.

The 2015 Legislative Session typically approves the Washington County District agricultural conversion.

¹ <http://governor.utah.gov/>
² <http://governor.utah.gov/>
³ Utah State Water Plan, Kar
⁴ "A Performance Audit of P
http://le.utah.gov/audit/15_waterplan

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In addition, the 576–678 percent increase in water rates means that Washington County water users would demand more than their current water demand¹⁸ but only 84–90 percent of their current water supply in 2060 (worksheet "Water Demand" cells U11 and AG11), so there would be no need for LPP water.

How then do we square all of this with a University of Utah report that states...

Increases in water rates from 576 to 678 percent means Washington County water user would demand less than 90 percent of their current water supply, so there would be no need for Lake Powell Pipeline Water

Reason #1

University of Utah Professors Use a Misleading and Inconsistent Price of Water



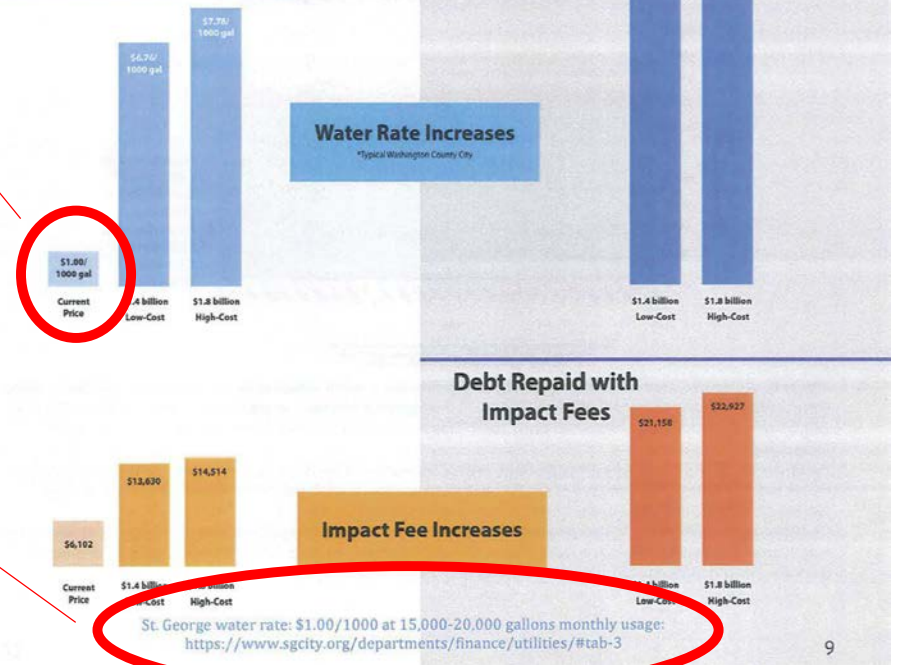
St. George water rate: \$1.00/1000 at 15,000-20,000 gallons monthly usage:
<https://www.sgcity.org/departments/finance/utilities/#tab-3>

Water Rate and Impact Fee Increases from LPP

Debt Repaid with Impact Fees and Water Rates

Figure 4: The WCWCD would be required to increase revenues substantially to cover annual LPP debt payments. Since WCWCD cannot raise taxes further, this increase in revenues would have to come from water rates and/or impact fees.

The right side of this graphic shows the increases required by WCWCD if they chose to only increase revenues from one source to repay the debt (cells B12 & B17). The left side of this graphic shows the increases required if WCWCD shifted the increases proportionally on the revenue sources (cells B20 & B22). The upper and lower parts of the graphic show the water price increases and impact fee increases required respectively.



Reason #1

University of
Utah Professors
Use a
Misleading and
Inconsistent
Price of Water

HOW DO YOU DEFINE THE PRICE OF WATER

- 6 WAYS TO DEFINE PRICE
 - AVERAGE PRICE (AP)
 - MARGINAL PRICE (MP)
 - SHIN PRICE (SHIN)
 - TOTAL REVENUE (BILLINGS)
 - INSTRUMENTAL VARIABLES (IV)
 - DISCRETE – CONTINUOUS CHOICE (DUC)

Source: Professor Gail Blattenberger, Presentation to the Executive Water Finance Board, May 22, 2018.

University of Utah researchers calculated the current price of water and the total quantity of water demanded, using “water sales revenue” of approximately \$7.0 million from the annual financial statements of the Washington County Water Conservancy District

	A	B	C	D	E	F
1	WCWCD Revenue Stream					
2	Source: 2013 WCWCD Audited Financial Statement					
3	Property Tax	\$9,938,660		Total Service Area Property Valuation	\$10,240,302,002	
4				2013 Property Tax Collection Rate	0.000970544	
5	Impact Fees			Maximum Legal Property Tax Rate	0.001	
6	Total	\$5,919,316		Additional Revenue if use Max. Rate	\$301,642.00	
7						
8	Cost per ERU	\$6,102				
9	Total New 2013 ERU's	970				
10				Note: Equivalent Residential Unit (ERU) is the metric used to determine cost of impact fee per lot, equivalent to 1 ERU per 10,000 sq. ft. of irrigable land		
11	Water Availability Surcharge					
12	Fee/ ERU	\$1.75				
13	2013 Total	\$1,248,977				
14	Total ERU's	713,701		Note: The Water Availability Surcharge is charged to all water bills as a monthly fee		
15						
16	2013 ERU Growth	0.001359199				
17						
18	Operating Revenues					
19	Power sale revenue	\$926,134				
20	Water sales revenue	\$7,013,377				
21	Water Development and Connection Fees	\$1,379,171		\$2,305,305		
22	Total Operating Revenues	\$9,318,682				
23						
24	Real Property					
25	Acres	1000	Annual	1200	Annual	According to page 7 of
26	Low Value	\$50,000,000	\$1,000,000	\$60,000,000	\$1,200,000	1000-1200 acres in re
27	High Value	\$125,000,000	\$2,500,000	\$150,000,000	\$3,000,000	additional funds. The
28	Average	\$87,500,000	\$1,750,000	\$105,000,000	\$2,100,000	\$

To estimate the quantity of water demanded, the university researchers start with a baseline consumption level of 294.3 gallons per capita per day. They apply a conservation factor of 18 percent by 2060, and then multiply this value by the projected population in Washington County. This results in an estimated water demand of 45,739 acre feet in 2010, escalating to 157,252 acre feet in 2060 (with conservation).

							Estimated Per Capita Water Use (with conservation)	Total Number of Acre Feet of Water Demanded (with conservation)			
	A	B	C	D	E	F	G	H	I	J	K
1	Note: for this graph to look right, cell M6 of the "First Scenario" tab should be "A" and cell M6 of the "Second Scenario" tab should be "B".										
2											
					Base Per Capita Use (GPCD)	Assumed Conservation from 2005	Per Capita Use with Conservation (GPCD)	2005 Projected Water Demand w/ cons. (ac- ft/yr)	2012 Projected Water Demand w/ cons. (ac- ft/yr)	Expressed in Gallons	2012 Projected Water Demand w/o cons. (ac- ft/yr)
3	Year	Current Supply	Supply with LPP								
4	2009	82,010	82,010		294.3	0%	294.3	55408	45,739	14,904,149,308	45,739
5	2010	82,010	82,010		294.3	1%	291.4	54854	45,282	14,755,107,815	45,739
6	2020	130,840	151,010		294.3	5%	279.6	87646	61,621	20,079,148,635	64,864
7	2030	130,840	151,010		294.3	9%	267.8	124648	84,164	27,424,865,746	92,488
8	2040	130,840	199,840		294.3	12%	259.0	162359	107,842	35,140,337,842	122,547
9	2050	130,840	199,840		294.3	16%	247.2	196517	130,859	42,640,583,401	155,785
10	2060	130,840	199,840		294.3	18%	241.3	232576	157,252	51,240,873,082	191,771
11					2060 demand as a fraction of 2010 supply ->				192%		
12					2060 demand as a fraction of 2010 demand ->				344%		

Applying the researchers' logic to 2015 values results in approximately 16.15 billion gallons of water demanded by the residents of Washington County.

Estimated Washington County Population	155,000	
Gallons of Water Demanded Per Capita Per Day (GPCD)	285	← Midpoint of 2010 and 2020 Estimates
Total Gallons of Water Consumed in Washington County Each Day (Population * GPCD)	44.2M	
Total Gallons of Water Consumed in Washington County Each Year (Population * GPCD *365 Days Per Year)	16.15B	← Total Quantity of Water Demanded

Consumers typically pay for water based on a price per 1,000 gallons consumed. The professors suggest this unit price is approximately 45 cents per 1,000 gallons

Total Water Rate Revenue:	\$7,245,479
Total Water Demanded, in Gallons:	16,150,521,825
Gallons Demanded / 1,000:	16,150,522
Price Per 1,000 Gallons Consumed:	\$0.45

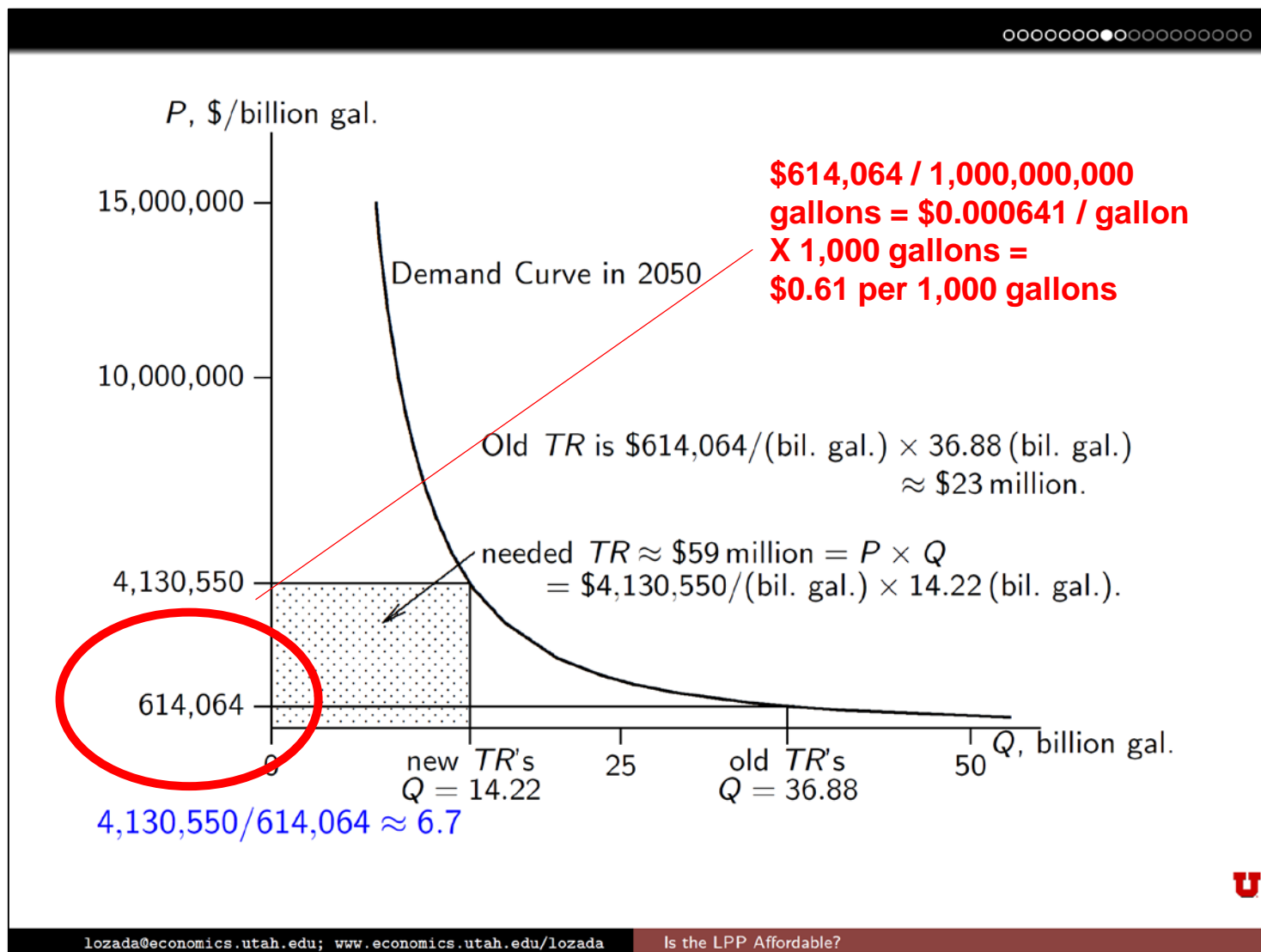
Is the Lake Powell Pipeline Affordable?

Gabriel A. Lozada
Associate Professor
Department of Economics
University of Utah

November 16, 2016



Reason #1
University of
Utah Professors
Use a
Misleading and
Inconsistent
Price of Water



Analysis assumes in 36.88B gallons are consumed

Analysis assumes \$23M in revenue is generated

Translates into a total revenue price point based on \$0.62 per 1,000 gallons

Residents of Washington County pay significantly more than 1 dollar, 61 cents, or 45 cents per 1,000 gallons of water consumed.

Below is a typical water bill for a single family household in St. George, Utah

CITY OF ST. GEORGE - UTILITIES
 PO BOX 1750
 St. George, UT 84771-1750
 435.627.4700 www.sgcity.org

I wish to donate \$ _____ to help those in need of assistance with their utility bills.

Please check lower portion of statement for important messages.

ACCOUNT NUMBER	SERVICE ADDRESS	BILLING DATE	DUE DATE	AMOUNT DUE
██████████	██████████	11/30/2015	12/22/2015	\$157.88

If your mailing address has changed, please correct the address below.
 (NOTE: If you are moving to a new location, you must complete a new application at the City Offices at 175 East 200 North.)

Return with Payment
 Enter Amount Enclosed
 if different from
 AMOUNT DUE \$ _____



TO INSURE PROPER CREDIT, PLEASE TEAR AND RETURN THIS UPPER PORTION WITH YOUR PAYMENT PAYABLE TO City of St. George.
 KEEP THIS LOWER PORTION FOR YOUR RECORDS

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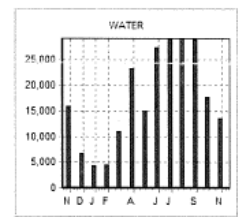
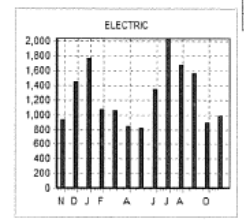
ACCOUNT NUMBER: ██████████
 CUSTOMER NAME: ██████████
 SERVICE LOCATION: ██████████
 BILLING DATE: 11/30/2015

NOTE: YOUR BILL IS PAYABLE ON OR BEFORE DUE DATE. IF PAYMENT IS NOT RECEIVED BY DUE DATE A PENALTY OF 5% WILL BE ASSESSED.

SERVICE		DAYS	DESCRIPTION	METER READING		USAGE	MULTIPLIER	AMOUNT
FROM	TO			PREVIOUS	CURRENT			
ELECTRIC								
PREVIOUS BALANCE								154.73
PAYMENTS RECEIVED								154.73-
10/20	11/19	30	ELECTRIC	9916	10898	982	1	90.49
			Customer Charge			15.65		
			KWH Charge			74.84		
10/20	11/19	30	WATER	267993	269338	13450		21.75
			SEWER					10.68
			GARBAGE					11.50
			ENERGY TAX					5.43
			DRAINAGE					1.50
			WCD SURCHRG					1.75
			FLOOD CNTRL					1.50
			SALES TAX					3.30
			CURRENT CHARGES					157.88
AMOUNT DUE								\$157.88

Month	Usage
N	800
D	1000
J	1400
F	1600
M	1100
A	1000
M	800
J	1300
J	2000
A	1600
S	1100
O	900

Month	Usage
N	10000
D	12000
J	15000
F	18000
M	10000
A	8000
M	12000
J	22000
J	25000
A	18000
S	10000
O	8000



MESSAGES: ***ATTENTION**BUSINESS LICENSE HOLDERS**ATTENTION***
 BUSINESS LICENSES WILL EXPIRE ON 12/31/15. COURTESY RENEWAL APPLICATIONS WILL BE MAILED BY 12/15/15 AND DUE BY 1/1/2016. IF YOU DO NOT RECEIVE AN APPLICATION PLEASE CONTACT THE BUSINESS LICENSE DEPARTMENT AT 435-627-4740. BLANK APPLICATIONS ARE AVAILABLE ON THE CITY WEB PAGE AT WWW.SGCITY.ORG.
 BUSINESS LICENSES ARE DELINQUENT ON 2/28/2016, AT THAT TIME A \$25.00 LATE FEE IS CHARGED.

Total Water Consumed: 13,450
 Note: This is consistent with average consumption in the region.

Residents of Washington County pay significantly more than 1 dollar, 61 cents, or 45 cents per 1,000 gallons of water consumed.

Below is a typical water bill for a single family household in St. George, Utah

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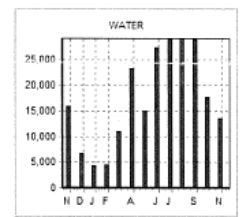
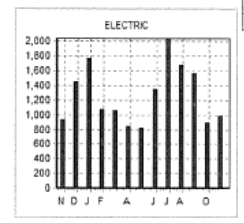
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 SERVICE LOCATION: ██████████
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FLOOD CNTRL								3.30
SALES TAX								157.88
CURRENT CHARGES								
AMOUNT DUE								\$157.88

Month	Usage
N	850
D	900
J	1400
F	1600
M	1100
A	1100
M	800
J	800
J	1300
A	2000
S	1600
O	900

Month	Usage
N	10000
D	10000
J	10000
F	10000
M	10000
A	10000
M	10000
J	10000
J	10000
A	10000
S	10000
O	10000



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← Total Water Cost: \$31.73

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*** AUTO - CRRT C016

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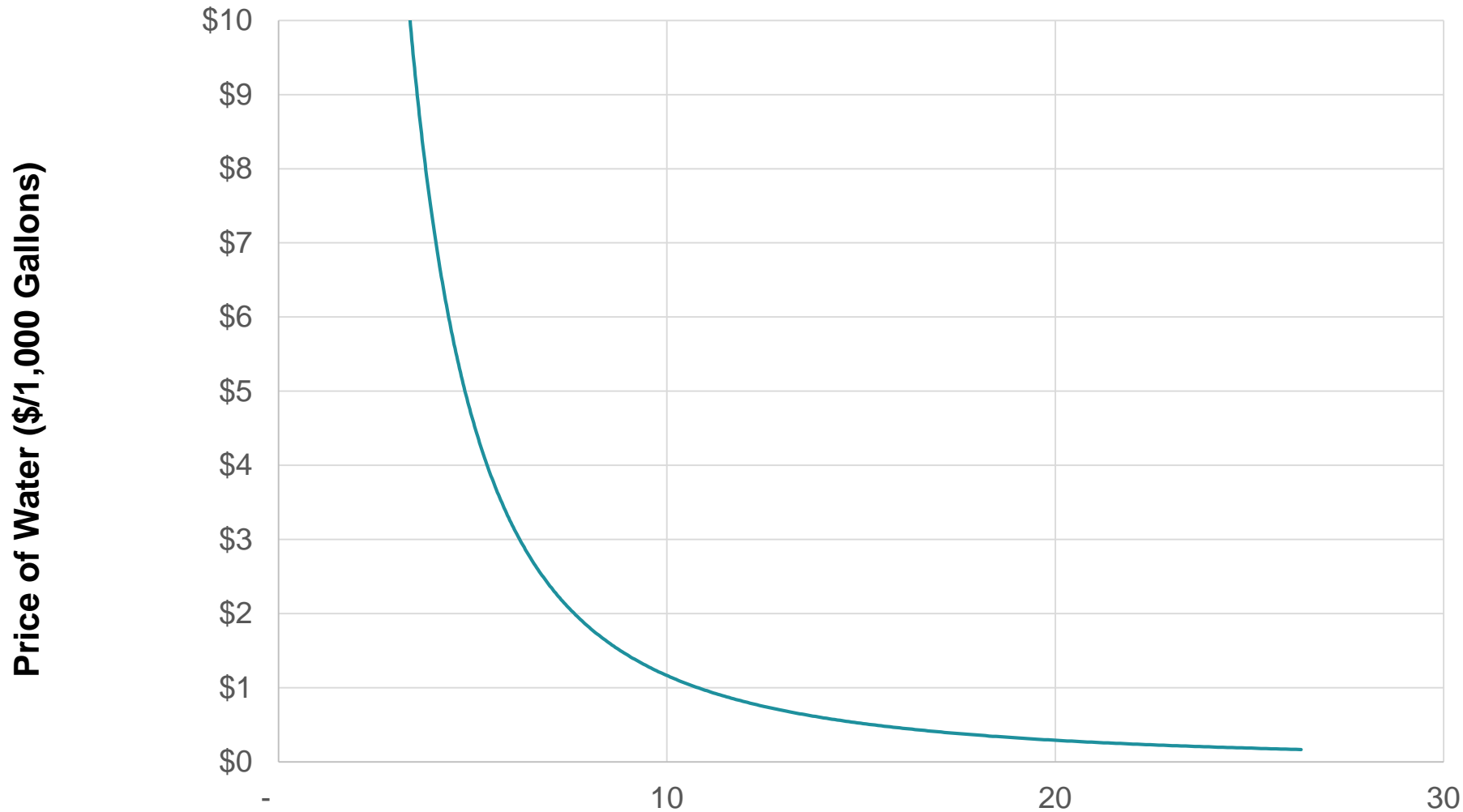
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					PREVIOUS	CURRENT			
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				ENERGY TAX					5.43
				DRAINAGE					1.50
				WCD SURCHRG					1.75
				FLOOD CNTRL					1.50
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AMOUNT DUE									\$157.88

MESSAGES: ***ATTENTION**BUSINESS LICENSE HOLDERS**ATTENTION***
BUSINESS LICENSES WILL EXPIRE ON 12/31/15. COURTESY RENEWAL APPLICATIONS WILL BE MAILED BY 12/15/15 AND DUE BY 1/1/2016. IF YOU DO NOT RECEIVE AN APPLICATION PLEASE CONTACT THE BUSINESS LICENSE DEPARTMENT AT 435-627-4740. BLANK APPLICATIONS ARE AVAILABLE ON THE CITY WEB PAGE AT WWW.SGCITY.ORG.
BUSINESS LICENSES ARE DELINQUENT ON 2/28/2016, AT THAT TIME A \$25.00 LATE FEE IS CHARGED.

Water Cost Per 1,000 Gallons Consumed:
\$2.36
Note: This is simply the \$31.73 divided by total consumption of 13,450 divided by 1,000.

Water Demand in Washington County, Utah

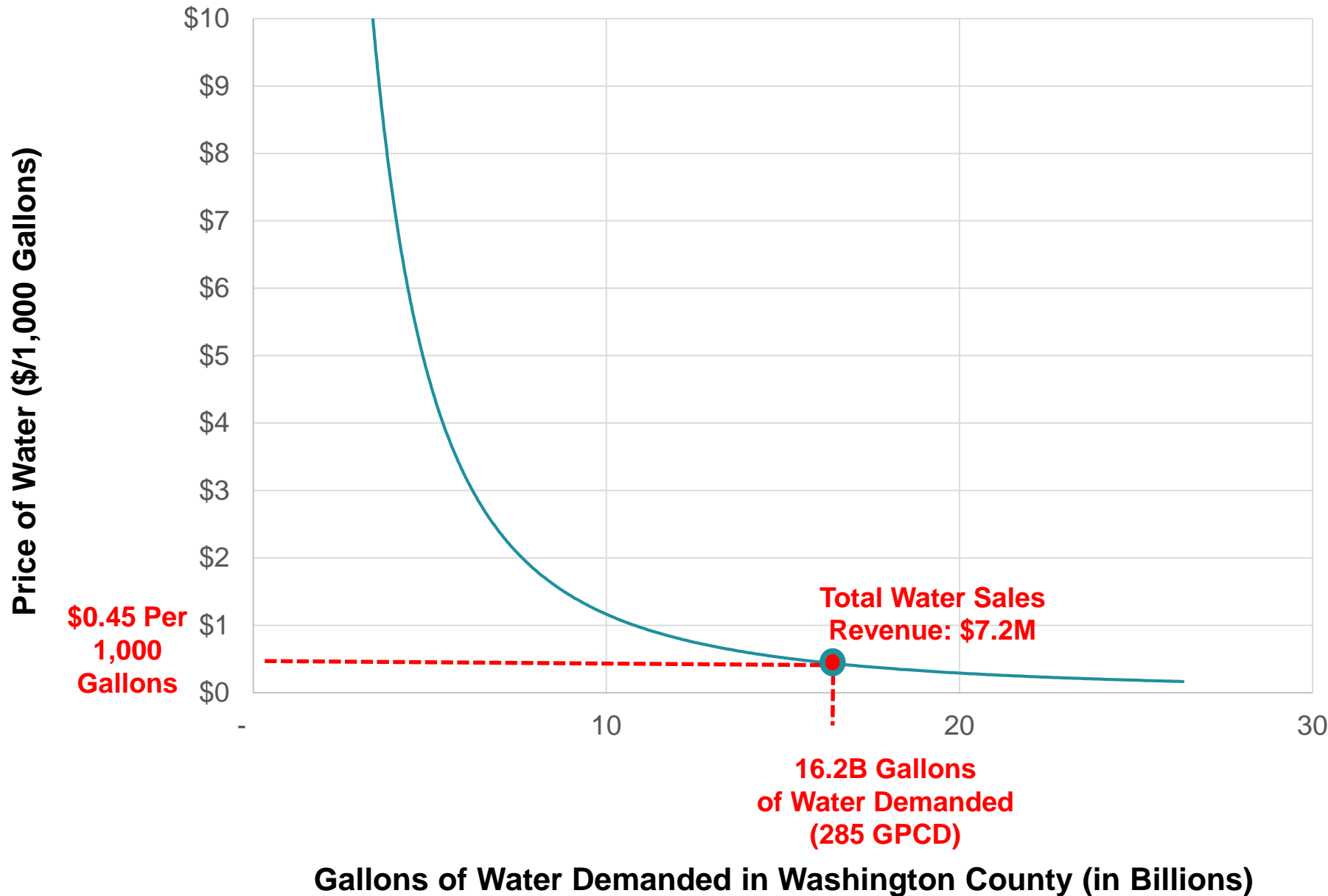


Reason #2

Flawed
Assumptions
Lead to Flawed
Calculations

Gallons of Water Demanded in Washington County (in Billions)

Water Demand in Washington County, Utah



According to the university researchers' analysis, Washington County is currently on the point of this curve where \$7.2 million in water revenues are generated from the sale of 16.2 billion gallons of water at \$0.45 per gallon.

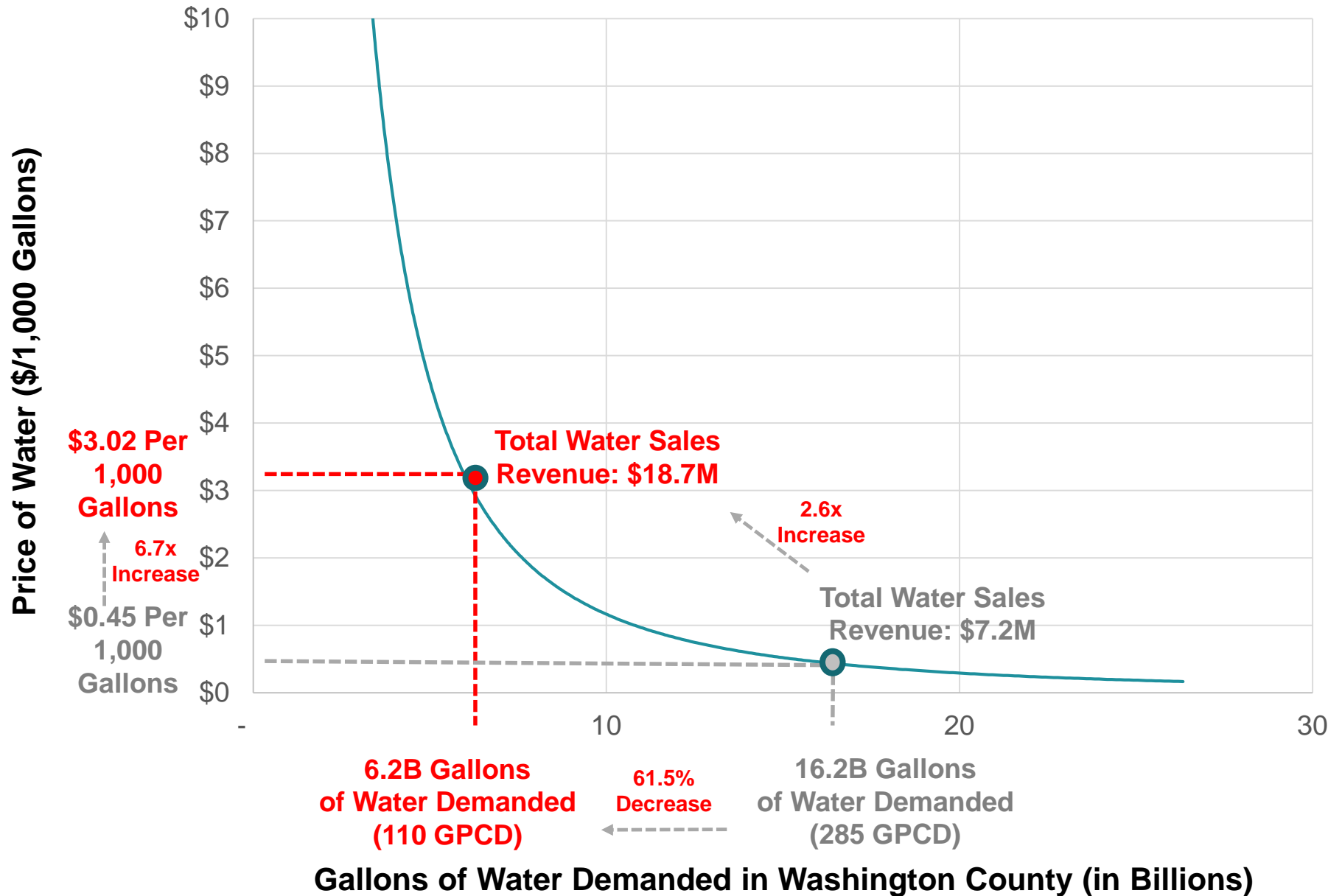
Gallons of Water Demanded in Washington County (in Billions)

The researchers suggest that water sales revenue will need to increase by a factor of 2.6x to pay for the Lake Powell Pipeline and that, because higher prices will lead to decreased demand for water, prices will need to increase by a factor of 6.7x to generate a sufficient amount of revenue.

	A	B	C	D	E	F	G	H	I
1		\$9,938,660	2013 Property Tax Collections						
2		\$7,013,377	2013 water sales revenue Revenue						
3		\$6,102	2013 Impact Fee per ERU						
4		0.03309	GOPB 50-Year Household Growth Rate Projection				4.16	Factor by which # of people wil	
5		1.03309	GOPB 50-Year Household Growth Rate Projection, plus one.						
6		1.040	<- enter 1 plus assumed interest rate on reserves (the interest rate on savings)						
7			$Q \propto P^{-(1/2)}$ is the assumed demand curve, so revenues $R = P^{(1/2)}$, so to increase R by a factor of "x" requires P						
8		4.19272	If water sales revenue rises by a factor > this, (Q_2060 under new water price) < (Q_2010 under current water p						
9			Given unchanged impact fees: (see Column P)						
10		3.18713	The factor by which water sales revenue needs to increase to eliminate the debt by 2062, minus one						
11		4.18713	The factor by which water sales revenue needs to increase to eliminate the debt by 2062.						17
12		17.53203	The factor by which water prices need to increase to eliminate the debt by 2062.						
13		0.23883	The factor by which water demanded will change vs. base case when water prices rise enough to eliminate debt						
14			Given unchanged water prices: (see Column R)						
15		2.45680	The factor by which Impact Fees need to increase to eliminate the debt by 2062, minus one.						
16		3.45680	The factor by which Impact Fees need to increase to eliminate the debt by 2062.						
17		\$21,093	2013 average Impact Fee per ERU, if Impact Fees increased as much as needed to eliminate the debt by 2062.						
18			Given Split Between Impact Fees and Water Rates: (see Column T)						
19		2.59356	The factor by which water sales revenue needs to increase to eliminate the debt by 2062.						
20		6.72657	The factor by which water prices need to increase to eliminate the debt by 2062.						
21		2.22840	The factor by which Impact Fees need to increase to eliminate the debt by 2062.						
22		\$13,598	2013 average Impact Fee per ERU, if Impact Fees increased as much as needed to eliminate the debt by 2062.						

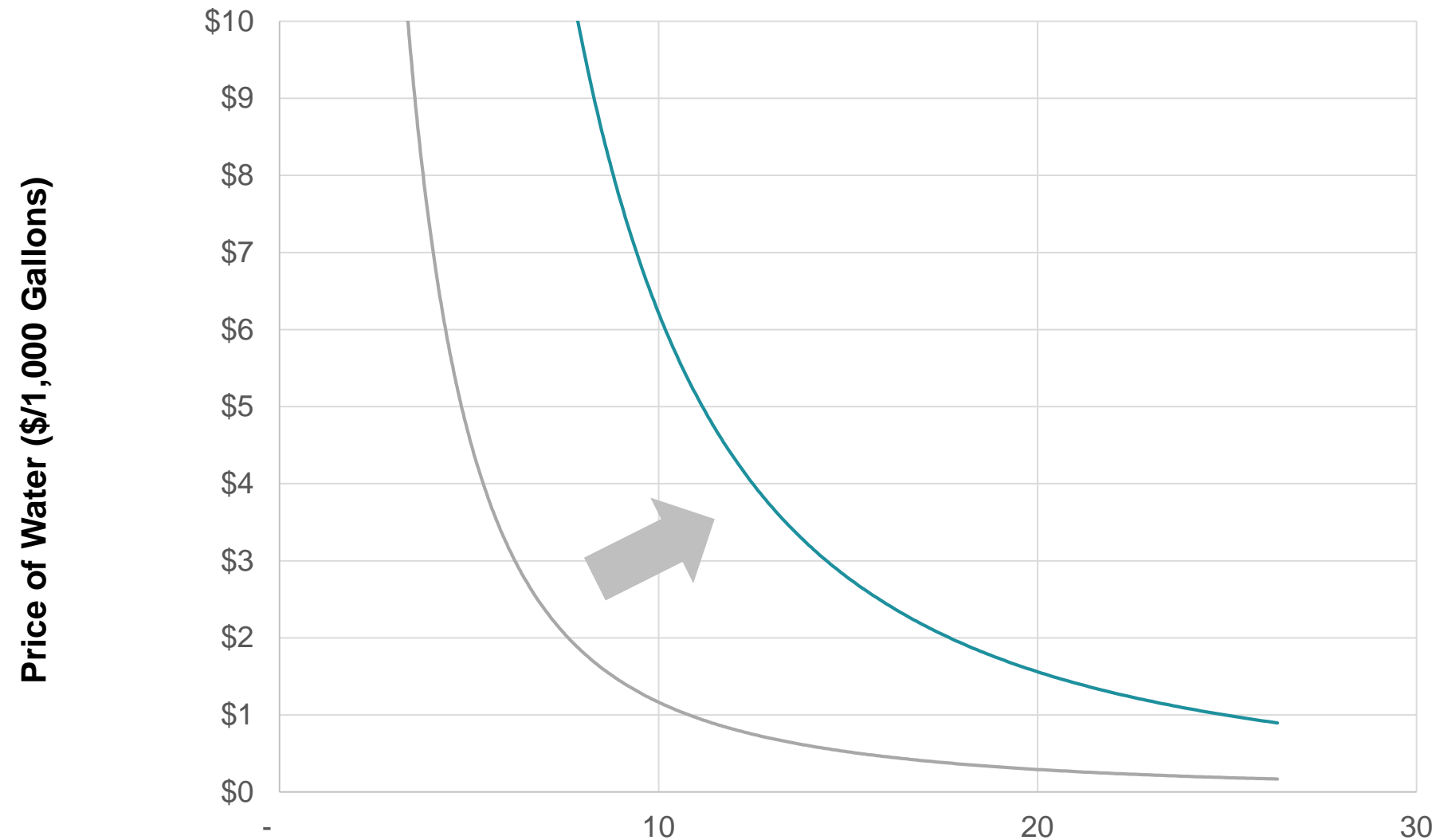
Note: This review is based on a single scenario, which assumes the Lake Powell Pipeline is repaid over 50 years and costs are allocated equally between water rates and impact fees. In other scenarios, where 100 percent of the cost is borne by water rates or the repayment period is shortened, the magnitude of the professors' errors are magnified.

Water Demand in Washington County, Utah



Under the researchers' assumptions, water rates increase by a factor of 6.7x, or from the assumed \$0.45 per to \$3.02 per 1,000 gallons. This, in turn, reduces total water demanded from 16.2 billion to 6.2 billion, resulting in a 61.5-percent decrease in per capita water use in Washington County. Because this reduction in water use would be impractical to achieve, the professors conclude that the Lake Powell Pipeline is infeasible.

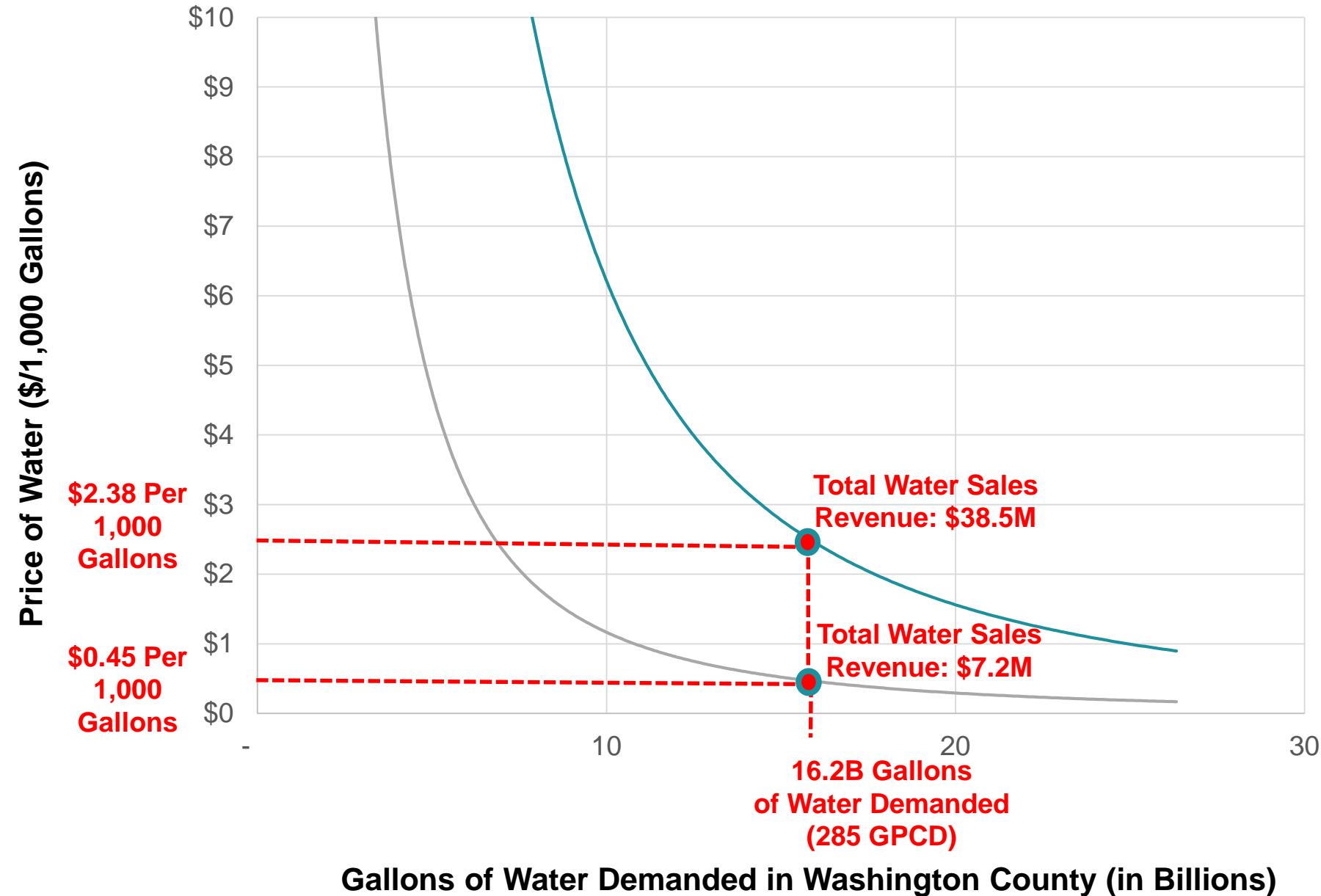
Water Demand in Washington County, Utah



When the actual price of water is applied, the price elasticity curve shifts to the right, reflecting higher quantities demanded at all price points.

Gallons of Water Demanded in Washington County (in Billions)

Water Demand in Washington County, Utah



Using the correct price of water in Washington County, the total water demanded, as estimated by the professors, generates approximately \$38.5 million per year as compared to \$7.2 million.

HOW DO YOU DEFINE THE PRICE OF WATER

- 6 WAYS TO DEFINE PRICE

- AVERAGE PRICE (AP)
- MARGINAL PRICE (MP)
- SHIN PRICE (SHIN)
- TOTAL REVENUE (BILLINGS)
- INSTRUMENTAL VARIABLES (IV)
- DISCRETE – CONTINUOUS CHOICE (DUC)

Reason #2

Flawed
Assumptions
Lead to Flawed
Calculations

Is the Lake Powell Pipeline Affordable?

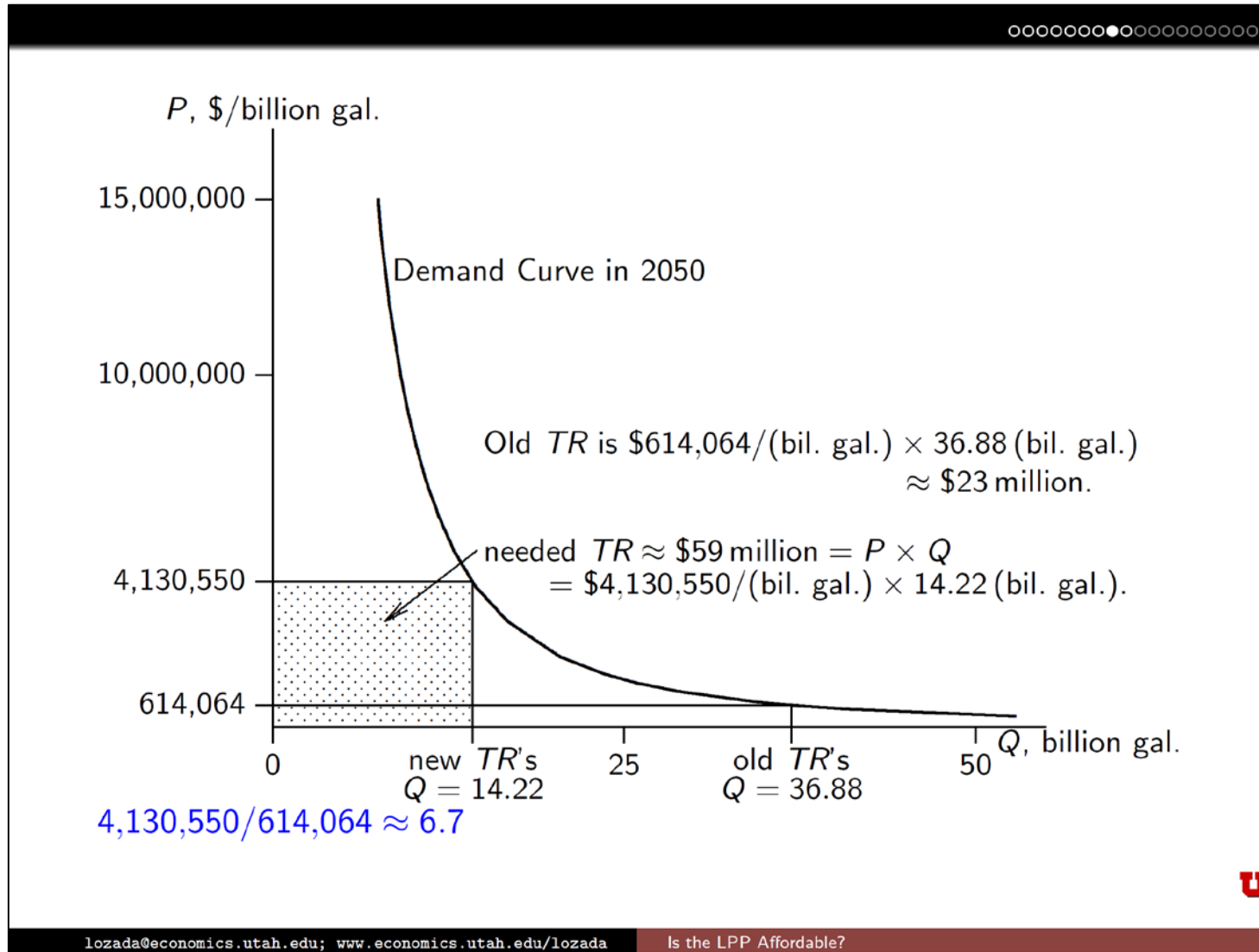
Gabriel A. Lozada
Associate Professor
Department of Economics
University of Utah

November 16, 2016



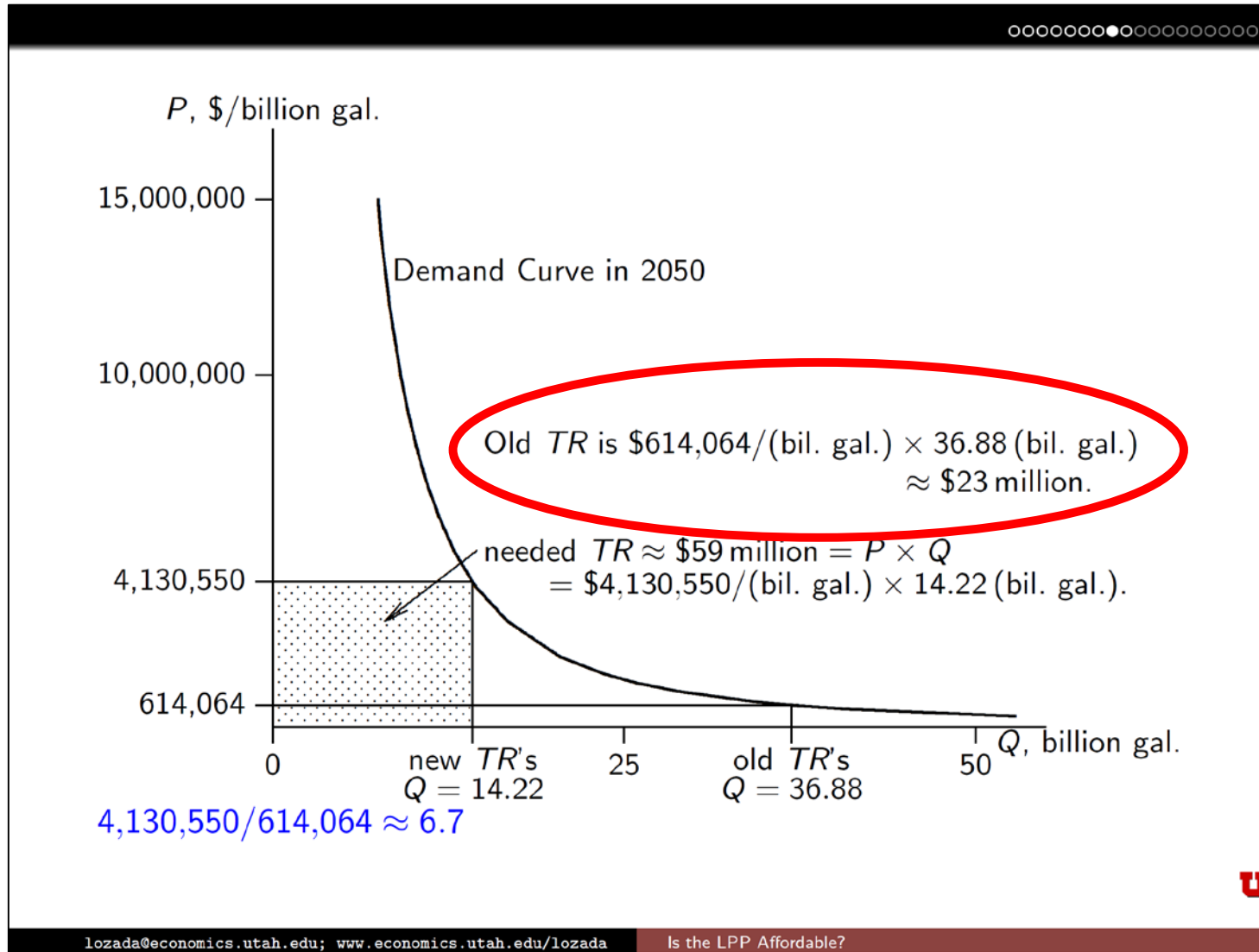
Reason #2

Flawed
Assumptions
Lead to Flawed
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Reason #2

Flawed
Assumptions
Lead to Flawed
Calculations



Flawed assumptions lead to flawed conclusions...

Analysis assumes in 36.88B gallons are consumed

Analysis assumes \$23M in revenue is generated

Translates into a total revenue price point based on \$0.62 per 1,000 gallons

Summary of Base Case for Economists' Model

- District's annual debt payment \$62 million for 50 years (\$3.1 billion in total).
- Can be paid for by:
 - raising impact fees from \$6,102 to \$13,598 and
 - raising water prices by a factor of 6.7.
- This prices the LPP's water out of the market (at least before 2050).

lozada@economics.utah.edu; www.economics.utah.edu/lozada

Is the LPP Affordable?

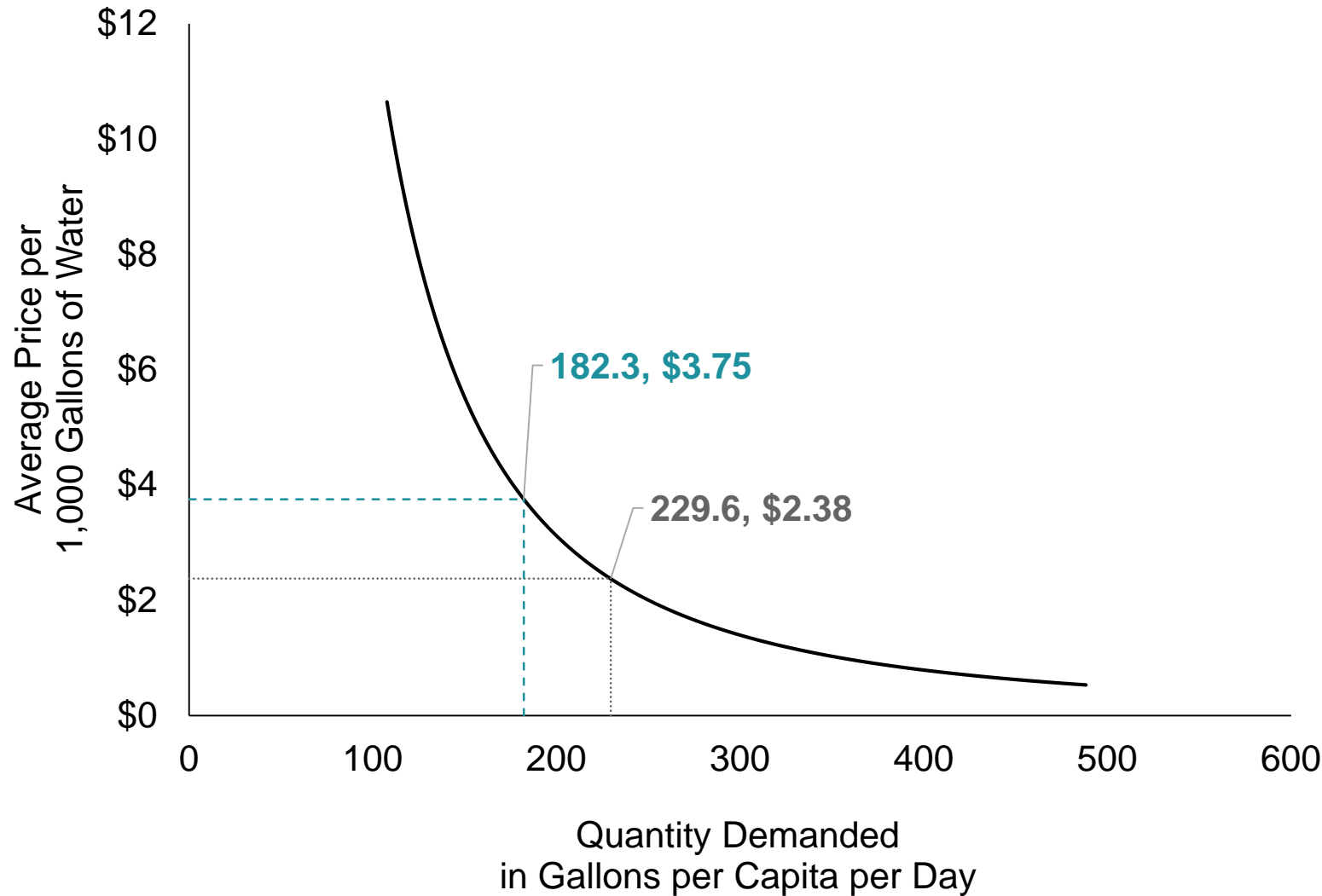


Flawed assumptions lead to flawed conclusions...

Analysis assumes in 36.88B gallons are consumed

Analysis assumes \$23M in revenue is generated

Translates into a total revenue price point based on \$0.62 per 1,000 gallons



Price Elasticity of Demand Considered in Supply-Demand Estimates

— Demand Baseline Assumptions - - - - New Assumptions

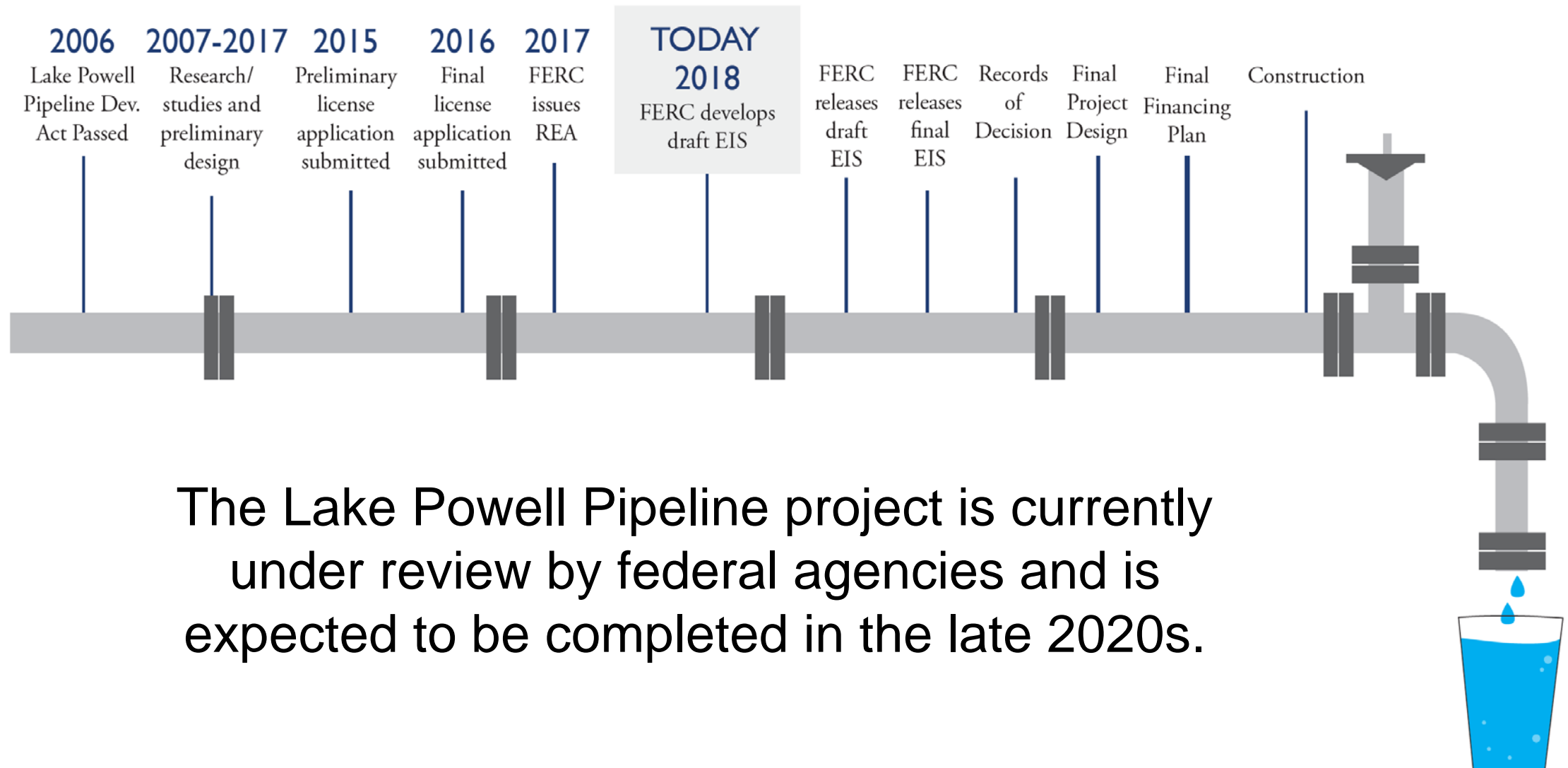
Reason #3

University of Utah Professors Rely on Unrealistic Assumption

- **Assumes Ample Water Exists**
“Washington County has ample water to serve future populations without participation in the Lake Powell Pipeline.”
- **Assumes an Accelerated Timeline for the LPP Project**
Model assumes that the residents of Washington County begin paying for the cost of the Lake Powell Pipeline in 2015, the year before the analysis was completed
- **Ignores the Lake Powell Pipeline Development Act**
Assumes a straight-line amortization (mortgage) approach to repayment of the pipeline

University of Utah professors assume the cost of the pipeline is incurred more than a decade before the project would come on line

Year	Property Taxes	water sales revenue	Power sale revenue and Surcharges	Impact Fees	Real Estate sale revenue	LPP Power sale revenue	TOTAL REVENUES	Annual Debt Service on Existing Debt	Existing O&M Costs	Annual LPP Debt Service	LPP O&M Costs	Total Annual Debt Service	TOTAL EXPENSES
2015	\$10,267,571	\$7,245,479	\$2,381,597	\$9,399,311	\$15,000,000	\$0	\$44,293,958	\$7,026,322	\$13,231,636	\$61,840,170	\$0	\$68,866,492	\$82,098,128
2016	\$10,607,367	\$7,485,261	\$2,460,414	\$9,710,373	\$15,000,000	\$0	\$45,263,415	\$7,039,458	\$13,669,525	\$61,840,170	\$0	\$68,879,628	\$82,549,153
2017	\$10,958,409	\$7,732,979	\$2,541,839	\$10,031,729	\$15,000,000	\$0	\$46,264,956	\$7,048,107	\$14,121,906	\$61,840,170	\$0	\$68,888,277	\$83,010,183
2018	\$11,321,068	\$7,988,895	\$2,625,959	\$10,363,720	\$15,000,000	\$0	\$47,299,643	\$7,048,318	\$14,589,258	\$61,840,170	\$0	\$68,888,488	\$83,477,746
2019	\$11,695,728	\$8,253,281	\$2,712,863	\$10,706,699	\$15,000,000	\$0	\$48,368,571	\$7,050,648	\$15,072,077	\$61,840,170	\$0	\$68,890,818	\$83,962,895
2020	\$12,082,788	\$8,526,416	\$2,802,643	\$11,061,027	\$15,000,000	\$0	\$49,472,874	\$6,451,090	\$15,570,874	\$61,840,170	\$0	\$68,291,260	\$83,862,134
2021	\$12,482,657	\$8,808,590	\$2,895,394	\$11,427,082	\$15,000,000	\$0	\$50,613,723	\$6,456,332	\$16,086,178	\$61,840,170	\$0	\$68,296,502	\$84,382,680
2022	\$12,895,760	\$9,100,103	\$2,991,214	\$11,805,251	\$15,000,000	\$0	\$51,792,328	\$6,138,580	\$16,618,536	\$61,840,170	\$0	\$67,978,750	\$84,597,286
2023	\$13,322,534	\$9,401,262	\$3,090,206	\$12,195,936	\$15,000,000	\$0	\$53,009,938	\$5,095,230	\$17,168,512	\$61,840,170	\$0	\$66,935,400	\$84,103,912
2024	\$13,763,431	\$9,712,389	\$3,192,473	\$12,599,550	\$15,000,000	\$0	\$54,267,843	\$5,101,740	\$17,736,688	\$61,840,170	\$0	\$66,941,910	\$84,678,598
2025	\$14,218,920	\$10,033,812	\$3,298,125	\$13,016,520	\$0	\$0	\$40,567,377	\$5,109,185	\$18,323,668	\$61,840,170	\$0	\$66,949,355	\$85,273,023
2026	\$14,689,482	\$10,365,872	\$3,407,274	\$13,447,291	\$0	\$9,947,747	\$51,857,666	\$5,099,965	\$18,930,074	\$61,840,170	\$23,493,231	\$66,940,135	\$109,363,439
2027	\$15,175,618	\$10,708,921	\$3,520,035	\$13,892,317	\$0	\$10,345,657	\$53,642,548	\$3,178,350	\$19,556,548	\$61,840,170	\$24,432,960	\$65,018,520	\$109,008,028
2028	\$15,677,841	\$11,063,324	\$3,636,527	\$14,352,071	\$0	\$10,759,483	\$55,489,246	\$3,178,995	\$20,203,755	\$61,840,170	\$25,410,278	\$65,019,165	\$110,633,198
2029	\$16,196,686	\$11,429,455	\$3,756,875	\$14,827,040	\$0	\$11,189,862	\$57,399,917	\$3,188,875	\$20,872,380	\$61,840,170	\$26,426,689	\$65,029,045	\$112,328,114
2030	\$16,732,701	\$11,807,702	\$3,881,205	\$15,317,728	\$0	\$11,637,457	\$59,376,793	\$1,786,290	\$21,563,133	\$61,840,170	\$27,483,757	\$63,626,460	\$112,673,350
2031	\$17,286,455	\$12,198,468	\$4,009,650	\$15,824,654	\$0	\$12,102,955	\$61,422,182	\$1,610,460	\$22,276,746	\$61,840,170	\$28,583,107	\$63,450,630	\$114,310,483
2032	\$17,858,535	\$12,602,165	\$4,142,346	\$16,348,357	\$0	\$12,587,073	\$63,538,477	\$1,610,460	\$23,013,975	\$61,840,170	\$29,726,432	\$63,450,630	\$116,191,037
2033	\$18,449,547	\$13,019,223	\$4,279,433	\$16,889,392	\$0	\$13,090,556	\$65,728,151	\$1,610,460	\$23,775,602	\$61,840,170	\$30,915,489	\$63,450,630	\$118,141,721



The Lake Powell Pipeline project is currently under review by federal agencies and is expected to be completed in the late 2020s.

Reason #4

Calculation Errors Limit the Utility of the Provided Analysis

3. Estimate of Additional Debt Service from the Lake Powell Pipeline on WCWCD

3a. 50-Year Repayment Obligation for Lake Powell Pipeline by Washington County Taxpayers.

The following is the calculation of total annual debt service the WCWCD would incur to participate in the LPP. The WCWCD has announced they intend to receive 94.5 percent of the project water¹¹, meaning they will be required to repay 94.5 percent of the roughly \$1.4–\$1.8 billion cost.¹² The WCWCD can therefore expect to repay \$1.33 billion – \$1.75 billion in capital costs to repay.

Assuming a 50-year repayment period, the annual debt service varies with the interest rate as follows:

Annual Debt Service Payments for LPP by the Washington County Water Conservancy District				
	Interest Rate			
Repayment Cost	0.03	0.04	0.05	0.07
\$1.33 Billion	\$51,631,330	\$61,840,178	\$72,758,808	\$96,260,153
\$1.75 Billion	\$101,799,606	\$130,945,384	\$166,211,969	\$258,354,138

\$1.75 Billion Amortized Over 50 Year at a 4 Percent Interest Rates Equals, \$81.5M, not \$130.9M.

THE ECONOMIC AND
FISCAL IMPLICATIONS OF
WATER POLICY
IN WASHINGTON COUNTY, UTAH

JUNE 13, 2018

Additional Slides

Quantifying the Fiscal Implications

