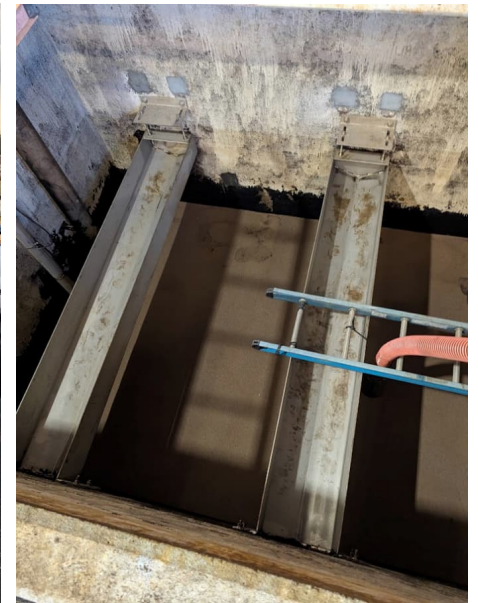
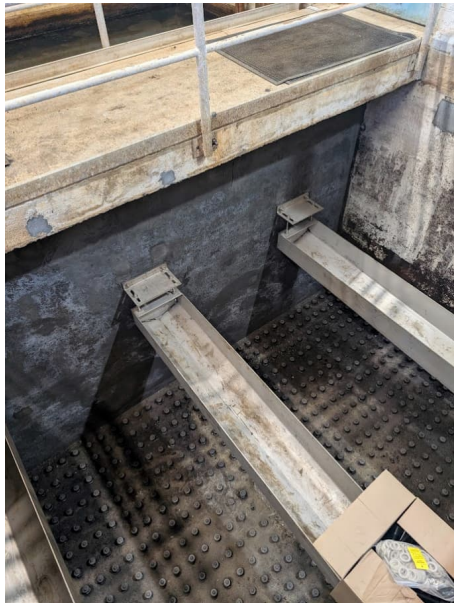


Hazen



South Granville Water and Sewer Authority

Filter Media Replacement: Drivers & Benefits for the Butner WTP

September 2, 2026



Condition of Filter Media at Butner WTP

Filter Media Replacement

- Previous media installed in 2002
 - Industry practice is to replace media every **10-15 years**
- Why replace media?
 - Media hardness decays, causing media to break down into smaller fines
 - Media effective sizes (ES) and uniformity coefficients (UC) decrease
 - *Solids tend to get removed at top of media rather than depth filtration*
 - *Higher head requirements -> shorter filter runs*
 - **Precipitates accumulate on media surface (measured with acid solubility)**



Media replacement is a routine WTP maintenance activity that maintains filtration performance, preserves media characteristics, minimizes excessive headloss, and reduces media loss during backwashing

Original (Old) Media Analysis Results

Filter 2 Media Analysis

	Anthracite		Sand	
Parameter	Original Design Value	Lab Analysis	Installed	Lab Analysis
Effective Size (mm)	0.9 – 1.2	0.65	0.45 – 0.55	0.29
Uniformity Coefficient (max)	1.7	2.3	1.65	2.3
Acid Solubility (max %)	5	27.6	5	43.1

Filter 5 Media Analysis

	Anthracite		Sand	
Parameter	Original Design Value	Lab Analysis	Installed	Lab Analysis
Effective Size (mm)	0.9 – 1.2	0.65	0.45 – 0.55	0.27
Uniformity Coefficient (max)	1.7	2.5	1.65	2.5
Acid Solubility (max %)	5	25.3	5	33.6

The effective sizes of anthracite and sand were 28% and 36% lower than original spec

The uniformity coefficients for anthracite and sand increased 47% and 51% respectively

New Installed Media Properties

	Anthracite		Sand	
Parameter	Design Value	New Installed	Design Value	New Installed
Effective Size (mm)	0.95 – 1.05	1.0	0.45 – 0.55	0.51
Uniformity Coefficient (max)	1.4 or less	1.3	1.4 or less	1.3
Acid Solubility (max %)	5	1.3	5	1.4

↑
Original anthracite
was up to 27.6%!

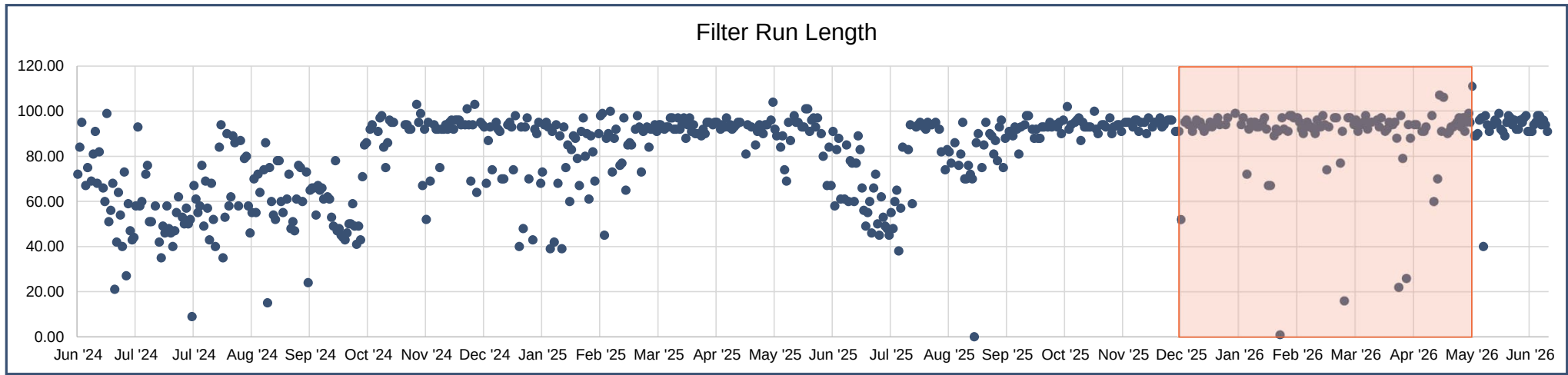
↑
Original sand was
up to 43%!

Operational Improvements Based on MOR Data

Filter Runtime

- **16% increase** in average filter runtime (which relates to production efficiency)
 - Jun 2024 – Apr 2026: 80 hr
 - May 2026 – Jun 2026: 93 hr

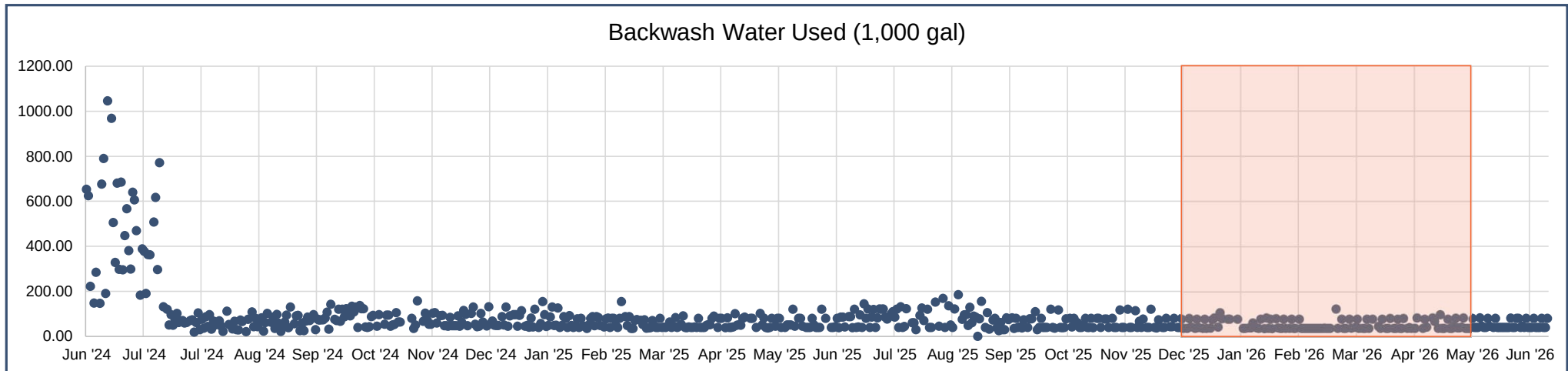
Filter Media
Replacement Period



Backwash Water Use

- **42% decrease** in average backwash volume (which means more produced water is available for distribution to customers)
 - Jun 2024 – Apr 2026: 91,380 gal
 - May 2026 – Jun 2026: 52,780 gal

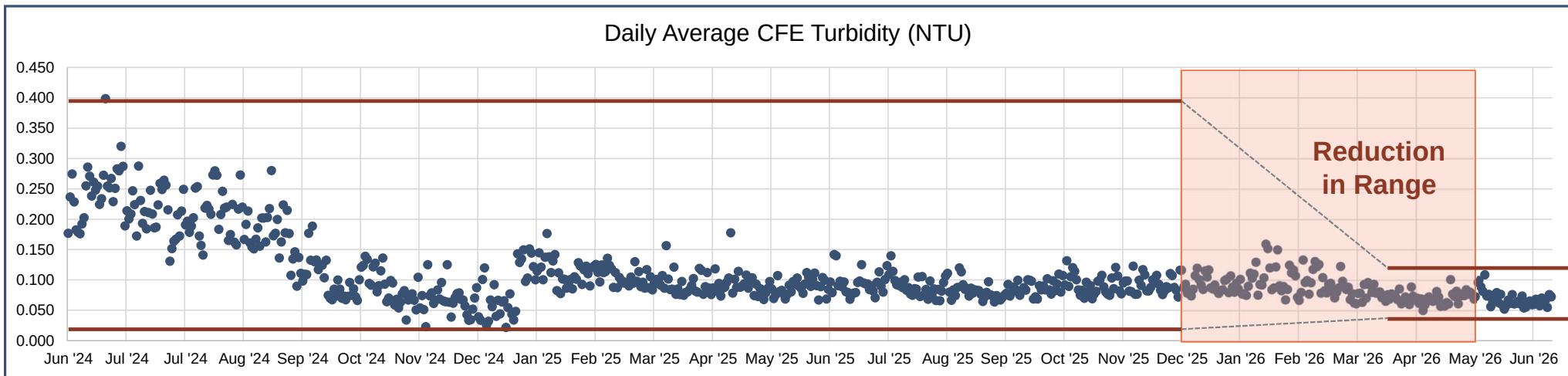
Filter Media
Replacement Period



Effluent Turbidity

- **37% decrease** in average finished water turbidity
 - Jun 2024 – Apr 2026: 0.11 NTU
 - May 2026 – Jun 2026: 0.07 NTU
- **85% decrease** in range of average finished water turbidity
 - Jun 2024 – Apr 2026: 0.02 – 0.4 NTU
 - May 2026 – Jun 2026: 0.05 – 0.11 NTU

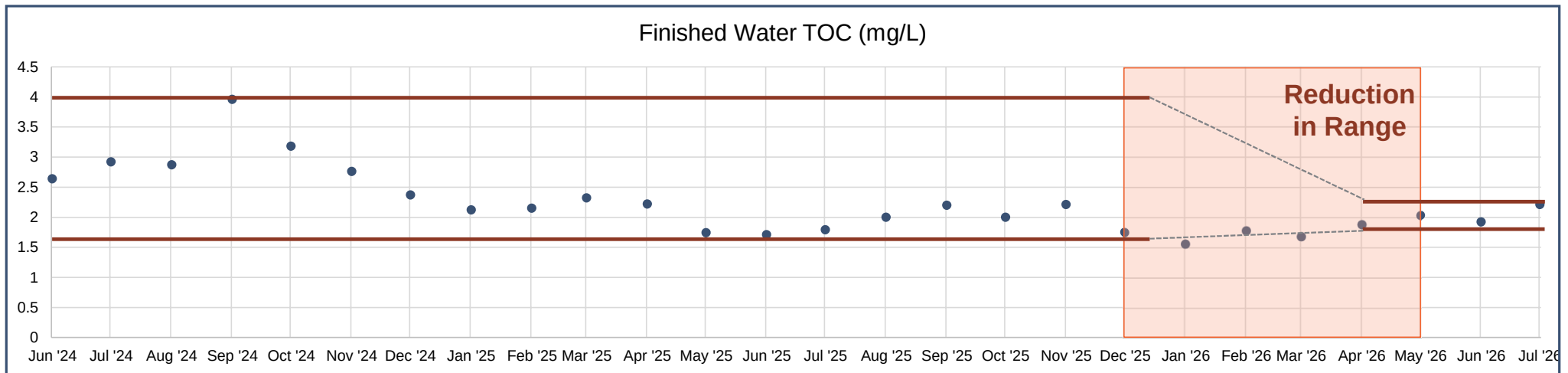
Filter Media
Replacement Period



Finished Water TOC

- **9% decrease** in average finished water TOC
 - Jun 2024 – Apr 2026: 2.3 mg/L
 - May 2026 – Jun 2026: 2.1 mg/L
- **88% decrease** in range of finished water TOC
 - Jun 2024 – Apr 2026: 1.6 – 4.0 mg/L
 - May 2026 – Jun 2026: 1.9 – 2.2 mg/L

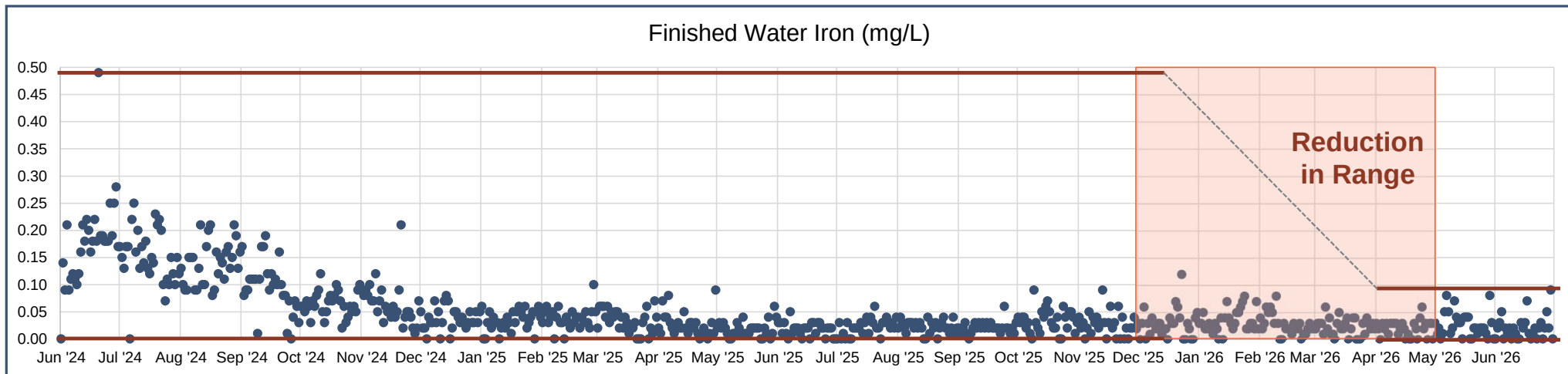
Filter Media
Replacement Period



Finished Water Iron

- **54% decrease** in average finished water iron
 - Jun 2024 – Apr 2026: 0.05 mg/L
 - May 2026 – Jun 2026: 0.02 mg/L
- **82% decrease** in range of finished water iron
 - Jun 2024 – Apr 2026: 0.00 – 0.49 mg/L
 - May 2026 – Jun 2026: 0.00 – 0.09 mg/L

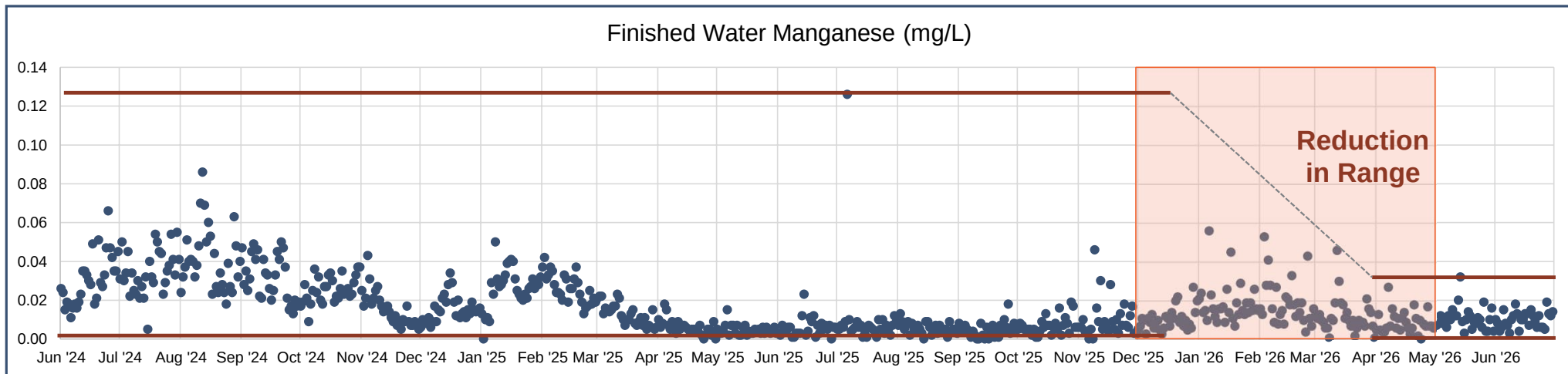
Filter Media
Replacement Period



Finished Water Manganese

- **38% decrease** in average finished water manganese
 - Jun 2024 – Apr 2026: 0.02 mg/L
 - May 2026 – Jun 2026: 0.01 mg/L
- **77% decrease** in range of finished water manganese
 - Jun 2024 – Apr 2026: 0.00 - 0.13 mg/L
 - May 2026 – Jun 2026: 0.00 – 0.03 mg/L

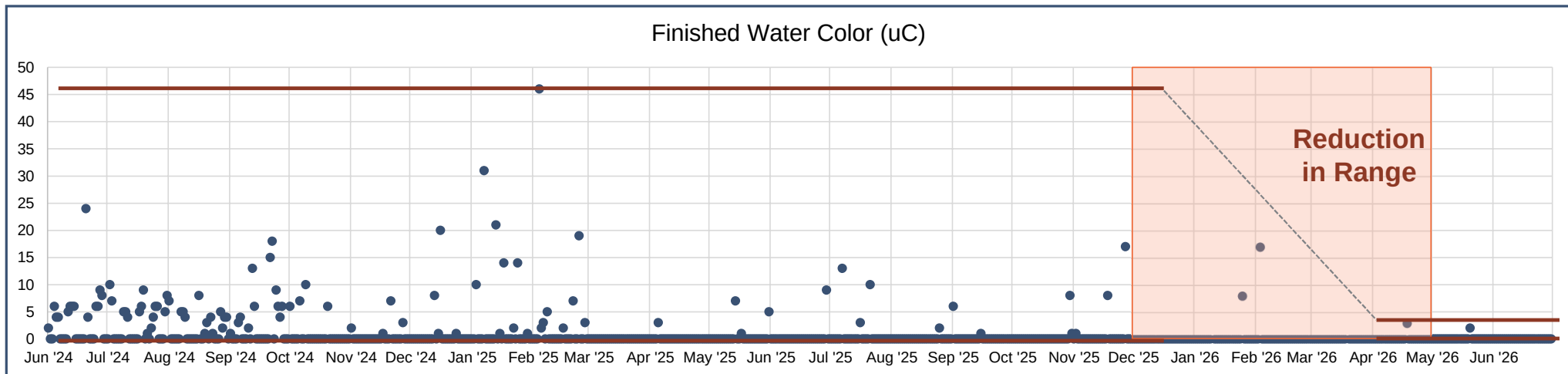
Filter Media
Replacement Period



Finished Water Color

- **97% decrease** in average finished water color
 - Jun 2024 – Apr 2026: 1.00 uC
 - May 2026 – Jun 2026: 0.03 uC
- **96% decrease** in range of finished water color
 - Jun 2024 – Apr 2026: 0.0 – 46 uC
 - May 2026 – Jun 2026: 0.0 – 2.0 uC

Filter Media
Replacement Period



Summary

Filter Media Replacement: Drivers & Benefits Summary

Why Replace the Media?

- Existing media exceeded its service life and no longer met key design criteria
- Media degradation can increase headloss, reduce filtration efficiency, and increase maintenance requirements
- New media restores filter performance and supports long-term operational reliability

What Were the Results?

- 16% longer filter runs
- 42% less backwash water usage
- Improved effluent quality and consistency
- Media properties restored to design specifications
- New filter media should help provide more consistent water quality even with changing source water conditions