

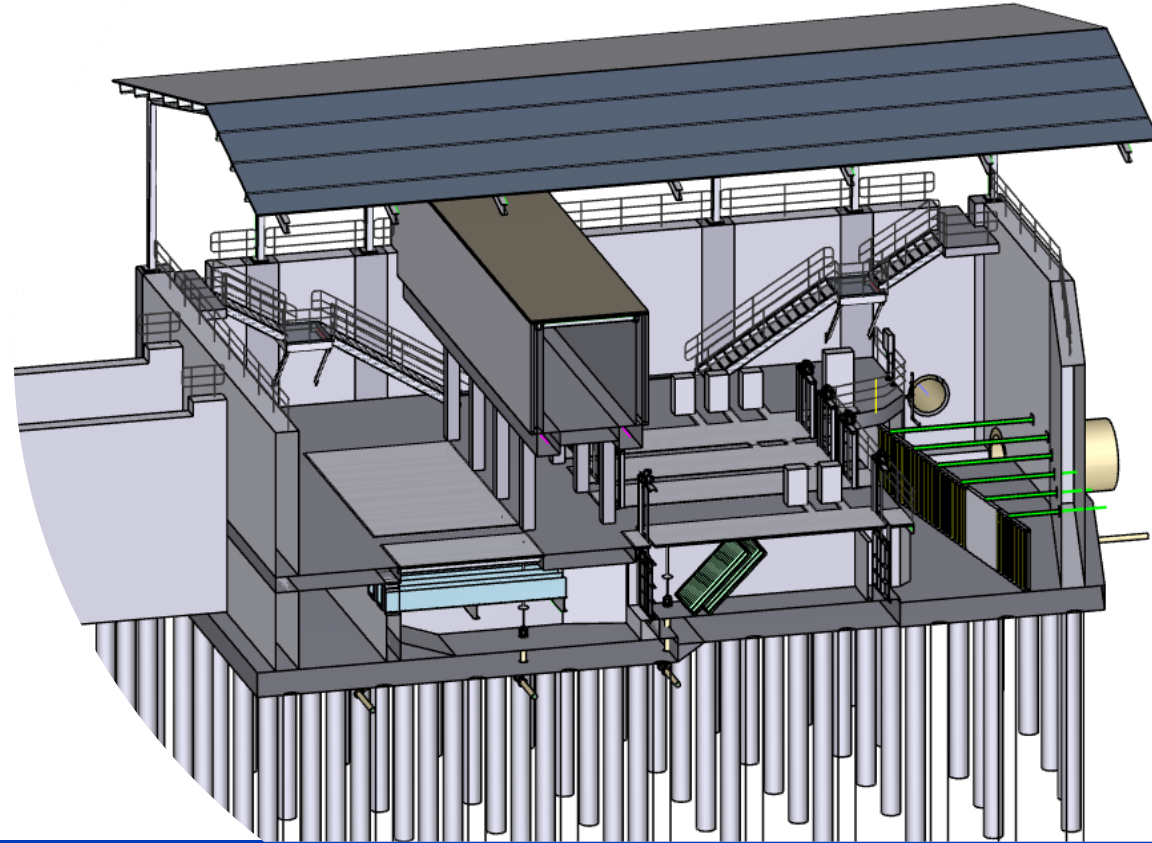
Beyond Chlorine Gas

Conversion to UV to Provide Safe and Resilient
Disinfection for the Walnut Creek WWTP

Danny Hurtado, PE – Project Manager
Carollo Engineers

Curtis Feronti, PE – Project Engineer
Carollo Engineers

TACWA Meeting
Austin, Texas

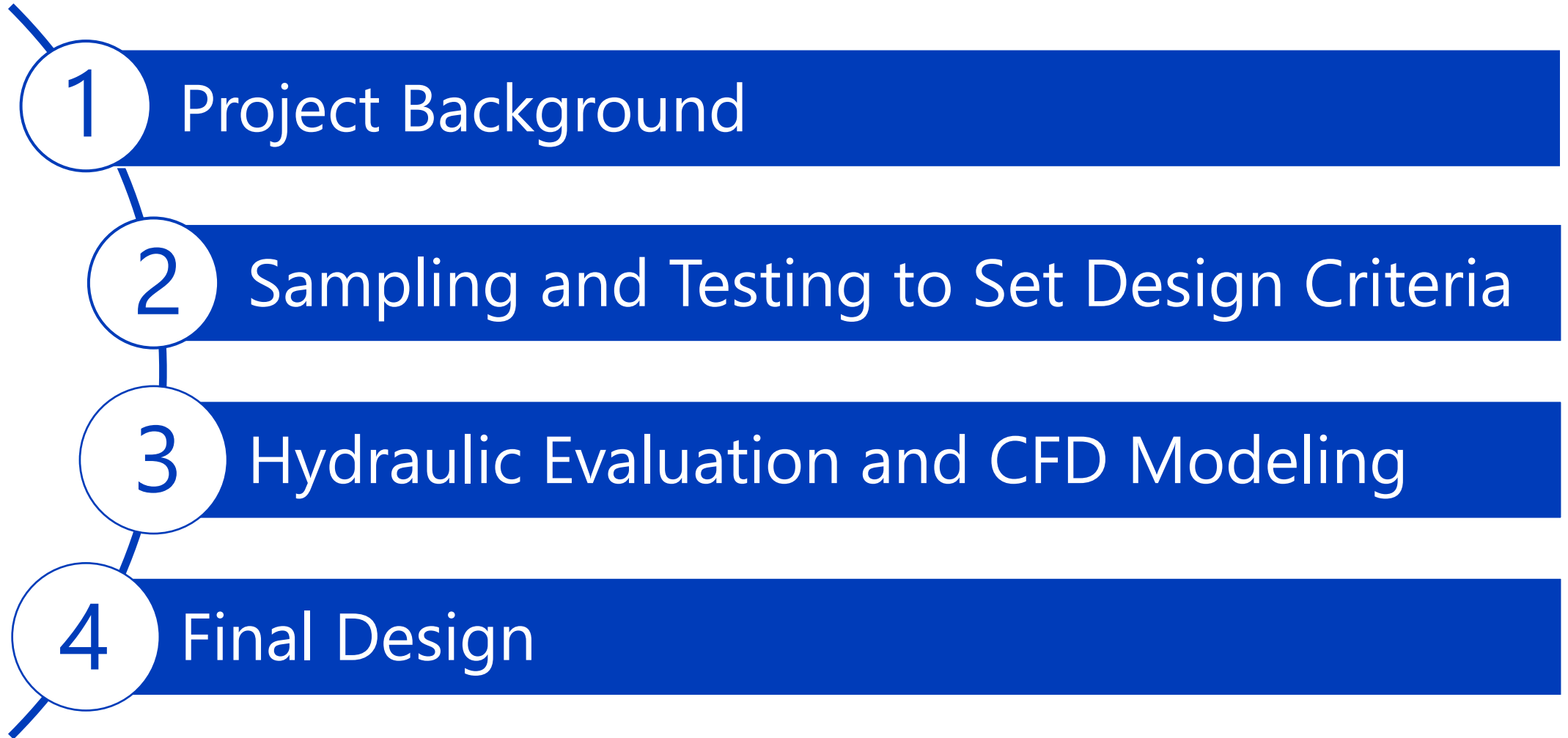


June 5, 2026

carollo®



Agenda



1

Project Background

Design Team

Walnut Creek WWTP Expansion



- Capital Delivery Services
- Austin Water

AECOM



carollo



Principal-in-Charge
Hani Michel, PE

Project Manager
Danny Hurtado PE



Chief Technologist
Bill Sotirakos, P.Eng.



Headworks

Odor Control

Chemical Facilities

Wet Weather
Treatment

Post Aeration

UV Disinfection
Curtis Feronti, PE

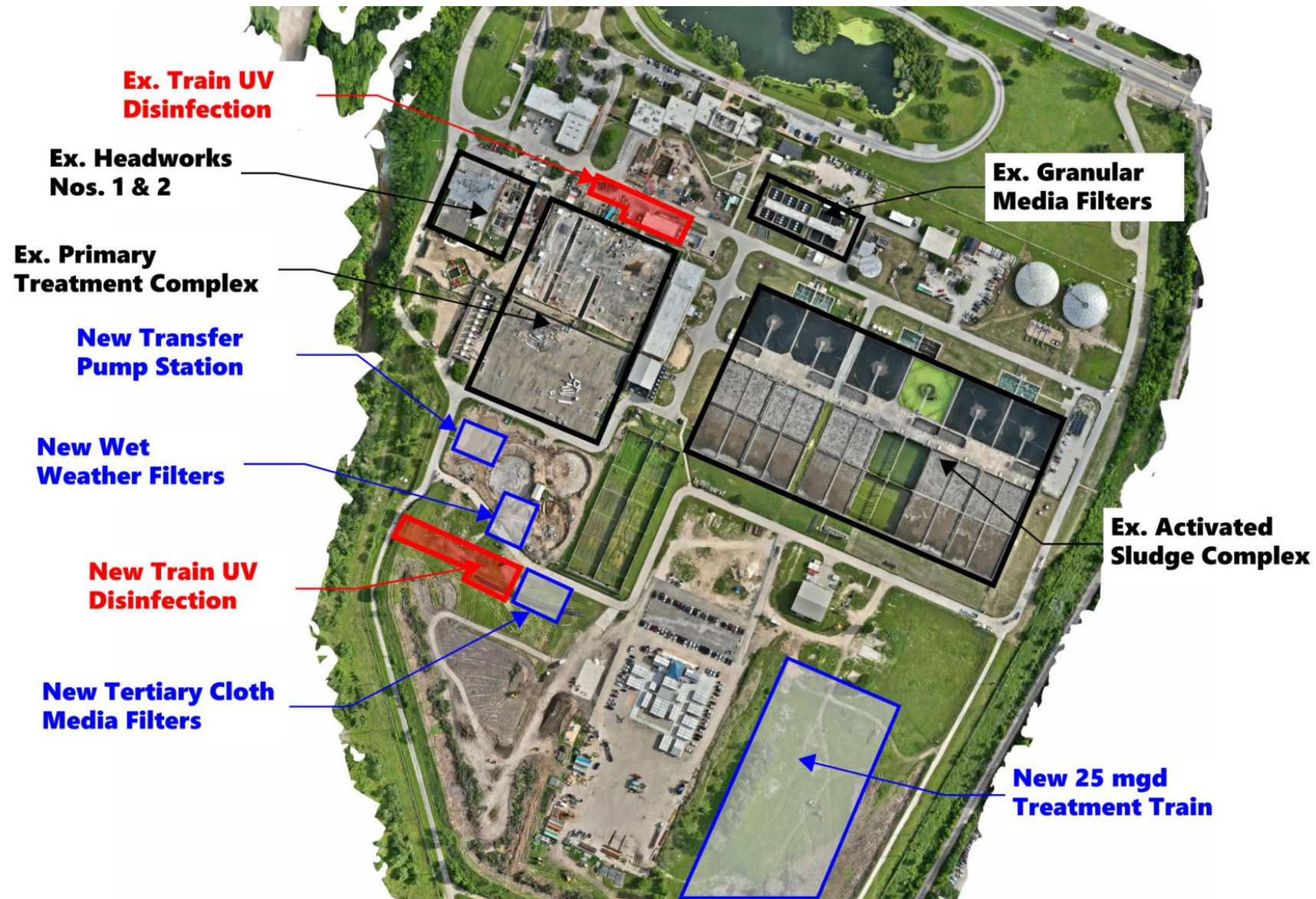


Carollo operates the world's largest UV validation facility in Portland, Oregon

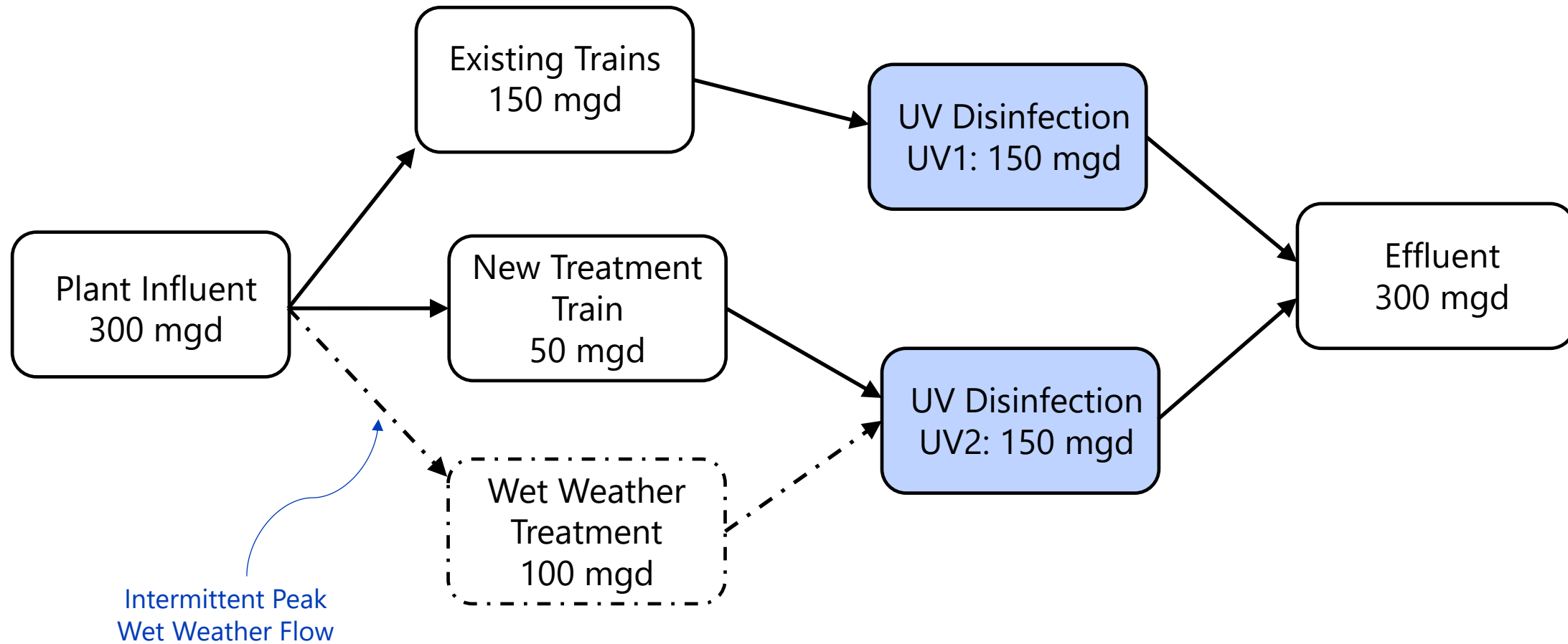
- Commissioned in 2003
- UV validation of >90 commercial reactors per USEPA, IUVA and NWRI guidance
- Flow rates per reactor from 0.1 to 80 mgd



Walnut Creek WWTP Expansion



Walnut Creek WWTP – Peak Flow Diagram



Walnut Creek WWTP – A Leader in Wastewater



Peak Performance

AWARDS

Platinum Award



ENVISION™

Potentially the Largest Envision
Wastewater Project

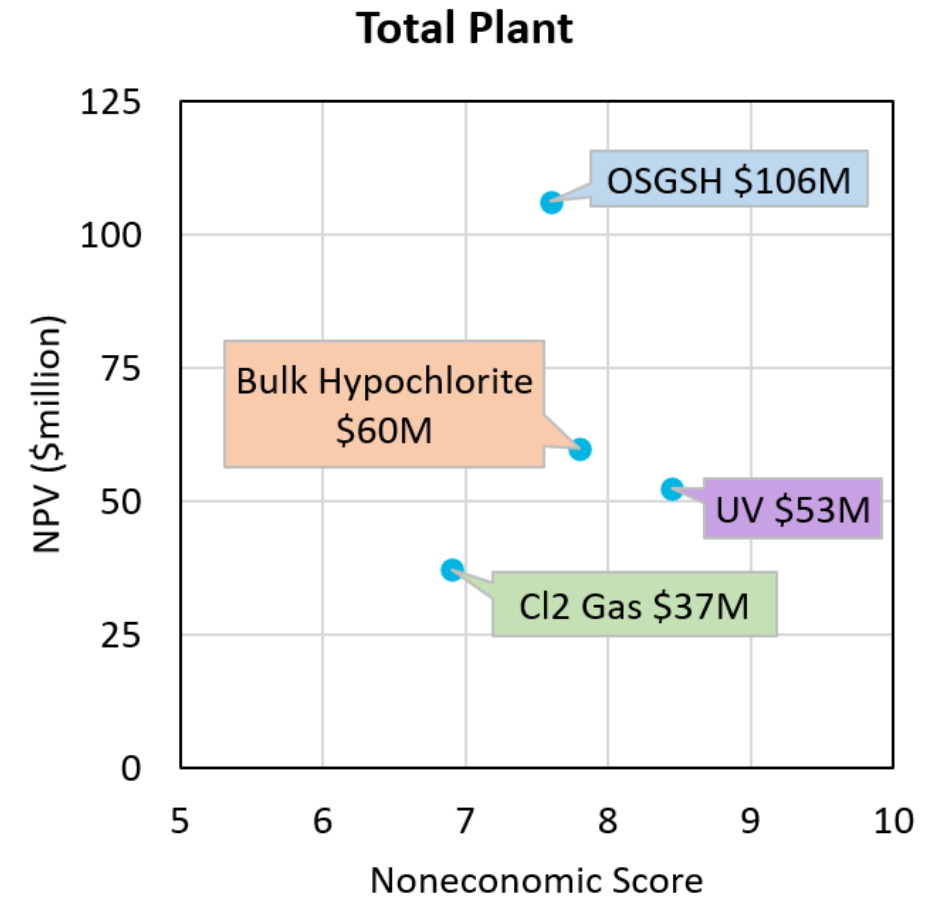
Open Channel UV was the highest scoring of the disinfection alternatives

Category	Weight	Baseline – Chlorine Gas		Bulk Sodium Hypochlorite		Onsite SH Gen.		Open-Channel UV		Medium-Pressure Closed-Vessel UV		LPHO Closed-Vessel UV	
		Raw Score	Weighted Score	Raw Score	Weighted Score	Raw Score	Weighted Score	Raw Score	Weighted Score	Raw Score	Weighted Score	Raw Score	Weighted Score
Safety	30%												
Constructability	20%												
TDS Impacts	10%												
Resiliency	25%												
Hydraulics	10%												
Site Utilization	25%												
Total	100%		6.9		7.8		7.6		8.8		7.8		8.1

UV was selected from an evaluation of disinfection alternatives

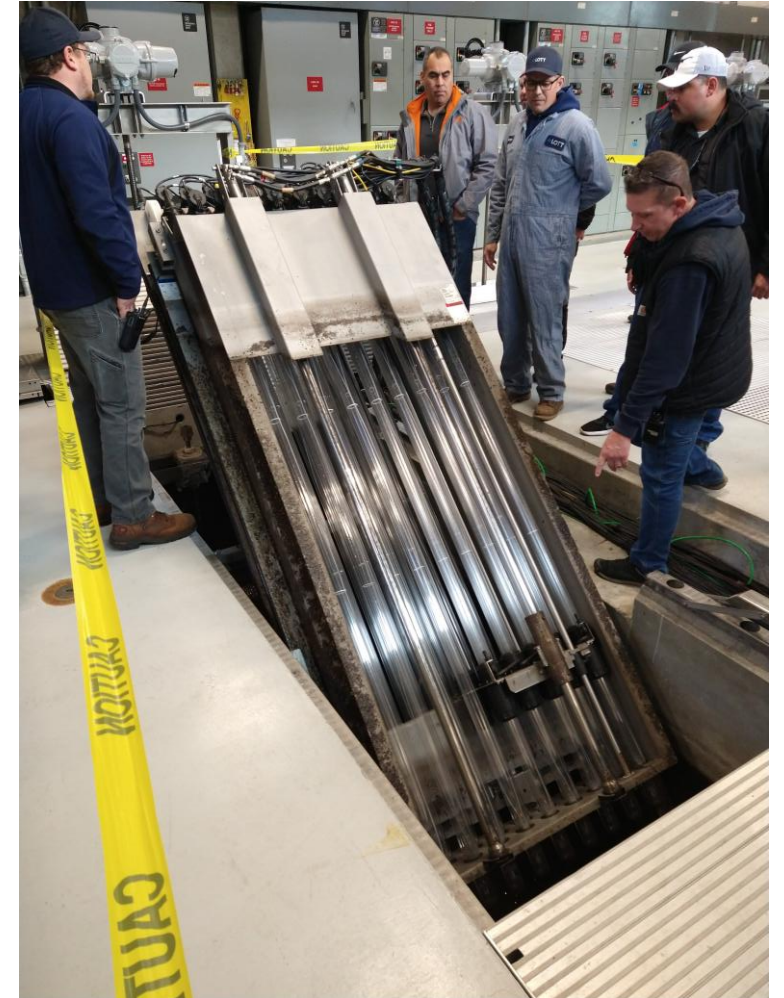
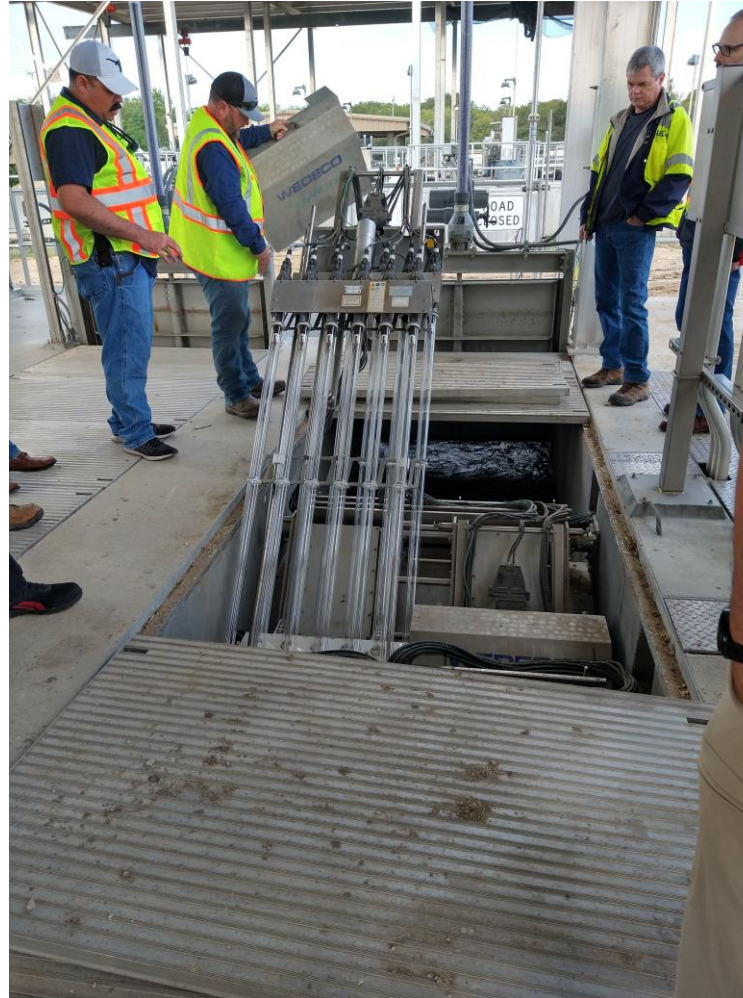
Benefits of UV:

1. More economical than most chlorine options.
2. Safer than most chlorine options.
3. No TDS additions.
4. No dependency on chemical deliveries.



Visited Open Channel UV Installations

- O&M discussion with other utilities.
- Inclined reactor and lamp orientation.
- Automatic Chemical/Mechanical Cleaning.
- UV Sensor based Closed-Loop Dose Pacing Control.

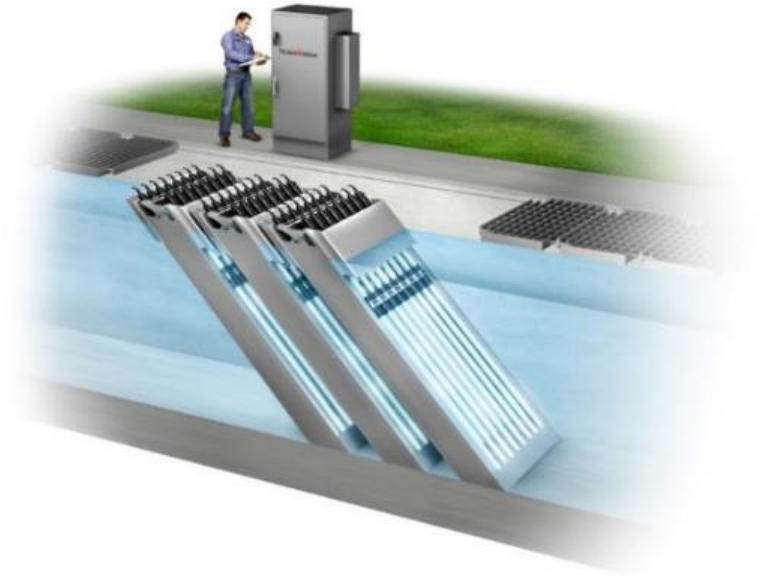


2

Setting Design Criteria

Factors Affecting UV Disinfection

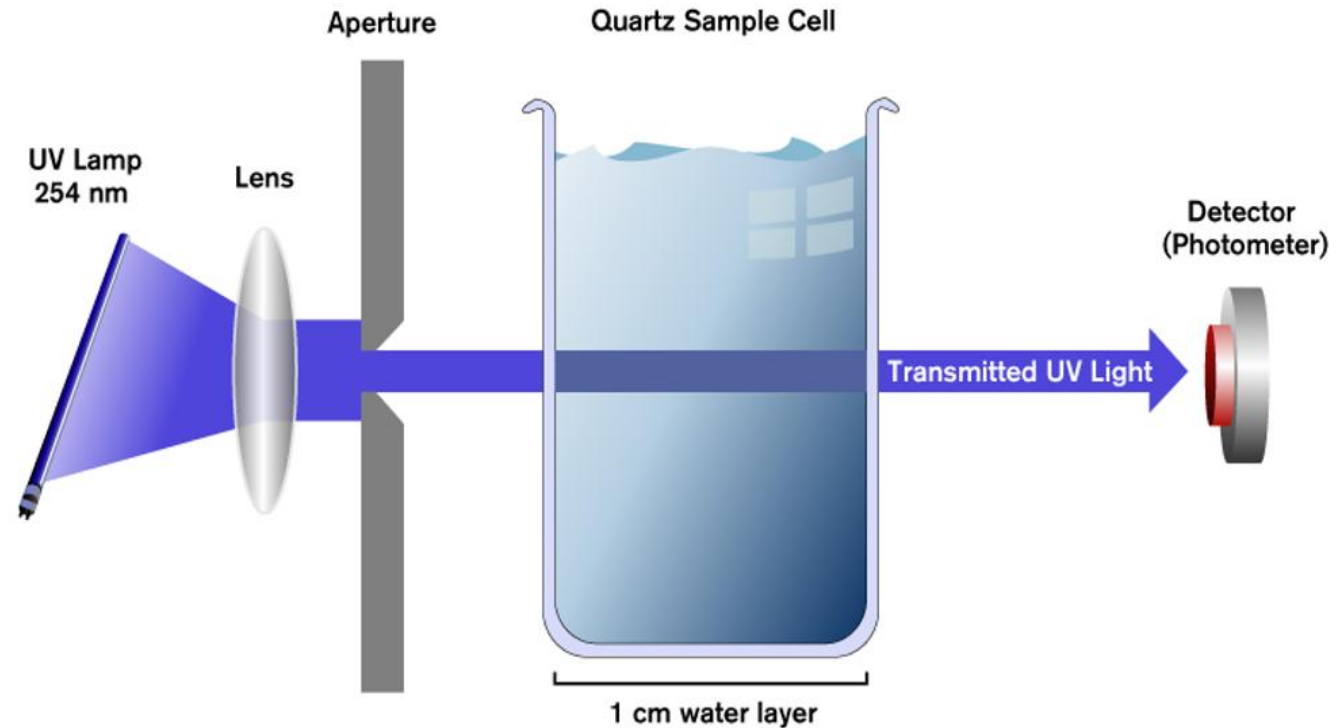
- Permit Limit for *E. coli*
 - » 126 CFU/100 mL 30-day geometric mean
 - » 399 CFU/100 mL daily maximum
- Flow Rate (Maximum, Average, and Minimum)
- Total Suspended Solids (Design Maximum)
- UV Transmittance (Design Minimum)



Source: Trojan UVSigna 2-Row

UV Transmittance (UVT)

- As % UV Transmittance decreases, the ability of the UV Light to penetrate the wastewater and reach the target organisms decreases.
- A decrease in UVT by 5% will increase the UV system's lamp count by approximately 20%.



Effluent sampling to inform design criteria

- UV transmittance was collected daily at the WWTP.
- Water samples tested:
 - Secondary effluent.
 - Gravity media filtered effluent.
 - Cloth-filtered effluent (lab-filtered).



Curtis Feronti

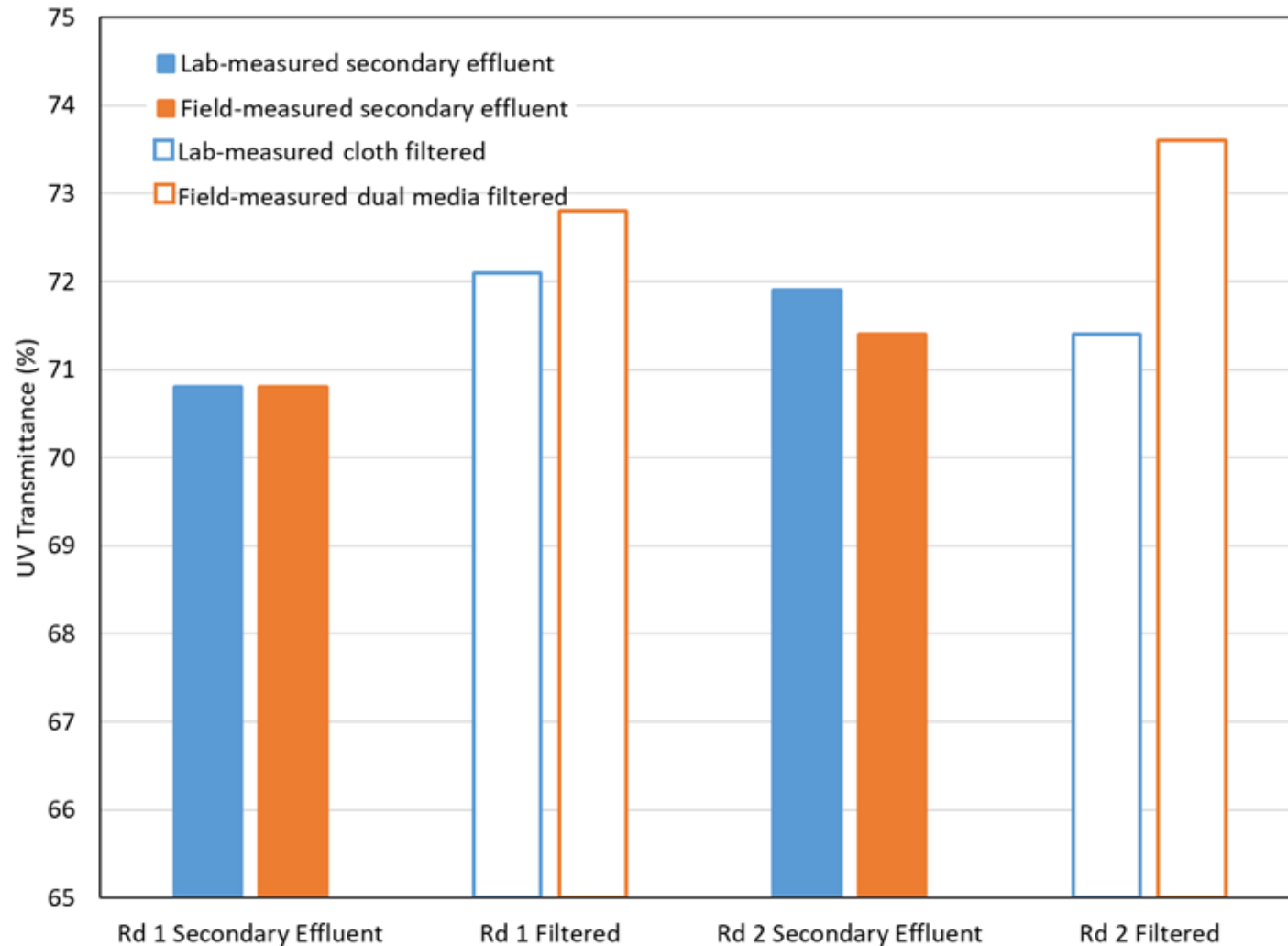


Brenna Bates



Jerry Yan

UV Transmittance (UVT) Design Criteria



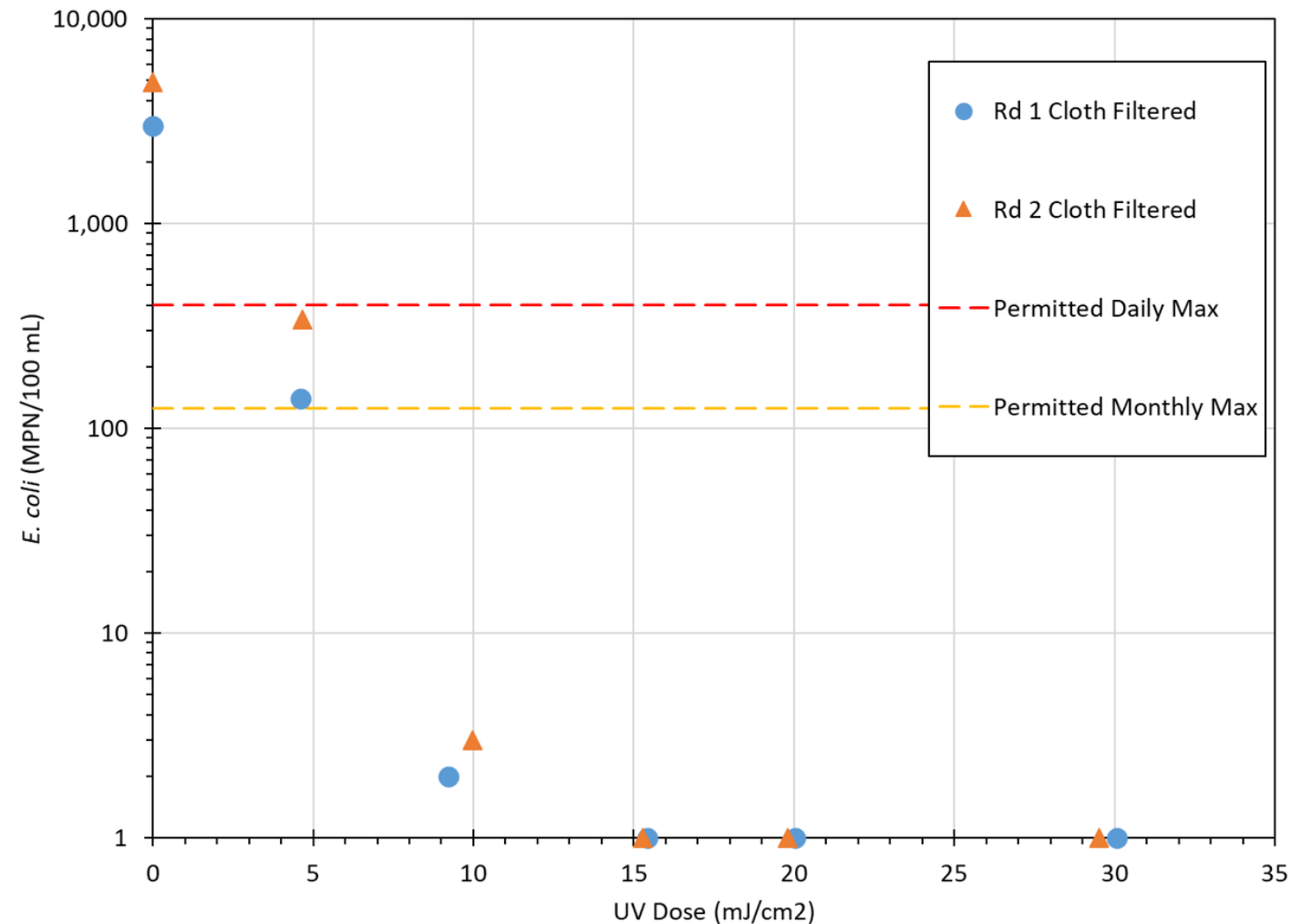
UVT (%)	Undisinfected Secondary Effluent	Filtered Effluent
Average	69.7	73.3
Lower 10 th Percentile	66.6	70.3
Number of Samples (N)	63	62

UV Dose-Response Test Results



Collimated Beam Testing

- A UV dose of 10 mJ/cm² reduced *E. coli* concentrations to single digits.
- A UV dose of 15 mJ/cm² reduced *E. coli* concentrations to less than 1 MPN/100 mL.
- A UV dose of 17 mJ/cm² was selected for the filtered effluent design criteria.



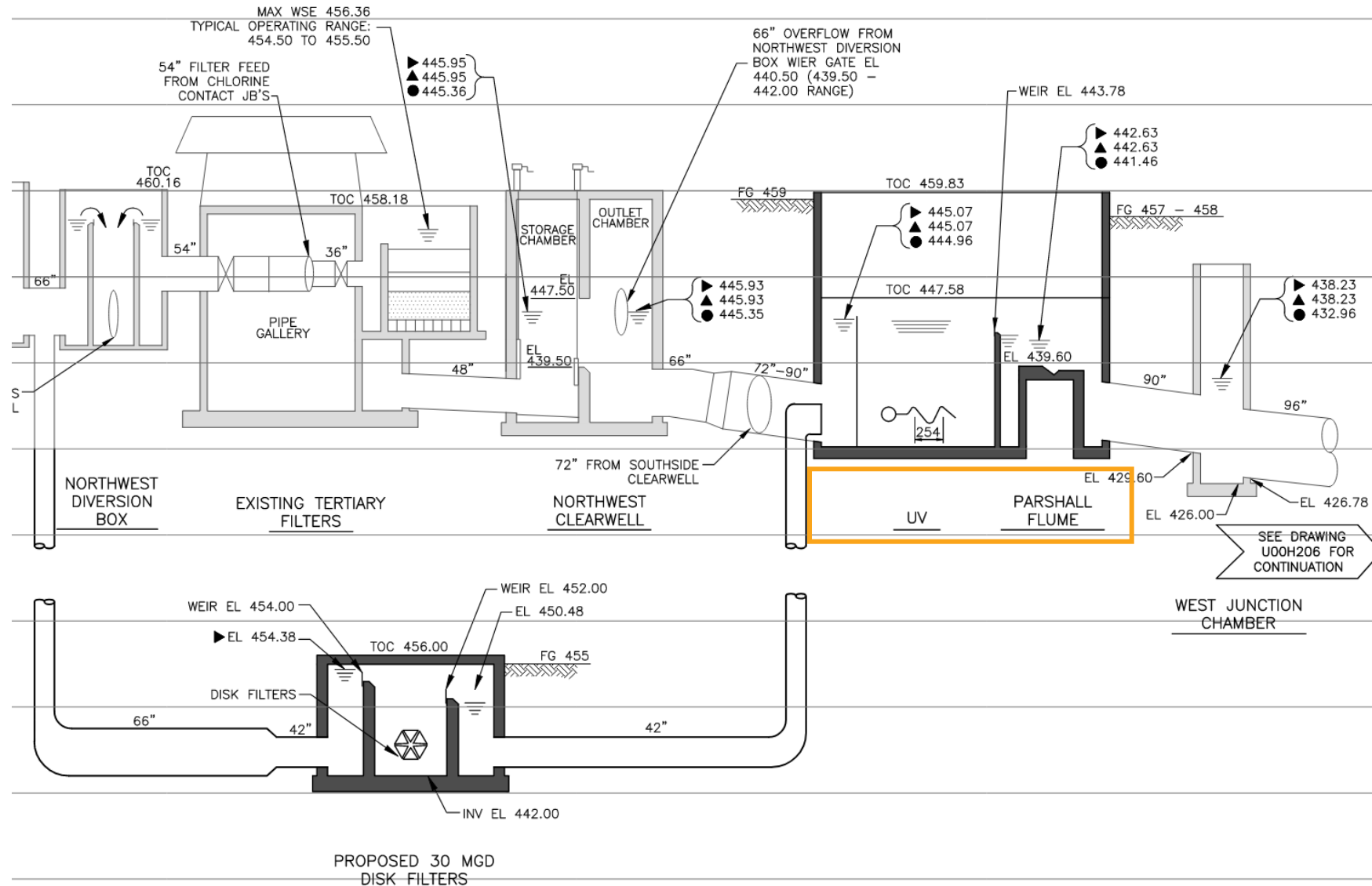
Key Design Criteria

Parameter	UV1	UV2
Peak 2-Hour Flow (mgd)	150	150
Upstream Process	Existing Gravity Media Filters (120 mgd) New Cloth Media Filters (30 mgd)	Expansion Train Cloth Media Filters (50 mgd) Wet Weather Treatment (100 mgd)
Design UVT (%)	70%	60%
Minimum UV Dose (mJ/cm ²)	17 mJ/cm ² (T1)	37 mJ/cm ² (MS2)
No. of Channels	5	6
No. of Banks per Channel	2	4
System Peak Load (kW)	265	623

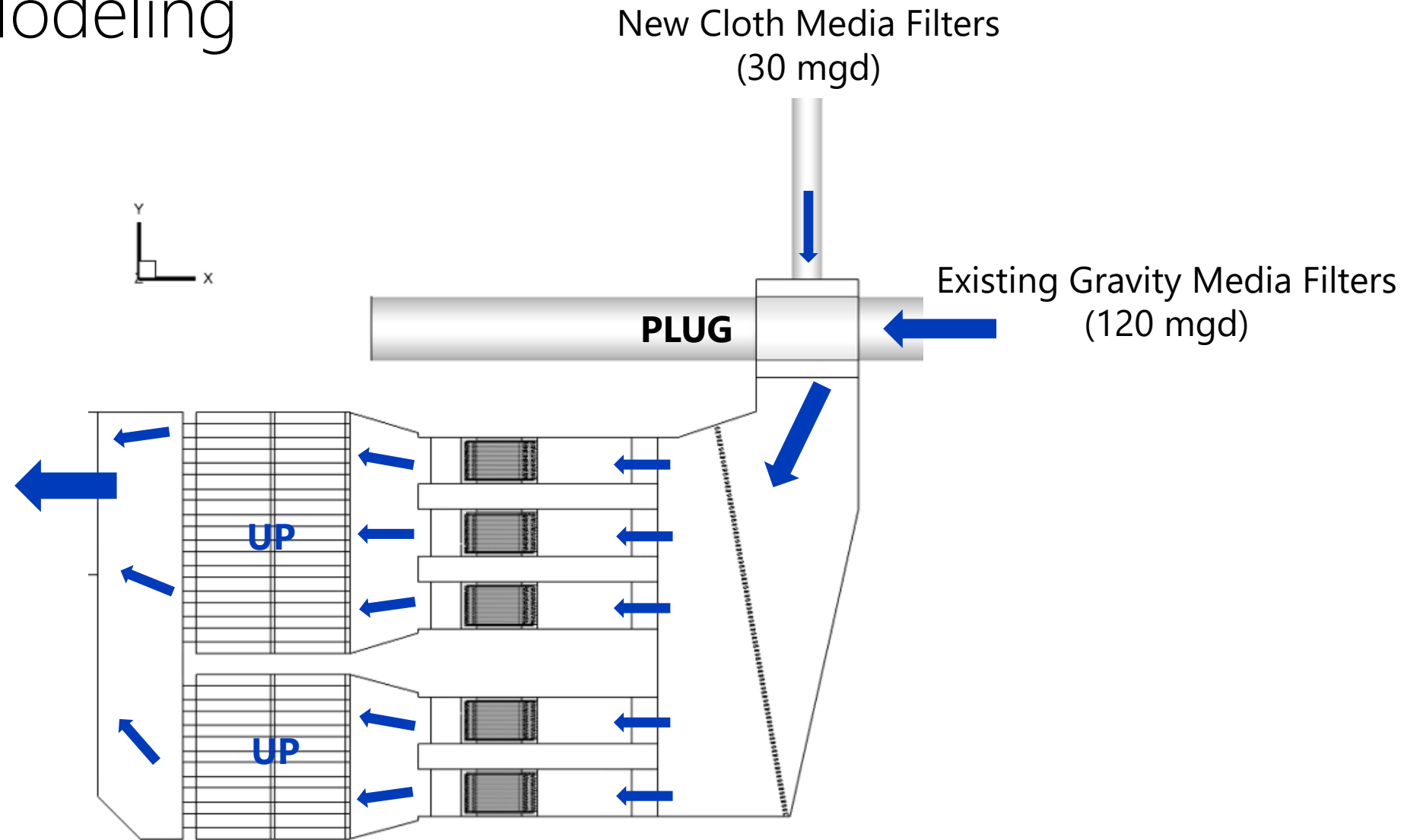
3

Hydraulic Evaluation and CFD Modeling (UV1)

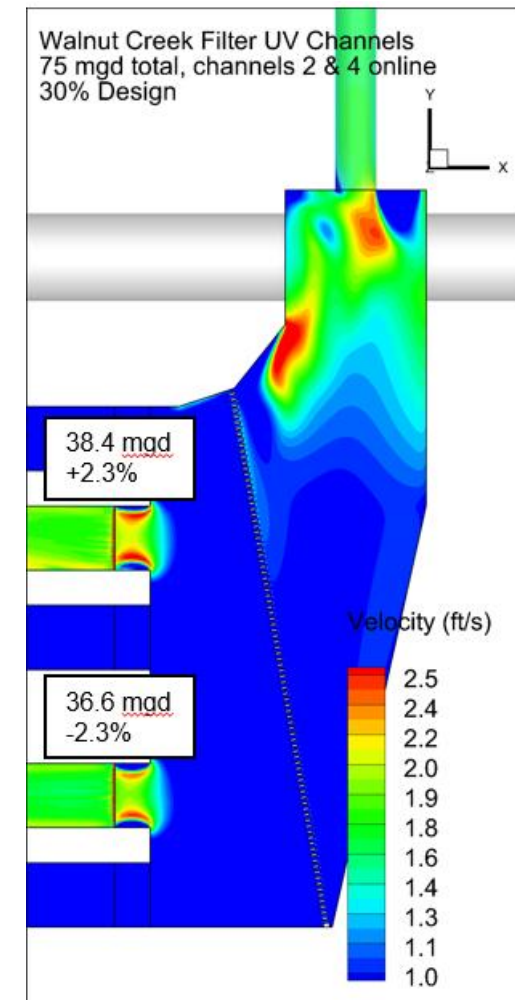
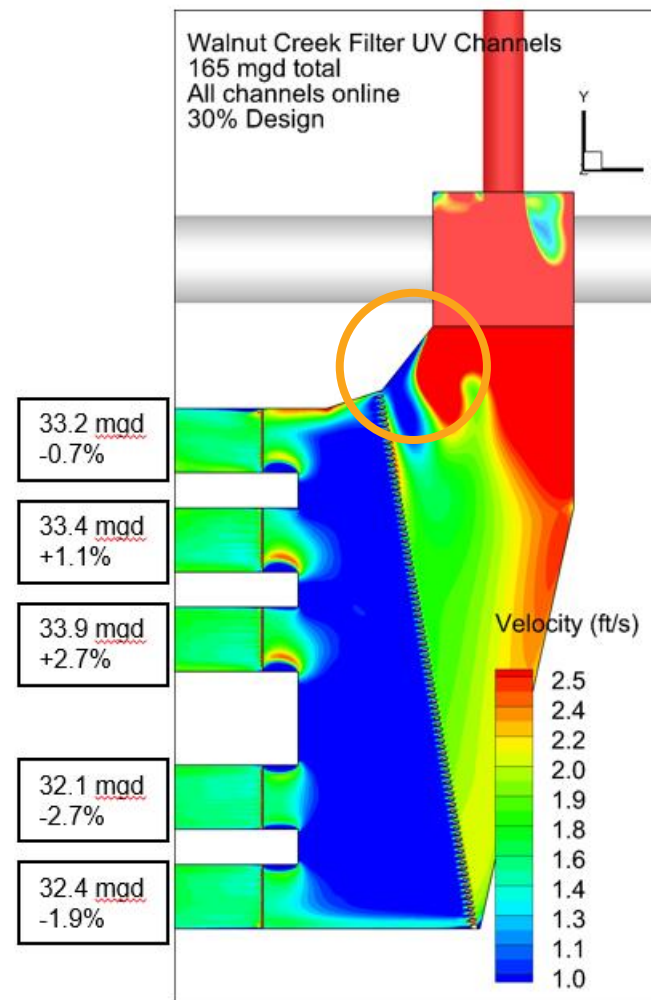
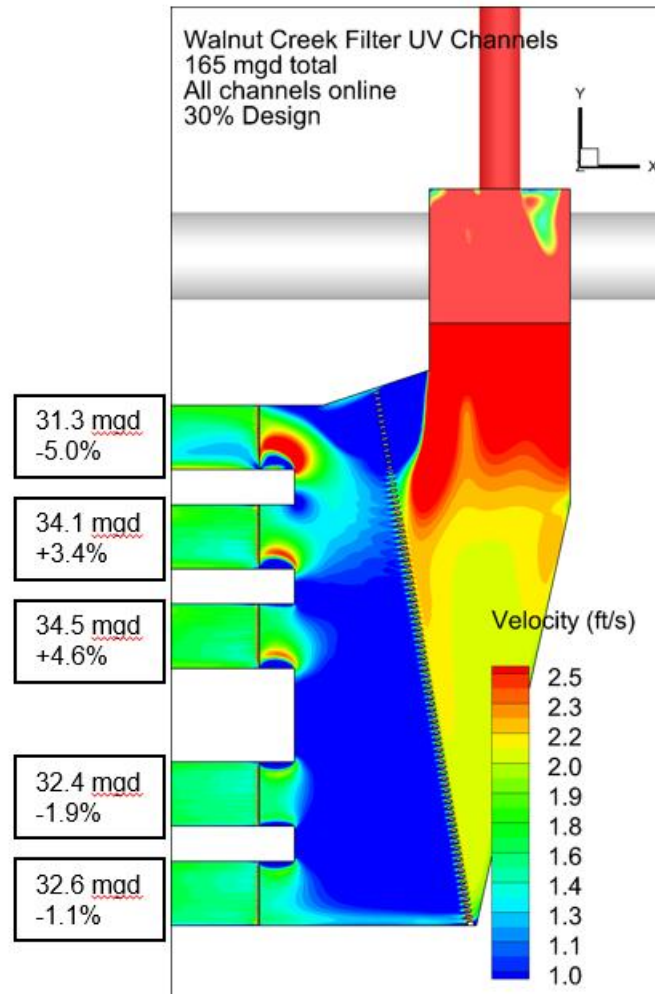
UV1 Hydraulic Profile Considerations



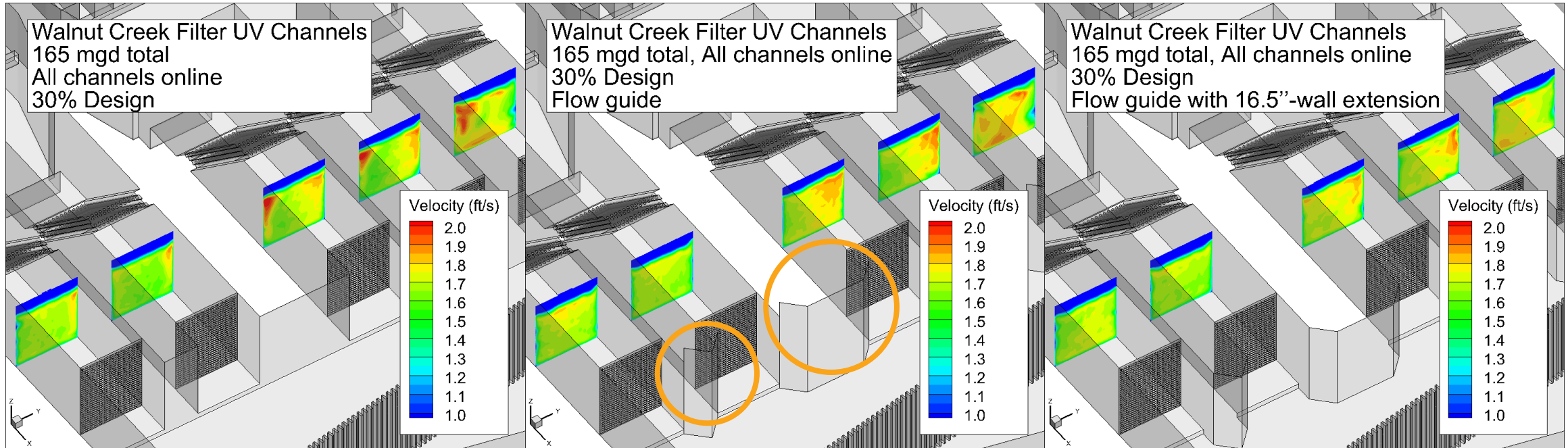
UV1 CFD Modeling



Goal 1: Even flow split between channels.

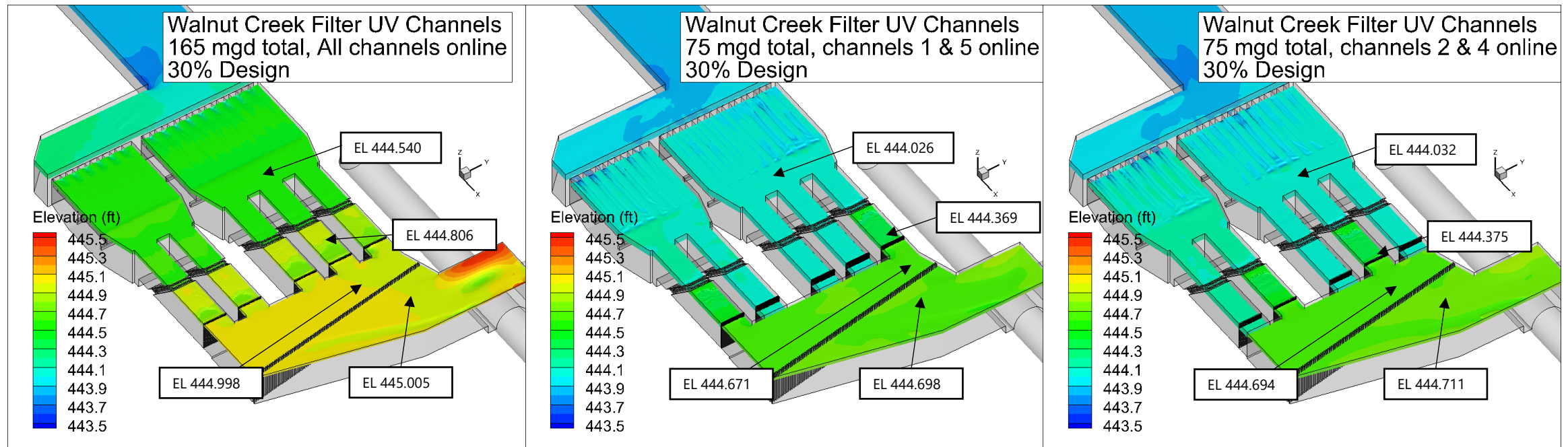


Goal 2: Uniform approach velocity within each channel.



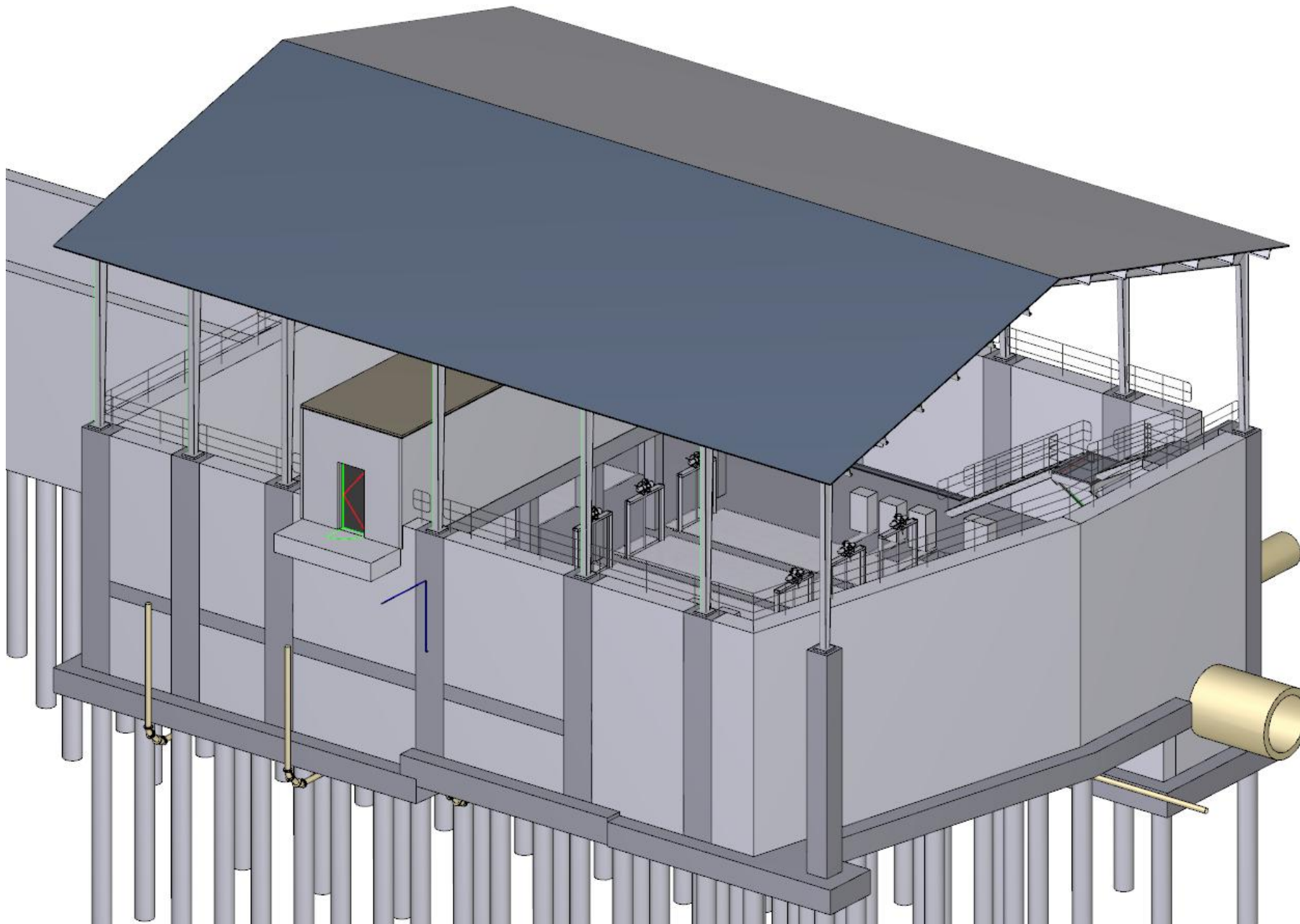
Requirement: Fit within hydraulic profile.

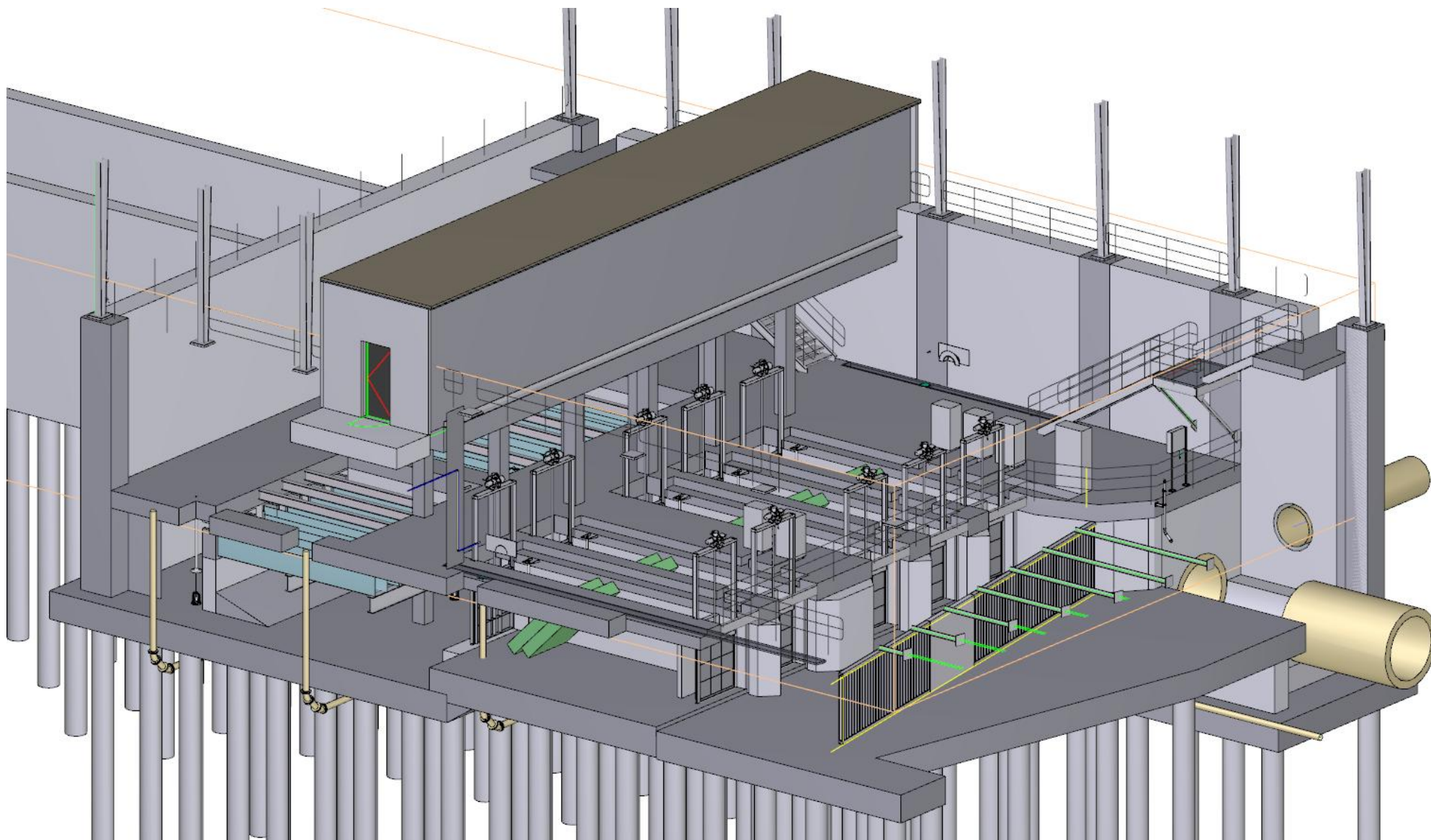
CFD Confirmation of Water Surface Elevations



4

Final Design (UV1)





Takeaways

- UV was selected for safety and resiliency benefits compared to other disinfection alternatives
- UVT is a key driver of system size
 - » Sampling and testing
- Fitting into existing plant hydraulic profile
 - » CFD modeling
- Design with O&M in mind
 - » Visit existing installations
 - » 3D modeling