



DON'T DRINK FROM THE TOILET, PLEASE:

Colorado's Implementation of Reclaimed Water Regulations

January 30, 2019

Outline

- CDPHE Regulatory Requirements and Approval Process
 - Focus on Localized Systems
 - Approval Process
 - Implementation Status
- Case Studies
 - Pikes Peak Visitor Center
 - Denver Water Administration Building





CDPHE Regulatory Requirements and Approval Process

Brief History of Reclaimed Water Regulations in Colorado

- Regulation 84 - Reclaimed Water Control Regulation
- Note: this regulation is for blackwater only. Colorado has a different regulation for greywater reuse.
- Three categories of reclaimed water based on use and human exposure
- Required treatment to meet TSS/turbidity and e. coli standards designated by use category.



Accepted Uses

- Industrial
 - Evaporative Industrial Processes
 - Wash Water Applications
 - Non-Discharging Construction and Road Maintenance
- Landscape Irrigation
 - Restricted Access
 - Unrestricted access
 - Resident Controlled



Accepted Uses

- Commercial
 - Zoo Operations
 - Commercial Laundries
 - Automated Vehicle Washing
 - Manual Non-Potable Vehicle Washing
- Fire Protection
 - Nonresidential Fire Protection
 - Residential Fire Protection



Accepted Uses

- Agricultural Irrigation
 - Non-food crop irrigation and silviculture



Why Reclaimed Water?

- Water conservation
- Selling point for new cutting edge developments
- Creative way to dispose of wastewater in challenging locations
- Permitting reasons such as TDS limits in groundwater discharge permits



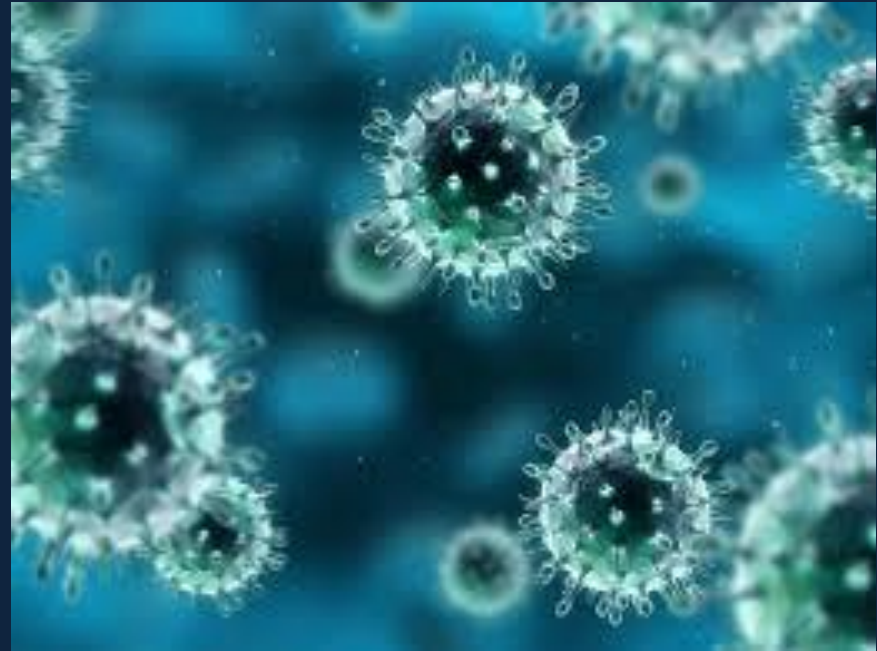
2018 Changes to Reclaimed Water Regulation

- 2 major additions to the regulation
 - Added indoor toilet and urinal flushing as an acceptable use.
 - Distinguished between centralized and localized treatment facilities.
 - Localized systems required to have more robust treatment and operations and monitoring requirements.



Localized System Treatment Requirements

- Require filtration and disinfection of secondary treated effluent.
- Required to meet log reduction targets (LRTs) for virus, protozoa, and bacteria based on the use category.



Localized System Log Reduction Targets

- Log reduction concept:
 - 6 logarithmic reduction in viruses = 99.9999% reduction in viruses
 - Way to quantify wastewater treatment
- Regulation 84 states “The Division will develop policy defining credits for the log reduction of pathogens through various treatment processes.”



Log Removal Targets

	Enteric Viruses	Parasitic Protozoa	Enteric Bacteria
Log ₁₀ Reduction Target (10 ⁻²) Category 1	6.0	-	-
Log ₁₀ Reduction Target (10 ⁻²) Category 2	6.0	5.0	4.0
Log ₁₀ Reduction Target (10 ⁻⁴) Category 3	8.5	7.0	6.0

- Category 1 – irrigation with restricted access
- Category 2 – Non-residential fire protection
- Category 3 – indoor toilet and urinal flushing or resident-controlled irrigation



Localized System Monitoring Requirements

- Continuous monitoring for appropriate process control parameters.
- Flow meter on reclaimed water supply line and potable makeup water supply.
- Automatic shutdown and overflow connection to approved and permitted domestic wastewater treatment works in case of excursion.



Localized System Field Verification and Commissioning

- Prior to supplying reclaimed water, treater must verify that the system is operational and meets LRTs and provide report and operations and monitoring plan.
- Operations and monitoring plan defines locations for monitoring, data storage and reporting.
- Division may perform inspection.



Additional Requirements for Indoor Toilet Flushing Use

- Public education program
- Cross connection control plan
- Mapping of reclaim water lines
- Maintain chlorine or chloramine residual at distal end of distribution system
- All plumbing modifications to be made by licensed plumber
- Backup potable water supply

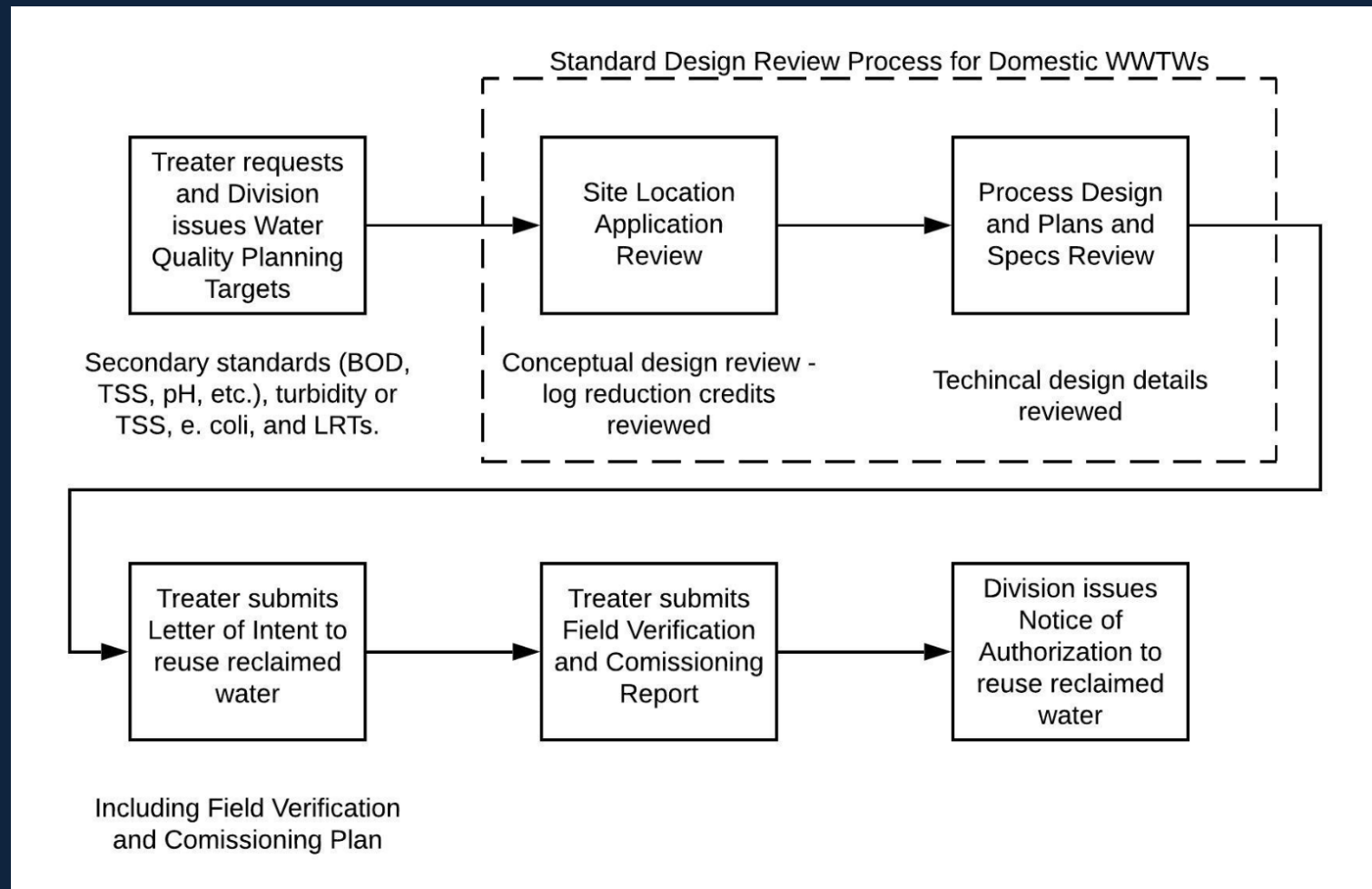


Policy Development

- Policy was not developed when first applicants came in.
- Policy development is still underway.
- Utilizing various resources to assist with policy development:
 - Water Environment and Reuse Foundation (WE&RF) Risk Based Framework for the Development of Public Health Guidance for Decentralized Non-Potable Water Systems
 - Draft Blue Ribbon Commission Report
 - National Water Research Institute (NWRI) UV Disinfection Guidelines for Drinking Water and Water Reuse
 - Drinking water protocols for filtration and disinfection
 - San Francisco Public Utilities Council
 - WaterVal Membrane Bioreactor Validation Protocol



Colorado Approval Process



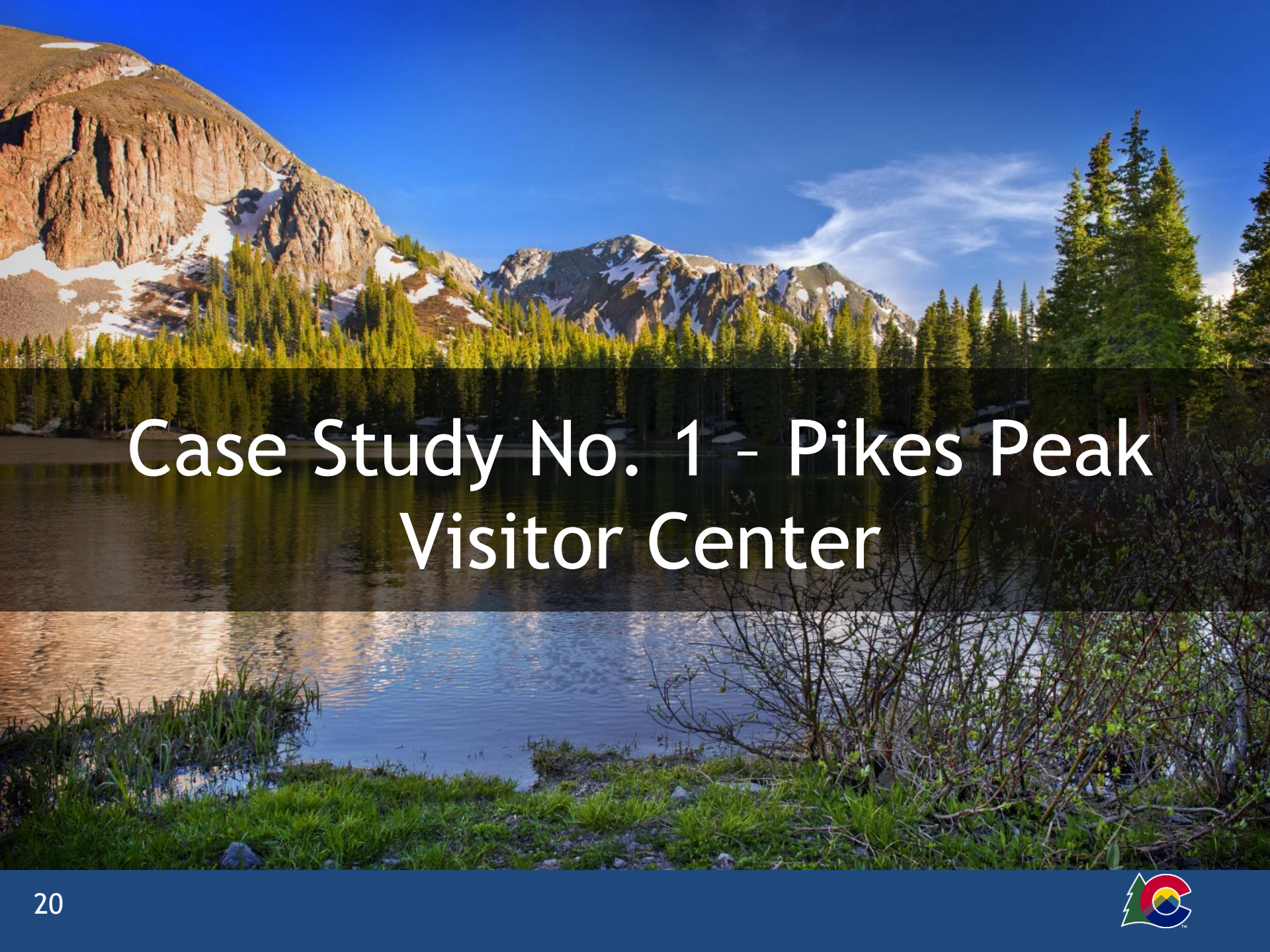


Case Studies

Early Implementers

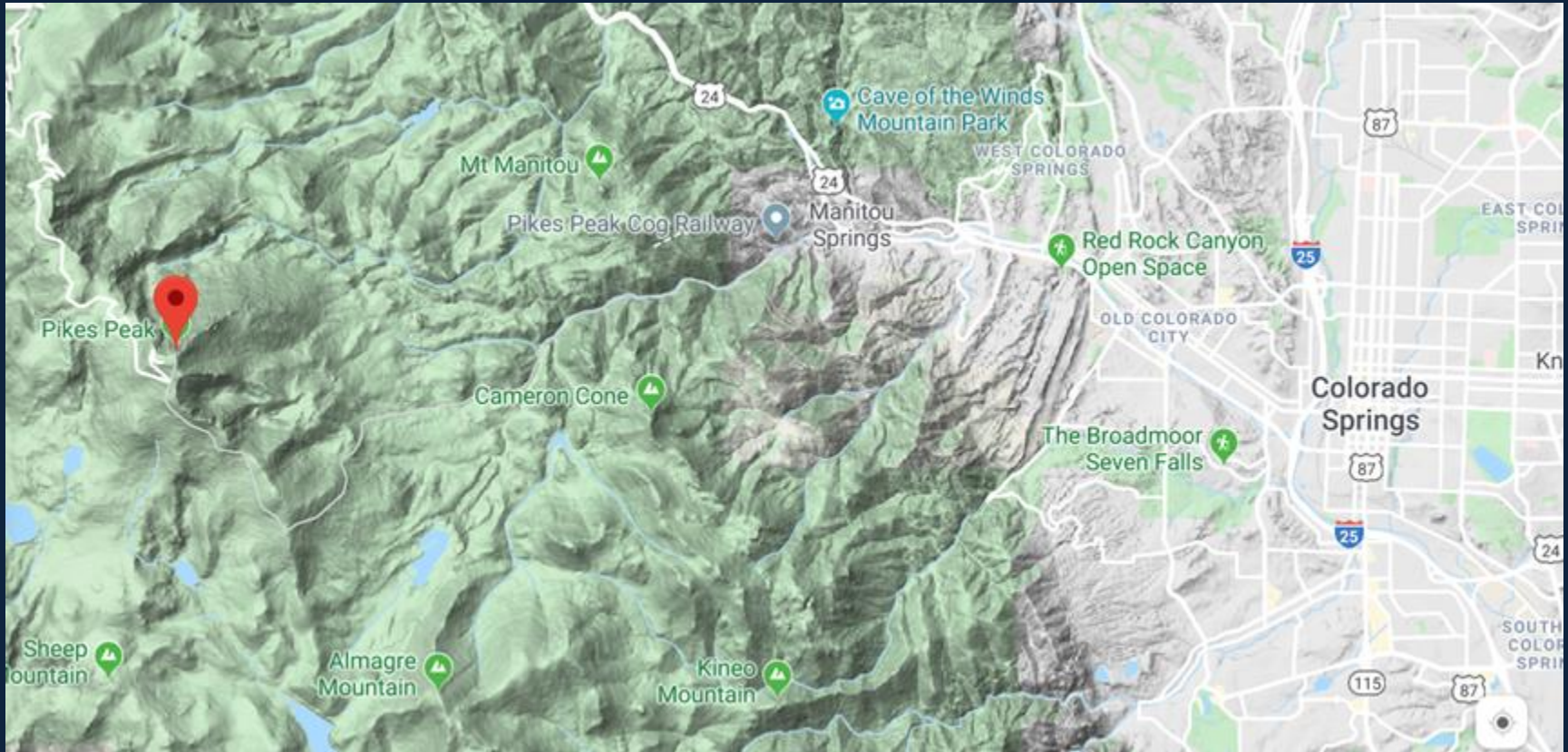
- No entity is fully through the process
- Two entities partially through the process
 - Pikes Peak Summit Visitors Center
 - Denver Water Administration Building
- Several other parties interested





Case Study No. 1 - Pikes Peak Visitor Center

Pikes Peak Visitor Center



10 miles west of downtown Colorado Springs

Elevation: 14,115

Pikes Peak Visitor Center - Overview

- Over 750,000 visitors per year
- Visitor Center accessed by:
 - Pikes Peak Highway
 - Cog Railway
 - Hiking Trails
- Originally constructed in 1963
- Historically potable water hauled to Visitor Center and Wastewater hauled down to Colorado Springs WWTF



Pikes Peak Visitor Center - Design Parameters

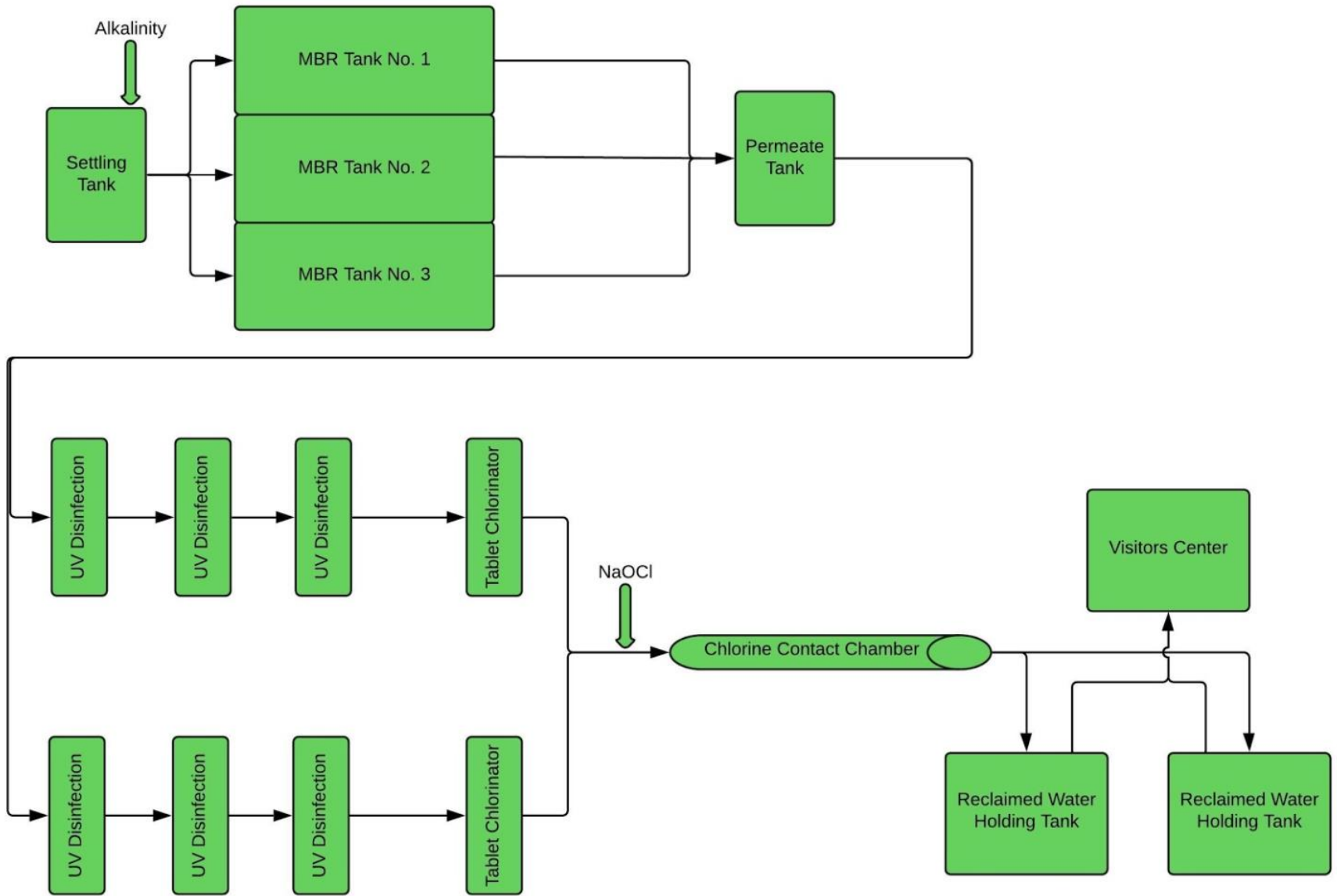
- New Visitor Center to include bathroom facilities and food service kitchen
- Design per capita flow rate of 1 gpdc



Pikes Peak Visitor Center

- MMAD Flow = 8,000 gpd
- Design BOD concentration = 1,200 mg/L
- Design N concentration = 300 mg/L
- 30% of reclaim water will be reused with remaining hauled for disposal
- Wide seasonal population variation





<u>Parameter</u>	<u>Parameter Limitations</u>	<u>Parameter</u>	<u>Parameter Limitations</u>
BOD5 mg/L	30 (30-day average) 45 (7-day average)	Oil and Grease mg/L	10 mg/L (inst. Max)
Total Suspended Solids mg/L	30 (30-day average) 45 (7-day average)	Turbidity NTU	3 (monthly avg.) not to exceed 5 in more than 5% of individual samples
CBOD5 mg/L	25 (30-day average) 40 (7-day average)	E. coli cfu/100mL	None detected in at least 75% of samples per calendar month and 126/100mL single sample max
Residual Chlorine mg/L	0.5 (inst. Max)	At distal end of distribution system	0.2 mg/L minimum free chlorine or 0.5 mg/L minimum monochloramine
pH s.u.	6.0-9.0 (inst. Max)		

Pikes Peak Visitor Center - Water Quality Targets

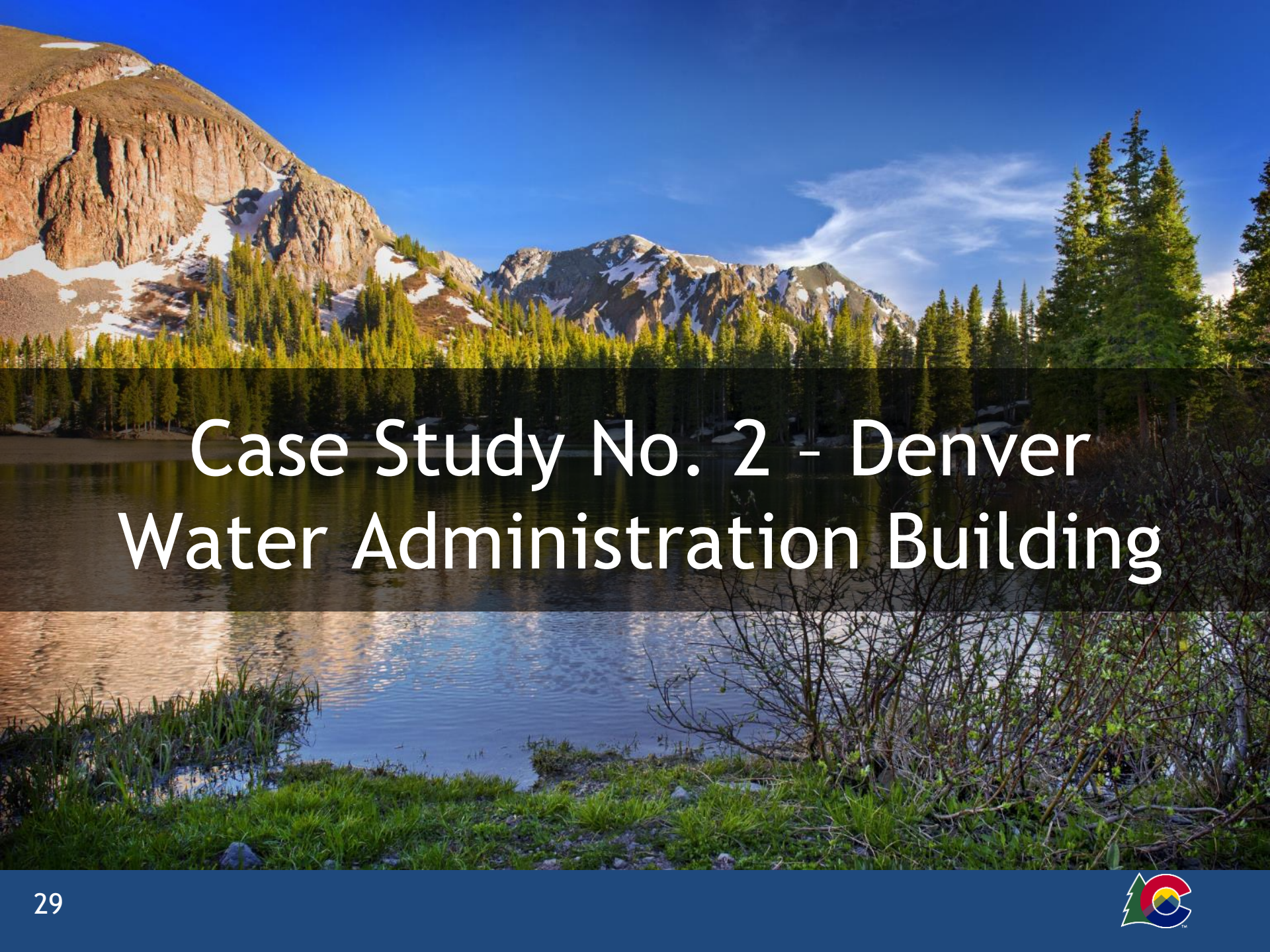
Log Reduction Credits:

- Category 3 - Reuse for indoor toilet and urinal flushing and potential future irrigation

	Enteric Viruses	Parasitic Protozoa	Enteric Bacteria
Required LRTs	8.5	7.0	6.0
MBR	0.0	0.0	0.0
UV Disinfection	6.0	7.0	6.0
Chlorine Disinfection	2.5	0.0	0.0
Total	8.5	7.0	6.0

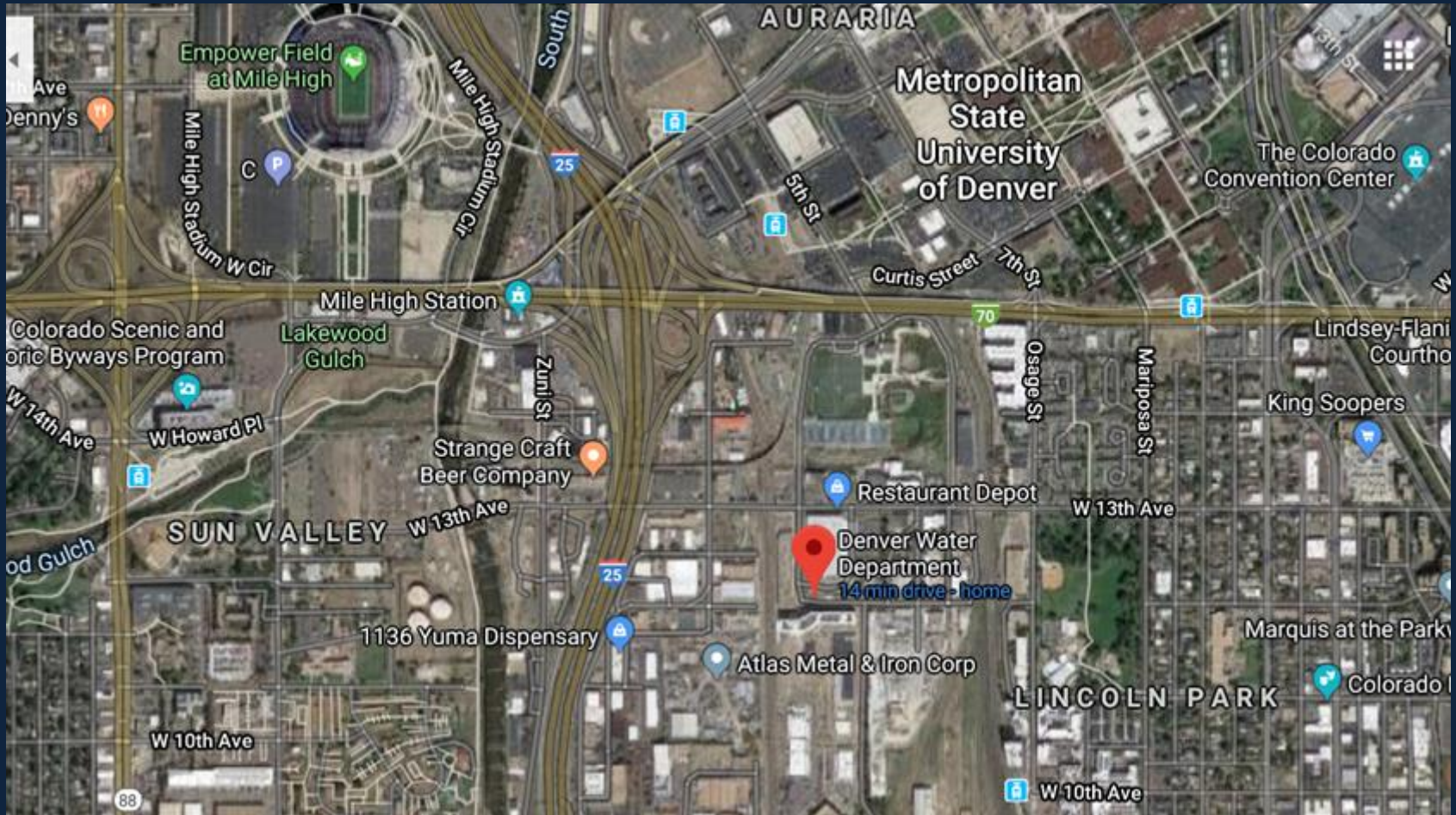
Pikes Peak Visitor Center - Construction Status

- Building is currently under construction
- Estimated startup in spring 2021
- System still needs to submit LOI, field verification and commissioning report, and receive notice of authorization before reuse can begin
- Estimated WWTF cost = \$1.8 million



Case Study No. 2 - Denver Water Administration Building

Denver Water Admin Building



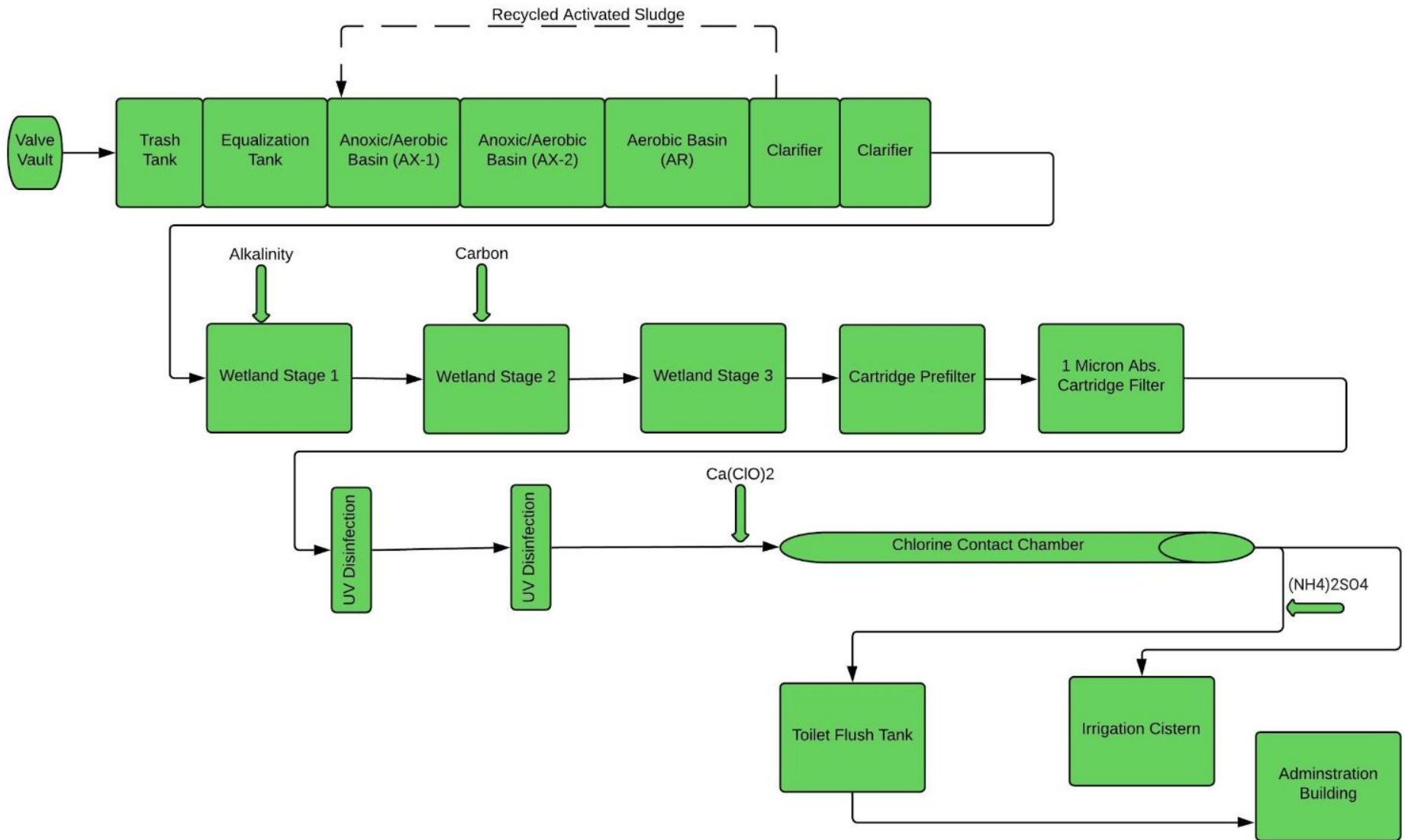
Denver Water Admin Building - Building Features

- Building capacity: 700 employees and 50 visitors
- Building includes bathroom and shower facilities as well as a cafeteria
- New building constructed in 2019
- Public education about water conservation is incorporated into the design - above and beyond regulation requirements
 - Two of the treatment cells are located in the Admin Building lobby

Denver Water Admin Building - Design Parameters

- MMAD Flow = 7,000 gpd
- Design BOD concentration = 855 mg/L
- Design N concentration = 137 mg/L
- Weekly variability in flows with minimal flows over the weekend



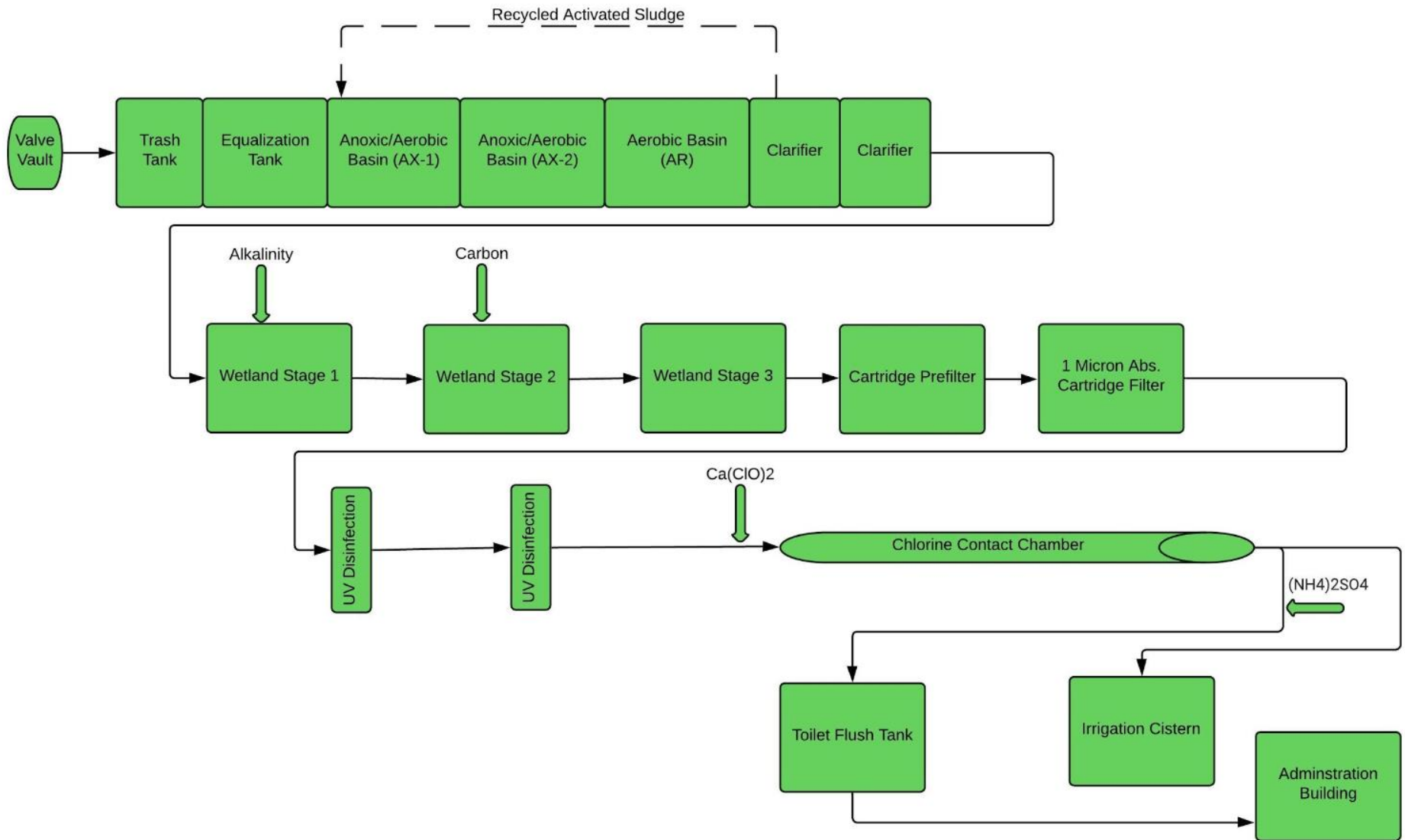


Multistage Treatment Unit



MSTU





Wetlands



Wetlands



Wetland 1

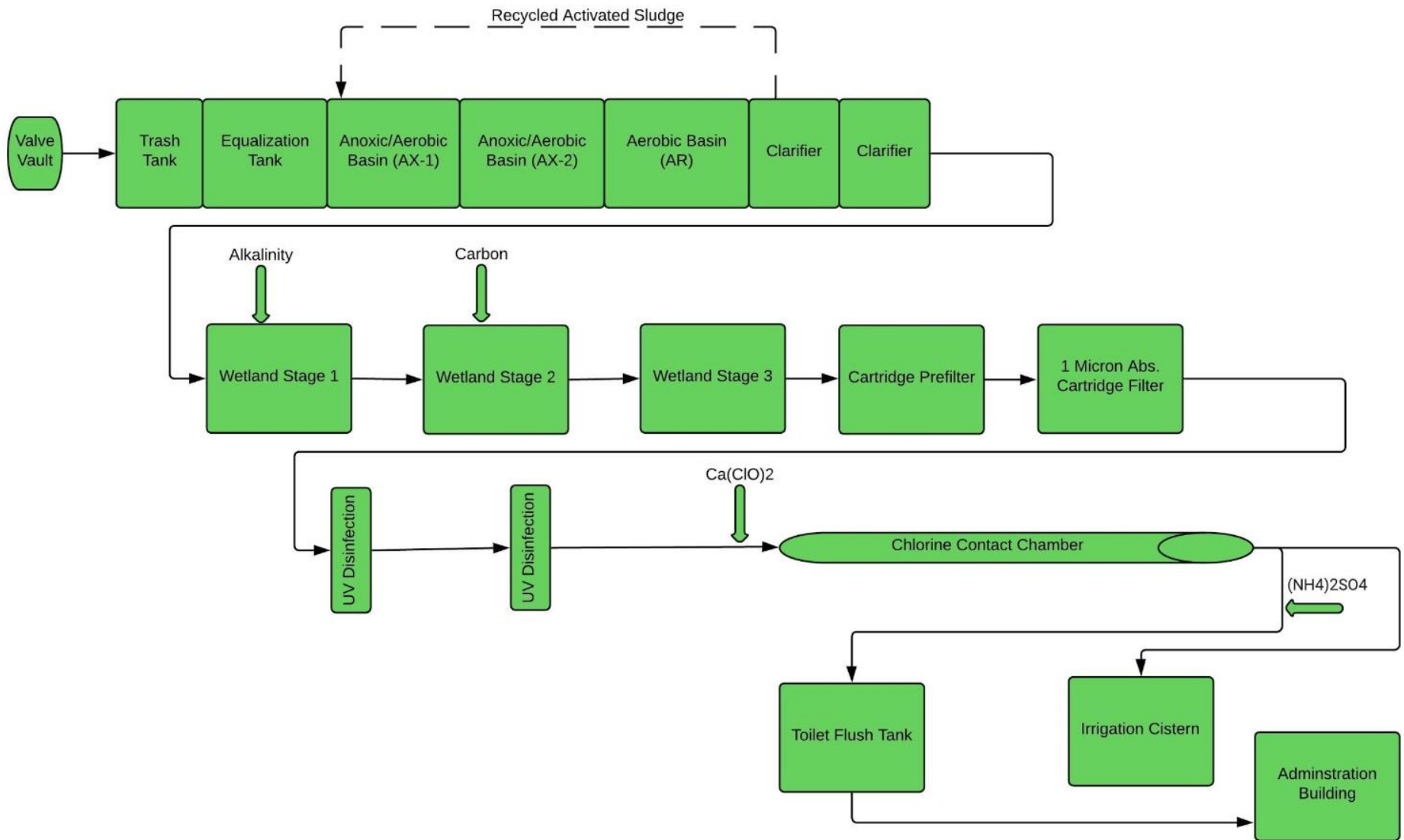


Wetland 2



Wetland 3

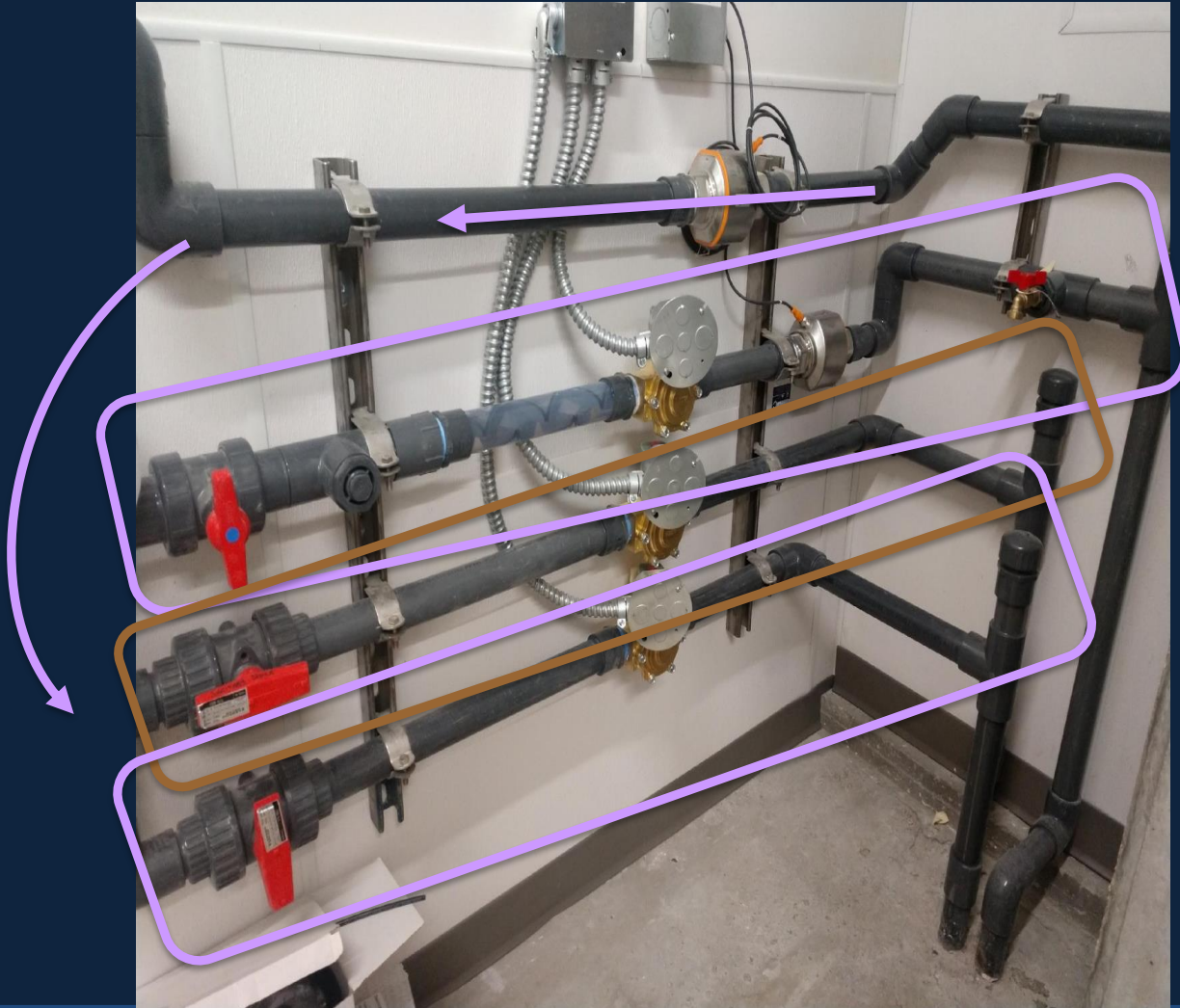




Controls Room



Controls Room



Storage



Distribuiton



**Nonpotable Recycled
Water Used For Irrigation**



Don't Drink From the Sprinklers!
¡No tome de la sistema de irrigación!



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BOD5 mg/L	30 (30-day average) 45 (7-day average)	Oil and Grease mg/L	10 mg/L (inst. Max)
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Denver Water Admin Building - Water Quality Targets

Log Reduction Credits:

- Category 3 - Reuse for indoor toilet and urinal flushing and irrigation

	Enteric Viruses	Parasitic Protozoa	Enteric Bacteria
Required LRTs	8.5	7.0	6.0
MBBR	0.0	0.0	0.0
Wetlands	0.0	0.0	0.0
Cartridge Filtration	0.0	2.0	0.0
UV Disinfection	4.0	5.0	1.5
Chlorine Disinfection	4.5	0.0	4.5
Total	8.5	7.0	6.0

Denver Water Admin Building - Construction Status

- Construction complete and occupied
- Reclaim water treatment facility in final stages of construction
- Estimated startup in spring 2020
- System still needs to submit LOI, field verification and commissioning report, and receive notice of authorization before reuse can begin
- Estimated WWTF cost = \$1.5 million



Denver Water Admin Building - Design Challenges

- Compatibility with Denver Water's potable makeup supply source
- Public Education
 - When and what to tell staff regarding use of reclaim water
- Coordination with Building Inspectors and plumbing code

Denver Water Admin Building - Implementation Challenges

- Plumbing code, Reg 84 and signage



Public Outreach and Education

- Naming Competition
WINNER - RUFUS
– ReUse For US



WATER DOWN THE DRAIN, WHERE DOES IT GO?

This building has an innovative, living system, unique in Colorado, that collects and treats the water for reuse on site. **WHAT YOU DO MATTERS.**

Please only use the soap provided. It was chosen to protect this building's living system.

Denver Water Admin Building - Startup and Monitoring Challenges

- Field Verification and Commissioning - CDPHE does not have a template for the plan or report
- Continuous monitoring
 - Chloramine monitoring at distal ends
 - Concern with chloramine residual over the weekend

Conclusions

- Excited for future of reclaim water implementation in Colorado.
- Still things to iron out with respect to Log Reduction Crediting and Field Verification and Commissioning requirements.



Contact Information

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Regulation 84 Permits Page:

<https://www.colorado.gov/pacific/cdphe/wq-reclaimed-water-reuse-permits>

QUESTIONS?



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