

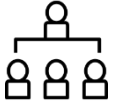
Water and Sewer Board

Regular Meeting

City Council Chambers – City Center South

1001 11th Ave February 18, 2026 at 2:00 p.m.

Regular meetings of the Water and Sewer Board are held **in person** on the 3rd Wednesday of each month in the City Council Chambers, 1001 11th Avenue, Greeley, Colorado.



Members of the public may attend and provide comment during public hearings.



Written comments may be submitted by US mail or dropped off at the Water and Sewer office located at 1001 11th Avenue, 2nd Floor,



Greeley, CO 80631 or emailed to wsadmin@greeleygov.com. All written comments must be received by 10:00 a.m. on the date of the meeting.



Meeting agendas and minutes are available on the City's meeting portal at <https://greeleyco.portal.civicclerk.com>

IMPORTANT – PLEASE NOTE

This meeting is scheduled as an **in-person session only**. If COVID, weather, or other conditions beyond the control of the City dictate, the meeting will be conducted virtually and notice will be posted on the City's CivicClerk meeting portal by 10:00 a.m. on the date of the meeting (<https://greeleyco.portal.civicclerk.com/>).

In the event it becomes necessary for a meeting to be held virtually, use the link below to join the meeting via Zoom. <https://greeleygov.zoom.us/j/81782466253>

For more information about this meeting or to request reasonable accommodations, contact the administrative team at 970-350-9801 or by email at wsadmin@greeleygov.com





Water & Sewer Board

February 18, 2026 at 2:00 PM

1001 11th Avenue, City Center South, Greeley, CO 80631

Agenda

1. Roll Call: _____ Chairman Harold Evans _____ Vice Chairman Mick Todd
 _____ Ms. Cheri Witt-Brown _____ Mr. Fred Otis
 _____ Mr. Joe Murphy _____ Mr. Tony Miller
 _____ Mr. Matt Anderson _____ Mayor Dale Hall
 _____ Mr. Brian McBroom _____ Mr. Kirk Jones
2. Approval of Minutes
3. Approval of the Agenda
4. Welcome New Employees and Promotions
5. Approve and Recommend to Council Authorization of Eminent Domain for Waterline
6. Water Demand and Revenues – Long Term Trends
7. Review of Water & Sewer Utility Funding for Greeley Public Art Program
8. Chimney Hollow Update
9. Legal Report
10. Director's Report
11. Such Other Business That May Be Brought Before the Board Added to This Agenda by Motion of the Board
12. Executive Session
 - a. NISP Update
13. Adjournment



If, to effectively and fully participate in this meeting, you require an auxiliary aid or other assistance related to a disability, please contact the Water and Sewer Department administrative staff at 970-350-9801 or wsadmin@greeleygov.com

**City of Greeley
Water and Sewer Board
Minutes of January 21, 2026
Regular Board Meeting**

Chairman Harold Evans called the Water and Sewer Board meeting to order at 2:03 p.m. on Wednesday December 17, 2025.

1. Roll Call

The Clerk called the roll and those in attendance included:

Board Members:

Chairman Harold Evans, Vice Chairman Mick Todd, Fred Otis, Joseph Murphy, Matt Anderson, Cheri Witt-Brown, Mayor Dale Hall, Interim City Manager Brian McBroom, Interim Deputy Director of Finance Kirk Jones

Water and Sewer Department Staff:

Director Sean Chambers, Deputy, Deputy Director of Utility Finance and Customer Service Erik Dial, Deputy Director of Water and Wastewater Operations and Maintenance Rebecca Andrus, Deputy Director of Water Resources Leah Hubbard, Chief Engineer Adam Prior (arrived 2:12 pm), Executive Assistant Gigi Allen, Administrative Assistant IV Tracy Simon, Water Resource Administrator II Morgan Effrein, Water Resource Operations Manager Brian Von Seggern, Water Resource Administrator I Eric Clark, Water Resource Administrator III Travis Gilbertson, Utility Finance Manager Virgil Pierce, Long Range Utility Planner Derek Hannon, Civil Engineer IV Jim Paulson, Water Efficiency Manager Dena Egenhoff (arrived 2:08 pm), Civil Engineer II Heather Mullen, Deputy City Manager Bret Naber

Legal Counsel:

Deputy City Attorney Jerrae Swanson, Senior Environmental and Water Resources Attorney Dan Biwer, Environmental & Water Resources Attorney Jessie Raybon, Counsel to Water and Sewer Board Attorney Carolyn Burr

Guests:

James Sutherland, Wingfoot Water, Communications Specialist II Cory Channell, Dr. Michael Welsh, University of Northern Colorado, Justin Bieri, State Land Board – Colorado, City Council member, Deb DeBoutez

2. Approval of Minutes

Mr. Otis made a motion, seconded by Mr. Murphy to approve the December 2025 Water and Sewer Board meeting minutes. The motion carried 6-0.

3. Approval of Agenda

There were no changes to the agenda.

4. Election of Board Officers

Ms. Witt-Brown moved to nominate Harold Evans as Chairman of the Water and Sewer Board for 2025 and Joseph Murphy nominated Mick Todd as Vice Chairman of the Water and Sewer Board for 2025. The motion was seconded by Mr. Anderson. The motion carried 6-0.

5. Welcome New Employees and Promotions

Director Sean Chambers provided an introduction of new Water and Sewer Department employees.

6. Approve and Recommend to Council of State Land Board Lease Amendment

Leah Hubbard and guest, Justin Bieri from the State Land Board presented that through the Terry Ranch acquisition, the City of Greeley inherited a groundwater production lease agreement with the State Land Board (SLB). This lease was originally executed between the State Land Board and Wingfoot Water Resources, LLC.

Greeley has drilled 16 wells on the SLB parcels through 2025 to meet the terms of the lease. It was determined alongside SLB that the lease should be amended to better represent a municipal government needs, additional parcels added to the lease under new contract terms, and to perpetually cement that the well drilling obligation has been completed by Greeley.

Vice Chairman Todd moved that the Board approve and recommend to City Council the Lease Amendment between State Land Board and the City of Greeley in the form presented, and delegate authority to the Director of Water and Sewer or their designee to: (1) approve minor revisions to the agreement before execution, provided the material substance remains unchanged and (2) enter into subsequent amendments, including but not limited to amendments that relate to the financial assurances or the development, production, operation, and maintenance of the leased water and related infrastructure determined to be necessary to administer the Lease Amendment over time. Mr. Murphy seconded the motion. The Motion carried 6 to 0.

7. Approve and Recommend to Council of Graywater Prohibition Ordinance

Graywater recapture is the collection of lightly used household water and its reuse for non-potable purposes, such as irrigation or toilet flushing. Water and Sewer staff Brian Von Seggern presented the significant risks and implementation challenges of graywater systems for use in Greeley. First, he reviewed Colorado Regulation 86, which provides a legal pathway for graywater systems and House bill 24-1362 which makes graywater authorized statewide unless a municipality adopts a prohibition. Second, he identified that Graywater often contains pollutants and brings a risk of contaminating the public drinking water if a cross-cross connection is made. He explained the risk is magnified in retrofitting existing homes. Third, he explained there were implications for other water source operations. The Water and Sewer Board recommended that the Greeley City Council adopt a prohibition on greywater collection due to the numerous risks and uncertainties outweighing the limited benefits if implemented correctly.

Vice Chairman Todd moved that the Greeley Water and Sewer Board recommend that the Greeley City Council adopt a prohibition on graywater collection and use in the form of the enclosed ordinance amending Title 20, Chapter 3, Article 3 of the City of Greeley Municipal Code. Mr. Otis seconded the motion. The motion carried 6-0.

8. Approval of 2nd Amendment to the Wingfoot Master PSA

Sean Chambers provided the background on the master purchase and sale agreement (MPSA) to purchase the Terry Ranch groundwater project from Wingfoot Water Resources for aquifer storage and recovery purposes. He described the unique purchase structure, where Greeley secured Terry Ranch in exchange for Raw Water Credits that are available for dedication to meet Greeley's raw water requirements for new development. Additionally, the MPSA obligated Wingfoot to contribute \$125 million to cost to develop the infrastructure to deliver Terry Ranch water. Included within the master purchase and sale agreement was a provision where the seller could "Put" to Greeley during times of slow credit sales on the open market, obligating Greeley to purchase up to 167 Raw Water Credits annually through 2045. Mr. Chambers described how Raw Water Credit sales have proven slower than anticipated for Wingfoot since the MPSA was finalized in 2021. This has driven Wingfoot to Put to Greeley from 2022 to 2025 for a total of 668 Raw Water Credits. The slow Raw Water Credit Sales also made it difficult for Wingfoot to contribute its current financial contribution to infrastructure construction.

Mr. Chambers shared that Greeley staff and Wingfoot recognized the slow pace growth in Greeley and slow pace of Raw Water Credit Sales, and entered into negotiations for the 2nd Amendment to the MPSA. The 2nd Amendment allows Wingfoot to provide a partial cash contribution for their construction escrow and in exchange, Greeley can now utilize the 668 Put Raw Water Credits to create a Primary Employer Water Bank. The 2nd Amendment also describes how Wingfoot can utilize future Put/Call to sell to Primary Employers at a price less than the open market price. Long Range Utility Planner Derek Hannon then walked the Board through examples of how this program might work with different types of Primary Employer developments.

9. Terry Ranch Project Update

Jim Paulson gave semi-annual update on the Terry Ranch development project. The update included a progress report on water well drilling activities on State Land Board parcels on the Terry Bison Ranch. Also included was an update on the pipeline development project. Segment 2 is under construction with a target finish date of summer 2026. Segments 3 & 4 are in design and property acquisitions are in process.

10. Water Court Update

Morgan Effrein updated the Board that During the third trimester, the City of Greeley Water and Sewer Department continued its active involvement in Water Court proceedings to secure new water supplies and safeguard existing water rights. The city filed six new statements of opposition and entered into eight stipulations – Five involving the City of Greeley Poudre Flows case, 21CW3056. In December, Judge Taylor entered the final decree for the Poudre Flows case. Joint applicants are now coordinating operations of the Poudre Flows plan under the guidance of the final decree. We continue to work with opposers in the other three applications and aim to have the City of Greeley Water Storage and Supply Company change case settled before the anticipated trial date in 2027. Legal expenses for Water Court proceedings totaled \$88,163, with engineering costs* at \$70,643 (*excluding December 2025), bringing the total expenditure to \$158,806 for the third trimester.

11. Legal Report

This report was provided by Carolyn Burr of Welborn Sullivan Meck & Tooley, P.C., outside counsel for the Greeley Water & Sewer Board and Dan Biwer, Senior Environmental and Water Resources Attorney, City Attorney's Office.

1. Future Filing for Non-Tributary Groundwater Rights in the Upper Laramie Aquifer on State Land Board Property as part of Terry Ranch Project.
2. Proposed Statements of Opposition: Based on our review of the November 2025 Water Court Resume in Div. 1 and Div. 5, staff and legal counsel recommend that the Water and Sewer Board authorize filing statements of opposition by the end of January 2026 to the following water court applications:
 - **Water Division 1 – Case No. 25CW3158:** This case concerns an application by the City of Aurora to change of 24 shares of the Western Mutual Ditch Company and 7 cfs of the Hewes and Cook Ditch, Priorities 13 and 23 on the South Platte River Aurora seeks new places and types of use, including storage. This is the most recent of several changes of Western Mutual shares. Greeley has participated in each of the prior changes. We recommend filing a statement of opposition to ensure that the return flows are replaced in quantity and time to protect Greeley's South Platte River exchange rights

from injury.

- **Water Division 1 – Case No. 25CW3168:** Application by CWH Properties, LLC to change 5.5 shares of the Box Elder Ditch historically used on the Swets and Weitzel farms located just east of the Costco on Harmony Rd. Greeley recommends filing a statement of opposition in order to protect Greeley’s water rights on the Lower Poudre and Fossil Creek.
- **Water Division 1 – Case No. 25CW3173:** This case concerns an application for reasonable diligence by Fox Acres Community Services & Hidden Lakes Golf & Trout Club for a conditional exchange of 150 acre-feet. The exchange from points include Seaman Reservoir, Terry Lake, Barnes Meadow, Comanche, and Peterson Reservoirs, and the applicants have contracts with Greeley for delivery of water from the former Mountain and Plains system. Greeley recommends filing a statement of opposition in order to monitor the case and to ensure any decree entered is consistent with prior related decrees and applicants’ contracts.
- **Water Division 5 – Case No. 25CW3177:** This case concerns an application by Colorado River Water Conservation District, Public Service Company of Colorado, and Colorado Water Conservation Board to change the Shoshone Water Rights to include instream flow use. Greeley recommends filing a statement of opposition in order to monitor the case and to protect the Colorado and South Platte River basin water rights in Greeley’s portfolio from injury.

Vice Chairman Todd moved that the Board authorize filing statements of opposition in Case Nos. 25CW3158, 25CW3168, and 25CW3173 in Water Division No. 1, and Case No. 25CW3177 in Water Division No. 5, and for staff and legal counsel to seek resolution of issues raised by this case consistent with Water and Sewer Board Resolution No. 3, 2015. Mr. Otis seconded the motion. The Motion carried 6 to 0.

Adam Prior and Brett Naber left the meeting at 4 pm
Jerrae Swanson left the meeting at 4:16 pm

12. Director’s Report

The Director provided the Water & Sewer Board with a summary of water resources and utility policy events, and updated Board on notable utility activities.

Moving the April 15th Board meeting to allow time for members of the Board to attend the State of the City was discussed and it was agreed to move the meeting to 10 am on April 15th.

13. Such Other Business That May Be Brought Before the Board and Added to This

Agenda by Motion of the Board

No other business was brought before the Board.

14. Adjournment

The Public Session of the meeting ended at 4:28 pm

Harold Evans, Chairman

Brian McBroom, Board Secretary



Agenda Summary

February 18, 2026

Key Staff Contact: Sean Chambers, Water & Sewer Director

Title:

Welcome New Employees and Promotions

Summary:

Promotions: **Daniel Biwer** – Supervising Senior Environmental & Water Attorney

New Hires: **Chad Brown** – Crew Supervisor – Water

Recommended Action:

None

Recommended Motion:

None

Attachments:

1. New Hires and Promotions

Welcome New Employees

February 18,
2026

Promotions and New Employees



PROMOTIONS:

Daniel Biewer

Supervising Senior Environmental & Water Attorney

NEW HIRES:

Chad Brown

Crew Supervisor - Water





Agenda Summary

February 18, 2026

Key Staff Contact: Adam Prior, Chief Engineer

Title:

Approve and Recommend to Council Authorization of Eminent Domain for Waterline

Summary:

The West Greeley catalyst entertainment district is contingent on the relocation of the two Boyd Lake transmission lines which currently are located directly under the arena, hotel, and water park. These two transmission lines provide water to the city during peak summer months from May through October and then flow in the opposite direction all winter. These are the critical path for starting the catalyst entertainment district facility and need to be started in February or March. The relocation of these lines has been engineered to full construction documents by the developer's team and the city staff. The proposed alignment will also replace and relocate the Kodak waterline from the future 4th St to the zone 4 pump station. This agenda item is to present the proposed infrastructure alignment and request authorization for acquiring property interests in real property that will enable the construction of relocated Boyd lake water transmission lines.

Recommended Action:

Approve Resolution to City Council to use Eminent Domain Authority to acquire real property interests for the development of the West Greeley Sanitary Sewer Infrastructure.

Recommended Motion:

"I move that the Board adopt the enclosed Resolution Authorizing the Acquisition of Interests in Real Property, by purchase or through the power of eminent domain, for the relocation of the Boyd Lake transmission pipelines and Associated Facilities and recommend that City Council authorize the same."

Attachments:

1. WG Boyd Line Eminent Domain Authority
2. Draft W&S Board Resolution (WG Boyd Line Relocation)

West Greeley Boyd Lake Transmission Lines: Easement Acquisitions and Authorization of Eminent Domain

Presented to Water & Sewer Board

February 18, 2026

By: Adam Prior, PE – Chief Engineer



Agenda



Presentation Agenda

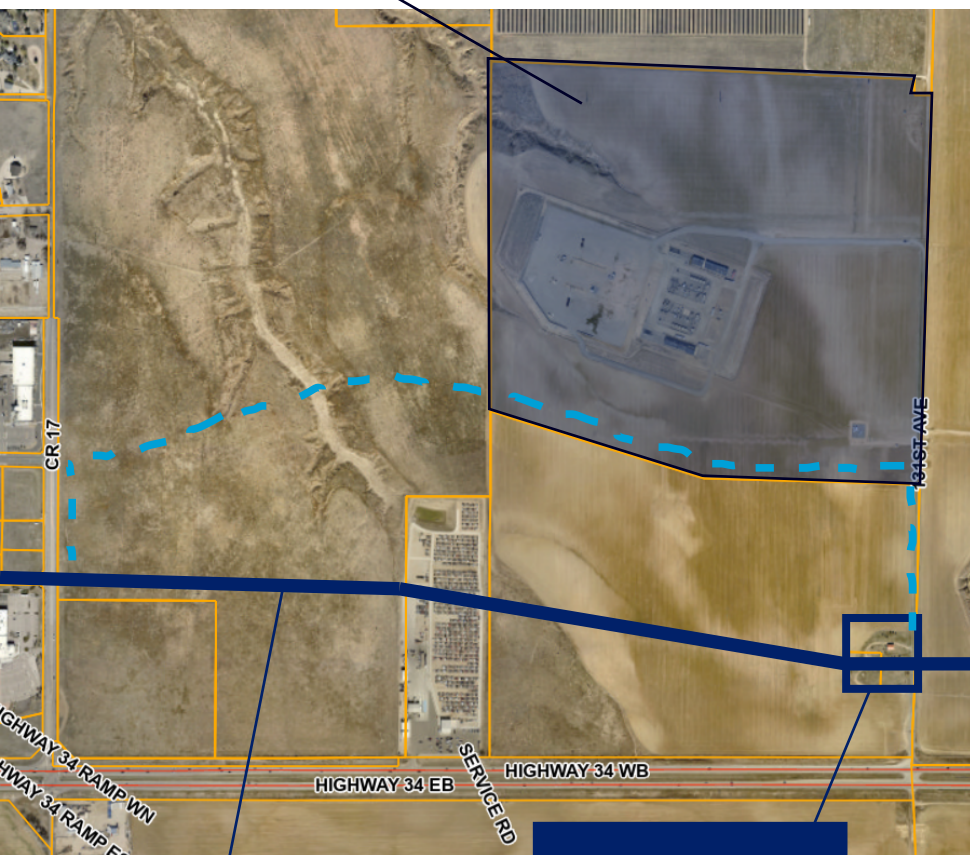
- Describe the location of real property acquisition
- Provide background and reason for acquisition
- Recommend approval to acquire the property

Purpose: To obtain approval from City Council for authorization to use eminent domain authority for the purchase of real property for the relocation of Boyd Lake potable transmission mains.



West Greeley Sewer Overview

West Greeley
Regional Map and
Oxy Property



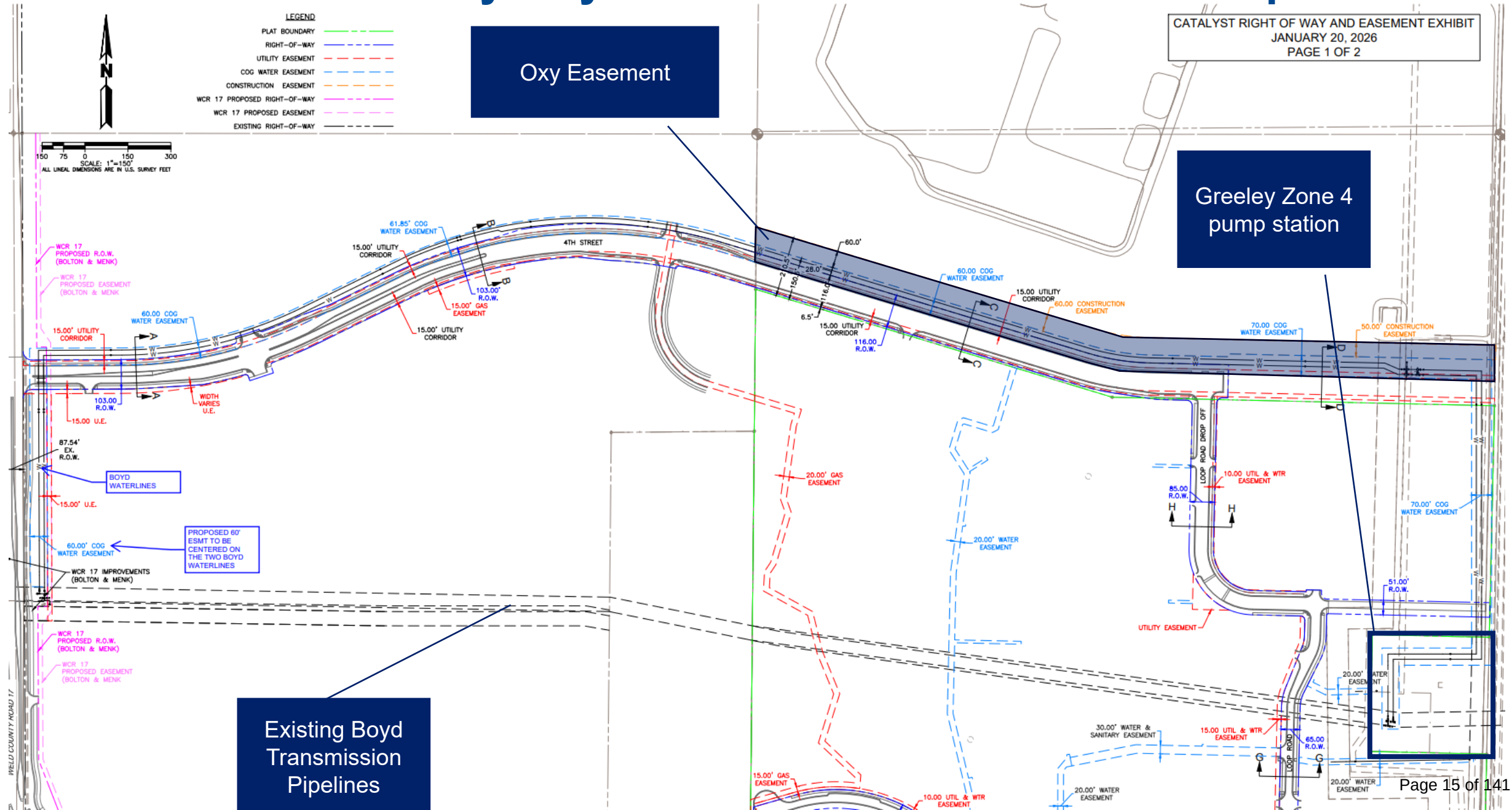
Existing Boyd
Transmission
Pipelines

Greeley Zone 4
pump station

- **West Greeley Potable Water Infrastructure**

- City's Catalyst development in West Greeley will construct new commercial entertainment features overlying the existing Boyd transmission pipelines (Boyd).
- The Boyd lines are high flow capacity & welded steel pipelines.
- New alignment will relocate pipelines east of CR. 17, extending to the City's zone 4 pump station on 131st Ave
- Most of the new alignment follows arterial road ROW, and one specific area, requires easement from private poverty owner(s) in the oil and gas business.
- City had anticipated having easement in hand by 2/15 for construction start, but discussions have been complicated, and the relocation project will urgently need possession and use of the water utility pipeline easement.

West Greeley Boyd Transmission Relocation Map



Project Acquisition Needs

- **To construct the project the City needs to acquire additional property interests from property owners along the pipeline route.**
 - Property interests include permanent easements, and/or temporary easements as determined by final project plans.
 - The City uses a uniform acquisition process, in accordance with law, to negotiate in good faith with all affected owners.
- **Council authorization is the first step in this process.**

Project Coordination

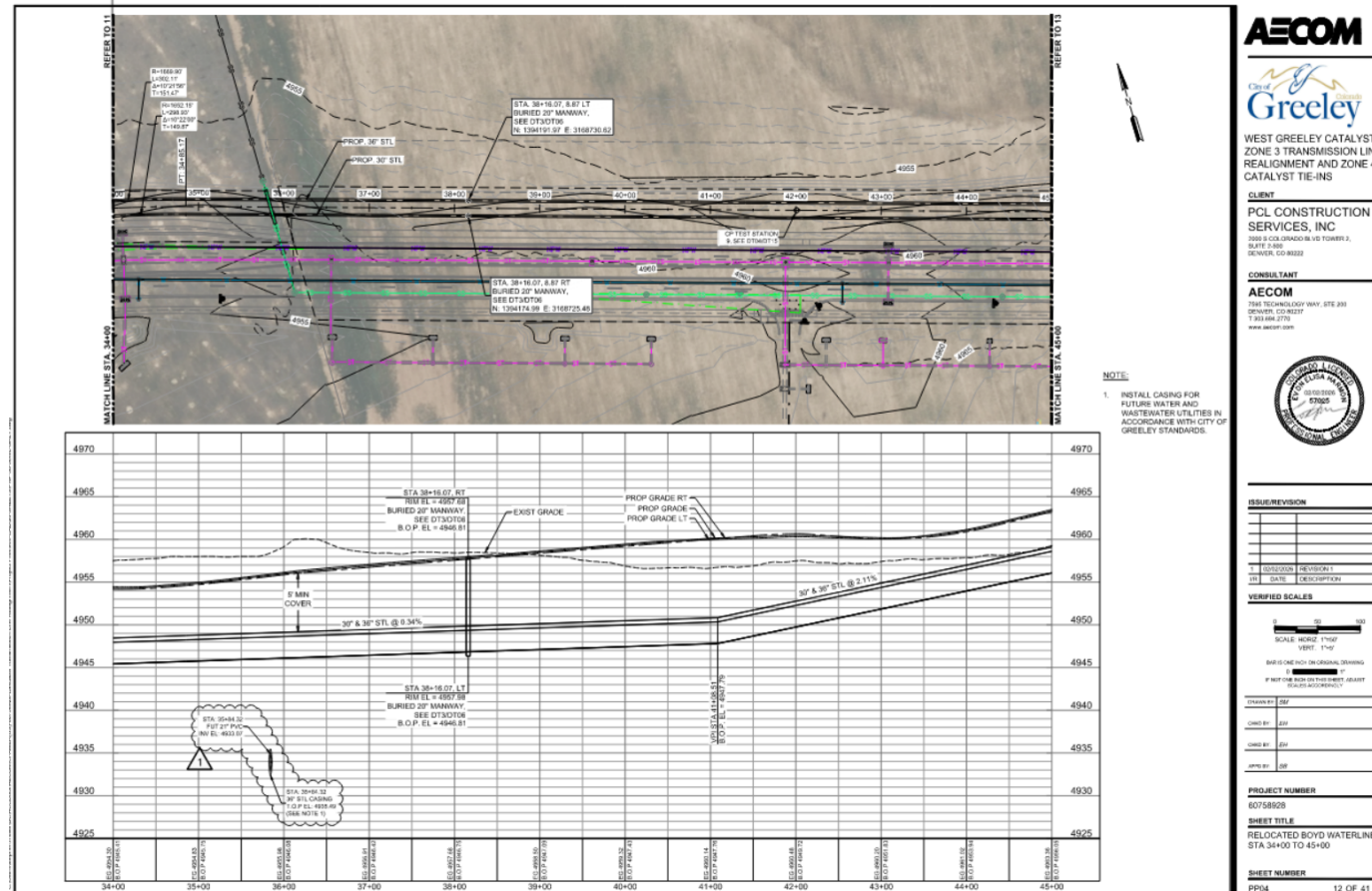
Standardized Landowner Engagement Process

- City REM/CAO staff engage with landowners along the route
- Meet with affected property owners to:
 - Provide an overview of the project, purpose, and schedule
 - Attend onsite meetings to understand concerns and any site constraints
 - Review the anticipated property interests needed for the project
 - Review the subsurface pipeline easement acquisition process
 - Use eminent domain only as a last resort

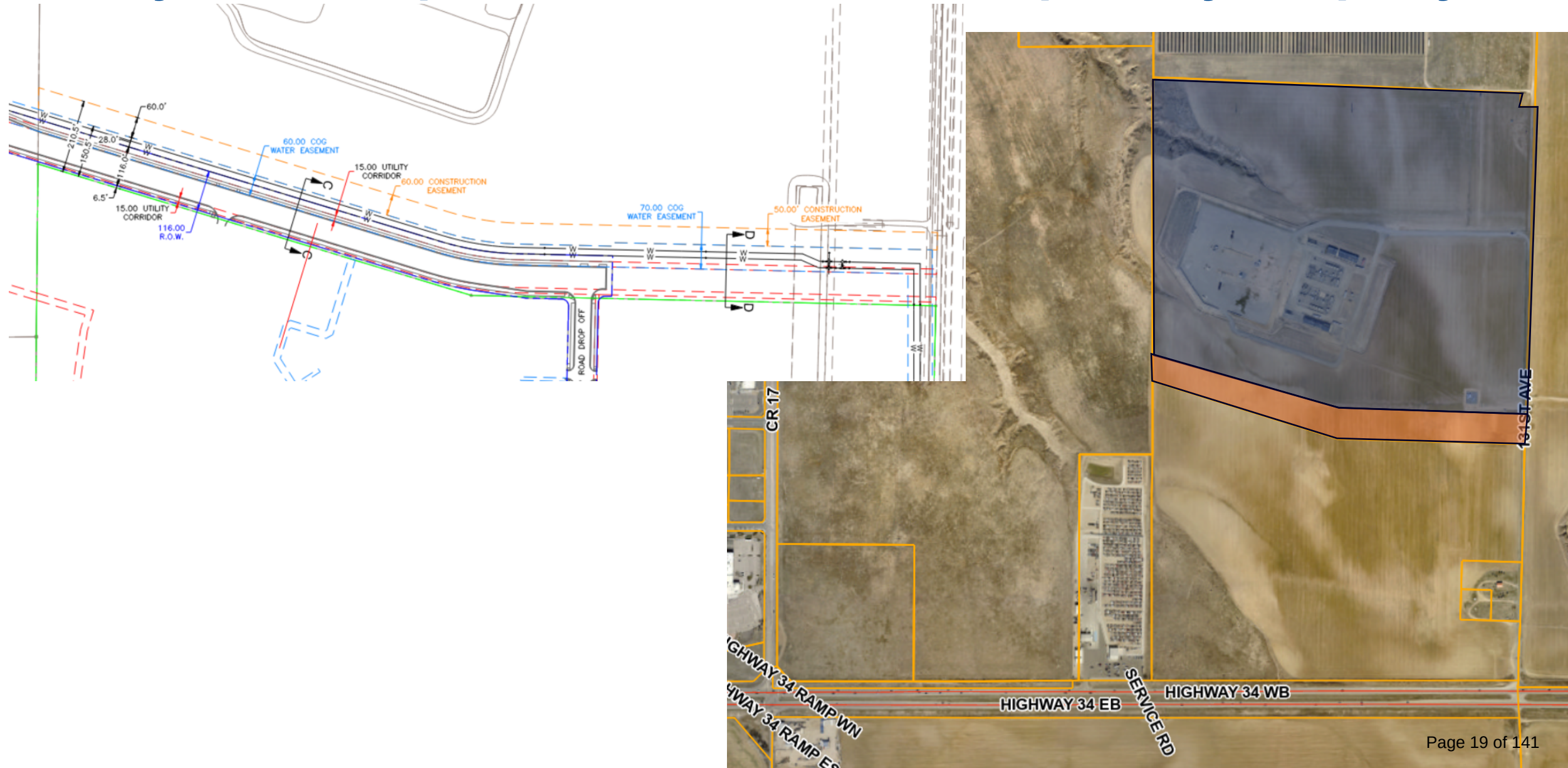
West Greeley Boyd Transmission Water Line Relocation

Easement Acquisitions Along Entire Route:

- Boyd Lake Potable Water Transmission Pipelines
 - 60’-70’ wide Permanent Easement
 - 50’-60’ wide Temporary Construction Easement



Boyd Lake Pipeline and Easement Map – Oxy Property



Conclusions and Staff Recommendations:

City Staff Recommends the Approval by City Council to use eminent domain authority to acquire easements from Oxy Petroleum for the purpose of locating two Boyd Lake potable water transmission mains along the future 4th St. alignment, as needed.



Questions ?



**THE CITY OF GREELEY, COLORADO
ACTING BY AND THROUGH ITS WATER AND SEWER BOARD**

RESOLUTION NO. ____, 2026

**A RESOLUTION AUTHORIZING THE ACQUISITION OF INTERESTS IN REAL
PROPERTY LOCATED IN WELD COUNTY, COLORADO, BY PURCHASE OR EXERCISE
OF THE POWER OF EMINENT DOMAIN, FOR THE CONSTRUCTION OF THE
RELOCATED BOYD LAKE WATER TRANSMISSION LINES, PURSUANT TO SECTION 7
OF ARTICLE XVI, SECTION 15 OF ARTICLE II, AND SECTIONS 1 AND 6 OF ARTICLE
XX OF THE COLORADO CONSTITUTION AND CRS §§ 31-15-101, *et seq.*; 38-1-101, *et seq.*
(WEST GREELEY SANITARY SEWER)**

WHEREAS, the City of Greeley (“City”) is a Colorado home-rule municipality empowered, pursuant to Sections 1 and 6 of Article XX of the Colorado Constitution, to, *inter alia*, construct, purchase, acquire, lease, add to, maintain, conduct, and operate water works and everything required therefor, within or without its territorial limits, for the use of the City, including through exercise of the power of eminent domain; and

WHEREAS, Section 15 of Article II and Section 7 of Article XVI of the Colorado Constitution further authorize the City to acquire property to convey water for domestic, irrigation, drainage, and other purposes; and

WHEREAS, C.R.S. §§ 31-15-101, *et seq.*, and 38-1-101, *et seq.*, provide the statutory framework within which the City may exercise the power of eminent domain; and

WHEREAS, Section 17-4 of the City's Charter authorizes and requires the City Water and Sewer Board (“Board”) to acquire, develop, convey, lease, and protect water and sewer assets, supplies, and facilities; and

WHEREAS, Section 17-1 of the Greeley City Charter authorizes the Board to qualify the Water and Sewer functions and operations as an “enterprise” as that term is contained in Section 20 of Article X of the Colorado Constitution, and to provide for every function and operation of an enterprise, including but not limited to, bond issuance and all other necessary and ordinary functions of Water and Sewer operations, the enterprises for which are established in Title 20, Chapter 2 of the Greeley Municipal Code; and

WHEREAS, the Board has determined that the acquisition of interests in real property for the development and construction of the relocation of the Boyd lake water transmission lines is needed for the public purpose of ensuring the safe and reliable conveyance of potable water for the residence of Greeley and surrounding communities using water from the Boyd Lake water treatment plant and thereby protecting their public health, safety, and general welfare; and

WHEREAS, the acquisition of interests in real property located in Weld County and identified on Exhibit A, whether by purchase or through exercise of the City’s power of eminent domain, is accordingly necessary.

NOW, THEREFORE BE IT RESOLVED BY THE WATER AND SEWER BOARD OF GREELEY, COLORADO:

Section 1. The Board hereby determines that it is necessary for the City to acquire, either by purchase or through exercise of the power of eminent domain, interests in the real property identified on Exhibit A for the development and construction of relocation of the Boyd lake water transmission lines is needed for the public purpose of ensuring the safe and reliable conveyance of potable water for the residence of Greeley and surrounding communities using water from the Boyd Lake water treatment plant and thereby protecting their public health, safety, and general welfare.

Section 2. The Board hereby determines that such acquisition of interests in the real property identified on Exhibit A for the development and construction of relocation of the Boyd lake water transmission lines is needed for the public purpose of ensuring the safe and reliable conveyance of potable water for the residence of Greeley and surrounding communities using water from the Boyd Lake water treatment plant and thereby protecting their public health, safety, and general welfare.

Section 3. City staff, consultants, and legal counsel are hereby authorized and directed to continue with the acquisition of the above-described interests in real property, either by purchase or through exercise of the power of eminent domain. Nothing in this resolution is intended or shall be construed to preclude good faith efforts by City staff, consultants, and legal counsel to negotiate a voluntary purchase of the necessary interests in real property.

Section 4. The Board hereby ratifies any previous actions taken by City staff, consultants, and legal counsel to negotiate the acquisition of such interests in real property, and in providing notice of the City's intent to acquire such interests, in accordance with C.R.S. § 38-1-101, *et seq.*

Section 5. The Board hereby recommends the Greeley City Council adopt an ordinance confirming the determinations set forth above and authorizing the acquisition of interests in real property as described in this resolution, either by purchase or through exercise of the power of eminent domain.

Section 6. This Resolution shall take effect immediately upon its passage.

PASSED AND ADOPTED, SIGNED AND APPROVED this ____ day of September 2025.

ATTEST:

THE CITY OF GREELEY, COLORADO

Secretary to the Board

Harold Evans
Chairman, Water and Sewer Board



Agenda Summary

February 18, 2026

Key Staff Contact: Erik Dial, Deputy Director of Utility Finance and Customer Service, Derek Hannon, Long Range Utility Planner

Title:

Water Demand and Revenues – Long Term Trends

Summary:

A cross functional Water and Sewer team reviewed long-term water use and revenue trends for Greeley and will update the Board with the findings. Staff recognized that customer water usage was evolving and that it was impacting water revenue collection. Staff will present the findings from the demand study done in-house and present key points from a price elasticity of water review done by WestWater Research, LLC. Strategies to mitigate revenue impacts and plan for the water utility's future will be discussed with Board as well.

Recommended Action:

None

Recommended Motion:

None

Attachments:

1. Water Use and Revenue Trends
2. Greeley_Price Elasticity Investigation



Water Demand and Revenues - Long Term Trends

Water & Sewer Board

February 18, 2026

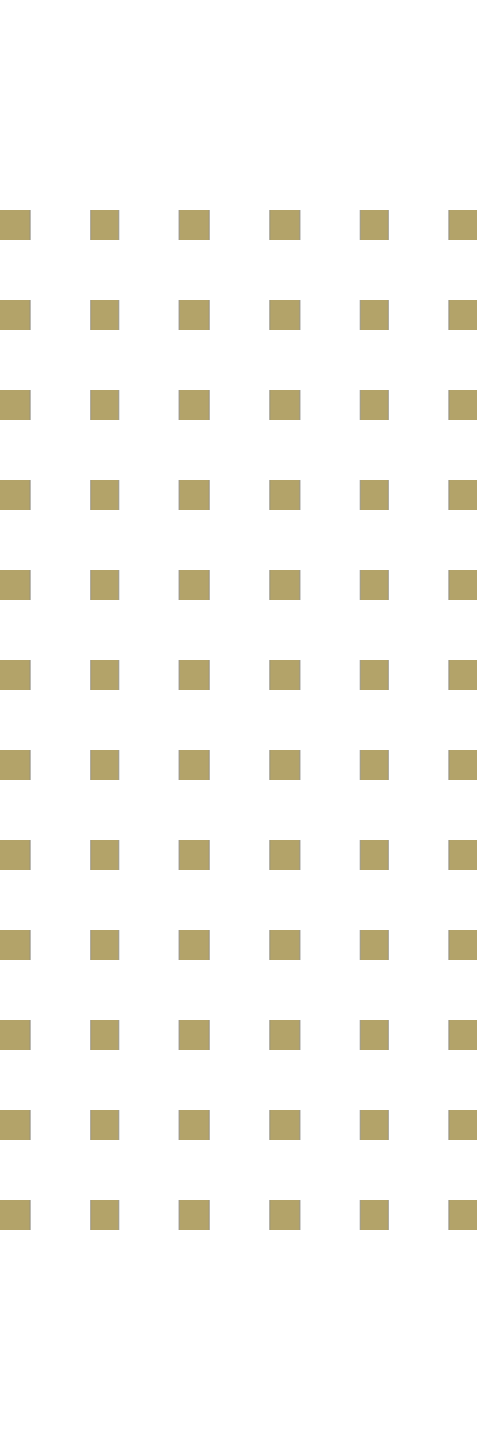
Erik Dial, Deputy Director – Utility Finance and Customer Service

Derek Hannon, Long Range Utility Planner

Agenda

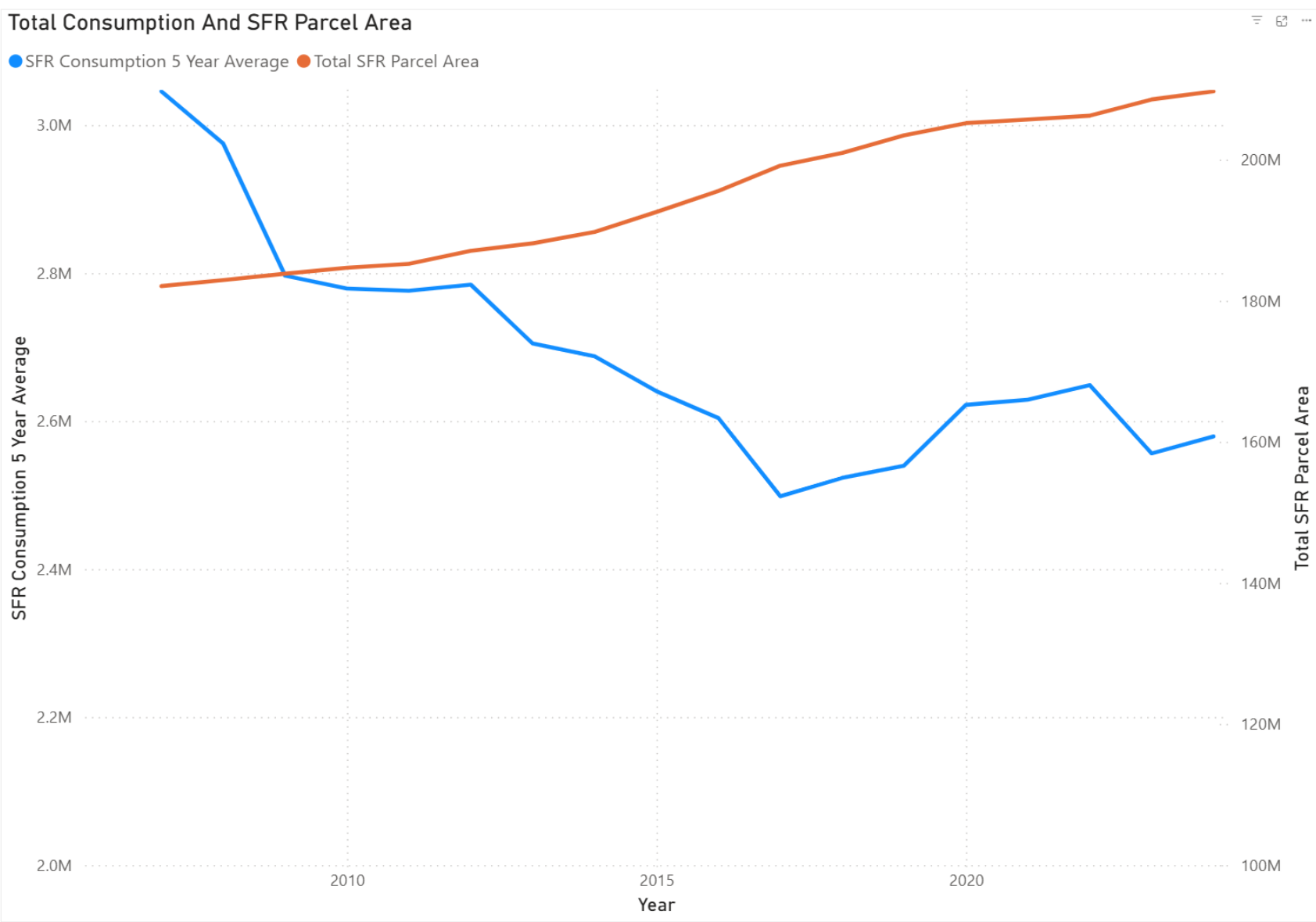


- Declining Water Consumption
- Trends in Single Family Development and Water Consumption
- Utility Affordability
- Price Elasticity Analysis
- Strategies

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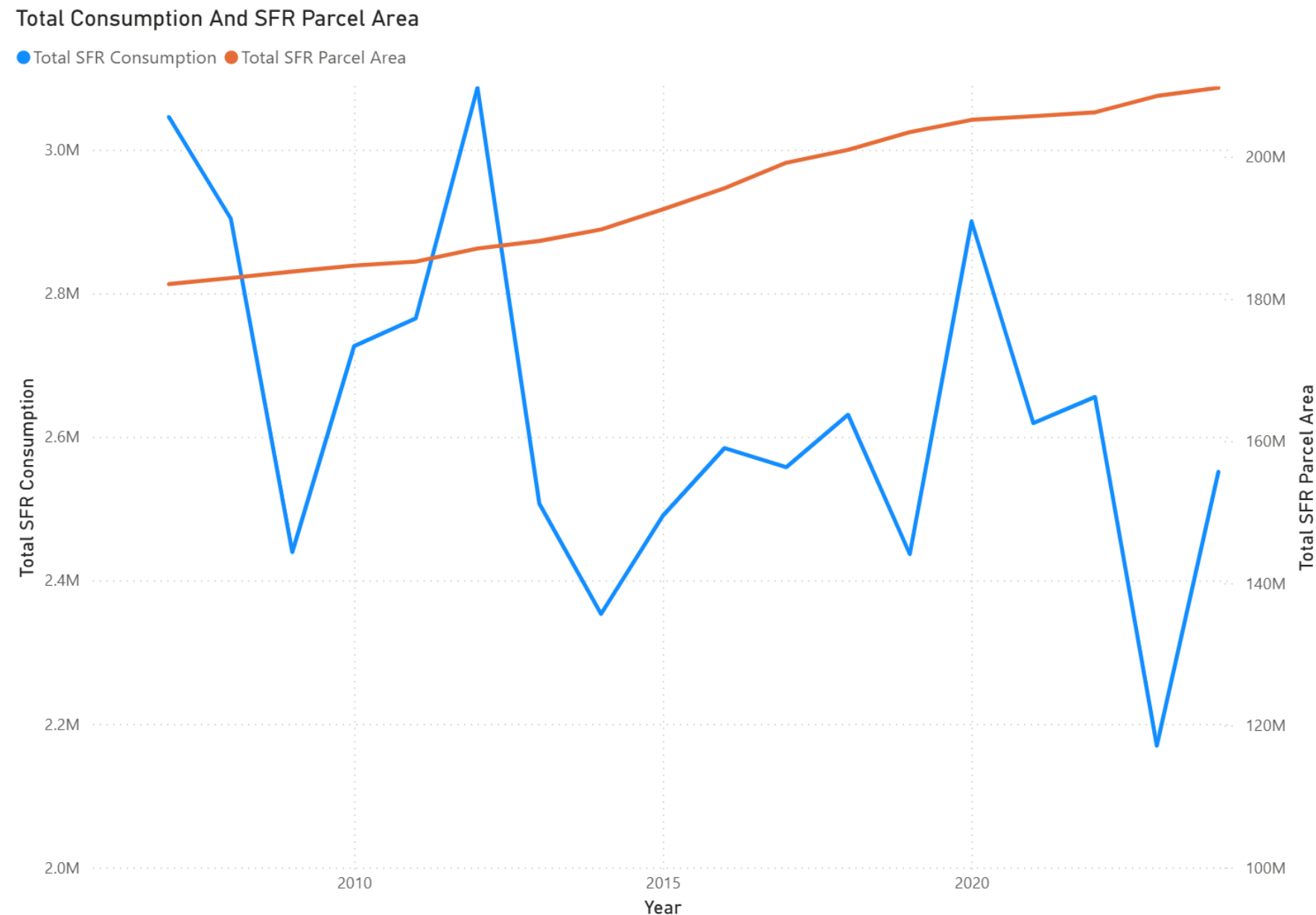
Declining Consumption

A Growing Customer Base with Decreasing Use



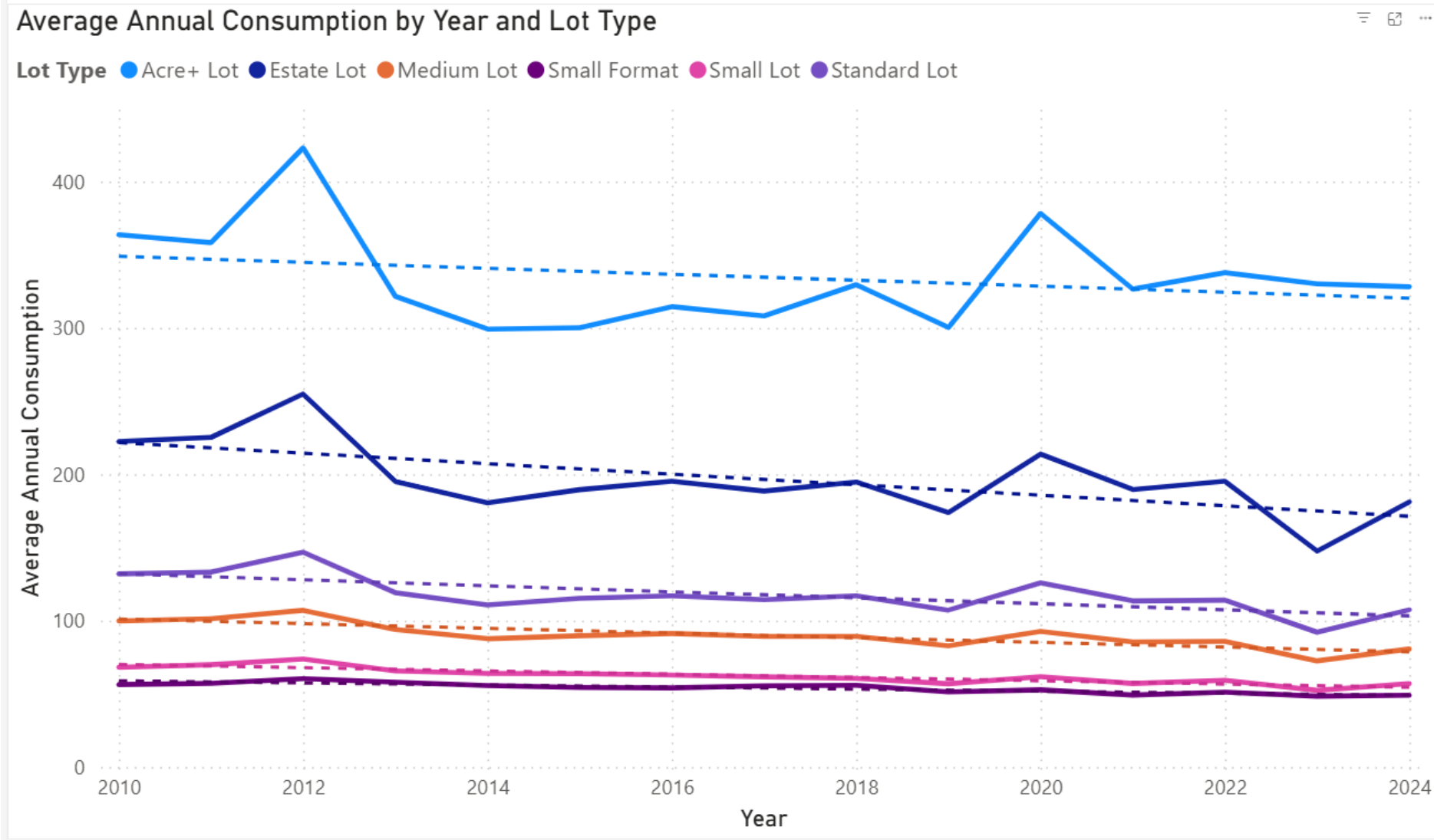
Despite an increase in single family residential customers, total water demand from that category has decreased.

A Growing Customer Base with Decreasing Use



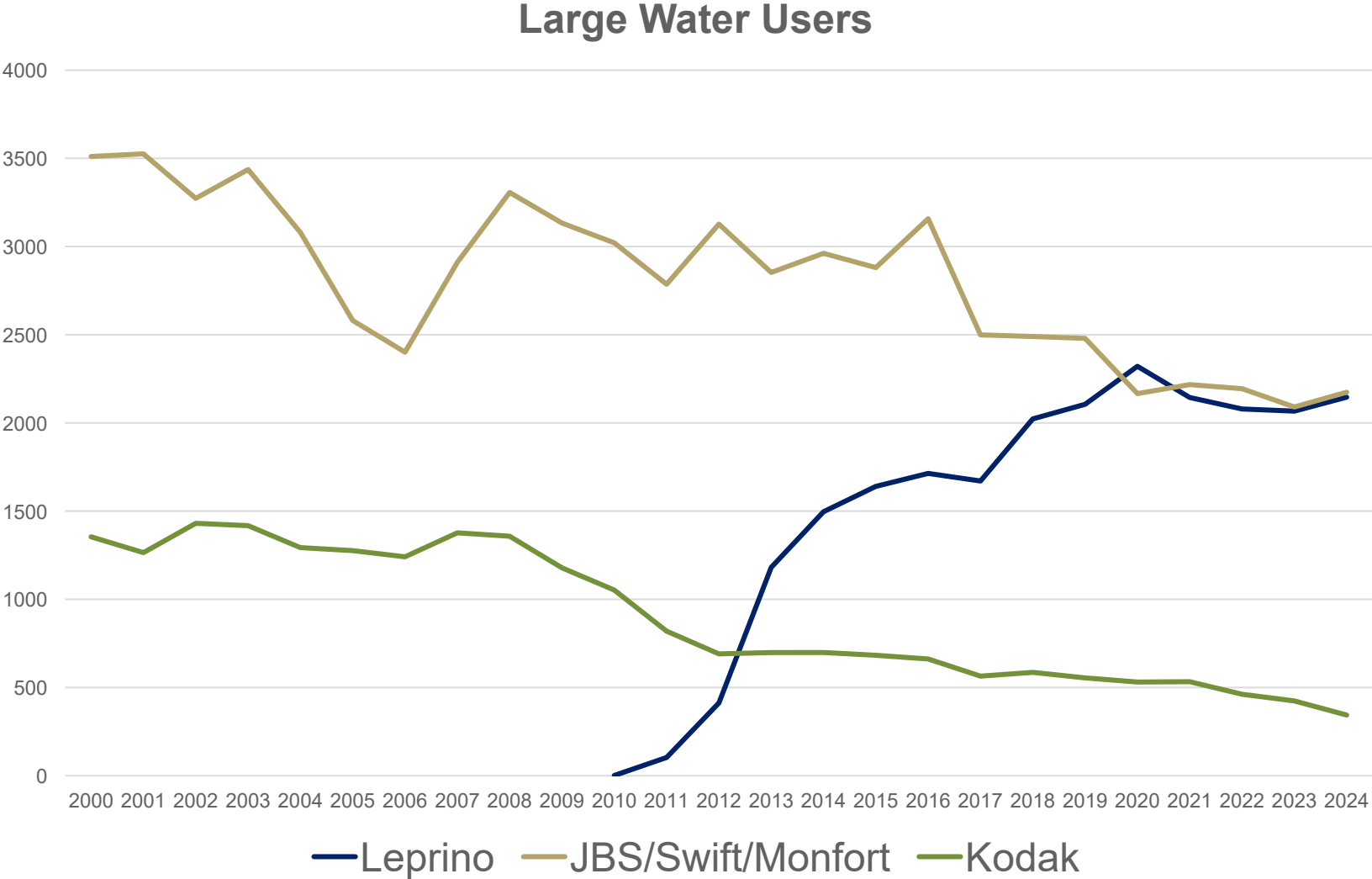
Compare 2012 and 2020 looking at annual values. We can see that, even in dry years, the peaks aren't as high as they used to be.

Average Annual Consumption by Lot

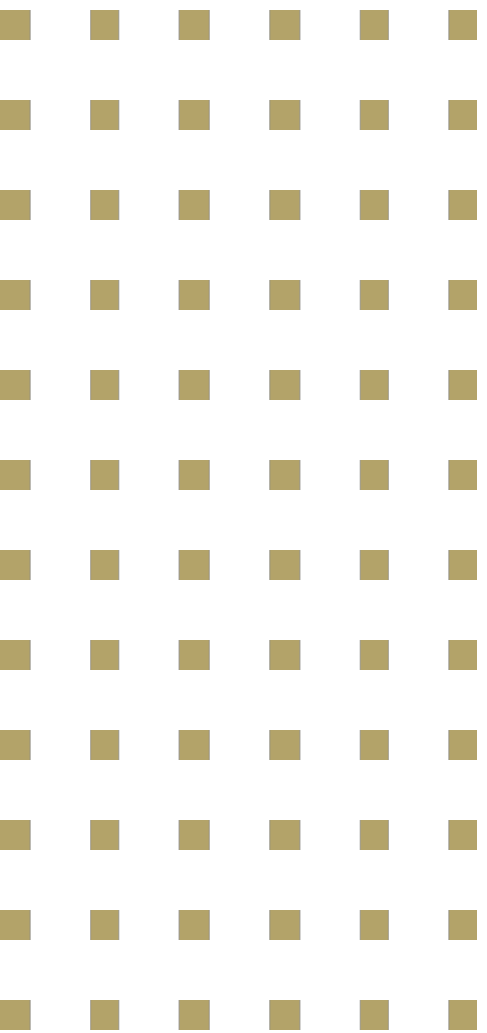


- Overall 28% decrease from 2007 to 2024
- Decreasing independent of lot size
- Homes built 2005 to present have remained relatively constant in use

Declining
Industrial
Water Use



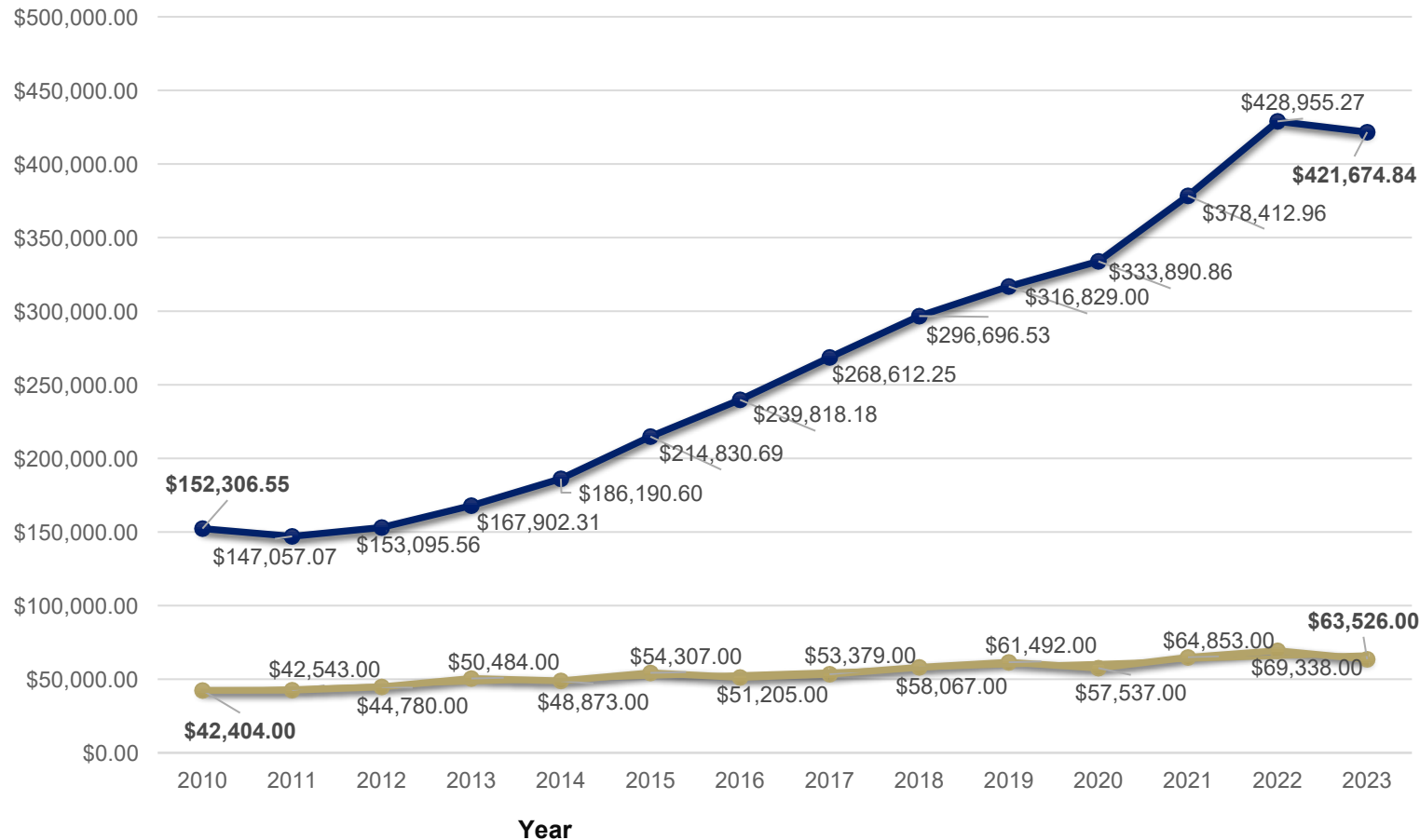
- Kodak/Carestream sites have wound down usage
- Leprino’s water use increased as production ramped up but has leveled off



Factors in the Decline

Financial Pressures on Customers

Home Value and Median Income



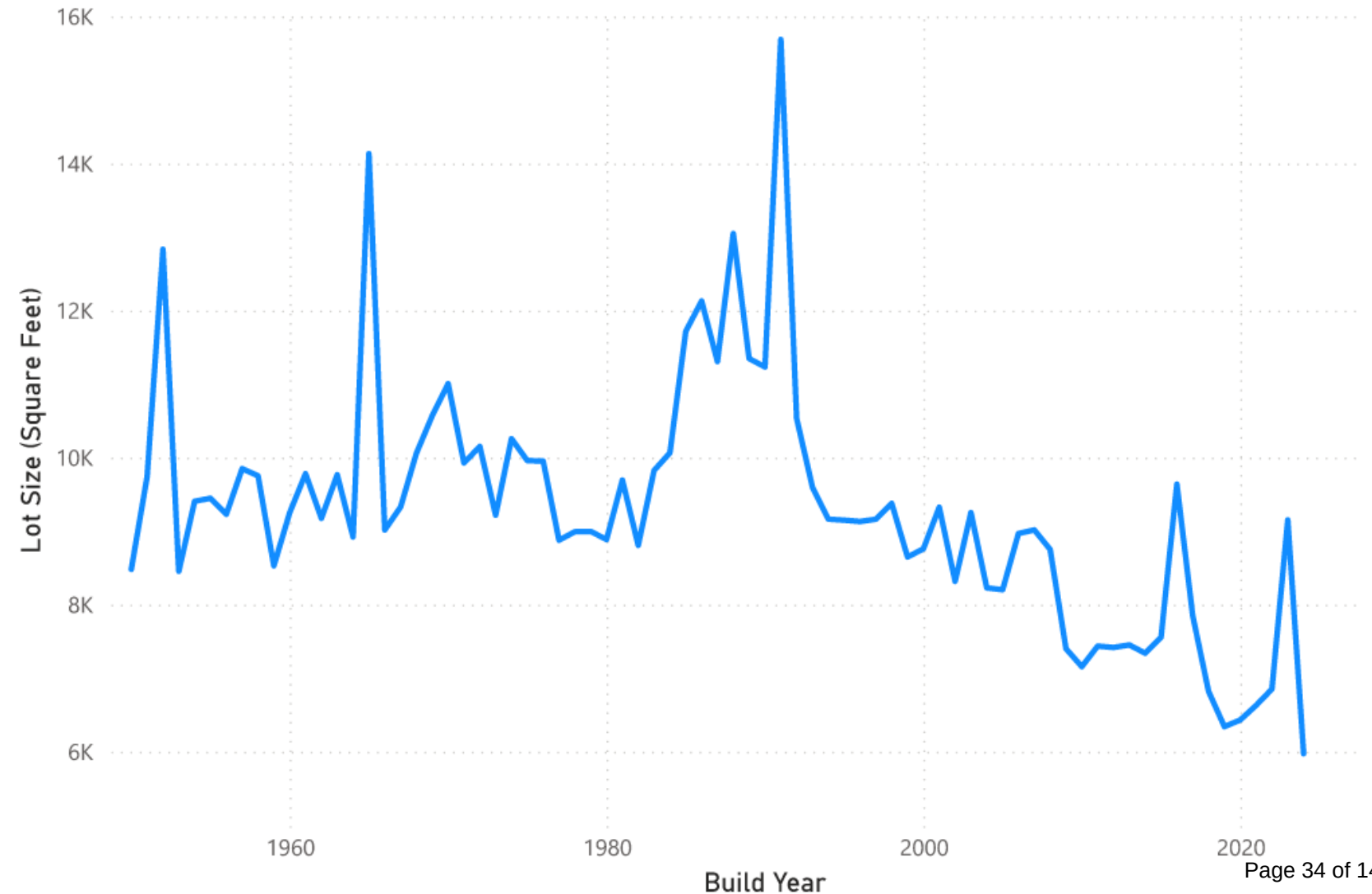
- Water use is the most directly controllable portion of a customer's utility bill
- According to WestWater's price elasticity report, customers don't just react to the price of water when determining their usage, they look at the total utility bill.

Changing Lot Layouts

Lot Size

- Average lot size has decreased
- Individual neighborhoods can cause spikes, but overall, a strong downward trend since 2000

Average Lot Size by Build Year

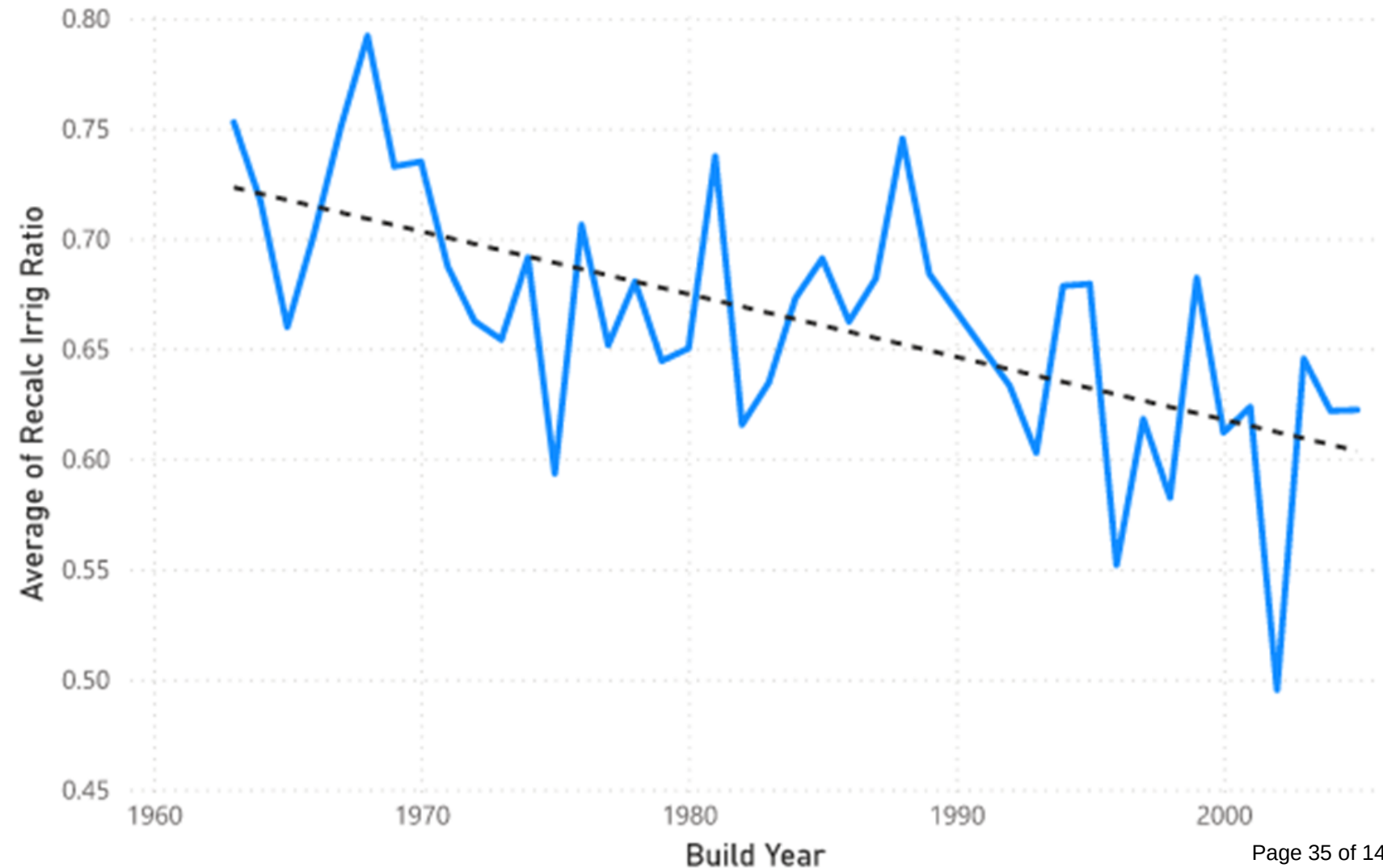


Changing Lot Layouts

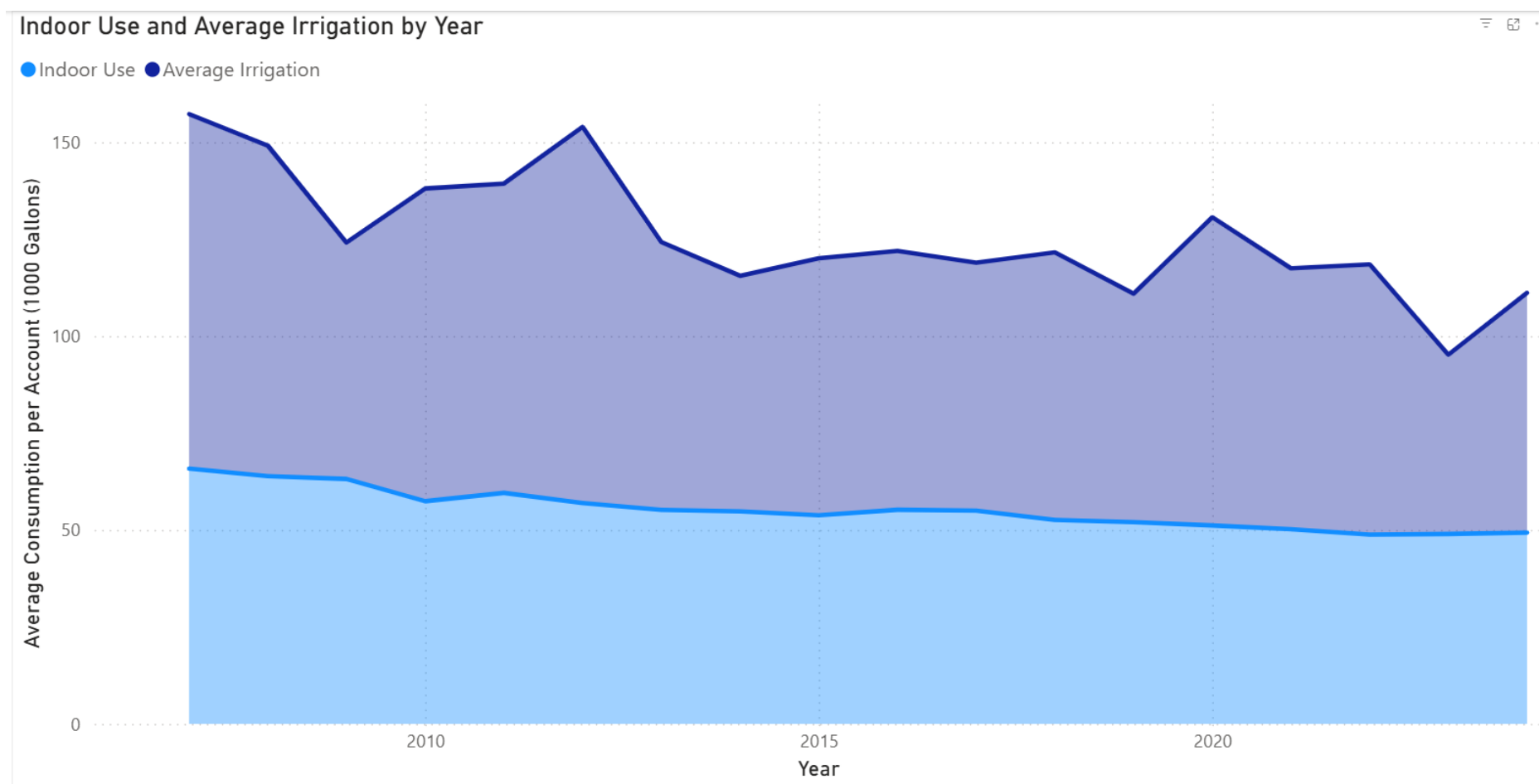
Irrigable Area Ratio

- Random selection of lots built since 1963
- Higher portion of average lot is impermeable area

Average of Recalc Irrig Ratio by Build Year



Usage Breakout



- Proportion of total use made up of irrigation water has decreased over time
- Increase in “Zero Irrigation Accounts” - those accounts whose annual use was less than or equal to their annualized WQA.
- Average indoor use has decreased as well

Decreasing Irrigation

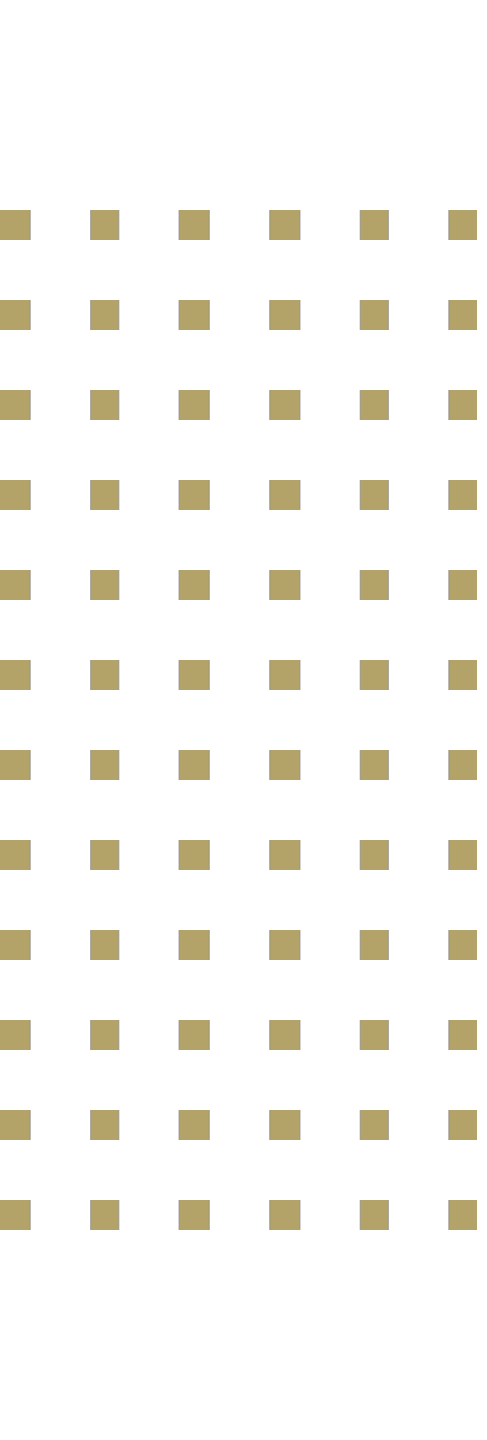
- Irrigation portion of overall water demand decreasing
- Water efficiency staff tracks “crispy” lawns
 - Customers not irrigating enough to keep landscapes healthy
 - Accelerating number of these customers since 2022
- Since 2007, there has been a 28% increase in customers who do not irrigate at all
 - Monthly water use is consistent year round



Changing Regulations, Perceptions, and Preferences



- Legislative changes that limit water intensive types of landscaping
- Regional water limitations
 - Neighboring water providers are water limited – assumed Greeley is as well
- Changing preferences – water wise landscaping is common and preferred for many people

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Water Price Considerations

Price Elasticity Considerations

- Engaged with WestWater Research to summarize research into water service price elasticity of demand (PED)
- WestWater performed a literature review of water PED studies
 - Found that water demand is still strongly inelastic when considered ***in isolation***
 - However, other pricing factors do impact water use

Price Elasticity Estimates – Western Region

Low	Median	High
-0.16	-0.33	-0.46

Figure 1. Classification of Price Elasticity of Demand (PED) Estimates

Classification:	Elastic		Inelastic				Elastic	
Subclass:	Strongly	Moderately	Moderately	Strongly	Strongly	Moderately	Moderately	Strongly
PED:	<-2	-2	-1	-0.5	0	0.5	1	2 >2
			Unit Elastic		Perfectly Inelastic		Unit Elastic	

Beyond Price Elasticity

Water demand may be inelastic, but compounding bill impacts still cause water use to drop

- Monthly service fees
- Other utilities included in bill
- Rate structures
 - Increasing block rate and complex rate structures cause customers to overestimate cost of using water



City of Greeley
Utility Billing
1000 10th Street
Greeley, CO 80631

Account Summary

Bill Date	01/29/26
Previous Bill	\$106.50
Total Payments	-\$106.50
Current Bill	\$109.97
Current Bill Due Date	02/19/26

Total Amount Due	\$109.97
-------------------------	-----------------

Account Information

Account Number

Service Address

Persons per Household	5
Stormwater (SQ FT)	7,872
Irrigable Area (SQ FT)	5,223

Customer Service (8-5 M-F)
970.350.9811

Online
www.GreeleyCO.gov

Email
utility.billing@greeleygov.com

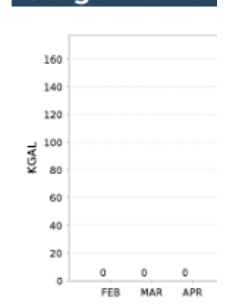
Current Charges

	Total
Meter Size Water Base Charge	\$20.60
Water Budget Billing - Water Budget (0% to 100%)	\$24.52
Sewer Base	\$20.60
Sewer Volume	\$13.99
Stormwater	\$30.26
Total Current Charges	\$109.97

Water Charges

BUDGET:	Indoor	8	Outdoor	1.5	Total	10
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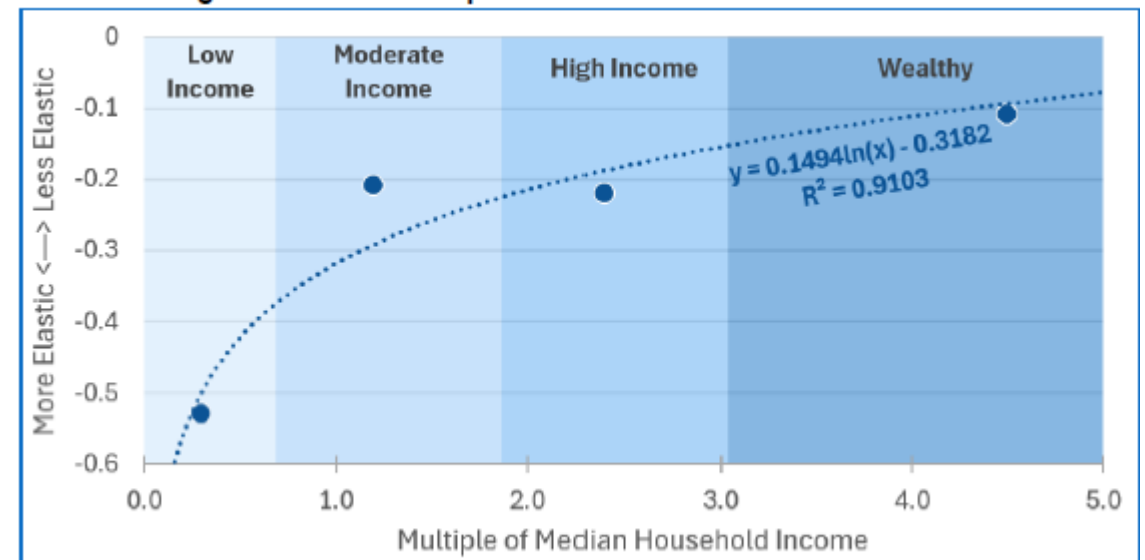
Usage Profile



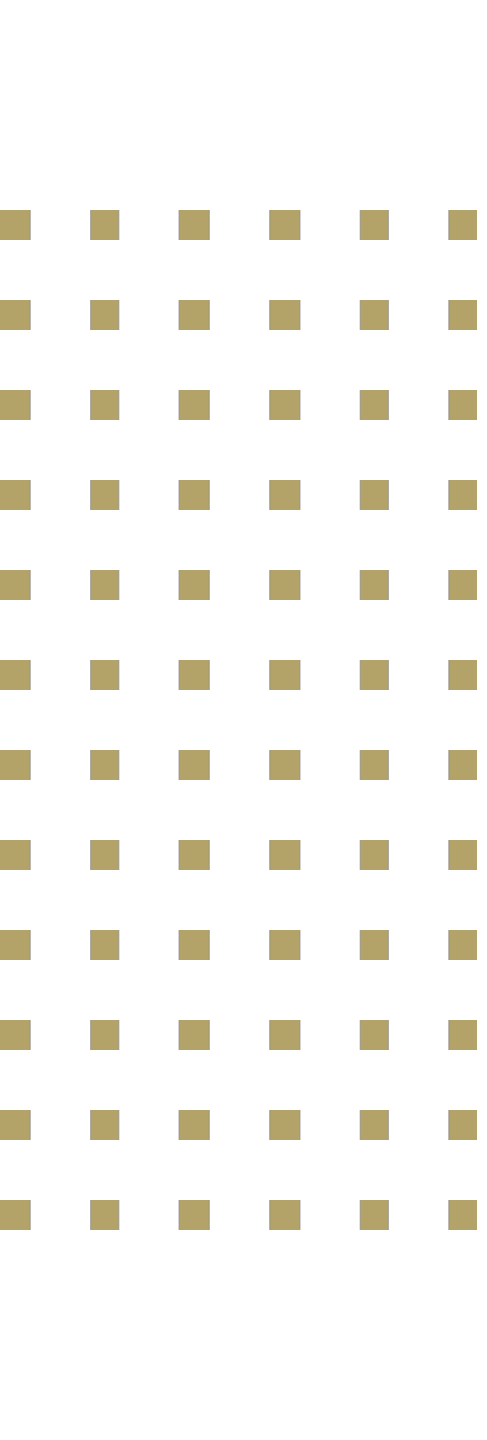
Other Pricing Factors

- Income sensitivity
 - Low-income households are 5 times more responsive to water price increases than high-income households
 - 1 in 10 U.S. households see water/sewer expenditures exceed 4.5% of income
- High water users and customers with larger landscapes are more sensitive to price increases
 - More opportunity to reduce water use

Figure 7. Relationship between Household Income & PED



Source: Extrapolation, conversion, and plotting of results reported by Renwick & Archibald (1998).

A decorative graphic on the left side of the slide, consisting of a grid of small, solid, olive-green squares arranged in 10 rows and 6 columns.

Potential Strategies

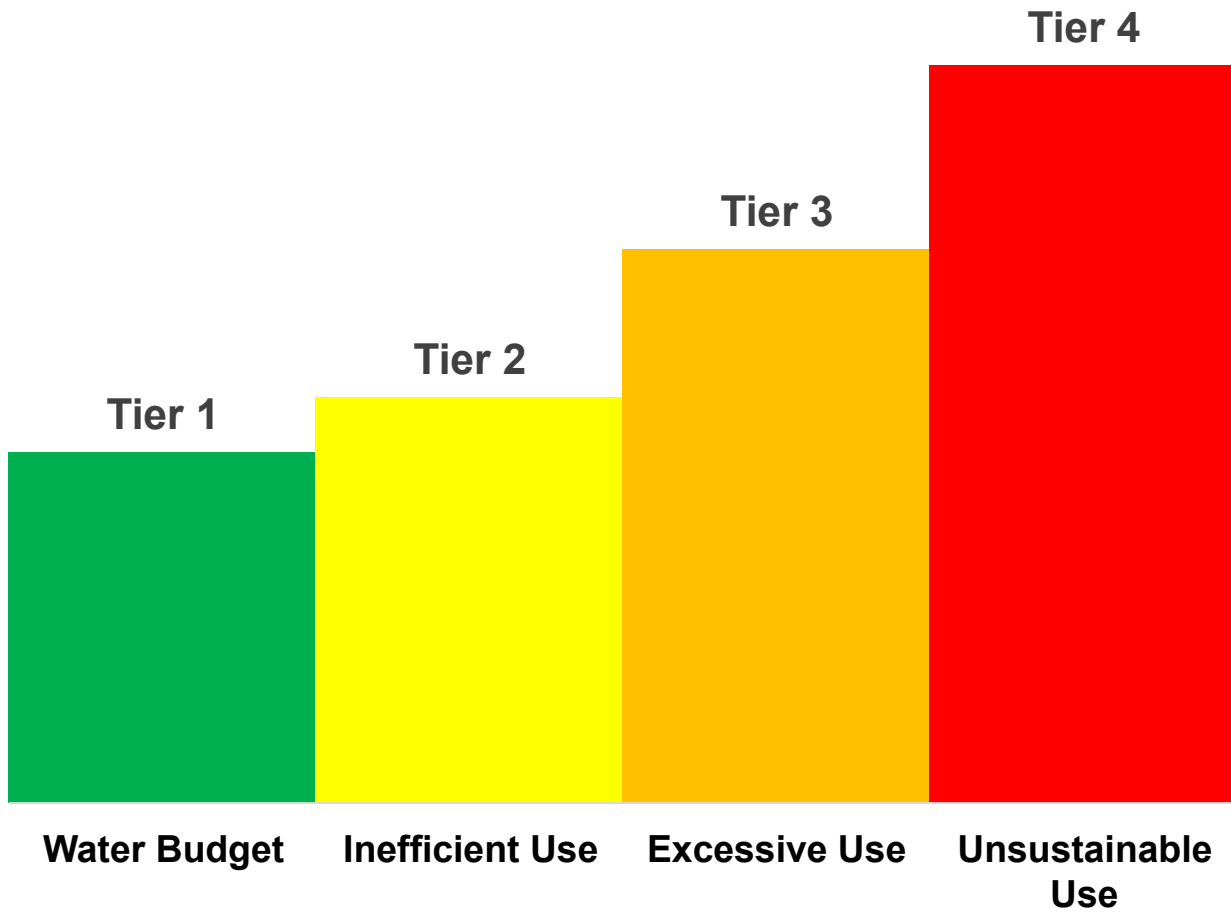
Capital Planning



- Plan for changing water use
 - Less turf – Less peaking demand?
 - Master planning assumptions
- Thoughtful approach to capital expansion projects
 - Water demand will increase eventually, but how much capacity is needed and when?
- Water portfolio
 - What future is Greeley planning for?
 - It will likely be less green and more “water wise”
- Infrastructure Partnerships

Financial Planning

Rate Structure for Greeley SFR customers



- Rate structure modifications
 - Options:
 - Water revenue shifting to higher fixed charges
 - Modifying rate structure to collect all needed revenue in lower tiers
 - Others?
- Reduce assumed water use per account
- Review raw water requirements for new development

Water Efficiency Messaging



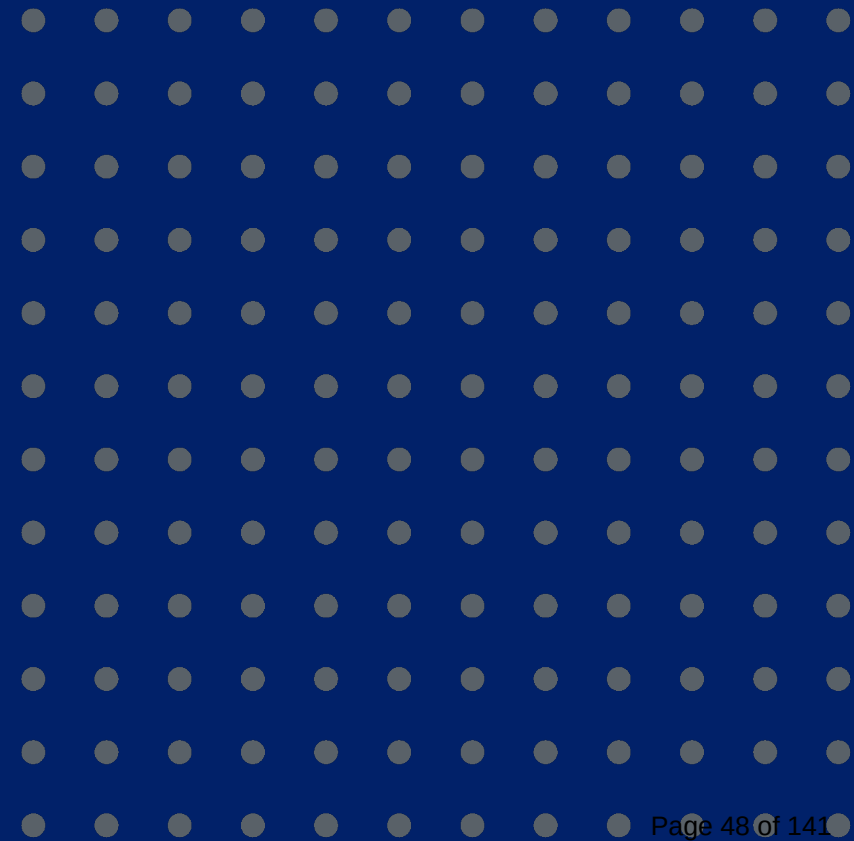
- Realigning water efficiency & customer communication strategies
- Focused efforts to reach underserved and income challenged customers
- Developing programs to help keep landscapes green for vulnerable customers

Closing Thoughts



- Decreasing water use per account is likely permanent
- Long term trend, not an emergency
 - Requires a multi-pronged approach
 - Creates revenue challenges, but also creates opportunities
 - Adjust expectations for what future water use looks like
- Greeley's robust water portfolio is an economic advantage in a water scarce region
 - Market Greeley's water availability to large water users

Thank you



Water Service Price Elasticity of Demand

Phase 1: Review and Evaluation of Western U.S. Price Elasticity of Water Demand Estimates and Revenue Stagnation Mitigation Strategies

Prepared for

City of Greeley
Water & Sewer Department
1001 11th Ave, 2nd Floor
Greeley, CO 80631



By

WestWater Research, LLC
205 S. Meldrum St.
Fort Collins, CO 80521



February 11, 2026

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1 Introduction

The City of Greeley (*Greeley* or *The City*) has been experiencing stagnating water demand in recent years despite an overall increase in customer accounts. Initial results from an analysis currently being conducted by the City (the *2025 Water Use Analysis*) indicates that this decreased consumption per account cuts across customer socio-economic class, age of home, and landscape types (among other differentiating variables), and points to price sensitivity and subsequent voluntary conservation measures as the likely primary driver.¹ Revenue generation challenges driven by waning customer demand is not unique to Greeley: “Nearly half of all utilities stated their revenues have been negatively affected by voluntary conservation measures adopted by customers” (Wallis-Lage, 2014).

The City would like to learn more about the extent of this issue and what strategies have been proposed in the literature and/or deployed by water providers to address it. The City engaged WestWater Research, LLC (WestWater) to conduct a brief research study (the *study* or *project*) investigating price elasticity of water service demand for residential customers. The City has made two related requests of WestWater for this research project:

1. Evaluate and summarize the body of literature investigating the price elasticity of residential water demand in the western United States and any alternative price strategies suggested or applied to bolster cost recovery in the face of low residential water demand.
2. Review the City’s 2025 Water Use Analysis for accuracy and theoretical defensibility.

As of the writing of this report, the 2025 Water Use Analysis is not yet ready for WestWater’s review. The project is therefore broken into two phases—Phase 1 being the satisfaction of the first request listed above and Phase 2 being the second. This report summarizes WestWater’s Phase 1 findings.

1.1 Framing the Issue

At a National Water Rates Summit in 2012, rate experts reported that “Partly due to successful water conservation programs, improved water-saving fixtures and technology, and a number of other factors, both water sales and water-related revenues are falling on a national level. (Barr & Ash, 2015). Decades of water conservation campaigns, advances in water efficiency technologies, and adoption of conservation-oriented rate structures have led to an uncomfortable new normal where utilities can’t sell enough water to offset the costs of service. Barr & Ash (2015) refer to this as a “conservation conundrum,” or the need remain solvent while advocating for conservation and considering customer equity.

The intuitive strategy for closing the revenue gap is to raise the prices for the water that is being sold. However, if customers are sensitive to water price (i.e., demonstrate price-elastic demand), then this approach may consistently come up short, or change the distribution of the cost burden among customers. Quantifying the level of price sensitivity is therefore an important step in beginning to address this issue and is one of the primary goals of this study.

¹ 2025 *Single Family Water Use Analysis*. Microsoft Excel workbook shared with WestWater on June 27, 2025. The accompanying report detailing analysis methods and findings is pending completion.

1.2 Report Organization

This report is prepared as follows:

- **Section 2** defines price elasticity of demand and discusses how elasticity estimates are interpreted. Additionally, this section provides an overview of rate structures. The definitions and terminology established in this section are used throughout the report.
- **Section 3** introduces the reader to the price elasticity estimate database developed by WestWater, leverages this database to calculate geographically-specific elasticity estimates, and discusses a selection of the variables identified in the literature as having an effect on elasticity.
- **Section 4** summarizes the results of a detailed model developed by WestWater to quantify the effects of different elasticities on a utility's ability to achieve full cost recovery.
- **Section 5** reports out a collection of strategies identified in the literature for bolstering water utility revenues paired with examples of their real-world implementation where available.
- **Section 6** summarizes the research findings, the quantification of elasticity effects, and the cost recovery strategies with specific considerations to Greeley and the Front Range.

2 Overview of Price Sensitivity & Rate Structures

Price sensitivity is commonly estimated as *price elasticity of demand* (PED). This metric is used throughout this report to compare price sensitivity across geographies and time and to quantitatively model a selection of scenarios in Section 4. This section provides a clear definition of PED and how it is derived, as well as a guidance for interpreting PED estimates. This section also gives an overview of basic water utility rate structures. Much of the terminology established in this section is used throughout the report.

2.1 Definition & Conceptual Review of Price Elasticity of Demand

PED is the change in the quantity of a good or service purchased (i.e., demanded) in response to a change in its price. An *elastic good* is one where demand is highly responsive to price changes, while an *inelastic good* is one where demand is relatively unresponsive to price changes. The PED for a good or service is expressed by **Eq.1**.

$$PED = \frac{\% \Delta Q}{\% \Delta P} = \frac{Q_2 - Q_1}{Q_1} \times \frac{P_1}{P_2 - P_1} \quad (1)$$

Where:

PED = Price elasticity of demand for a good or service

$\% \Delta Q$ = The percent change in quantity demanded of the good or service

$\% \Delta P$ = The percent change in the price of the good or service

Q_2 = New quantity demanded immediately after the price change

Q_1 = Initial quantity demanded immediately before the price change

P_2 = New price, immediately after the subject price change

P_1 = The initial price, immediately before the subject price change

When the absolute value of PED is equal to one, a 1% change in price will cause exactly a 1% change in the quantity demanded; this scenario is considered to demonstrate *unit elasticity*.

- A PED with an absolute value less than one is considered inelastic, and a PED with an absolute value greater than one is considered elastic.
- A PED of absolute value 0.5 or less is considered strongly inelastic while a PED of absolute value between 0.5 and one is considered moderately inelastic.
- Moderate elasticity is generally defined as a PED of absolute value between one and two and strong elasticity is generally defined as a PED of absolute value greater than two.

PED classifications and subclassifications are shown in **Figure 1**.

Figure 1. Classification of Price Elasticity of Demand (PED) Estimates

Classification:	← Elastic →		← Inelastic →				← Elastic →	
Subclass:	Strongly	Moderately	Moderately	Strongly	Strongly	Moderately	Moderately	Strongly
PED:	<-2	-2	-1	-0.5	0	0.5	1	2 >
			Unit Elastic		Perfectly Inelastic		Unit Elastic	

Most elasticities are negative due to the typical relationship between price and quantity, that is as price increases, demand tends to decrease. Therefore, an elastic PED implies greater effectiveness of price as a conservation tool. Given that water does not have any good substitutes and typically represents a small percentage of total household expenditures, residential water demand is generally expected to be price inelastic.

2.2 Water Utility Rate Structures

Rate studies are effective in achieving many objectives, but not necessarily at the same time. Some examples of objectives are conservation, revenue recovery, and promoting fairness and equity. It is important that the water provider prioritizes an objective of the rate structure, and then engineer the rates based on these priorities. There are a handful of typical rate structures that water providers use for their customers. Conceptual examples of these rate structures are illustrated in **Figure 2**.

- **Flat Rate** – The most basic price structure is a flat rate, which requires the customer to pay a fixed fee per billing cycle for their water services. This fee covers all the customers' water use, regardless of how much they consume.
- **Uniform Rate** – A uniform rate charges a per unit fee for water consumption. Uniform rates may also include a fixed fee, similar to a flat rate.
- **Increasing Block Rate (IBR)** – is a price structure that consists of more than one tier, with each tier including an increasing volumetric (per unit) rate. An example of an IBR might be a water provider that charges \$1 per thousand gallons up to 5,000 gallons of consumption, and

after reaching this threshold, the volumetric rate increases to \$2 per thousand gallons, and so on. IBR structures also commonly include a fixed fee, typically referring to as a base rate.

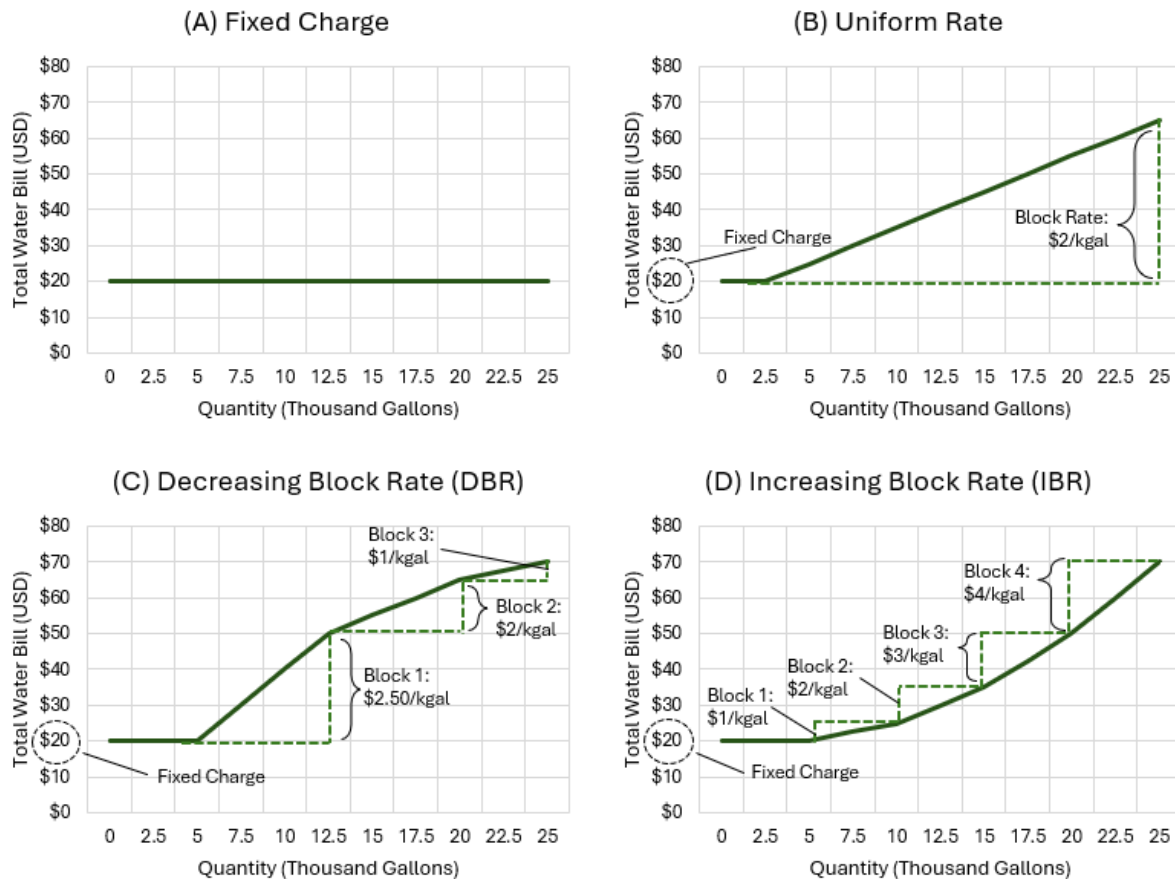
- **Decreasing Block Rate (DBR)** – Block structures may also be decreasing, referring to as a decreasing block rate (DBR). These rates would charge a volumetric rate that decreases as consumption decreases. For example, the water provider may charge \$2 per thousand gallons up to 5,000 gallons of consumption and then decrease the rate to \$1 per thousand gallons after the customer exceeds the 5,000-gallon threshold.

While both the flat rate and uniform rate structures are found across the U.S., most water providers currently use some form of IBR, while DBRs are rarely seen. The prevalence of IBRs is likely due to their conservation-forward pricing aspect.

Under the umbrella of IBR exist other rate structures that vary slightly in how they are designed. A water-budget rate (WBR) is the primary rate structure under this umbrella. A WBR has the same format as an IBR but uses attributes of the individual customer to designate volumes to each block in the WBR. The City of Greeley uses this type of pricing for their municipal customers. In a WBR, the volume of each block is an additive percentage of the customer's water budget.

IBR has often been deemed a form of "conservation pricing" because it requires the customer to pay an increasingly higher rate as they continue to consume water. For example, in 2016 the State of Utah enacted Utah Code §73-10-32.5, requiring retail water providers to implement an IBR structure for all culinary (potable) water use (Culinary Water Pricing Structure, 2016). The law does not specify how to engineer the IBR structures; it only requires that they be implemented.

Figure 2. Types of Water Rate Structures



3 Water Service PED Metanalysis & Driving Factors

The existing literature on price elasticity of demand for water is robust. Economists have been modeling the relationship between price and water demand beginning in 1926, when Leonard Metcalf published his work on the effect of water rates and population growth on water consumption (Metcalf, 1926). In the following decades, this topic became thoroughly studied, producing abundant research through the 1970s and 80s. Studies address confounding factors such as population growth, short-run versus long-run, rate structures, sectoral consumption, income, and indoor versus outdoor use, among other variables. Today, researchers remain focused on understanding how price changes potable water consumption to work toward a broader goal of securing economical and reliable water for the future.

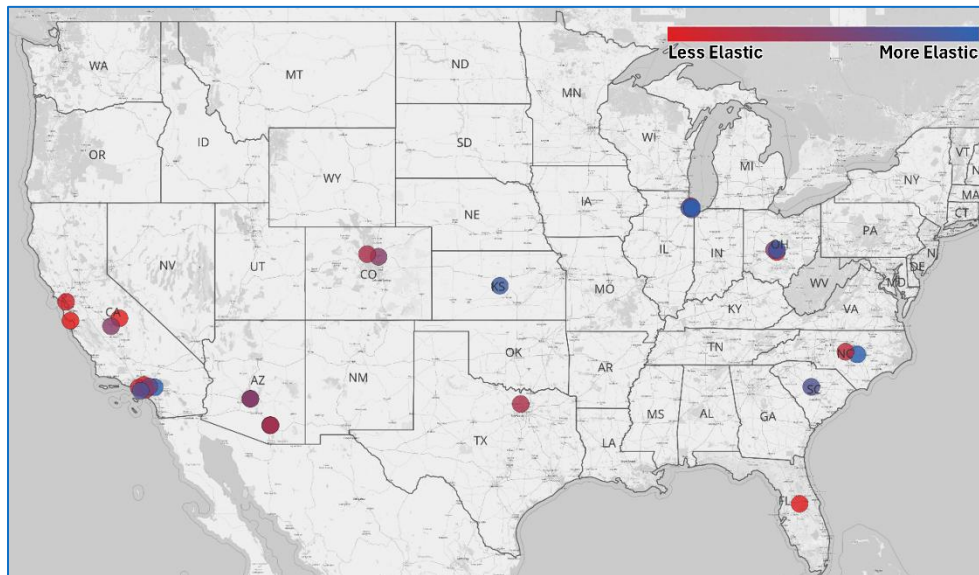
WestWater aggregated the PED estimates from its extensive literature review into a database to accommodate a cursory metanalysis. The database includes 59 PED estimates or estimate ranges and accompanying criteria from 39 different studies spanning the years 1963–2021. Fifty-six of the 59 estimates are for specific geographies within the U.S. or the U.S. as a whole, two estimates are for the “U.S. and Canada,” and one estimate is for the country of Chile. The findings from this metanalysis are discussed in this section while a more extensive summary of the database generated is provided as **Appendix A** to this report. Note that all the studies evaluated and listed in

the appendix are based on nominal prices. Nominal prices represent the dollar value of a product at the time it was produced and all prices in this report are stated in nominal dollars.

3.1 PED Estimates by Geography & Decade

The studies reporting PED estimates for water in the U.S. were conducted across various regions. **Figure 3** provides the spatial distribution of U.S. PEDs and their relative elasticities to each other. Red dots indicate less elastic demand, meaning consumers are less willing to change their consumption based on price, whereas blue dots indicate more elastic demand, meaning customers are relatively more inclined to change their consumption based on the price.

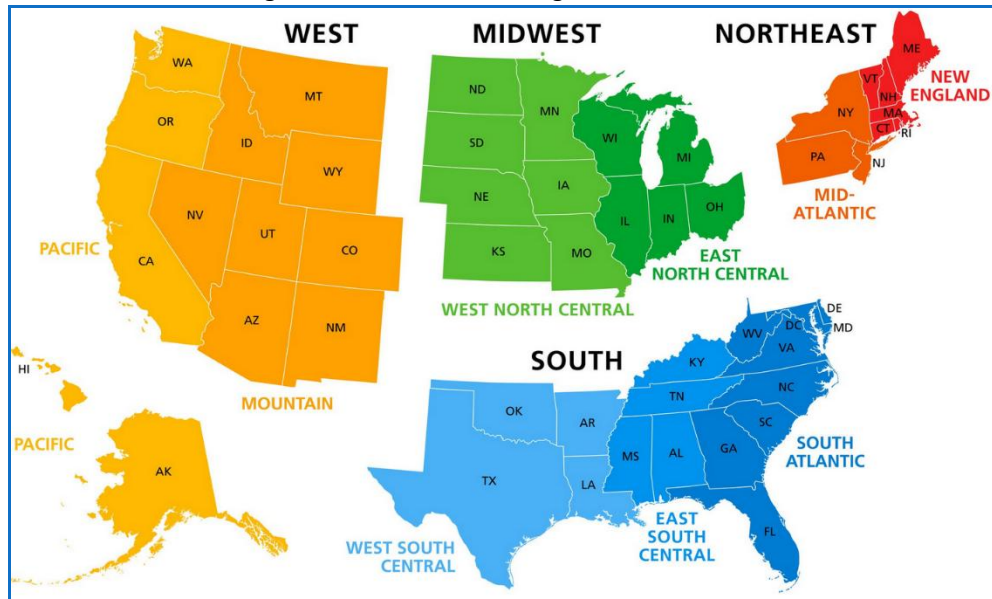
Figure 3: Map of Water Service PED Estimates Across the United States



There is no clearly discernable relationship between elasticity and geography in **Figure 3**, but at a high level, the Upper Midwest and Southern California appear to have the highest concentration of higher-elasticity estimates, while the South and Northern California appear to have higher concentrations of lower-elasticity estimates.

To gain a better understanding of the spatial and temporal differences in PED estimates, the data was broken out by U.S. Census Region and/or Division and by decade. There are four Census Regions, and each region is comprised of two or more Census Divisions (**Figure 4**). There were enough estimates to evaluate the Pacific and Mountain divisions of the West Region independently, while the Midwest and South regions are only presented in aggregate. The literature review did not uncover any PED estimates for the Northeast Census Region. **Table 1** provides an accounting of the studies from which the PED estimates were obtained by region or division and the range of years in which these estimates were developed. The final row of the table is an accounting of studies for the U.S. in aggregate, not a summation of those estimates already accounted for by Region or Division.

Figure 4. U.S. Census Regions & Divisions



Source: <https://cdn.mappr.co/wp-content/uploads/2021/12/us-regions-map-census.jpg>

Figure 5 plots all the PED estimates, categorized by Census region, over the full data period (1963–2021). Evaluating the PED estimates in aggregate reveals a wide range in values and no temporal consistency. Roughly speaking, U.S. PED estimates for water have generally fallen between -0.6 and -0.2 since the 1960s, however, as seen in **Figure 5**, there is significant variance from that middle range. Additionally, the figure does not reveal a clear trend in PED over time. The linear trendline depicted on the figure is regressed on the dataset in its entirety and depicts a slight decreasing trend in elasticity but the very low R-squared indicates that this basic regression explains less than 1% of the variance in the data.

The following sections evaluate PED at the regional and divisional levels. Note that the tables in these section report an *estimate* count for any division or region that is greater than or equal to the *study* count for that geography. There are two reasons for this, which are not mutually exclusive:

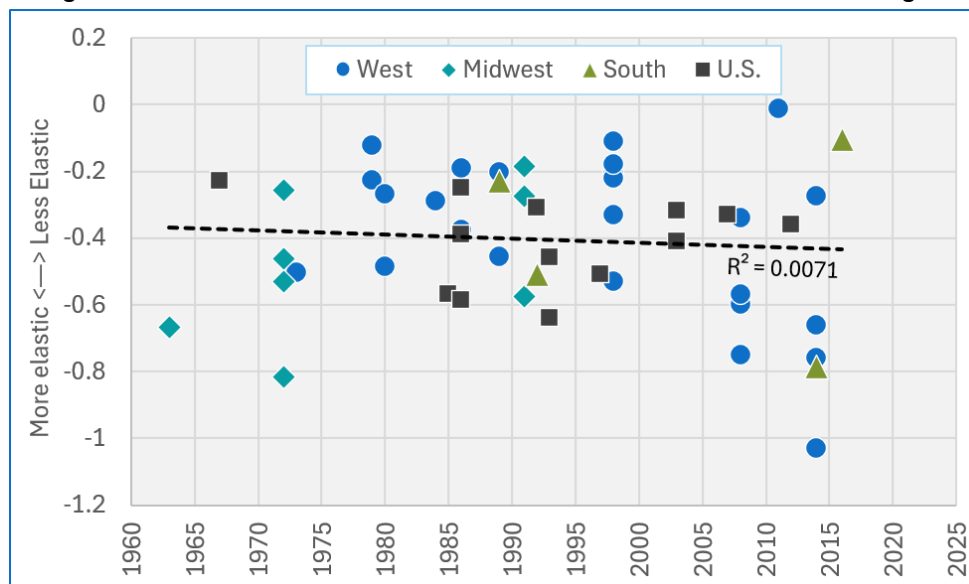
1. Many studies report multiple PED estimates for a given geography based on different evaluated characteristics (such as household income or level of water use). In such cases, all estimates are included in the summary statistics reported in the tables below. Of the 39 studies comprising the dataset 10 studies fall into this category.
2. Many of the PED estimates for a given geography are stated as a range. In such cases the high and low ends of the range are included as separate estimates and both contribute to the summary statistics reported in the tables below. Of the 59 estimates comprising the dataset 30 estimates fall into this category.

Table 1. PED Estimates Accounting by Census-Designated Geography

Census Region	Census Division	Study Count	Study Year Min	Study Year Max
West	Pacific	8	1989	2021
West	Mountain	12	1973	2018
West	All	19	1973	2021
South	All	6	1989	2016
Midwest	All	3	1963	1991
U.S.*	Country	10	1967	2012

*U.S. includes "US & Canada."

Figure 5: Estimated PED for Water Service Across Time & Census Region



3.1.1 Mountain Division of the West Census Region

Summary statistics for the Mountain Division are reported in **Table 2**. This region includes Colorado, so is of particular interest. The region has seen no studies conducted in the 2020s, but six studies conducted in the 2000s and 2010s provide 13 PED estimates. The most recent estimates for this division, those from the 2010s, show an average PED of -0.469 and a median of -0.300. Notably, the average falls outside of the 25th–75th percentiles (otherwise known as the *interquartile range* or IQR) of -0.370 to -0.200, meaning significant downward skewness in the distribution. The median is therefore considered a better indicator of central tendency for the dataset. Considering Mountain Division PED estimates for all study years, we see an average of -0.413 and a median of -0.340, though in this case the average falls within the IQR of -0.600 to -0.200, indicating a still-skewed, but more normal distribution. The median is quite consistent by decade, with three of the four falling between -0.318 and -0.300 and only the 2000s median of -0.585 being outside of this range.

Table 2. Mountain Census Division Price Elasticity Summary Statistics

Study Decade	Study Count	Estim. Count	10-year Average	More elas.	<< Interquartile Range >>			Less elas.
				Min	25pctl	Median	75pctl	Max
<1980	2	4	-0.340	-0.600	-0.458	-0.318	-0.200	-0.122
1980s	4	12	-0.344	-0.710	-0.486	-0.312	-0.169	-0.019
1990s	0	0	--	--	--	--	--	--
2000s	1	4	-0.565	-0.750	-0.638	-0.585	-0.513	-0.340
2010s	5	9	-0.469	-1.930	-0.370	-0.300	-0.200	-0.080
>2020	0	0	--	--	--	--	--	--
All Years	12	29	-0.413	-1.930	-0.600	-0.340	-0.200	-0.019

3.1.2 Pacific Division of the West Census Region

The Pacific Division (**Table 3**) includes five estimates from the 2010s and two from the 2020s. The interquartile range shifts from -0.310 to -0.150 in the 2010s to a slightly tighter range of -0.333 to -0.218 in the 2020s and the median shifts from -0.240 to -0.275; revealing more elastic PED estimates in the 2020s overall and with less variability. The tighter IQR and median of -0.275 from the 2020s is considered good data to support an estimate of western U.S. PED.

Table 3. Pacific Census Division Price Elasticity Summary Statistics

Study Decade	Study Count	Estim. Count	10-year Average	More elas.	<< Interquartile Range >>			Less elas.
				Min	25pctl	Median	75pctl	Max
<1980	0	0	--	--	--	--	--	--
1980s	1	1	-0.202	-0.202	-0.202	-0.202	-0.202	-0.202
1990s	2	7	-0.251	-0.530	-0.275	-0.210	-0.180	-0.110
2000s	0	0	--	--	--	--	--	--
2010s	4	5	-0.294	-0.760	-0.310	-0.240	-0.150	-0.012
2020+	1	2	-0.275	-0.390	-0.333	-0.275	-0.218	-0.160
All Years	8	15	-0.266	-0.760	-0.320	-0.210	-0.160	-0.012

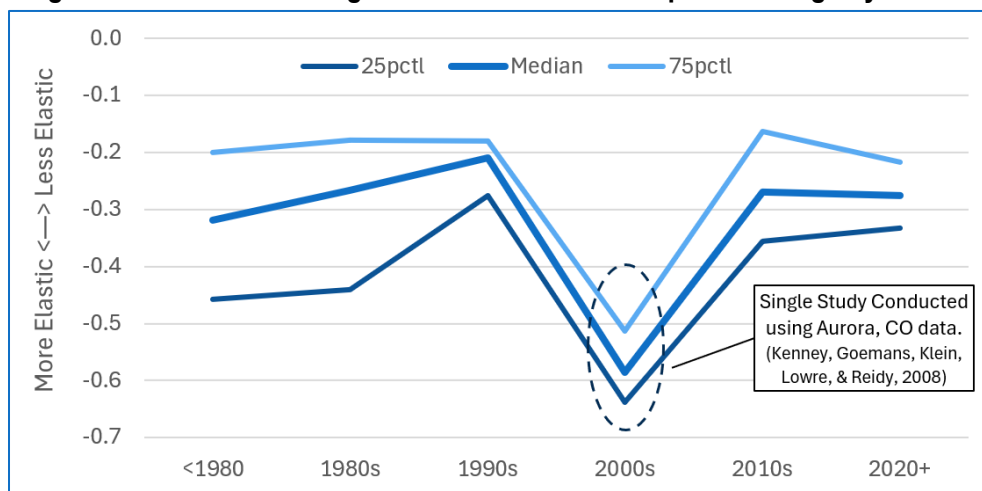
3.1.3 West Census Region in Aggregate

Reviewing the West Region in aggregate (**Table 4**) provides 14 PED estimates in the 2010s and two in the 2020s, with the 16 total estimates coming from nine different studies—a relatively robust dataset for studies conducted within the last 15 years. While the 10-year average increases substantially from the 2010s to the 2020s (from -0.407 to -0.275), the medians are nearly identical (-0.270 and -0.275), as are the IQRs, indicating a few very low observations skewing the 2020s average downward.

The median and IQR for West Region PED estimates by decade is graphed in **Figure 6**. The figure reveals that aside from the 2000s, the median has consistently fallen between -0.3 and -0.2 and the IQR has consistently ranged between -0.46 to -0.16. The seemingly anomalous observations from the 2000s are all reported in a single 2008 study using data collected from Aurora, CO (Kenney, Goemans, Klein, Lowre, & Reidy, 2008). It is unclear why these estimates are significantly lower (indicating stronger elasticity) than those reported by the other 18 West Region studies. Due to their inconsistency with the other studies, they are not considered to be typical of western U.S. PED. The dataset supports a PED estimate for western water of -0.16 to -0.46, centering around -0.33, which is generally characterized as strongly inelastic (see **Figure 1**).

Table 4. West Census Region PED Estimates Summary Statistics

Study Decade	Study Count	Estim. Count	10-year Average	More elas.	<< Interquartile Range >>			Less elas.
				Min	25pctl	Median	75pctl	Max
<1980	2	4	-0.340	-0.600	-0.458	-0.318	-0.200	-0.122
1980s	5	13	-0.333	-0.710	-0.440	-0.266	-0.179	-0.019
1990s	2	7	-0.251	-0.530	-0.275	-0.210	-0.180	-0.110
2000s	1	4	-0.565	-0.750	-0.638	-0.585	-0.513	-0.340
2010s	8	14	-0.407	-1.930	-0.355	-0.270	-0.163	-0.012
2020+	1	2	-0.275	-0.390	-0.333	-0.275	-0.218	-0.160
All Years	19	44	-0.363	-1.930	-0.463	-0.283	-0.174	-0.012

Figure 6. West Census Region PED Estimates Interquartile Range by Decade

3.1.4 PED Estimates for Colorado & the Rocky Mountain Region

Three studies specifically investigated PED in Colorado or the Rocky Mountain Region.² Foster & Beattie (1979) report a PED for the Rocky Mountains of -0.226, while Jones & Morris (1984) estimated a PED of -0.44 to -0.14 for Denver based on 326 observations in the metro area. Finally, Kenney, Goemans, Klein, Lowre, & Reidy (2008) report an overall average PED for Aurora, Colorado of -0.60. As mentioned above, this is considerably lower than the majority of estimates for the West, and also considerably lower than the PED estimates from the other two (albeit dated) Colorado studies. Based on the two older and consistent studies and the estimates reported for the Mountain Division and West in general, the PED for Colorado water users is expected to be consistent with that found for the West: a range of -0.16 to -0.46 centering around -0.33, which is characterized as strongly inelastic (see **Figure 1**).

² Two additional studies investigate PED estimates specific to Colorado but are focused on testing specific hypotheses and therefore their methods do not conform to the study results from some of the past work mentioned here.

3.1.5 Other Census Regions

For comparison, PED estimates by decade for the Midwest and South Census Regions are reported in **Table 5** and **Table 6**. Though the data is sparser, the statistics are generally consistent with those for the West. The most recent data for the Midwest (1990s) shows an average of -0.346 and a median of -0.248, while the most recent data for the South (2010s) shows an average of -0.355 and a median of -0.265. The extent of their combined interquartile ranges is -0.408 to -0.138, which is characterized as strongly inelastic.

Table 5. Midwest Census Region Price Elasticity Summary Statistics

Study Decade	Study Count	Estim. Count	10-year Average	More elas.	<< Interquartile Range >>			Less elas.
				Min	25pctl	Median	75pctl	Max
<1980	2	6	-0.567	-0.817	-0.674	-0.593	-0.480	-0.257
1980s	0	0	--	--	--	--	--	--
1990s	1	6	-0.346	-0.918	-0.394	-0.248	-0.143	-0.110
2000s	0	0	--	--	--	--	--	--
2010s	0	0	--	--	--	--	--	--
2020+	0	0	--	--	--	--	--	--
All Years	3	12	-0.456	-0.918	-0.662	-0.451	-0.251	-0.110

Table 6. South Census Region Price Elasticity Summary Statistics

Study Decade	Study Count	Estim. Count	10-year Average	More elas.	<< Interquartile Range >>			Less elas.
				Min	25pctl	Median	75pctl	Max
<1980	0	0	--	--	--	--	--	--
1980s	1	2	-0.231	-0.460	-0.346	-0.231	-0.117	-0.002
1990s	1	2	-0.510	-0.700	-0.605	-0.510	-0.415	-0.320
2000s	0	0	--	--	--	--	--	--
2010s	4	8	-0.355	-1.140	-0.408	-0.265	-0.138	-0.070
2020+	0	0	--	--	--	--	--	--
All Years	6	12	-0.360	-1.140	-0.438	-0.310	-0.138	-0.002

3.1.6 PED Over Time & Indications for Future Movements in Price Sensitivity

The aggregate dataset graphed in **Figure 5** and the West median in **Figure 6** both track slightly downward over time, but the high level of variance in the data preclude a confident statement that customers are becoming more price elastic over time. Rather, the consistent central tendency of the aggregate dataset between -0.6 and -0.2 is reasonable evidence that price sensitivity hasn't appreciably changed in the last 60 years. Likewise, the relative steadiness of the IQR and median seen in the West subset (omitting the 2008 study) reveals that PED in the West has been consistently estimated between -0.46 and -0.16 for the last 60 years. Based on this analysis, WestWater expects price sensitivity to remain in this PED range for the foreseeable future.

3.2 Variables Identified as Impacting Price Sensitivity & Consumption

This section discusses in depth a selection of the variables identified in the literature as having the most consistent and pronounced effect on PED for water service and water consumption in general.

3.2.1 Price Basis Selection: Marginal versus Average Price

A persistent topic across the literature is the selection of a price basis for measuring PED: whether the price used should be the *marginal price* or the *average price*. Both represent a unit price for water service (i.e., dollars per unit of volume), but generally they will have a different numerator and denominator in their calculation.

- **Marginal Price** is the price of the last unit consumed. When considering an IBR structure, this would be the volumetric rate for the last unit consumed in a month, i.e., the most expensive unit consumed.
- **Average price** is generally calculated as the total water bill (inclusive of any base charge and other fixed fees) divided by the total volume consumed in that month.

Theoretically the marginal price of the last unit purchased is the correct price for estimating demand. However, there is a loose consensus in the literature that users likely don't recognize the marginal price through the current price paid but rather react to the average price paid in the latest water bill received. Most PED modeling therefore lags the price variable in the elasticity calculation. The logic for using previous billing period price is that water users would see their previous month billing period water bill and react to that in the current period. For example, the average price of water in a June water bill that is received in early July may represent the price that influences water use in July.

Several studies have focused on this question as a primary research question and many more have included this topic as a secondary research question in their work. Most of the studies reviewed, and most of the PED estimates comprising the database, use an average price basis. Wichman (2014) found that residential customers in North Carolina were most responsive to a change in average price, or a change in their total bill at the end of the billing cycle. In a subsequent study Wichman, Taylor, & von Haefen (2016) provide empirical evidence that households respond to average price, not marginal price. They determined that the modest size of most water bills relative to income and information costs may lead households to be rationally unaware of their marginal water price and to simplify decision-making use their most recent monthly water bill as a proxy for current price. Finally, Ito (2014) provides empirical evidence that average price better predicts household behavior than does marginal price in water and energy demand applications.

One notable study found strong evidence for marginal price as a behavioral driver. Nataraj & Hanemann (2011) exploited a natural experiment in Santa Cruz, California where a third pricing block was introduced and found that customers high-use households decreased water used by 12% in response to a doubling of the marginal price.

Some work has suggested that the use of average price may yield an upward bias in elasticity estimates because of the presence of fixed charges in the calculation (Taylor, McKean, & Young, 2004). However, most researchers are of the thought that the exclusion of fixed charges from the price variable (i.e., use of marginal price) misestimates the perceived budget constraints of the consumers and therefore support the use of average price (Ito, 2014) (Puri & Maas, 2020).

3.2.2 IBR Pricing Structures

- **IBRs lead to decreased consumption independent of an actual price effect** – A number of studies have found that the existence (or rather customer awareness) of rate structures can lead to customer behavioral changes even in the absence of an impact to the overall water bill. Kenney, Goemans, Klein, Lowre, & Reidy (2008) found that when households were faced with an IBR pricing structure they consumed 5% less than they would have under a uniform rate structure, indicating that rate structures themselves can be valuable in promoting conservation. They suggest that a rationale for this effect: “...although households do not often have detailed knowledge of the rate structure, they are generally aware that excessive consumption will result in excess costs. This awareness causes them to consume less in an attempt to limit this possibility.”

Likewise, Piper (2014) found that the IBRs used by a water supplier has an impact on water use that is independent of the price effect, indicating that “...a neutral price change in rate structure, where tiers are implemented but average cost remains the same, could potentially lead to a reduction in water use...the use of a tiered rate system can help accomplish water use reduction goals while avoiding...an increase in water costs to households.”

- **IBRs can have a conservation impact greater than that of price itself** – Olmstead, Hanemann, & Stavins (2003) revealed a very strong effect from the implementation of IBRs and write that “The impact of the price structure on demand appears to be greater than the impact of marginal price itself.”

3.2.3 Billing Complexity

- **Complex billing structures can lead to misaligned reductions in consumption** – Related to the effect of IBRs stated above, and perhaps an explanation for their over-pronounced conservation effect, Brent & Ward (2019) show that the complex nonlinear nature of such price structures led customers to overestimate the costs of using water. In aggregate, their study participants increased water use after taking part in the study, potentially due to learning that water is cheaper than they previously thought. The increased consumption was concentrated among low users who were more likely to over-estimate the costs of using water.

3.2.4 Bundled Billing & Billing Frequency

It is not uncommon for municipalities to bundle their water and sewer service bills. In such cases the customer’s attention is first drawn to the single, total, amount due. Water users likely feel a lesser sense of control over the sewer proportion of this combined bill but may feel some control as to the water consumption aspect. If customers react to average price—as indicated by a consensus of the literature (see Section 3.2.1)—the combined bill is now effectively representative of the average price they experience. The study highlighted below supports this total price principle.

- **Sewer prices are part of the combined price signal** – A Florida study examining 16 water utilities found that sewer prices are part of the price signal sent to customers, in combination with water prices. In the few cases where customers did not receive sewer service (on-site septic systems), the price signal is solely the water price. Inspection of these customers show that their actual water use falls along the statistically derived combined water/sewer price demand curves (Whitcomb, 2005).

This suggests customers respond to the *total* price signal rather than distinguishing between water and sewer components. Recall that the previous section discussed billing complexity, and a bundled bill is inherently more complex. Collectively, the higher total price and increased complexity might have an especially pronounced effect on consumption.

Relatedly, billing frequency has an apparent effect on consumption. All else equal, a longer billing cycle generates higher bill totals.

- **Longer billing cycles lead to decreased consumption** – Wichman (2017) finds that both frequency and clarity affect responsiveness, stating that “Frequent information nudges consumers closer to the neoclassical ideal of decision-making under perfect information.” The study revealed that Spaniards who were shifted from a bi-monthly (i.e., billed every other month) to a monthly billing period used more water after being shifted to the higher-frequency billing cycle.

3.2.5 Lot Size, Irrigation Systems, & Water Use Level

- **High-consumption users have shown increased price sensitivity** – The work of Chovar Vera, Vásquez-Lavín, & Oliva (2024) shows that high-consumption groups are more affected by the switch from uniform rates to IBRs. Upon implementation of the block rate, consumers in the low consumption group increased their consumption by 13% from non-summer to summer, while consumers in the high consumption group only increased their consumption by 8.7%. Kenney, Goemans, Klein, Lowre, & Reidy (2008) found that in times of no water use restrictions, high users are more sensitive to price than the average user (PED of -0.75 versus -0.60) and much more price sensitive than low users (PED of -0.34).
- **Price sensitivity has been found to increase with lot size** – Renwick & Archibald (1998), who studied price elasticity in Southern California, state that in the face of increasing prices: “In both communities [Santa Barbara and Goleta, CA] water use fell most among households with larger landscaped areas (low density households).” This is consistent with the findings regarding water use level, as lot size has generally been found to be positively correlated with consumption.
- **Users with permanent irrigation systems show decreased price sensitivity** – Wichman, Taylor, & von Haefen (2016) find that high-use households in North Carolina are more than five times as likely to be irrigators, and that these households are less price responsive. On the other hand, those high-use households without an irrigation system are shown to be very price sensitive. This result suggests that the presence of in-ground irrigation system leads users to be less sensitive to water prices, which could be driven in part by the investment already made to irrigate and a likely positive correlation between irrigators and higher income households (see Section 3.2.6 regarding household income).

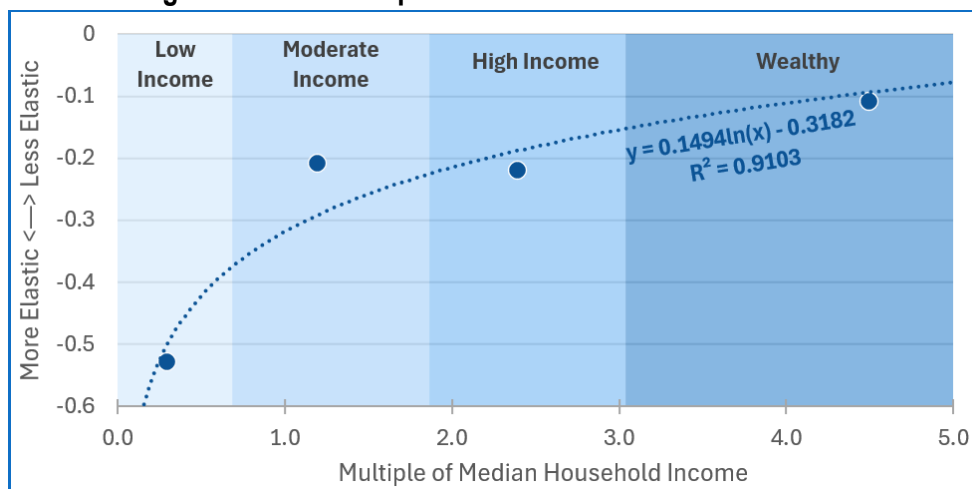
3.2.6 Household Income & Structural Economic Effects

The research consistently finds that lower-income households are more responsive to water price changes than higher-income households. Wichman, Taylor, & Haefen (2016) conducted one of the most detailed studies on this topic, finding strong evidence that price sensitivity correlates with income and that as household incomes rise their elasticities decline at a decreasing rate. The study concludes that:

- Lower-income households are the most sensitive to changes in price because water bills comprise a larger portion of their monthly expenditures than others in the sample.
- High-income households are significantly less responsive to price, and households with in-ground irrigation systems are essentially unresponsive to the price changes that occurred during the sample period.

Renwick & Archibald (1998) found even more dramatic differences: low-income households are five times more responsive to water price changes than high-income households. The study results imply that a 10% increase in water prices would result in a 5.3% reduction in demand for low-income households, a 2.2% reduction for moderate- to high-income households, and a 1.1% reduction for wealthy households. The PED estimates are plotted against household income (as a multiple of the median household) in **Figure 7**, below.³ The figure shows that price sensitivity decreases as income rises, but at a decreasing rate—fitting well to a logarithmic curve (R-squared of 0.91). This is an intuitive result, as one would expect a limit to inelasticity somewhere below zero (i.e., some level of price sensitivity remains regardless of wealth level). This is consistent with the findings of Wichman, Taylor, & Haefen (2016) stated above, that elasticities decline at a decreasing rate as incomes rise.

Figure 7. Relationship between Household Income & PED



Source: Extrapolation, conversion, and plotting of results reported by Renwick & Archibald (1998).

3.2.6.1 Recession Effects

Piper (2014) conducted a study using data provided by 11 water agencies in Nevada and California for the years 2000–2011, which is fully inclusive of the Great Recession. Piper reported that “Many of the water supply agencies participating in the study indicated that they observed reduced water use during the recessionary period from late 2007 to 2011.” He conducted additional aggregate regressions to evaluate the possible effect of the recession on residential water use. The modeling results revealed a structural difference in demand between the 2000–2006 pre-recessionary period and the 2007–2011 recessionary period. Pre-recession PED estimates ranged

³ The study was conducted using data from Santa Barbara and Goleta, California. A categorical variable for household income was tested and found to be statistically significant at the 95% confidence level or greater. The income brackets, reported in 1990 dollars, were converted to a multiple of 1990 median household income for Santa Barbara and plotted in **Figure 7**.

from -0.26 to -0.23 while estimates during the recessionary period ranged from -0.30 to -0.26, indicating that PED was approximately 14% greater (i.e., less elastic) than when there was no recession. This is consistent with the income effects noted above: essentially, as everyone felt poorer, they became more price sensitive.

3.2.6.2 Equity & Affordability Considerations

As laid out above, price sensitivity increases as household income decreases. There is evidence that low-income households are bumping up against a water service affordability threshold in some U.S. communities. One in 10 US households have essential water and sewer expenditures exceeding 4.5% of their income and those in the lowest decile of income spend on average 6.8% of their income on essential water and sewer service (Cardoso & Wichman, 2022). These expenditure figures meet or exceed the U.S. Environmental Protection Agency's (EPA) affordability benchmark of 4.5% of median household income for combined water and sewer expenses.⁴

The burden of pricing policies falls disproportionately on low-income households and fails to reduce consumption among households who generally are large consumers of water (Wichman, Taylor, & von Haefen, 2016). This creates a policy dilemma: price increases are effective at reducing consumption among those who can least afford it, while having minimal effect on high-use, high-income households. In other words, low-income households are price sensitive because they may already be consuming near essential levels, and high-income households are price insensitive because water costs are trivial relative to their income.

While low-income families may not respond to price because they are using water only for basic needs, high-income families fail to respond to the price signal once it is not strong enough to reduce their consumption (Matos, Teixeira, Bento, Varajão, & Bentes, 2014). This body of research has significant implications for utility rate design: increasing block rates and conservation pricing may achieve efficiency goals but raise serious equity concerns, as they burden low-income households while failing to curtail discretionary use by high-income consumers.

One can therefore reason that water providers serving low-income communities are fundamentally limited in their ability to use price increases as a tool for cost recovery compared to providers serving wealthier communities. Patterson & Doyle (2023) conclude as much and state that "Increasing income disparities have created challenges for utilities to generate sufficient revenues while maintaining affordable services." Their study, evaluating data from 787 communities across the U.S., found that communities with more than 30% of households below 200% of the federal poverty level were particularly sensitive to small changes in rate structures.

4 Demonstration of PED Effect on Cost Recovery

The findings from the literature indicate that residential water demand in the West is strongly price inelastic. However, this does not preclude a potentially significant impact on western water utilities' revenue generation capabilities. This section summarizes the results of a detailed model developed by WestWater to quantify the effects of a PED range characterized as moderately-to-strongly inelastic on a utility's ability to collect sufficient revenues to achieve cost recovery.

⁴ The EPA established a 4% of median household income benchmark for affordability; 2% for wastewater treatment and 2% for drinking water supplies. This benchmark was later amended to 4.5% to allow 2.5% for drinking water expenses.

The model is developed with three PEDs: -0.17, -0.33, and -0.50, which roughly align with the interquartile range and median seen in the West in general over the past 20 years (Section 3.1). The model is applied to a hypothetical utility and forecasted over a 10-year period under two scenarios.

- **Scenario 1** represents a utility naïve of its customers' price sensitivity. The utility increases average water charges at an annual rate matching the rate at which their cost of service (COS) is increasing. This scenario quantifies the decrease in annual demand due to the price increases and the revenue shortfalls due to ignoring PED.
- **Scenario 2** represents a utility that is aware of its customers' price sensitivity and increases water charges at a sufficient annual rate to satisfy full cost recovery. This scenario quantifies the rate of unit price increase and related decrease in demand and demonstrates how this would be reflected in the volumetric rates and monthly base charge.

4.1 Foundational Assumptions for Both Scenarios

- A 10-year period of analysis (POA) is modeled (2025–2034). 2025 serves as the base year.
- The model assumes 20,000 accounts in 2025, or a city of approximately 60,000 in population. The city population is assumed to grow at an annual rate of 2%, which is reflected by annual account growth of 2%.
- Utility cost of service (COS) is set to \$12.0 million in 2025 and is assumed to escalate at a compound annual growth rate (CAGR) of 6% to a total of \$20.3 million in 2034. COS is considered to include all operational costs, annualized capital investments and replacements, debt service, and any other expenditures.
- In 2025 the utility is considered revenue neutral, i.e., total COS is equal to total revenues collected. Therefore, total revenues in 2025 are \$12.0 million.
- The average 2025 account demands of 8.0 kgal/month and average unit price is \$6.25/kgal.
- To achieve full cost recovery through the 10-year POA, total revenues must increase at 6% annually. This is partially offset by the growth in accounts (2% annually). Therefore, a more suitable metric is the revenue per account that must be collected. This revenue begins at \$600/account in 2025 and escalates at 3.92% annually for a target of \$848/account in 2034.⁵
- The model assumes that customers react to average price, that is, the PEDs are based on the total monthly bill, not the marginal price change between tiers. For example, at a PED of -0.17, when the average monthly bill *increases* by 3.92%, average customer demand *decreases* by 0.67% (calculated as $3.92\% \times -0.17$).
- The model does not incorporate any minimum threshold for necessary household water use, meaning that the model would theoretically allow demand to approach zero kgal.

Based on the stated assumptions, **Table 7** summarizes the average account in the first model year (2025) and **Table 8** reports the revenue requirements for cost recovery.

⁵ 3.92% is the net growth rate required, i.e., the change in revenue per account to be collected is calculated as $((1+6\%)/(1+2\%))-1$.

Table 7. Average Account & Total Revenue, 2025 (Base Yr.)

2025 Water Rates		
Volumetric Rates		
<i>Tier</i>	<i>kgal</i>	<i>\$/kgal</i>
1	0–5.0	\$3.45
2	5.0–10.0	\$4.25
3	>10.0	\$5.50
Base Charge (\$/Mo.)		\$20.00
2025 Average Account		
Demand (kgal/Mo.)		8.00
Avg. Bill (\$/Mo.)		\$50.00
Avg. Unit Price (\$/kgal)		\$6.25
Annual Paid (\$/Yr)		\$600.00
2025 Utility Totals		
Total Accounts		20,000
Avg. Revenue/Account		\$600.00
Total Revenue (\$M)		\$12.00

Table 8. Revenue Requirements for Cost Recovery

Year	Accounts	Total COS = Tot. RevReq (\$M)	COS/Acct = RevReq/Acct
<i>CAGR→</i>	<i>2.00%</i>	<i>6.00%</i>	<i>3.92%</i>
2025	20,000	\$12.00	\$600
2026	20,400	\$12.72	\$624
2027	20,808	\$13.48	\$648
2028	21,224	\$14.29	\$673
2029	21,649	\$15.15	\$700
2030	22,082	\$16.06	\$727
2031	22,523	\$17.02	\$756
2032	22,974	\$18.04	\$785
2033	23,433	\$19.13	\$816
2034	23,902	\$20.27	\$848

4.2 Scenario 1: Rate Increases Set to Match Cost of Service Increases

Under Scenario 1 the utility is naïve to customers' price sensitivity and increases the average unit price of water service at a CAGR of 3.92%—the per-account revenue increase required to achieve full cost recovery through 2034. **Figure 8** displays the revenue and demand effect for each of the modeled PEDs. Detailed results for model years 2, 6, and 10 for the three modeled PEDs are reported in **Table 9**. Findings are interpreted and summarized below.

- **Price Elasticity Typical of the West (PED = -0.33)** – for every 1% increase in price there is a 0.33% decrease in demand. Rather than achieving the targeted total revenue growth of 6.0% CAGR, this PED renders revenue growth at 4.63% CAGR.
 - As unit prices increase at 3.92%, demand per account decreases at -1.29%.
 - Per-account revenue grows at 2.58%; 1.34 percentage points less than the 3.92% required to offset costs.
 - Demand per account drops to just over 7.1 kgal/month by 2034.
 - Total annual revenue shortfall in 2034 is \$2.24 million.
 - Cumulative revenue shortfall through 2034 is nearly \$10 million.

Figure 8. Scenario 1: Monthly Demand & Annual Revenue Shortfall by PED

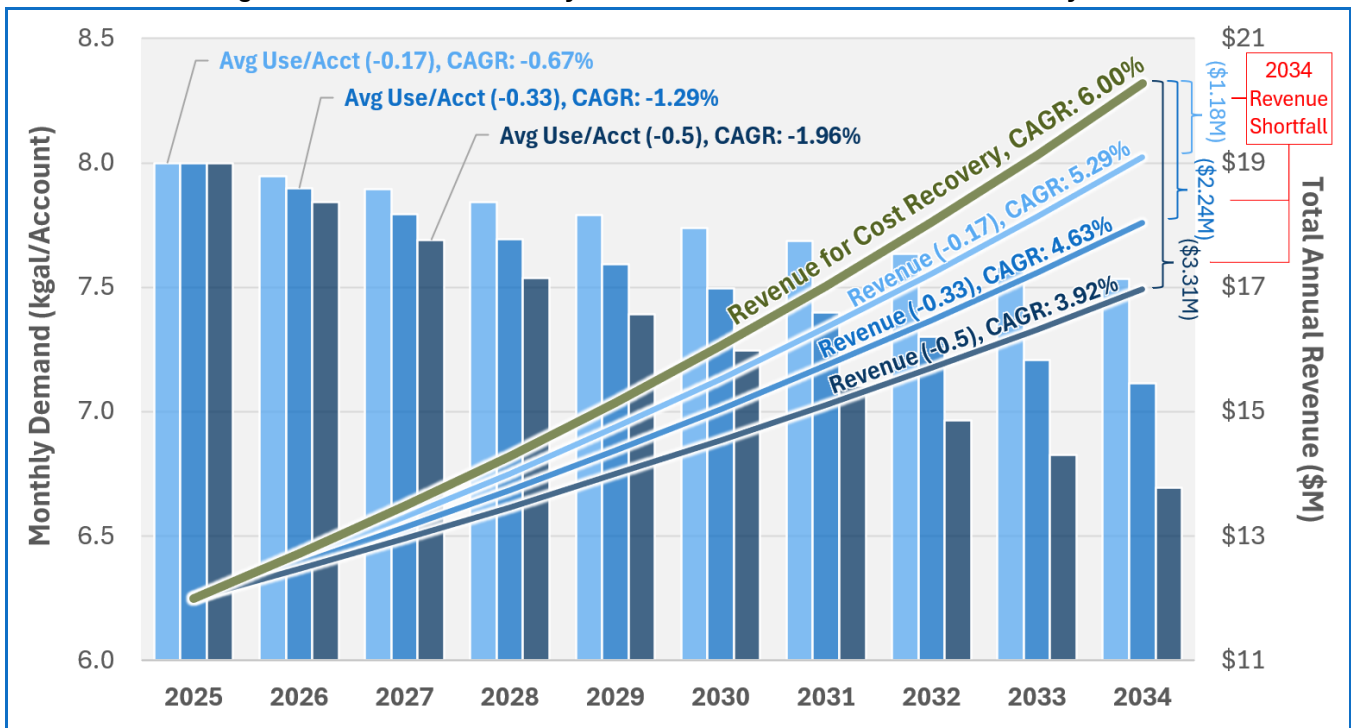


Figure Notes: All revenue curves are estimated using the same unit prices: a 6.00% CAGR applied to the 2025 price of \$6.25/kgal.

Table 9. Scenario 1 Modeling Results by PED for Analysis Years 2, 6, & 10

PED CAGR _s	Accounts by Year (Acct)	Rev. Requirement		Avg. Unit Price (\$/kgal)	Demand per Acct (kgal/mo)	Rev. Collected		Cost Recovery (%)	Surplus (Deficit)	
		Total (\$M)	per Acct (\$)			per Acct (\$)	Total (\$M)		by Yr (\$M)	Cumul. (\$M)
-0.17	2.00%	6.00%	3.92%	3.92%	-0.67%	3.23%	5.29%	-0.67%	39.04%	67.09%
	2026	20,400	\$12.72	\$624	\$6.50	7.95	\$619	\$12.64	99.3%	(\$0.08)
	2030	22,082	\$16.06	\$727	\$7.58	7.74	\$703	\$15.53	96.7%	(\$0.53)
	2034	23,902	\$20.27	\$848	\$8.84	7.53	\$799	\$19.09	94.2%	(\$1.18)
-0.33	2.00%	6.00%	3.92%	3.92%	-1.29%	2.58%	4.63%	-1.29%	38.61%	66.72%
	2026	20,400	\$12.72	\$624	\$6.50	7.90	\$615	\$12.56	98.7%	(\$0.16)
	2030	22,082	\$16.06	\$727	\$7.58	7.50	\$681	\$15.05	93.7%	(\$1.01)
	2034	23,902	\$20.27	\$848	\$8.84	7.12	\$754	\$18.03	88.9%	(\$2.24)
-0.50	2.00%	6.00%	3.92%	3.92%	-1.96%	1.88%	3.92%	-1.96%	38.15%	66.34%
	2026	20,400	\$12.72	\$624	\$6.50	7.84	\$611	\$12.47	98.0%	(\$0.25)
	2030	22,082	\$16.06	\$727	\$7.58	7.25	\$659	\$14.55	90.6%	(\$1.51)
	2034	23,902	\$20.27	\$848	\$8.84	6.69	\$710	\$16.96	83.7%	(\$3.31)

The picture improves when PED is assumed at -0.17. Water demand decreases at a rate of -0.67% and total annual revenues increase at a 5.29% CAGR. However, this is still short of the 6% needed and the cumulative revenue shortfall across the POA is \$5.2 million.

When assuming the most elastic PED of -0.50, the results are especially bad for the utility. As the average price of water service increases by 3.92%, water demand decreases at a rate of -1.96%. By 2034 the average unit price of water has risen to \$8.84/kgal but demand has dropped to 6.7 kgal/month and total annual revenue has only grown at 3.92%—far short of the 6% required for cost recovery. The annual revenue shortfall in 2034 is \$3.3 million and the cumulative revenue shortfall over the POA is nearly \$15 million.

4.3 Scenario 2: Achieving Full Cost Recovery by Accommodating PED

Scenario 2 assumes that the utility has a reasonable estimate of the PED for the customer base and adjusts prices accordingly to ensure sufficient revenues to achieve full cost recovery. The results for this scenario are reported in **Table 10** and graphed in **Figure 9**.

At a PED of -0.33, which the literature supports as typical for the West, the utility must increase the average unit price of water at 6.03% CAGR. Though this leads to a -1.99% annual rate of decrease in water demand, on balance sufficient revenue is accrued to meet the per-account annual revenue growth target of 3.92% and satisfy full cost recovery.

At the less elastic **PED of -0.17** the average unit price of water service is increased at a 4.77% CAGR to achieve the per-account revenue growth target of 3.92%.

At a PED of -0.5—the most elastic PED modeled—the average unit price of water service is increased at 8.58%, which leads to a decrease in demand by -4.29% and an average per-account monthly demand of 5.4 kgal by 2034.

Figure 9. Scenario 2: Unit Price Requirement to Match COS & Resulting Demand Effects by PED

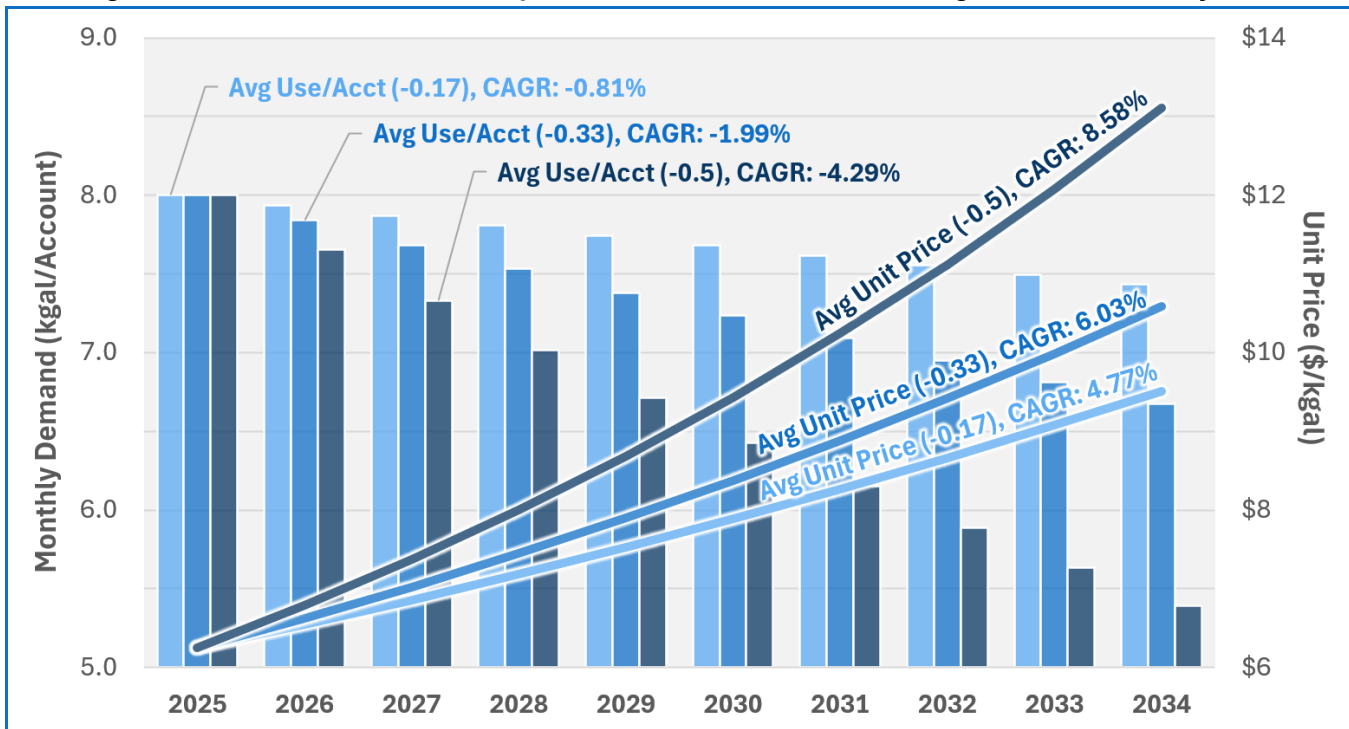


Table 10. Scenario 2 Modeling Results by PED for Analysis Years 2, 6, & 10

PED CAGR _s	Accounts by Year (Acct)	Rev. Requirement		Avg. Unit Price (\$/kgal)	Demand per Acct (kgal/mo)	Rev. Collected		Cost Recovery (%)	Surplus (Deficit)	
		Total (\$M)	per Acct (\$)			per Acct (\$)	Total (\$M)		by Yr (\$M)	Cumul. (\$M)
-0.17	2.00%	6.00%	3.92%	4.77%	-0.81%	3.92%	6.00%	0.00%	0.00%	0.00%
2026	20,400	\$12.72	\$624	\$6.55	7.94	\$624	\$12.72	100.0%	\$0.00	\$0.00
2030	22,082	\$16.06	\$727	\$7.89	7.68	\$727	\$16.06	100.0%	\$0.00	\$0.00
2034	23,902	\$20.27	\$848	\$9.51	7.43	\$848	\$20.27	100.0%	\$0.00	\$0.00
-0.33	2.00%	6.00%	3.92%	6.03%	-1.99%	3.92%	6.00%	0.00%	0.00%	0.00%
2026	20,400	\$12.72	\$624	\$6.63	7.84	\$624	\$12.72	100.0%	\$0.00	\$0.00
2030	22,082	\$16.06	\$727	\$8.38	7.23	\$727	\$16.06	100.0%	\$0.00	\$0.00
2034	23,902	\$20.27	\$848	\$10.59	6.68	\$848	\$20.27	100.0%	\$0.00	\$0.00
-0.50	2.00%	6.00%	3.92%	8.58%	-4.29%	3.92%	6.00%	0.00%	0.00%	0.00%
2026	20,400	\$12.72	\$624	\$6.79	7.66	\$624	\$12.72	100.0%	\$0.00	\$0.00
2030	22,082	\$16.06	\$727	\$9.43	6.43	\$727	\$16.06	100.0%	\$0.00	\$0.00
2034	23,902	\$20.27	\$848	\$13.11	5.39	\$848	\$20.27	100.0%	\$0.00	\$0.00

Table 11 shows the monthly base charge and volumetric rates under Scenario 2, were they to be maintained at consistent proportional steps and escalated at the same rate across the POA, a common practice for utilities. Specifically, the volumetric rate increase between tier 1 and tier 2 is held at 23% across all PEDs and all years and the increase between tier 2 and tier 3 is held at 29%.

Note that the CAGR for each of the rate components is consistent within any PED, but does not match the CAGR for the average unit price for the same PED reported in **Table 10**. This is because the rates shown in **Table 11** are back-calculated to achieve the required average unit price, and the components contribute to the average unit price in different proportions, which also change by year as demand decreases. This is demonstrated explicitly in **Table 12** for a PED of -0.33. Observe that the volumetric rates and base charge all grow at 5.31% annually. Tier 1 consumption is 5.00 kgal/month throughout the POA (as demand never drops below that threshold), while tier 2 consumption decreases from 3.0 kgal/month in 2025 to 1.68 kgal/month in 2034. Like tier 1, the base charge is monthly constant and increases at 5.31% annually. Building up the average monthly payment, we see that tier 1 and base charge payments grow at a 5.31% CAGR while tier 2 payments decrease at a -1.29% CAGR. The net effect of these rates is a total monthly payment that increases at 3.92% CAGR—the growth rate required to achieve full cost recovery. These absolute changes by component, and the change relative to one another, are illustrated graphically in **Figure 10**.

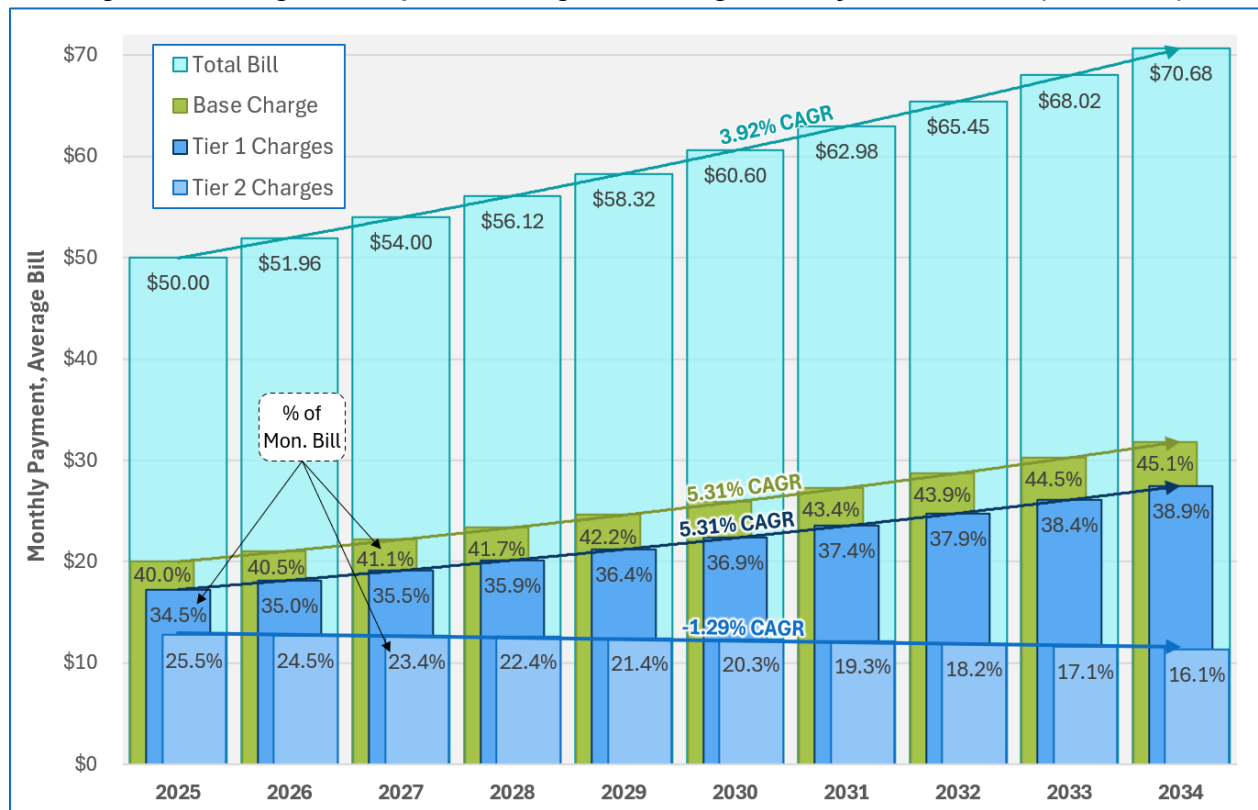
Table 11. Scenario 2 Component Rates by PED assuming Fixed Proportional Tiers & CAGR

Year	PED = -0.17				PED = -0.33				PED = -0.50			
	Volumetric Rates (\$/kgal)			Base Charge (\$/mo)	Volumetric Rates (\$/kgal)			Base Charge (\$/mo)	Volumetric Rates (\$/kgal)			Base Charge (\$/mo)
	→ 23% → → 29% →				→ 23% → → 29% →				→ 23% → → 29% →			
	Tier 1	Tier 2	Tier 3		Tier 1	Tier 2	Tier 3		Tier 1	Tier 2	Tier 3	
CAGR→	4.49%	4.49%	4.49%	4.49%	5.31%	5.31%	5.31%	5.31%	6.86%	6.86%	6.86%	6.86%
2026	\$3.61	\$4.44	\$5.75	\$20.90	\$3.63	\$4.48	\$5.79	\$21.07	\$3.69	\$4.55	\$5.89	\$21.41
2030	\$4.30	\$5.29	\$6.85	\$24.92	\$4.47	\$5.51	\$7.13	\$25.93	\$4.83	\$5.95	\$7.70	\$27.99
2034	\$5.12	\$6.31	\$8.17	\$29.70	\$5.50	\$6.77	\$8.76	\$31.86	\$6.27	\$7.72	\$9.99	\$36.33

Table 12. Buildup of Average Monthly Bill Achieving Full Cost Recovery (PED: -0.33)

PED	Rates & Monthly Base Charge				Monthly Consumption (kgal)				Monthly Payment (\$)				
-0.33	Volumetric Rates (\$/kgal)			Base Charge	Total	Consumption per Tier			Vol. Rate x Consumption			Base Charge	Total Pmt
Year↓	Tier 1	Tier 2	Tier 3		Cons.	Tier 1	Tier 2	Tier 3	Tier 1	Tier 2	Tier 3		
CAGR→	5.31%	5.31%	5.31%	5.31%	-1.99%	0.00%	-6.27%	--	5.31%	-1.29%	--	5.31%	3.92%
2025	\$3.45	\$4.25	\$5.50	\$20.00	8.00	5.00	3.00	0.00	\$17.25	\$12.75	\$0.00	\$20.00	\$50.00
2026	\$3.63	\$4.48	\$5.79	\$21.07	7.84	5.00	2.84	0.00	\$18.17	\$12.72	\$0.00	\$21.07	\$51.96
2027	\$3.83	\$4.72	\$6.10	\$22.19	7.68	5.00	2.68	0.00	\$19.14	\$12.66	\$0.00	\$22.19	\$54.00
2028	\$4.03	\$4.97	\$6.43	\$23.38	7.53	5.00	2.53	0.00	\$20.16	\$12.58	\$0.00	\$23.38	\$56.12
2029	\$4.25	\$5.23	\$6.77	\$24.62	7.38	5.00	2.38	0.00	\$21.24	\$12.46	\$0.00	\$24.62	\$58.32
2030	\$4.47	\$5.51	\$7.13	\$25.93	7.23	5.00	2.23	0.00	\$22.36	\$12.31	\$0.00	\$25.93	\$60.60
2031	\$4.71	\$5.80	\$7.51	\$27.30	7.09	5.00	2.09	0.00	\$23.55	\$12.13	\$0.00	\$27.30	\$62.98
2032	\$4.96	\$6.11	\$7.91	\$28.75	6.95	5.00	1.95	0.00	\$24.79	\$11.91	\$0.00	\$28.75	\$65.45
2033	\$5.22	\$6.43	\$8.32	\$30.26	6.81	5.00	1.81	0.00	\$26.10	\$11.65	\$0.00	\$30.26	\$68.02
2034	\$5.50	\$6.77	\$8.76	\$31.86	6.68	5.00	1.68	0.00	\$27.48	\$11.34	\$0.00	\$31.86	\$70.68

Figure 10. Change in Component Charges of Average Monthly Bill over Time (PED: -0.33)



5 Strategies for Bolstering Cost Recovery

This section reports out a collection of strategies identified in the literature and through a web-based search for measures implemented by water providers that have achieved an improvement in cost recovery. The sources highlight several integrated strategies involving innovative rate designs, advanced asset management, and resource recovery. A helpful way to view this shift is that modern water management is moving from a "volume-based" business—where profit depends on selling more water—to a "service-based" business, where the goal is to manage a finite resource as efficiently as possible while maintaining the health of the physical system.

WestWater is aware that the City has already implemented a number of the items described (notably a water budget rate structure), so an effort has been made to complement the conceptual descriptions with implementation details and results wherever examples were found to provide comparative insight.

5.1 Rate Structure Modification or Redesign

Utilities have been experimenting with new pricing models aimed at ensuring full cost recovery while simultaneously encouraging efficiency (Dinckinson, Chesnutt, & Chery, 2015). Described below are some of the alternative rate structures being implemented in an attempt to achieve this goal.

- **Shifting to higher fixed charges** – Most water providers collect most or all revenues on a volumetric basis which can fail to ensure sufficient revenues are collected, especially if much of a utility's costs are indifferent to the level of consumption. For example, in Massachusetts, suppliers' short-term fixed costs often represent 90% or more of total costs, which stay the same regardless of the amount of water sold.⁶ Some utilities are rebalancing this by increasing the fixed portion of bills.
 - In their 2017–21 rate structure, the San Juan Water District (California) kept their volumetric rates constant while increasing the base charge so that a larger portion of customer payments would not fluctuate with use—this was a direct response to the conservation conundrum.⁷
 - WSSC Water, a water provider in Maryland, recently developed a rate structure that includes a fixed fee to pay for customer service and meter maintenance, providing a critical, reliable revenue stream that doesn't fluctuate with usage.⁸
 - The Salt Lake City Department of Public Utilities implemented base charge increases in 2024 to stabilize the budget after revenues "plummeted" due to reduced water demand and inflation.⁹
 - In 2012, Austin Water Utility (Texas) increased its fixed revenue goal to 20% of total water revenue requirements. Fixed revenues were allocated to each customer class based on its relative water cost of service after the monthly minimum charge. The recommended increase came from replacing a flat "revenue stability fee" with a

⁶ <https://www.mass.gov/guides/water-pricing>

⁷ <https://www.sjwd.org/water-rates-faqs>

⁸ WSSC (2024). Special meeting on water rates ([link](#))

⁹ The City Journals (2024). Fee increases for water services to stabilize Public Utilities budget ([link](#))

tiered fixed fee based on volume of water used. Prior to instituting a revenue stability fee in 2012, fixed revenue was about 11%.¹⁰

- **Increasing Block Rates (IBR)** – These rates make usage at the top tier expensive enough to encourage conservation while designing rates to recover up to 80% of variable costs, leaving the remaining 20% for high water users to cover. Seasonal summer rates (10%–20% higher than winter) also help reduce non-essential use like lawn watering.¹¹ This is the most common rate structure observed.
- **Water Budget-Based Rates** – Also called allocation-based rates, and generally employed as a specific variation of IBRs, these structures assign individualized water budgets based on family size, parcel area, and real-time weather data. Users are charged one rate for use within their budget and a higher rate for exceeding it. In a number of case studies, this model has allowed utilities to recover fixed operation and maintenance (O&M) costs in the lower tiers, ensuring revenue stability even as customers conserve (Barr & Ash, 2015).
 - Rancho California Water District implemented such a structure with a 500% rise between the lowest and highest tiers. The top tier users reduced usage by 50%, and while total demand declined 30% over five years, the district maintained full cost recovery.¹²
 - The Western Municipal Water District (WMWD) in Riverside, California implemented budget-based rates in 2011. The rate structure was designed to collect all revenue needed to cover O&M costs in the first and second tiers, ideally providing revenue stability even as customers reduce their use (Dinckinson, Chesnutt, & Chery, 2015).
 - In the first full year of the water budget rate structure the proportion of customers meeting allocations increased to 83% from 63% the prior year. Though less water was sold and delivered to consumers, program implementation costs were recovered within 6 months and revenue sufficient to cover fixed costs was achieved.
 - In the second year of water budget rates WMWD fully met its operating and fixed cost obligations, received \$1.9 million in “penalty” revenues, and 85 % of customers met their water budget allocations.
- **PeakSet Base Pricing** – Under this structure, a customer's base charge is individually set based on a three-year rolling average of their peak month of demand. This allows utilities to build more cost recovery into the base charge while still promoting conservation by discouraging high peak-month usage (Alliance for Water Efficiency, 2014).
- **Probability-Based Forecasting** – To avoid the "Flaw of Averages," utilities are adopting sales forecasts that incorporate uncertainty regarding weather, account growth, and demand elasticities (Dinckinson, Chesnutt, & Chery, 2015). This is often incorporated into water-budget based rate structures.

¹⁰ <https://texaslivingwaters.org/wp-content/uploads/2014/03/Texas-Rate-Report-2014-Final-1.pdf>

¹¹ Energy Central. Water Conservation & Rates ([link](#))

¹² AWE (2012). Declining Water Sales & Utility Revenues ([link](#))

Table 13: Positives and Negatives of Various Rate Structure Modifications

Rate Structure Modification	Positives	Negatives
Higher Fixed Charges	Guarantees recovery of supply-side fixed costs	Disproportionately impacts lower income groups
Increasing Block Rates (IBR)	Proportionately targets high-volume users with higher unit prices	May only temporarily address revenue shortfalls until high-volume users decrease consumption
Water-Budget Based Rates	Allocates proportional water budgets using aspects of the household	Susceptible to inaccurate billing due to number of aspects used to calculate a household's budget
PeakSet Base Pricing	Encourages long-term conservation by using rolling average of customer's consumption	May result in lagged revenue generation and customer response to a change in base pricing
Probability-Based Forecasting	Secures revenue recovery by including uncertainty in base charge calculation	Lower income groups may front more of the uncertainty costs than higher income groups

5.2 Revenue Decoupling Mechanisms & Alternative Financing

- Water Revenue Adjustment Mechanism (WRAM) & Modified Cost Balancing Account (MCBA)** – Policies like WRAM allow for incremental rate adjustments to offset fluctuations in demand or supply without the need for a formal, wholesale rate change process. These mechanisms are commonly seen among California non-municipal utilities that are prohibited from maintaining a reserve and must have rate changes approved by the public utility commission. The WRAM tracks the under- or over-collection in state-authorized water revenue due to lower or higher water usage and the MCBA tracks any savings or increases in water supply operating costs. Each year the utility calculates the difference in actual versus authorized net revenues and collects or credits the customers on the upcoming year bills.
 - California American Water uses the WRAM and MCBA, which decouple water sales from revenues. The WRAM tracks differences between authorized and actual revenues related to fixed costs, breaking the link between conservation and revenue shortfalls.¹³
 - Golden State Water noted that fixed costs average 76% of their utility expenses companywide. They use a WRAM and MCBA to ensure under-collected revenue is recovered with a temporary surcharge when actual water usage falls below forecasted levels.¹⁴
- Debt-Financing Efficiency** – Some utilities are treating efficiency programs as capitalized assets (similar to new supply projects) and using bond financing to spread these costs over several years to reduce short-term rate impacts.

¹³ <https://www.amwater.com/caaw/Customer-Service-Billing/Water-Rates/rate-design>

¹⁴ <https://www.gswater.com/rates-tariffs-and-regulations>

- **Environmental impact bonds** – DC Water implemented a green infrastructure program funded by an innovative environmental impact bond, which engages private investors in financing sustainable water projects. This model addresses funding gaps while integrating climate resilience and environmental benefits.¹⁵
- **State Revolving Funds and WIFIA** – These federal programs provide low-interest financing that makes large infrastructure projects more affordable. Communities repay the funds under favorable terms, and as loans are repaid, funds are recycled to support future projects.¹⁶
- **Full Cost Pricing Adoption** – The American Water Works Association urges adoption of "full-cost pricing"—rates that factor in past and future costs for operations, maintenance, and new and upgraded infrastructure — so that water utilities do not underprice themselves out of business over time.¹⁷
- **Property Tax/Assessment** – This has been done recently in Jordan Valley, UT to generate reliable revenues to support the water utility, where the “District may levy a maximum property tax rate of 0.0004 for operation and maintenance expenses.”¹⁸ This structure avoids the conservation conundrum, as it is based on property value, which is generally consistent and increasing over time. Furthermore, if water infrastructure costs generally track/escalate in tandem with property values this would provide a natural adjustment over time.

5.3 Best-Practice Asset Management & Operational Efficiency

- **Risk-Based Prioritization** – These frameworks provide the data necessary to prioritize capital projects based on actual asset condition rather than age alone, potentially reducing overall capital spending requirements (Wallis-Lage, 2014). A related concept, *condition-based assessment*, can also be more economical than traditional capital replacement schedules.
- **Leak detection and repair** – National studies indicate that, on average, 14% of water treated by systems is lost to leaks, with some utilities reporting losses exceeding 60%. Accounting for water and minimizing loss are critical functions for utilities seeking efficiency.¹⁹
- **Energy efficiency investments** – Water and wastewater utilities are typically the largest energy consumers in municipalities, often accounting for 30-40% of total energy consumed. Investing in energy efficiency can significantly reduce operating costs.²⁰
- **Advanced metering and technology** – Advanced monitoring and treatment technologies can utilize networked devices to optimize water distribution, detect leaks, and manage consumption patterns in real time. Remote operation capabilities for smaller treatment systems are also reducing long-term costs.²¹

¹⁵ <https://www.rand.org/pubs/commentary/2024/10/ensuring-resilient-water-infrastructure-requires-creative.html>

¹⁶ <https://www.awwa.org/resource/water-infrastructure-funding/>

¹⁷ <https://www.governing.com/finance/navigating-long-term-water-utility-inflation>

¹⁸ Jordan Valley Water Conservancy District. Adopted Financial Plan for the 2025/2026 Budget ([link](#)).

¹⁹ EPA (2025). Water Efficiency for Water Suppliers ([link](#))

²⁰ EPA (2017). Financing resilient & sustainable infrastructure ([link](#))

²¹ <https://www.rand.org/pubs/commentary/2024/10/ensuring-resilient-water-infrastructure-requires-creative.html>

6 Summary & Conclusions

Key findings from this research project are summarized below.

- **Household water demand in the West is price *inelastic*** – A PED between -1.0 and 0.0 is considered inelastic, with a PED of -0.5 to 0.0 being *strongly inelastic* (see Section 2.1).
 - PED in the West and in the Rocky Mountain Region can be described as centering around -0.33 with a strongly supported range of -0.46 to -0.16, all of which are characterized as strongly inelastic (greater than -0.5).
 - This estimate is supported by a review of 19 studies reporting 44 PED estimates.
- **Price-inelastic demand can have significant revenue implications** – A technical characterization of households being price inelastic does not mean they're unresponsive to water prices changes. Furthermore, their technically inelastic response can have significant revenue implications. WestWater modeled such a case and reports the results in Section 4.
 - WestWater's 10-year model assumes:
 - A utility serving 20,000 accounts (year 1) with annual account growth of 2%.
 - Annual cost of service of \$12M (year 1) increasing at 6% CAGR.
 - Utility is revenue neutral in year 1 (i.e., year 1 revenues = year 1 cost = \$12M).
 - At a strongly inelastic PED of -0.33 (typical of water customers in the West) the model showed annual deficits exceeding 5% of costs within five years.
 - Over a decade, the cumulative revenue shortfall approaches \$10 million at a PED of -0.33. At a PED of -0.50, the 10-year cumulative deficit is nearly \$15 million.
 - Were account growth to stagnate, these figures increase to \$15 million and \$22 million, respectively.
- **Price elasticities are not expected to change** – PED has remained steady over the last 60 years and there is no evidence in the data to suggest that it will change in the coming years.
- **IBRs lead to decreased consumption independent of an *actual price effect*** – This has been demonstrated by a number of studies, with some research indicating that the existence of an IBR can have a conservation impact greater than that of price itself (see Section 3.2.2). Relatedly, research has shown that the complex pricing structures of IBRs can lead customers to overestimate the costs of using water and lead to misaligned reductions in consumption (see Section 3.2.3).
- **Bundled billing and/or longer billing cycles may lead to misaligned use reductions** – Research consistently shows consumers respond to the total bill amount rather than individual components or unit pricing over a billing cycle. A bundled bill, or one charged over a longer billing cycle, might therefore create an artificially stronger price signal simply because the total appears larger (see Section 3.2.4).
- **Lower income households are much more sensitive to water price increases** – on its face, this statement seems obvious, but some of the implications are less so. It follows that water providers serving low-income communities are fundamentally limited in their ability to use price increases as a tool for cost recovery and as income disparities continue to grow the challenge for utilities to generate sufficient revenues will grow (Section 3.2.6).

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Appendices

- Appendix A: Price Elasticity of Water Demand Database

Appendix A. Price Elasticity of Water Demand Database

Author(s)	Aspect	Study Year	Geog. Level of Estimate	Geo Region for Estimate, to Most Specific Level					Price Elasticity Estimates
				Country	Census Geo Desig. Region	Division	State	City	
Gottlieb		1963	State	U.S.	Midwest	W.N.Central	KS		-0.656 to -0.68
Howe & Linaweaver		1967	Country	U.S.					-0.231
Wong	Towns less than 5,000 people	1972	City	U.S.	Midwest	E.N.Central	IL	Chicagoland	-0.257
	Cities 5,000 to 9,999 people								-0.463
	Cities 10,000 to 24,999 people								-0.817
	Cities over 25,000 people								-0.53
Young		1973	City	U.S.	West	Mountain	AZ	Tucson	-0.41 to -0.6
Foster & Beattie	Rocky Mountains	1979	Region	U.S.	West	Mountain			-0.226
	Southwest								-0.122
Agthe & Billings	long run	1980	City	U.S.	West	Mountain	AZ	Tucson	-0.266 to -0.705
	short run								-0.179 to -0.358
Jones & Morris		1984	City	U.S.	West	Mountain	CO	Denver	-0.14 to -0.44
Williams		1985	Country	U.S.					-0.05 to -1.09
Agthe, Billings, Dobra, Raffiee	long run	1986	City	U.S.	West	Mountain	AZ	Tucson	-0.125 to -0.624
	short run								-0.019 to -0.364
Williams & Suh	long run residential	1986	Country	U.S.					-0.294 to -0.485
	long run commercial								-0.141 to -0.36
	long run industrial								-0.438 to -0.735
Billings & Day		1989	City	U.S.	West	Mountain	AZ	Tucson	-0.2 to -0.71
Nieswiadomy & Molina		1989	City	U.S.	South	W.S.Central	TX	Denton	-0.002 to -0.46
Weber		1989	City	U.S.	West	Pacific	CA	Oakland	-0.202
Schneider & Whitlach	residential	1991	City	U.S.	Midwest	E.N.Central	OH	Columbus	-0.11 to -0.262
	commercial								-0.234 to -0.918
	industrial								-0.112 to -0.438
Martin & Wilder		1992	City	U.S.	South	S.Atlantic	SC	Columbia	-0.32 to -0.7
Nieswiadomy		1992	Country	U.S.					-0.17 to -0.45
Nieswiadomy & Cobb	increasing block rate	1993	Country	U.S.					-0.64
	decreasing block rate								-0.46
Espey, Espey, & Shaw		1997	Country	U.S.					-0.51
Renwick & Archibald	all water users	1998	Region	U.S.	West	Pacific	CA		-0.33
	less than \$20,000 income								-0.53
	\$20,000 to \$59,999 income								-0.21
	\$60,000 to \$99,999 income								-0.22
	over \$100,000 income								-0.11
Renwick, Green, McCorkle		1998	State	U.S.	West	Pacific	CA		-0.16 to -0.2
Dalhuisen et al.	meta-analysis of previous estimates from the US	2003	Country	U.S.					-0.41
Piper		2003	Country	U.S.					-0.32
Olmstead et al.	price elasticity may depend on price structure	2007	Country	U.S.					-0.33
Kenney et al.	All users	2008	City	U.S.	West	Mountain	CO	Aurora	-0.6
	Low users								-0.34
	Middle users								-0.57
	High users								-0.75
Nataraj & Hanneman	response to marginal price change	2011	City	U.S.	West	Pacific	CA	Santa Cruz	-0.012
Mansur & Olmstead	indoor & outdoor demand; households in US & CAN	2012	Country	U.S.					-0.36
Baerenklau et al.	uniform price changes	2014	City	U.S.	West	Pacific	CA	Riverside	-0.76
Klaiber et al.	estimates by season and use	2014	City	U.S.	West	Mountain	AZ	Phoenix	-0.13 to -1.93
Piper	Long run residential, 11 utilities in CA & NV, 2000–11	2003	Country	U.S.	West	Mountain	NV		-0.24 to -0.31
	Long run residential, 11 utilities in CA & NV, 2000–11						CA		-0.24 to -0.31
Wichman	response to average price change	2014	State	U.S.	South	S.Atlantic	NC		-0.43 to -1.14
Yoo et al.	census tracts, short- and long-run	2014	City	U.S.	West	Mountain	AZ	Phoenix	-0.66
Borisova & Dukes	responsiveness of water use to price changes	2016	State	U.S.	South	S.Atlantic	FL		-0.07 to -0.14
Buck et al.	utility level data from 53 urban utilities	2016	State	U.S.	West	Pacific	CA		-0.15
Wichman et al.	short run low- vs. high-income response to price	2016	State	U.S.	South	S.Atlantic	NC		-0.13 to -0.3
Wichman, Taylor, & von Haefen	HHs with <0.25-acre lots and average incomes	2016	State	U.S.	South	S.Atlantic	NC		-0.23 to -0.4
Clarke et al.	monthly elasticities	2017	City	U.S.	West	Mountain	AZ	Tucson	-0.08 to -0.37
Brent	outdoor water use	2018	City	U.S.	West	Mountain	AZ	Phoenix	-0.2 to -0.3
Brown et al.	82,300 households	2021	City	U.S.	West	Pacific	CA	Fresno	-0.16 to -0.39
Chovar Vera et al.	low- & high- consumption groups; seasonal effects	2021	Country	Chile					-0.071 to -0.568



Agenda Summary

February 18, 2026

Key Staff Contact: Sean Chambers, Water & Sewer Director

Title:

Review of Water & Sewer Utility Funding for Greeley Public Art Program

Summary:

On February 3, 2026, the City Council heard an informational item regarding City Council Initiative 3-2025 related to the Public Art Program, its funding, and the type of arts that are funded by the 1% for Art finding methodology. At the request of City Council, the Culture, Parks, & Recreation Dept. (CPRD) staff presented information on the current funding methodology and presented a range of options that might meet the Council goals and priorities. The CPRD staff also asked Council and City attorney's office for feedback to shape further policy investigation.

CPRD staff support the Greeley Art Commission, who oversees the Public Art program and assists in discovering art that reflects the broad range of social, cultural and historic values that define Greeley. The Commission is guided by the Art Master Plan for Greeley, which guides and supports the integration of art that contributes to Greeley's identity. The Art Commission recognizes the importance of art forms in public places. The Public Art collection consists of more than 350 works of rotating indoor art, and more than 220 pieces of outdoor art. The collection is continually updated with new artwork as the art commission purchases several pieces of art annually.

City City's public works and utility infrastructure capital expansion projects are the source of the 1% for Art funding. Over the past two decades, this funding has been instrumental in developing public art in Greeley. Over that time, the 1% funding policy has been implemented as a financial element of city capital projects meeting certain criteria, including Water & Sewer Department projects. Over that same time, the cost of water & sewer capital projects has been documented to grow at a rate that has consistently outpaced inflation.

The Board has requested this opportunity to understand the funding and its impact on utility projects, utility rates and fees, revenue bonding and the application of plant investment fees, know as PIFs.

Recommended Action:

None

Recommended Motion:

None

Attachments:

1. Water and Sewer -Funding for the Arts

2. City of Greeley Public Art Program



Review of Water & Sewer Utility Funding for Greeley Public Art Program

Water & Sewer Board

February 18, 2026

Sean Chambers, Water and Sewer Utilities Director

Erik Dial, Deputy Director – Utility Finance and Customer Service

Agenda



- Background on Greeley's Public Art Program and its funding
- Water and Sewer's contributions
- Board Discussion and Input

Purpose: Inform Board members about Greeley's Public Art Program and its funding

Public Art Program Background

- Public Arts Program established mid 1990's
- Program's purpose (from city code): ...Provide a means to fund the acquisition of works of art by the city which shall become the city's permanent collection, to provide a means to select works of art for the collection, to provide for the display of the collection and to provide for the maintenance and repair of the works of art in the collection.
- Funded by 1% of construction projects



Public Art Funding

- In practice, 1% for Arts has been funded from capital expansion projects
 - Not capital replacement or water acquisition
 - Code needs refinement – City Attorney's Office and Culture Parks and Recreation Department reviewing
- Water and Sewer historically had the largest capital program
 - Much of the Arts funding has come from utility expansion projects



Recent Water and Sewer Art Funding

Fund	2022	2023	2024	2025	2022-2025
Water Expansion	\$0	\$194,833	\$191,787	\$100,351	\$486,971
Sewer Expansion	\$10,000	\$7,138	\$0	\$977	\$18,115
Total Art Fund Revenue	\$83,057	\$311,234	\$296,999	\$288,992	\$980,282

- Capital Expansion projects are funded from two sources
 - Plant Investment Fees (PIF)
 - Bonds
- Debt service for bonding paid by rates
 - Legality of using bond funds will be reviewed





Board Feedback

Thank you

City of Greeley Public Art Program Water & Sewer Department Projects



Title: *Otterly Pointless*

Artist: Pati Stajcar

Date: 1998

Location: Greeley City Center South, North Side

Website: [Otterly Pointless in Greeley, CO](#)



Title: *Farr Sighted*

Artist: Seth Vandable

Year: 2012

Location: Farr Library

Website: [Farr Sighted in Greeley, CO](#)



Title: *Every Drop Counts*

Artist: Ann Martinez

Date: 2012

Location: Vinyl wrap, mural

Website: [Every Drop Counts in Greeley, CO](#)



Title: *Go West*

Artist: Lisa Cameron Russell

Date: 2012

Location: Centennial Village Museum

Website: [Go West CV Fence I in Greeley, CO](#)



Title: *Rain Symphony*

Artist: Joshua Wiener

Date: 2013

Location: Greeley Homestead Park

Website: [Rain Symphony in Greeley, CO](#)



Title: *Water in the Works*

Artist: Julie Dillon

Date: 2014

Location: 701 10th Ave (& various other locations in City)

Website: [Water in the Works in Greeley, CO](http://WaterintheWorks.org)



Title: *Drop*

Artist: Arnold Martin

Date: 2017

Location: Uptown Tree on 8th Street

Website: [Drop in Greeley, CO](#)



Title: *Maintain the Flow*

Artist: Laurie Lundquist

Date: 2018

Location: Woodbriar Park, 2819 W. 19th St.

Website: [Water Rights: Maintaining the Flow in Greeley, CO](#)



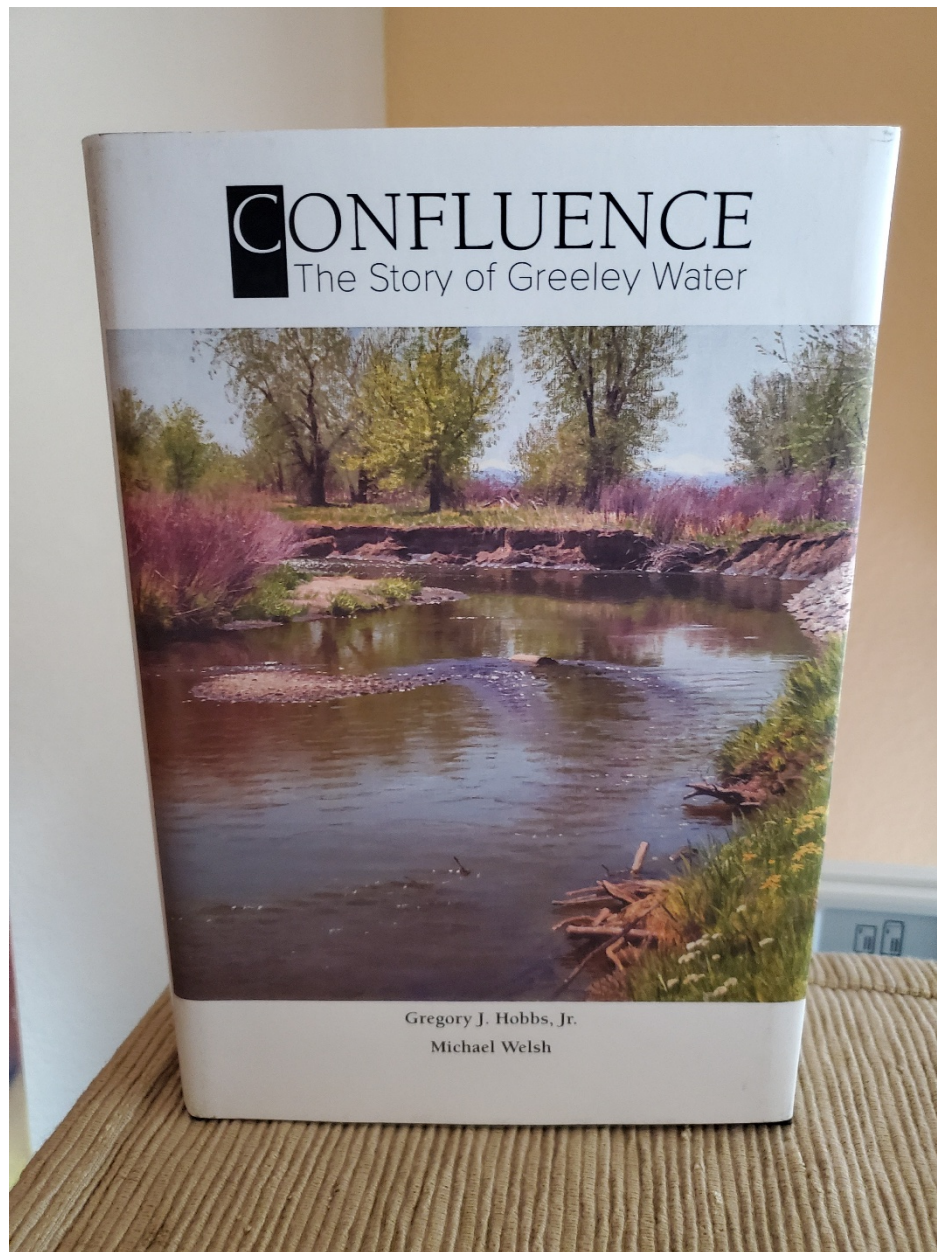
Title: *In the Current*

Artist: Travis Krause

Date: 2019

Location: Greeley Recreation Center

Website: [In the Current in Greeley, CO](#)



Title: Cover Art for Water Book

Artist: Jay Moore

Date: 2020



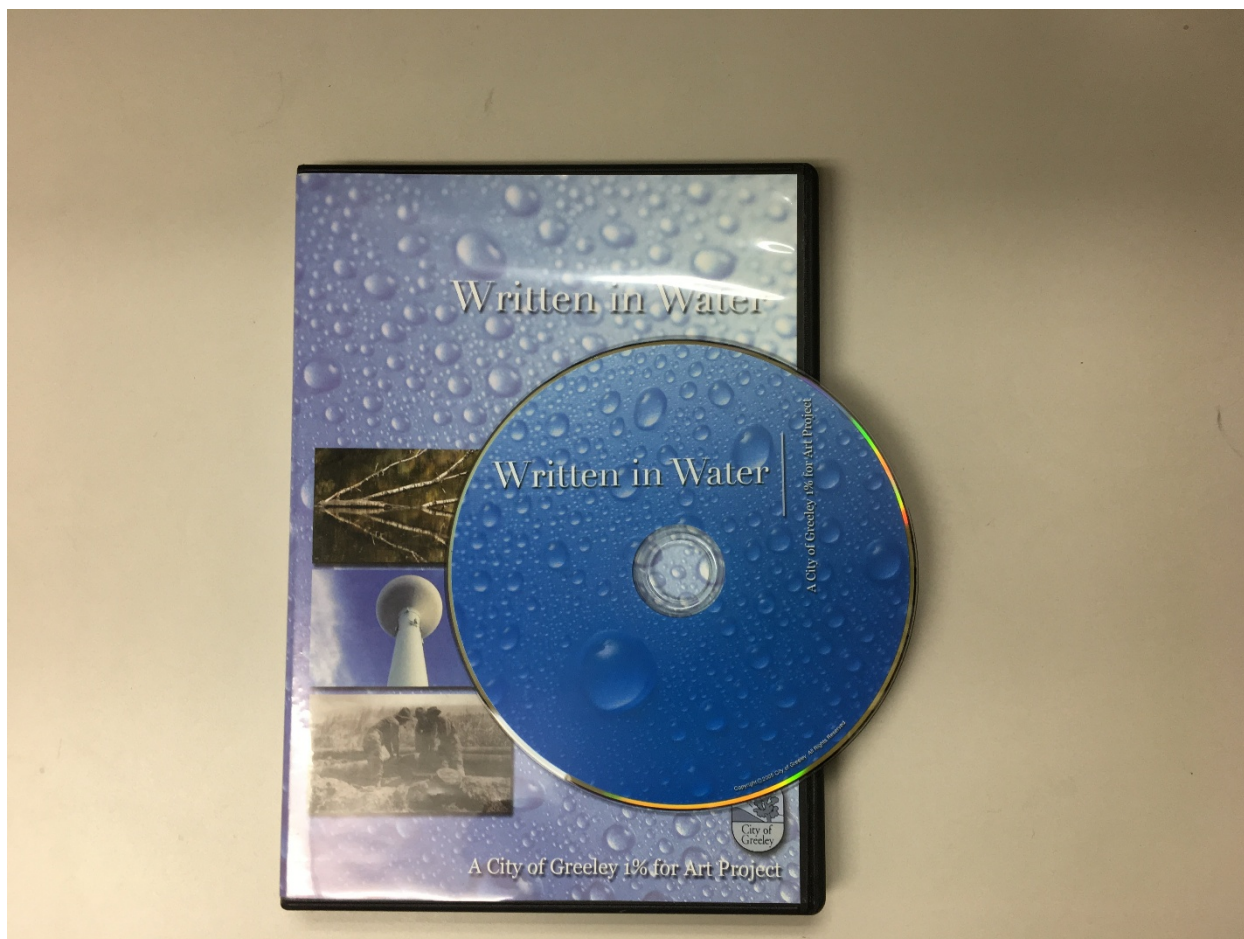
Title: *11th Ave Bridge*

Artist Mario Echevarria

Date: 2003

Location: N. 11th Ave and Poudre River

Website: [11th Ave Bridge in Greeley, CO](http://www.greeleyco.org/11thAveBridge)



Title: *Written in Water*

Artist: Alexandre Philippe

Date: 2005

Location: DVD

Website: [Written in Water in Greeley, CO](#)



Title: *Taking Off*

Artists: Colette and Gary Pitcher

Date: 2005

Location: Poudre River Trail ½ mile W of 71st Ave

Website: [Taking Off in Greeley, CO](#)



Title: *Luminaria*

Artist: Barbara Grygutis

Date: 2006

Location: Greeley Family FunPlex

Website: [Luminarias: The Seasons in Greeley, CO](#)



Title: *Rainbow Reef*

Artist: Julia Williams

Date: 2022

Location: Greeley Family FunPlex

Website: [Rainbow Reef in Greeley, CO](#)



Title: *Discovery Bay Wrap*

Artist: Mitchell Egly

Date: 2004

Location: Discovery Bay Waterpark

Website: [Public Art Archive - Make Public Art More Public](#)



Title: *Filter / Flow*

Artist: Adam Kuby

Date: 2024

Location: Storm Water Retention Pond; 10th St and 2nd Ave / 12 St Outfall

Website: [Filter/Flow in Greeley, CO](#)



Agenda Summary

February 18, 2026

Key Staff Contact: Leah Hubbard, Deputy Director of Water Resources

Title:

Chimney Hollow Update

Summary:

Update on the completion of the Chimney Hollow dam, success of the project, and naturally occurring uranium within the rock fill dam.

Recommended Action:

None

Recommended Motion:

None

Attachments:

1. Chimney Hollow Update

Chimney Hollow Reservoir Update

February 18, 2026

Leah Hubbard
Deputy Director of Water Resources



Agenda and Purpose



Agenda

- Chimney Hollow Reservoir
- Uranium Issue
- Future of Reservoir

Purpose: Informational

Reservoir

- Rockfill Asphalt Core dam approximately 350 feet tall
- 12 million cubic yards of rockfill and 75,000 cubic yards of asphaltic concrete
- **90,000 acre-feet of dedicated storage, Greeley owns 10% or 9,000AF**
- Water can be released downstream into Flatiron Reservoir (and via Carter Lake for southern delivery) to serve the 13 water participants via the existing CBT infrastructure



Reservoir



- Project was completed on time, which was a major success for a project of this magnitude
- Experienced lower incidents rate than country average
- Reached substantial completion December 19, 2025

Uranium identified in Quarry Rock

- During construction, Northern Water identified naturally occurring uranium from the granite used for the rockfill dam
- Uranium levels in the water at the dam face have shown potential to exceed the U.S. EPA's Maximum Contaminant Level (MCL) of **30 µg/L for drinking water**



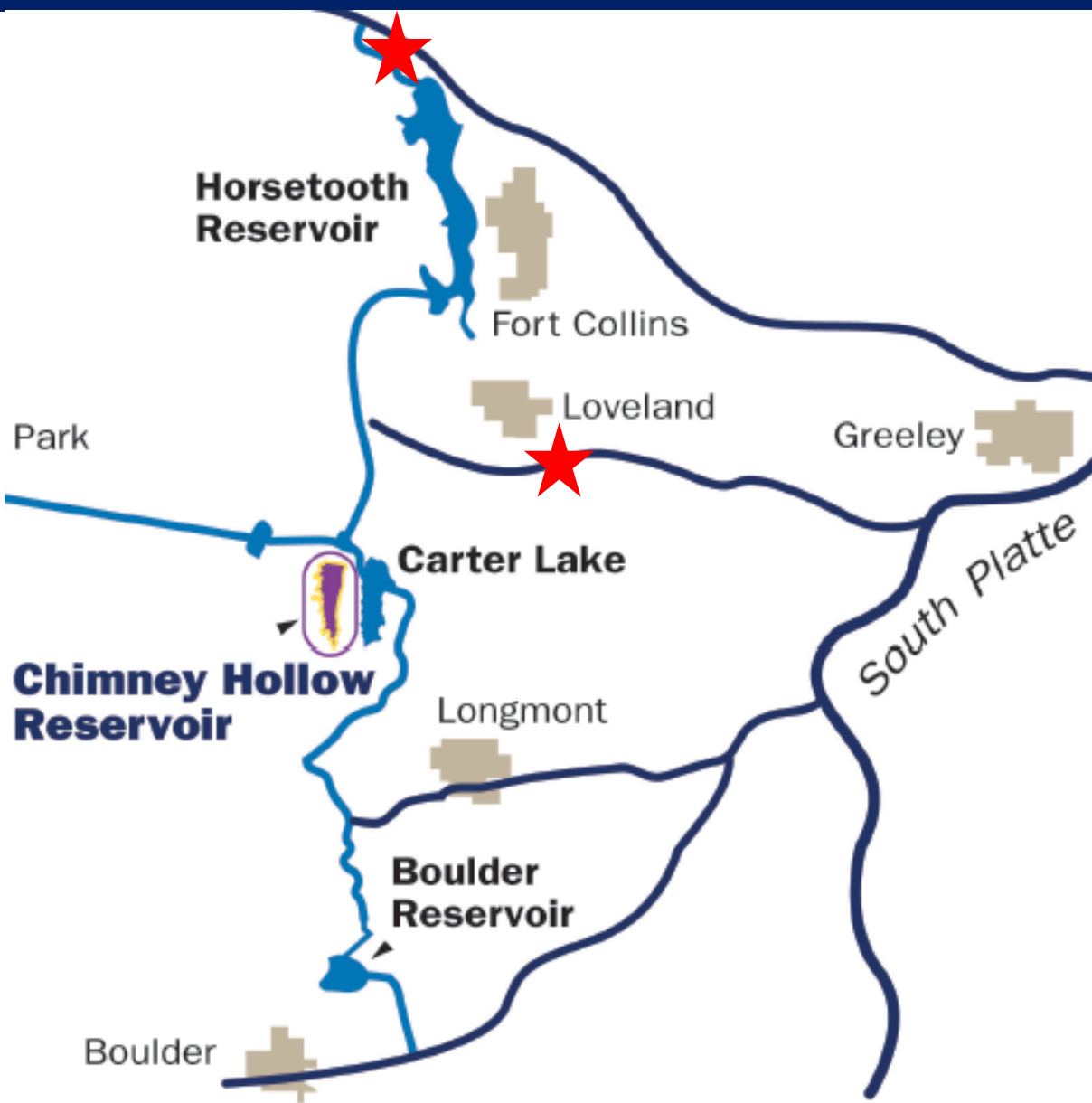
Uranium identified in Quarry Rock



First fill of the reservoir was delayed to allow additional monitoring, data collection, and evaluation of mitigation options

- Water quality sampling locations are established in reservoir and downstream to understand baseline conditions
- Participants are doing scoping studies and analyzing various mitigation strategies to recommend a Uranium management plan

Greeley and Chimney Hollow



Bellvue

- Mixing would occur in Flatiron reservoir and Horsetooth before treatment

Boyd

- Mixing would occur in the Big Thompson, Lake Loveland, Horseshoe, and Boyd Lake before treatment.

Chimney Hollow Future

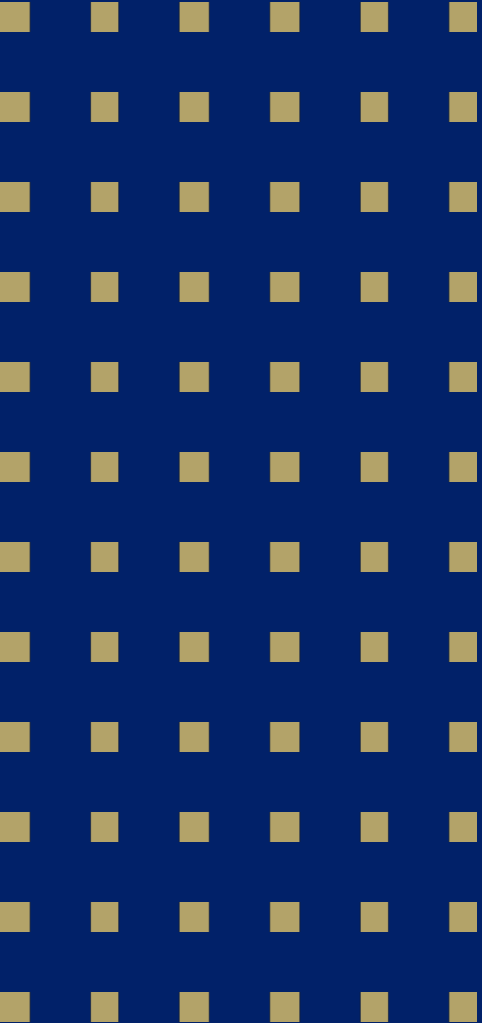
- The operational timeline is in the late 2020's due to uranium mitigation
- Uranium is considered a finite issue in the dam material, meaning it will dissipate in time.
- The area will provide recreational and community benefits for Northern Colorado



Conclusions



- Remains a vital source for Greeley's potable water supply
- Successful project
- Greeley regularly meets with the other participants and Northern Water to collaborate on uranium management strategies that meets our needs

A decorative graphic on the left side of the slide, consisting of a grid of small gold squares arranged in 10 rows and 6 columns.

Questions?



Water & Sewer Agenda Summary

Date: February 18, 2026

Key Staff Contact: Leah Hubbard, Deputy Director of Water Resources

Title: Legal Report

Summary: This report has been provided by James Noble of Welborn Sullivan Meck & Tooley, P.C., outside counsel for the Greeley Water & Sewer Board

Based on our review of the December 2025 Water Court Resume in Div. 1, staff and water counsel recommend that the Water and Sewer Board authorize filing a statement of opposition by the end of February 2026 to the following water court application:

- **Case No. 25CW3196:** This case concerns an application by the Little Thompson Water District to change 57.7 shares of the Handy Ditch Company, which is an irrigation ditch on the Big Thompson River. Little Thompson seeks to change these shares for municipal use and for storage in two existing reservoirs. The application further seeks a ditch-wide determination of the historical use of all of the shares in this ditch system. We recommend filing a statement of opposition to ensure that the historical use is properly quantified, and return flows are replaced in quantity and time to protect Greeley's water rights in the Big Thompson River from injury.

Recommended Action: Staff and water counsel recommend authorizing filing a statement of opposition in Division 1 Case No. 25CW3196.

Recommended Motion: "I move that the Board authorize filing a statement of opposition in Case No. 25CW3196, and for staff and legal counsel to seek resolution of issues raised by this case consistent with Water and Sewer Board Resolution No. 3, 2015."

Attachments: None.



Agenda Summary

February 18, 2026

Key Staff Contact: Sean Chambers, Water & Sewer Director

Title:

Director's Report

Summary:

The Director will provide the Water & Sewer Board with a summary of water resources and utility policy events, and an update Board on notable utility activities. Update Items include the following:

1. Water Industry Education and Advocacy Events
2. 60" Gold Hill Pipeline FEMA matching grant update and media coverage
3. Colorado River Negotiations on Interim Guidelines for Shortage Update
4. F – Street farm under Boyd-Freeman irrigation MOU for city tree farm update
5. Reminder of rescheduled April 15, 2026 Board meeting – moved to 10:00 AM on 4/15/26
6. Board Questions and Feedback

Recommended Action:

None

Recommended Motion:

None

Attachments:

1. Directors Report 2.18.26
2. Reclamation Draft EIS Maps Post-2026 Operations for Colorado River Dams _ Engineering News-Record
3. City of Greeley and Wingfoot Water Resources Launch Water Bank to Boost Job Growth _ City of Greeley News
4. Board Meeting Charts _ 2026



Directors Report Water & Sewer Utilities

Water & Sewer Board

February 18, 2026

Presented by:

Sean P. Chambers, Water & Sewer Utilities Director

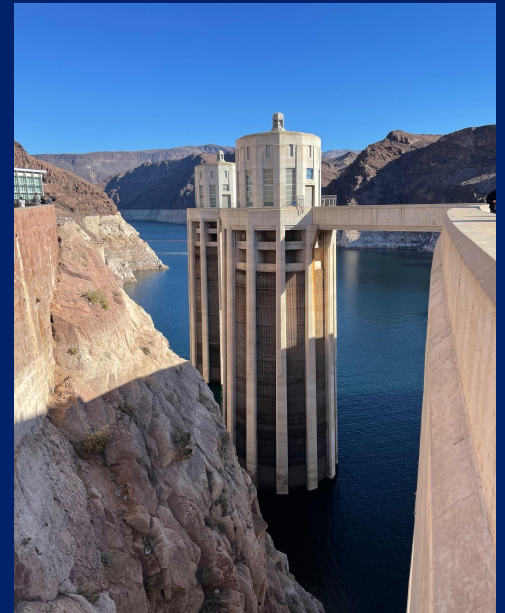
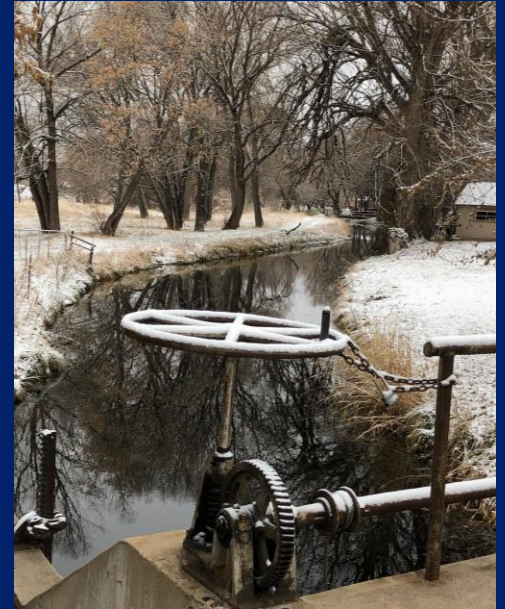
February 2026 Agenda

Director's Report:

1. Water Industry Education and Advocacy Events
2. Halligan Water Supply Project 401 Certification
3. 60" Gold Hill pipeline FEMA matching grant update
4. F-Street Farm – Tree Farm MOU update
5. Reminder of April 15th Board meeting early start

Purpose:

To share relevant and timely information with the W&S Board



Winter '25-'26 Water Industry Events

CSU Water Center 60th Anniversary and Water Archive – Water Tables Fundraiser

March 26, 2026 at CSU Ft. Collins - <https://watercenter.colostate.edu/water-center-60th-anniversary/>

Saint Vrain & Left Hand Water Conservancy District '26 Water Symposium

February 26th at Shupe Homestead www.svlh.gov

Northern Water Spring Water User Symposium and Quota Meeting

April 7, 2026 – Loveland, CO - <https://www.northernwater.org/about/education-and-outreach/events>

Confluence Water Summit by BizWest

April 30, 2026 at Aims CC Welcome Ctr. <https://events.bizwest.com/>

Assoc. of Metropolitan Water Agencies and AWWA Federal Water Policy fly-in

April 12-15, Washington, DC

National Water Resources Association – Water Issues Policy Conference

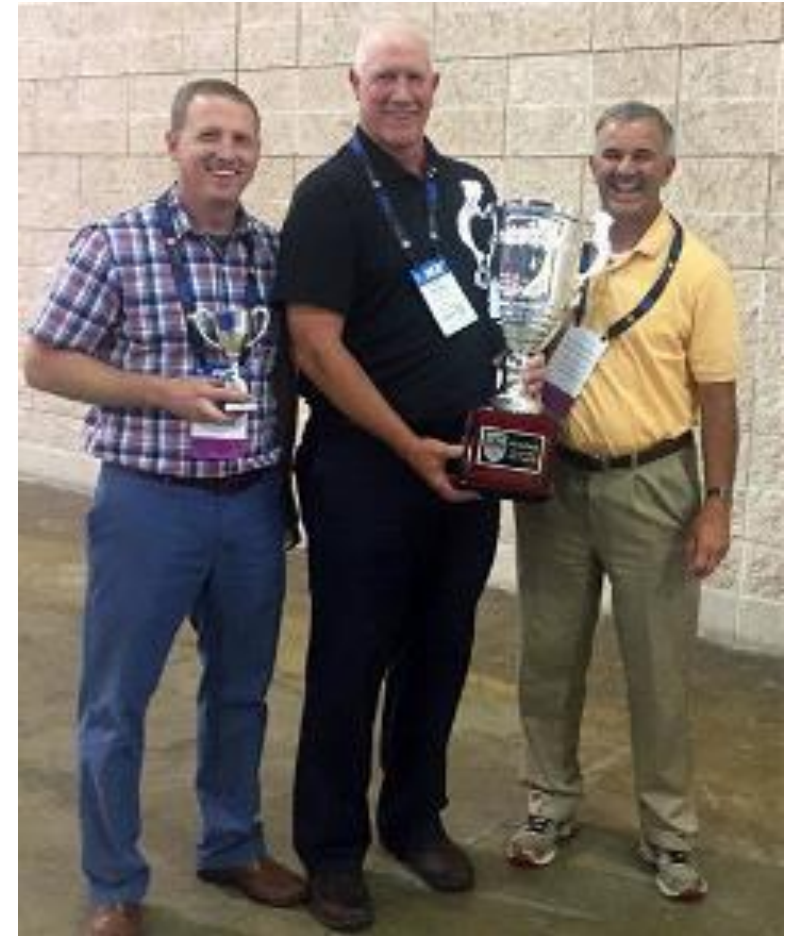
April 27-29th – Washington DC <https://www.nwra.org/event-6384906>

American Water Works Association – ACE-2026 Training and Innovations Conference

June 21-24, 2026 – Washington, D.C. <https://ace.awwa.org/schedule-at-a-glance/>

Rocky Mountain Section AWWA Conference and Best Tasting Water Competition

Aug. 30th – Sept 2nd 2026 - <https://www.rmsawwa.org/page/RMWC>



Gold Hill 60" Potable Transmission Main Matching Grant

Seeking a new source of matching grant funds:

- Greeley was awaiting a contract for ~\$13.6M in BRIC Funds
 - FEMA BRIC program was cancelled in whole in early April
 - FEMA notice of termination to BRIC grants program in April '25 (Building Resilient Infrastructure and Communities)
- 8th Congressional District Staff, confirmed that Rep. Evans has submitted Greeley's Gold Hill Project as one of their Community Directed Spending requests.
- Letters of support from Mayor Gates, Weld Co. BoCC, North Weld Co Water District, Town of Evans, Town of Milliken, Noosa, Leprino Foods, CO Dept. of Natural Resources and CO Dept. of Homeland Security and Emergency Management (DHSEM)
- Funding approved in DHS /minbus House appropriations bill ~6 weeks ago. Pending resolution of DHS Budget in Senate

New this year!

PDM Resilient Infrastructure Funding

PRE-DISASTER MITIGATION (PDM) GRANTS provide competitive funding for...



STATE



LOCAL



TRIBAL

...government projects that reduce their communities' risks from natural hazards.

One way PDM grants reduce risk is through

Resilient Infrastructure Projects

A new opportunity for the 2018 grant application period



During the FY 2018 funding period, FEMA will award the highest ranked Resilient Infrastructure subapplicants **up to \$10 million Federal cost share.**



Resilient Infrastructure projects may include those that help communities mitigate damage from many types of natural hazards.



FLOOD



EARTHQUAKE



WIND



WILDFIRE



DROUGHT



FEMA

Colorado River Negotiations on Interim Guidelines for Shortage

- The Post-2026 process is a multi-year NEPA process to determine long-term operations for Lake Powell and Lake Mead after the expiration of existing operating agreements in '26.
- BoR / Dept. of Interior Deadline of 11/11/25 and Feb.14th have passed, the parties continue to work toward negotiated solutions, and political leaders are now involved in negotiations.
 - January meeting of Governors at Bureau of Reclamation
- Hydrology is limiting to all users, and a new interim agreement that is guided by the River's limited hydrology is important.
 - UCRC position focus on supply-based management
 - Lower Basin shortages can be solved by conservation in upper basin
 - ENR Article on EIS & Dam operations is attached



F Street Tree Farm MOU – Overview



Purpose

- City of Greeley Water & Sewer has partnered with the Culture, Parks & Recreation Department (CPRD) to utilize ~3 acres of City-owned irrigable cropland at 5207 F Street to establish/maintain a tree farm.

Property & Water Rights

- Site is part of ~30-acre agricultural property acquired with City water enterprise funds
- Irrigation via City-owned Boyd Irrigation Company (BIC) shares
- Operations coordinated 24–48 hours in advance; aim for consistent watering schedule

Term

- Effective March 1, 2026; initial term through April 30, 2031
- Auto-renews annually up to five 1-year terms

Reimbursement

- Real Estate: \$130/acre; escalates 2% annually
- Water Rights: \$8/acre-foot based on estimated use



2026 State of The City

- April 15, 2025 @ Aims Welcome Center
- Will require the rescheduling of W&S Board



Questions and Feedback?

Thank you



Regulatory

Reclamation Draft Review Maps Future Operations for Colorado River Dams

Review assesses reservoir management options related to hydropower reliability and infrastructure risk

By Bryan Gottlieb



Image courtesy of Adobe Stock

Glen Canyon Dam on the Colorado River, where prolonged drought has intensified scrutiny of post-2026 reservoir operations under a newly released federal draft environmental impact statement.

January 12, 2026

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The U.S. Bureau of Reclamation on Jan. 9 released a draft review on managing Colorado River’s two largest reservoirs after 2026, impacting dam operations, hydropower reliability and infrastructure risk management across the West.

The Draft [Environmental Impact Statement](#) (EIS) evaluates post-2026 operational alternatives for Lake Powell and Lake Mead beginning in 2027, when the 2007 Interim Guidelines governing coordinated operations at Glen Canyon Dam and Hoover Dam are set to lapse. Reclamation did not designate a preferred alternative, preserving flexibility as negotiations among the seven Colorado River Basin states continue.

RELATED

[At Lake Powell, Engineering Is Outpacing Colorado River Policy](#)

Those negotiations involve the seven states that make up the Colorado River Compact—Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming—which are divided between the Upper Basin and Lower Basin under the original 1922 agreement that governs the river’s use.

“The Department of the Interior is moving forward with this process to ensure environmental compliance is in place so operations can continue without interruption when the current guidelines expire,” said Andrea Travnicsek, assistant secretary for water and science at the U.S. Department of the Interior. “The river and the 40 million people who depend on it cannot wait. In the face of an ongoing severe drought, inaction is not an option,” she added.

RELATED

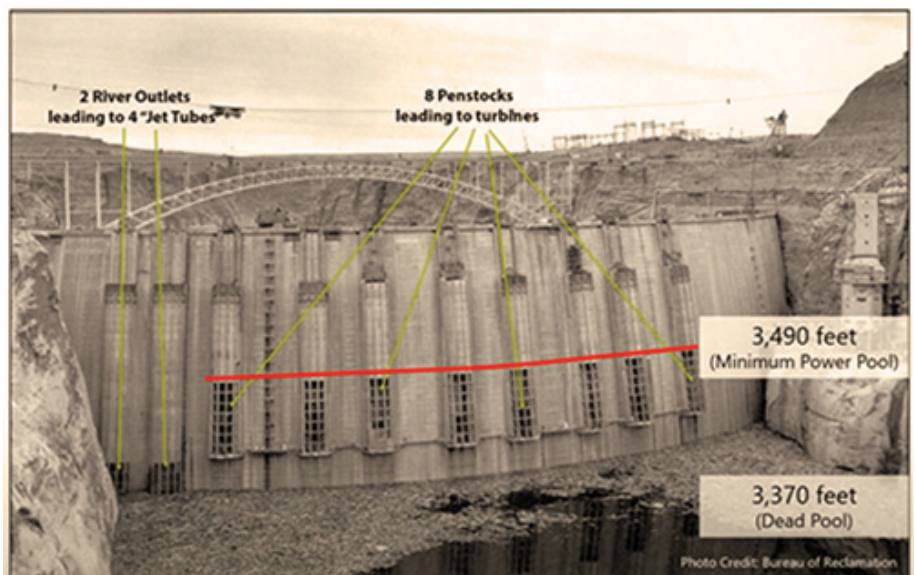
[Biden Administration Claims Near-term Victory in Colorado River System Stability](#)

A New Reality

The Draft EIS reflects the operational strain created by roughly 25 years of prolonged drought in the Colorado River Basin and forecasts that continue to point toward drier conditions.

These pressures have lowered reservoir levels to points that limit hydropower output and complicate dam operations, requiring federal managers to focus on safeguarding the infrastructure itself in addition to water delivery.

Reclamation analyzed five operational alternatives. The alternatives differ in how releases are coordinated between Lake Powell and Lake Mead, how shortages are triggered and distributed and how conserved water is stored and released under changing hydrologic conditions.



A Bureau of Reclamation diagram shows Glen Canyon Dam intake structures, highlighting the minimum power pool at 3,490 ft and the dead pool at 3,370 ft, thresholds central to post-2026 operations planning.

Image courtesy of the Bureau of Reclamation

Any eventual agreement among Compact states is expected to incorporate elements or variations of these approaches rather than adopting a single option wholesale.

“Given the importance of a consensus-based approach to operations for the stability of the system, Reclamation has not yet identified a preferred alternative,” said Scott Cameron, acting commissioner of the Bureau of Reclamation, in a statement.

“Reclamation anticipates that, when an agreement is reached, it will incorporate elements or variations of these five alternatives,” Cameron added, noting the breadth of alternatives in the EIS for “sustainable and effective management of the Colorado River.”

The Draft EIS directly addresses how close federal facilities are operating to critical thresholds. At Lake Powell, the analysis models conditions approaching minimum power pool, where turbine generation becomes constrained, and evaluates operations below that level through alternative outlet works.

Reclamation also assessed buffer elevations intended to reduce the likelihood that either Powell or Mead would fall into ranges that jeopardize hydropower generation and system operations.

To compare alternatives, the Draft EIS uses decision-making under “significant uncertainty,” assessing how often reservoir levels remain above specified performance thresholds across hundreds of possible future hydrologic scenarios, rather than relying on a single forecast.

The comprehensive approach highlights which operating strategies are most resistant to extended drought and pinpoints scenarios that could push the system into undesirable operating conditions.

The Colorado River supplies water to more than 40 million people across seven states and supports hydropower generation at nine federally operated facilities across the system, while also serving 30 Tribal Nations, two Mexican states and about 5.5 million acres of irrigated farmland.

Reclamation said the Draft EIS addresses only domestic river operations. A separate, binational process addressing deliveries to Mexico under the 1944 Water Treaty is also underway through the International Boundary and Water Commission.

Reclamation said the Draft EIS will be published in the Federal Register on Jan. 16, initiating a 45-day public comment period that runs through March 2. A decision on post-2026 operations is expected before Oct. 1, the start of the 2027 water year.

Federally Operated Colorado River Hydropower Facilities

The Colorado River system includes nine federally operated hydropower facilities managed by the Bureau of Reclamation, located on the mainstem river and key tributaries.

Lower Basin and Mainstem

- Hoover Dam
- Davis Dam
- Parker Dam

Upper Basin and Colorado River Storage Project

- Glen Canyon Dam
- Flaming Gorge Dam
- Navajo Dam
- Blue Mesa Dam
- Morrow Point Dam
- Crystal Dam

Historically, these facilities have generated about 12 billion kWh annually, though output has declined during prolonged drought as reservoir elevations have fallen.



City of Greeley and Wingfoot Water Resources Launch Water Bank to Boost Job Growth

January 26, 2026



GREELEY, Colo. — The City of Greeley and Wingfoot Water Resources have teamed up to create a new "Primary Employer Water Bank." This exciting initiative aims to provide companies with a reliable and affordable water supply, helping them grow and create jobs in our community.

Greeley has always invested in its water resources to ensure its water infrastructure is strong and ready for the future. The city's 2021 purchase of the Terry Ranch Aquifer Storage and Recovery project from Wingfoot demonstrates its commitment to and investment in this strategy. This project helps protect our water supply during droughts and provides approximately 12,100 raw water credits for new developments in Greeley.

The Primary Employer Water Bank is different from other standard water offerings. It is specifically designed to lower the costs for industries that create jobs by selling goods or services to statewide or national markets. With this partnership, Greeley and Wingfoot can provide raw water at lower prices to these types of businesses looking to build or expand in our city. This strategy aligns with Greeley Mayor Dale Hall's vision to drive job creation and strengthen the local economy.

"We are excited to advance this agreement and create more economic opportunities through our relationship with Wingfoot Water. The Water Bank and Wingfoot Raw Water Credit program build upon our tradition of providing reliable, cost-effective water services for industrial customers like Leprino Foods, Kodak, State Farm and JBS Corporate," said Sean Chambers, Director of Water Utilities.

Along with the Primary Employer Water Bank, Wingfoot is committed to selling raw water credits at preferential pricing to Primary Employers.

"This agreement represents a deliberate, shared commitment to Greeley's economic future," said Wingfoot Water's Kyle Akin. "By reserving available Wingfoot water assets specifically for Primary Employers, we have removed a barrier to job growth. This continued partnership aims to establish Greeley as the most water-secure and cost-competitive destination for job-creating industries on the Front Range."

About Wingfoot Water Resources

Wingfoot Water Resources owns Raw Water Credits that can be redeemed to the City of Greeley in satisfaction of raw water dedication requirements. Wingfoot helps real estate developers navigate water dedication obligations efficiently and cost-effectively. For more details about Wingfoot, go to wingfootwater.com.

More Information

For more details about the Primary Employer Water Bank, please contact Sean Chambers, Director of Water Utilities at the City of Greeley, at Sean.Chambers@greeleygov.com. You can also follow the City of Greeley on social media and subscribe to the Greeley Water & Sewer Newsletter at GreeleyCO.gov/water.

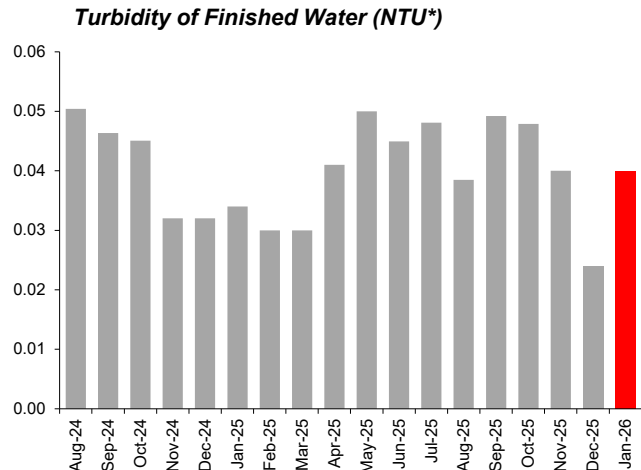
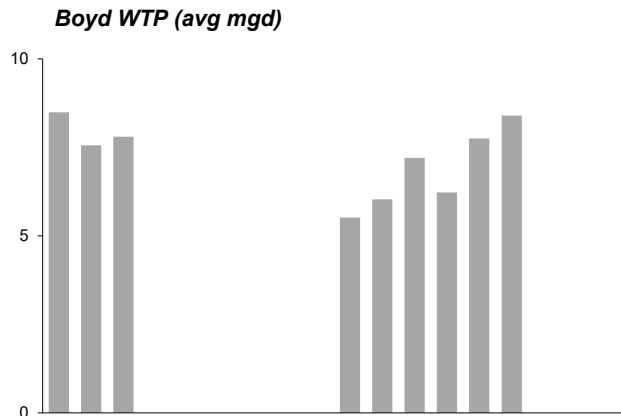
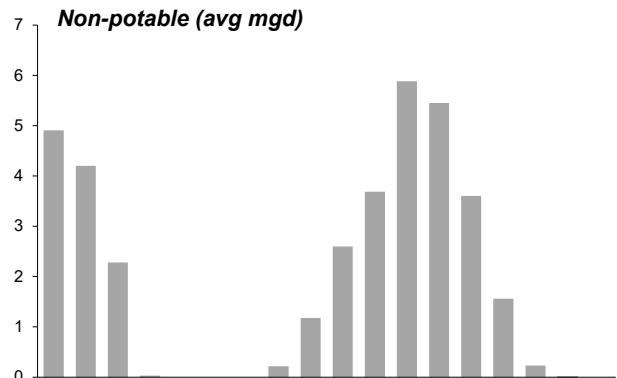
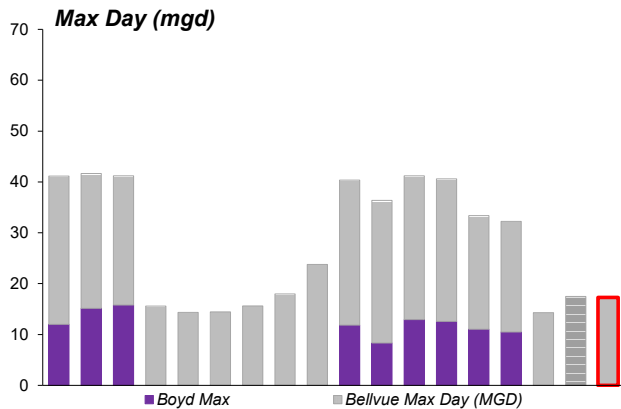
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Water Treatment

Bellvue Water Treatment Plant operates year-round with a transmission capacity of 29.1 million gallons per day (mgd) (plant capacity is 32 to 35 mgd). Water sources include Poudre River direct flows, Colorado-Big Thompson (C-BT), Windy Gap, High Mountain Reservoirs, Laramie-Poudre Tunnel, and Water Supply and Storage. Average volume is 19,000 acre-feet a year (2000-2011). The plant was built in 1907, with its last treatment upgrade in 2009. Solar panels were added in 2014.

Boyd Water Treatment Plant operates normally from April to October with a plant capacity of 38 mgd (transmission capacity is 40 mgd). Water sources include Greeley-Loveland Irrigation Company, C-BT, and Windy Gap. Average Volume is 8,200 acre-feet (2000-2011). The current plant was built in 1974, with its last treatment upgrade in 1999. Solar panels were added at Boyd in 2014. In 2016, tube settlers and plate settlers were replaced in the sedimentation basins. In 2018, all old existing chemical lines were replaced with new lines and the piping was up-sized to carry more chemical. A PLC upgrade was done on the SCADA system. Sludge pumps were replaced and hooked into the Trac Vac system that pulls sludge out of the sedimentation basins.

Combined, Bellvue and Boyd can treat a maximum of 70-73 million gallons per day.



Starting May 2016 Bellvue turbidity measurements will use a new method resulting in more accurate readings.

*Turbidity limit: 95% of samples must be below 0.3 NTU.

Turbidity is the measure of relative clarity of a liquid. Clarity is important when producing drinking water for human consumption and in many manufacturing uses. Turbidity is measured in Nephelometric Turbidity Units (NTU).

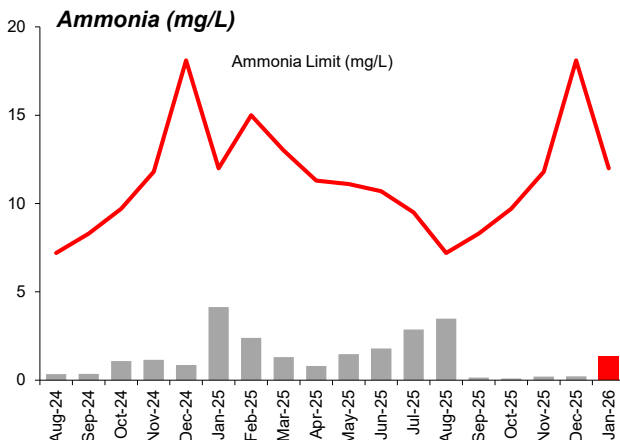
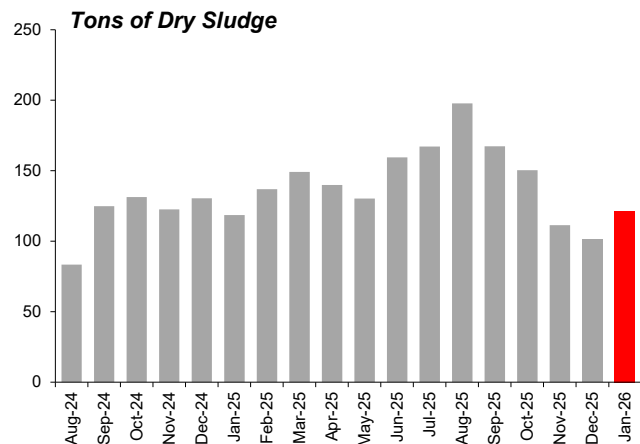
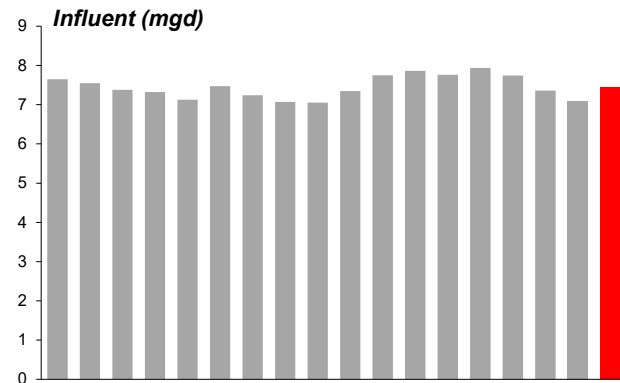
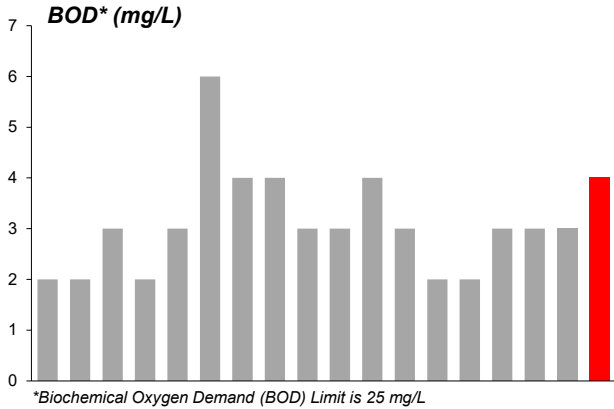
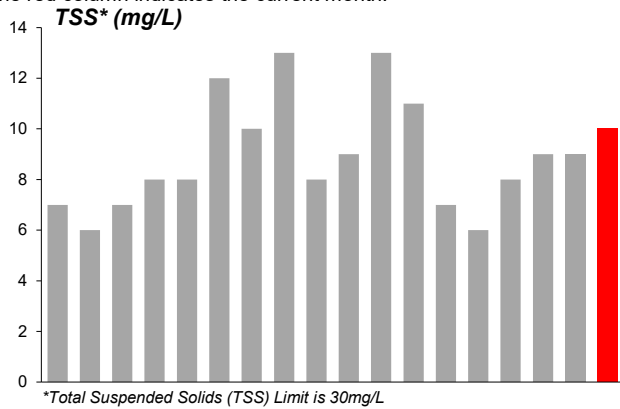


Wastewater Treatment

The Water Pollution Control Facility (WPCF) staff are dedicated environmental professionals who provide quality, safe and cost-effective wastewater treatment services for the citizens of Greeley. The WPCF treats wastewater to meet or exceed Environmental Protection Agency (EPA) and Colorado Department of Public Health & Environment requirements.

In 2011, the WPCF received an Xcel Energy Custom Efficiency Achievement Award for saving 2.78 million kWh and reducing CO2 emissions by 1,584 tons. In 2012, the WPCF received the Rocky Mountain Water Environment Association's (RMWEA) Sustainability Award for Colorado demonstrating excellence in programs that enhanced the principles of sustainability. A Certificate of Achievement from the Colorado Industrial Energy Challenge program managed through the Colorado Energy Office was received in the same year. In 2013, the plant received the City of Greeley's Environmental Stewardship Award for outstanding efforts to reduce energy (watts), conserve energy and water, reduce air and water pollution, and educate and encourage others to be environmental stewards. Also, in 2013, the plant was the recipient of a Bronze Award from the Colorado Environmental Leadership Program. In 2015, after having 5 years without a plant violation, the plant received the 2015 National Association of Clean Water Agencies (NACWA) Platinum Peak Performance award for the City of Greeley Water and Sewer Department.

Note: the red column indicates the current month.



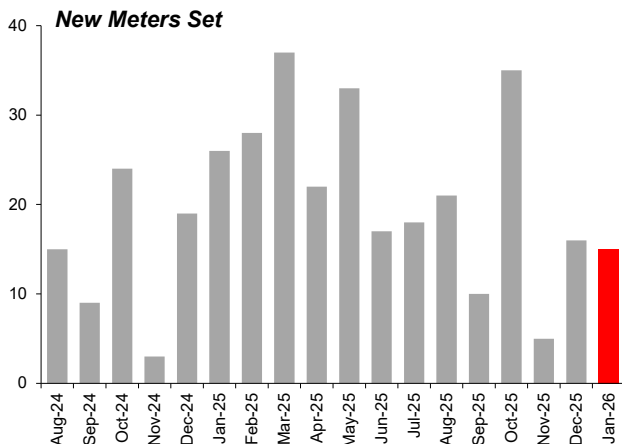
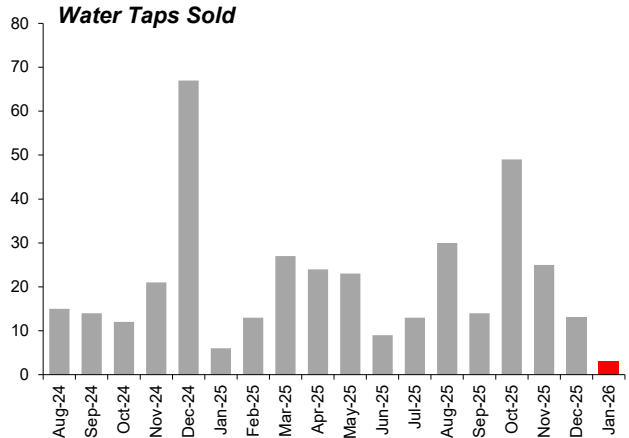
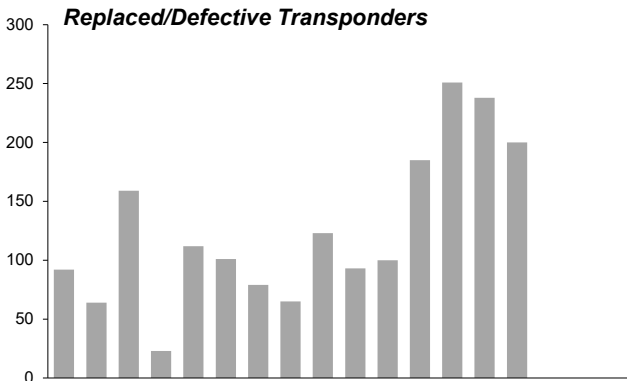
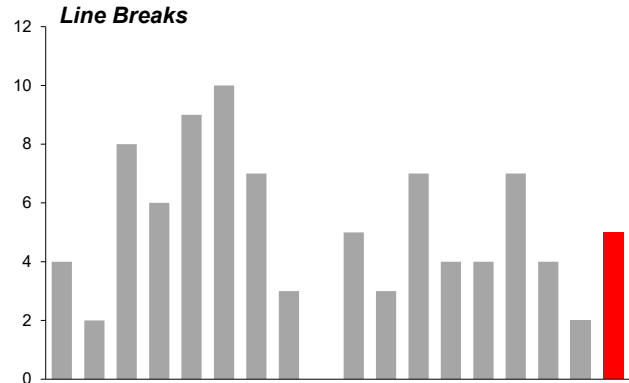
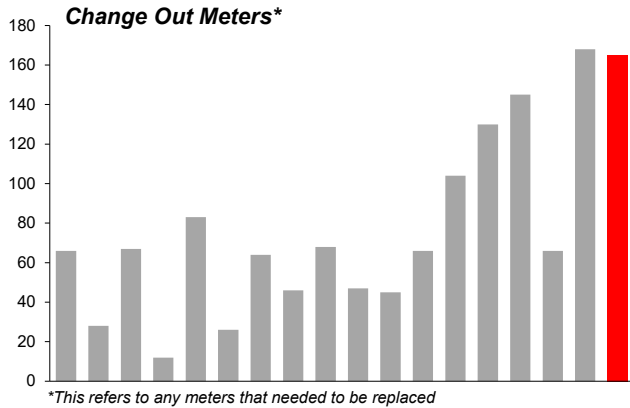
Water Distribution

The Greeley water distribution system consists of various sizes of pipes that generally follow the streets within the City. The distribution system serves residences and businesses in Greeley, Evans and Garden City, and the system is divided into four pressure zones.

There are 69.75 million gallons of potable water storage in Greeley. The water is stored within three covered reservoirs and one elevated tank; 23rd Avenue - 37.5 million gallons, Mosier Hill - 15 million gallons, and Gold Hill - 15 million gallons. The system also has 476 miles of pipeline, 24,233 water meters and 3,378 fire hydrants.

The water pipes in the distribution system vary in size from 4" to 36". Pipe material is steel, ductile iron, cast iron, or polyvinyl chloride. The age of the pipes varies from the 1890's to new installations.

Note: the red column indicates the current month.



Wastewater Collection

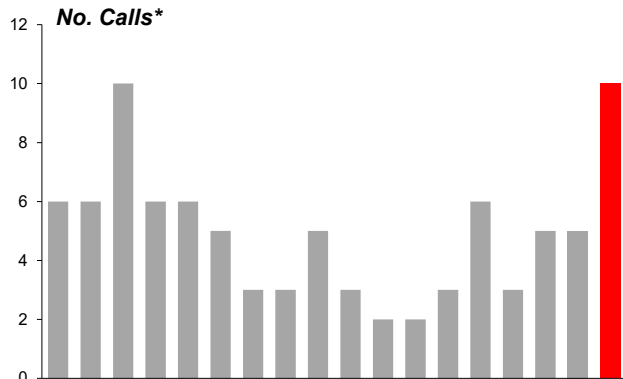
The mission of the Wastewater Collection Division of the Water and Sewer Department is to protect community health by transporting wastewater away from homes and businesses. This includes respecting property values and public safety by reducing the frequency of blockages in the sanitary sewer lines.

A wide variety of work is performed including routine cleaning of sewer lines, inspection of sewer lines, maintenance of the sewage pumping stations, rehabilitation of the system and responding to emergencies.

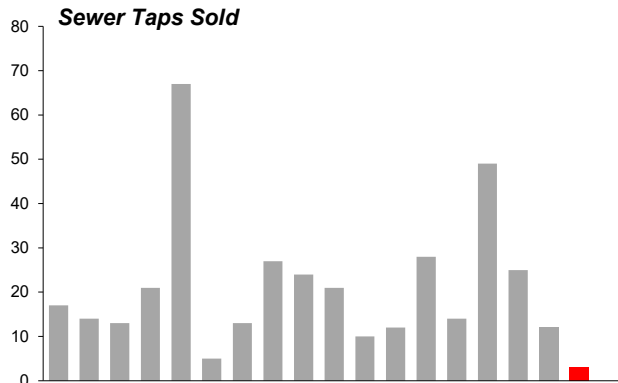
The wastewater collection system dates back to 1889. At the end of 2017, the system had a total of 364.8 miles of line and 10 sewage pumping stations. The sewer service area is approximately 51 square miles. Over the last 10 years, the system has grown by 17 miles.

Note: the red column indicates the current month.

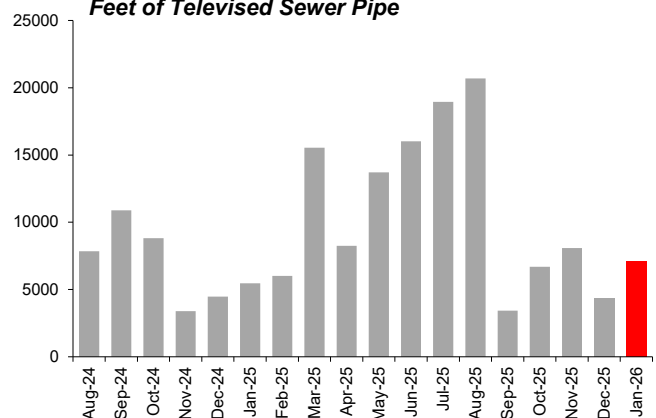
No. Calls*



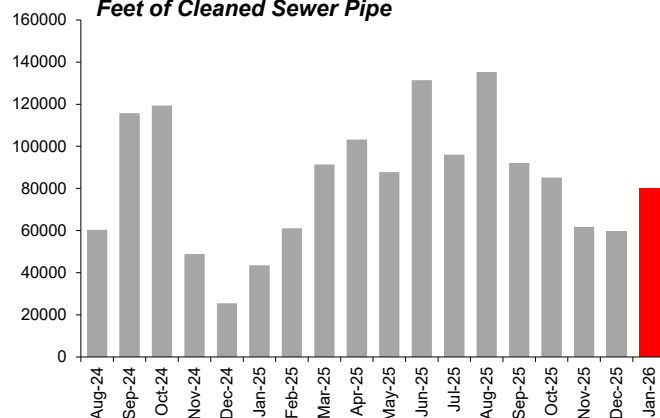
Sewer Taps Sold



Feet of Televised Sewer Pipe



Feet of Cleaned Sewer Pipe

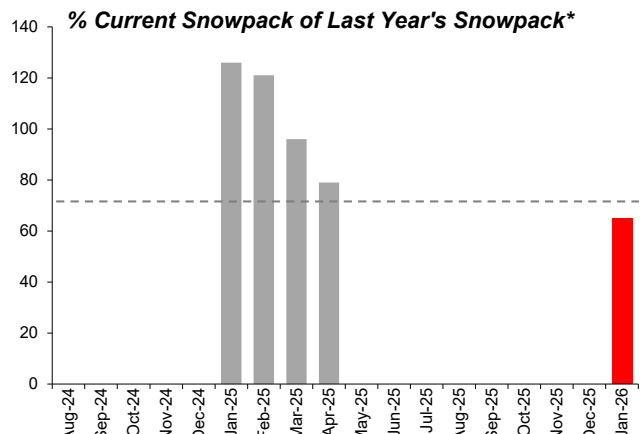
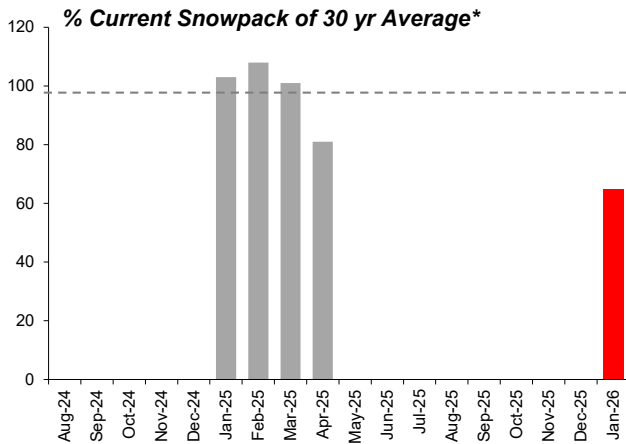
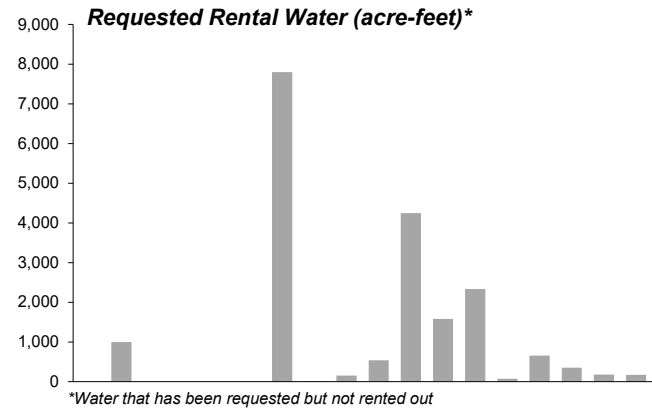
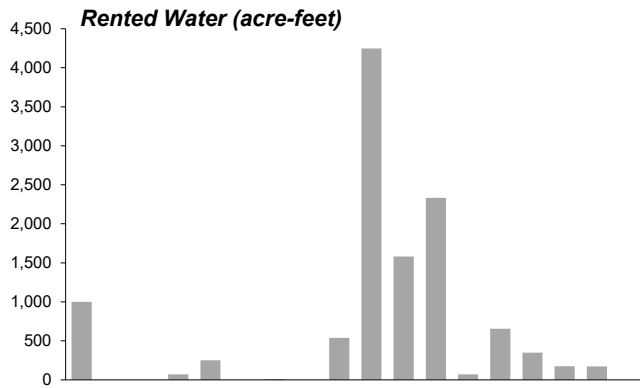
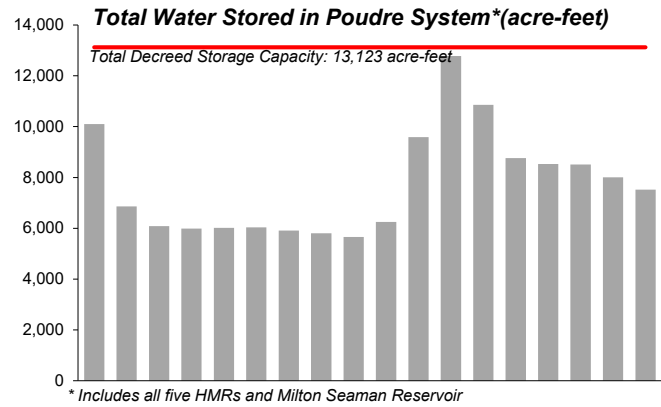
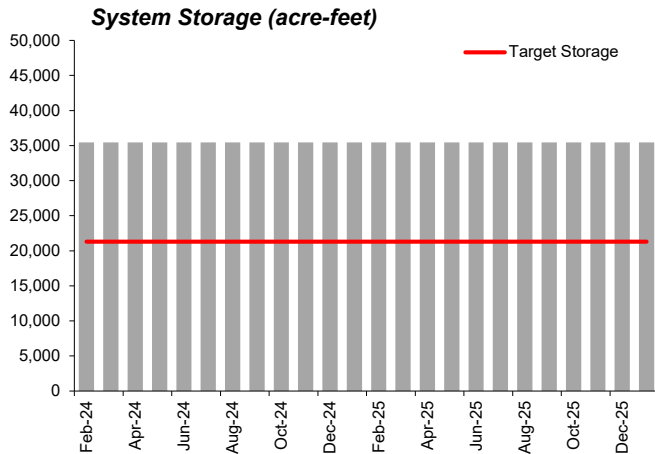


Water Resources

Greeley has numerous water rights in four river basins; the Upper Colorado River, Cache La Poudre, Big Thompson and Laramie River. The Water Resource staff must account for all of this water and comply with the rules of the Colorado Water Court and the State Engineer's Office which is in charge of allocating all of Colorado's water resources. Approximately one-third of the City's water supply comes from agricultural water rights. These water rights must be formally changed to municipal use by a special legal process through the Water Court. In this court, Water Resource staff and attorneys also defend the City's water rights against adverse claims from other parties.

Greeley's goal is to have enough water in carry-over storage to sustain Greeley through a 50-year critical drought. Water in excess of this carry-over drought supply can be leased to agriculture, both for revenue and to support our local agricultural community. Modeling has shown that, given existing population and demand factors, Greeley will have sufficient water for citizens, if at the beginning of the 6-year long, 50-year critical drought, there is 20,000 acre-feet in storage on April 1st of the following year.

Note: the red column indicates the current month.



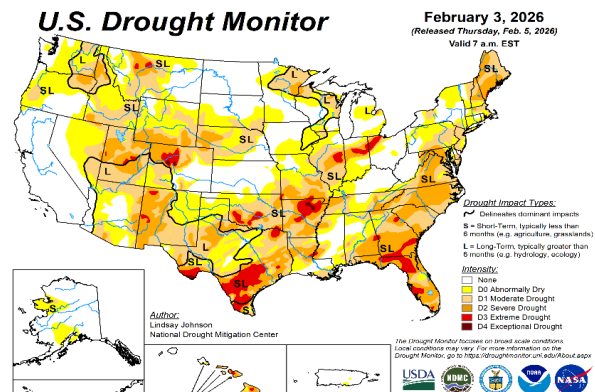
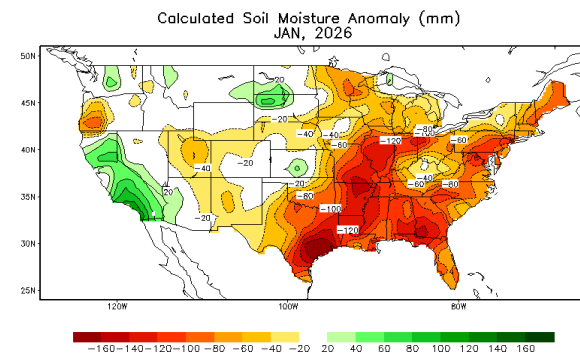
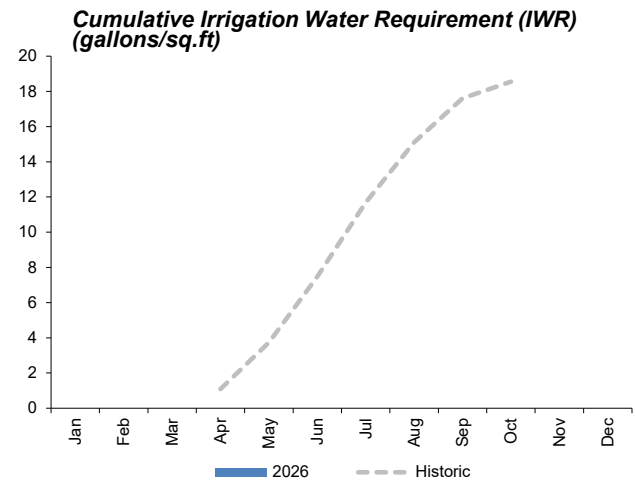
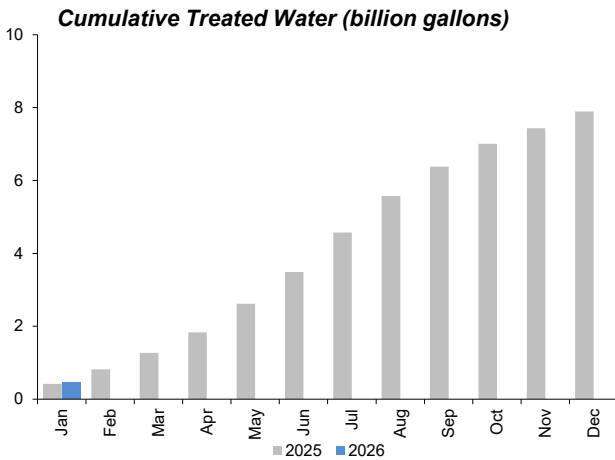
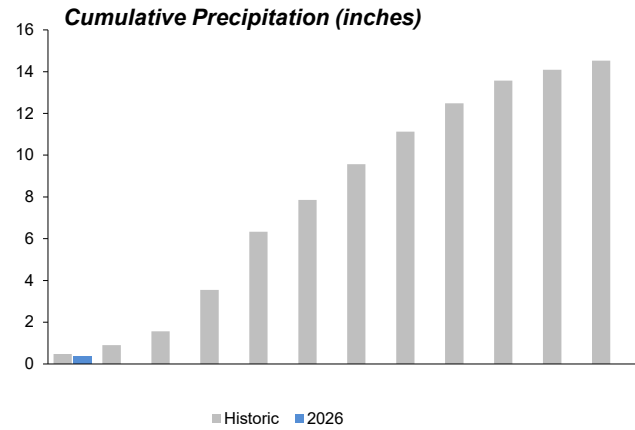
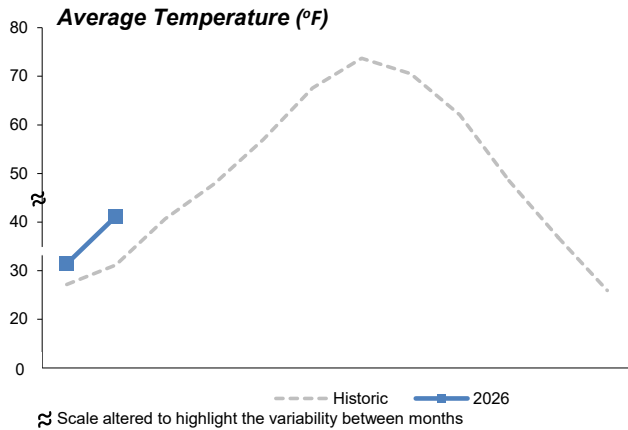
*Data is from the 1st of the month
 **Average of Deadman Hill and Joe Wright

*Data is from the 1st of the month
 **Average of Deadman Hill and Joe Wright

Treated Water and Weather Data

January was warmer than usual with an average daily temperature of 31.4°F.

Greeley received just 0.35 inches of precipitation in January.





Agenda Summary

February 18, 2026

Key Staff Contact: Sean Chambers, Water & Sewer Director

Title:

NISP Update

Summary:

Northern Water, through its Northern Integrated Water Supply Project (NISP) Enterprise, is seeking permission to locate NISP infrastructure on Greeley's Bellvue Water Treatment Plant (WTP) properties, and therewith NCWCD is seeking to obtain temporary construction easements and permanent utility easements for the proposed facilities that will convey water to and from the Cache la Poudre River (River). This proposal will create impacts to Greeley's WTP property and introduce complexity and risk to the operation of Greeley's own infrastructure and water rights. If implemented, the proposed NISP project elements diminish the City's future public use of the property.

The city's Bellvue WTP property is know more commonly as the City's Breckenridge property, and it is located on both sides of Hwy 14 at the mouth of the Poudre River Canyon. This property is important to city for the diversion of water rights from the river, securing water supply, and conveying water storage and raw water to the Bellvue treatment plant. The WTP property has variable topography with several existing raw water lines, two owned by City of Greeley and one belonging to City of Fort Collins. The property is also bisected by the Poudre Valley Canal (PVC) which diverts water rights from a location above the Greeley diversion near Picnic Rock, delivering it via an open earthen ditch to the east across Greeley's property. NISP's plans include an expansion of the PVC for the purpose of diverting the Gray Mountain junior water right and delivering it to the proposed Glade Reservoir Forebay.

The proposed NISP facilities on and across Greeley's WTP property will impact on the City's planned public uses of its WTP property. Throughout the NISP state and federal permitting process, Northern Water has planned to cross or impact Greeley's WTP property and has done so without an agreement with Greeley. The proposed NISP facilities and infrastructure on the City's WTP property include River diversions to the proposed Glade Reservoir and pipelines from Glade Reservoir conveying water back to the River below Greeley's existing diversion structure. Northern Water identifies both of these facilities as critical elements of NISP and their location on the City's WTP property as essential.

The staff and legal counsel from Kutak Rock will provide the Board with a summary of the NISP infrastructure proposed for Greeley's WTP property, describing its impacts and providing the Board with legal advice on a proposed legal position to protect the City's current and future public uses of the WTP property. W&S staff and counsel will seek advice to negotiators from the Board in advance of communicating the City's position to Northern Water on these matters.

Recommended Action:

None

Recommended Motion:

None

Attachments:

None