

Introduction to Seattle's Drinking Water Treatment

WSAC
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Seattle
 Public
Utilities

Seattle Public Utilities



City of Seattle

Purpose of Water Treatment

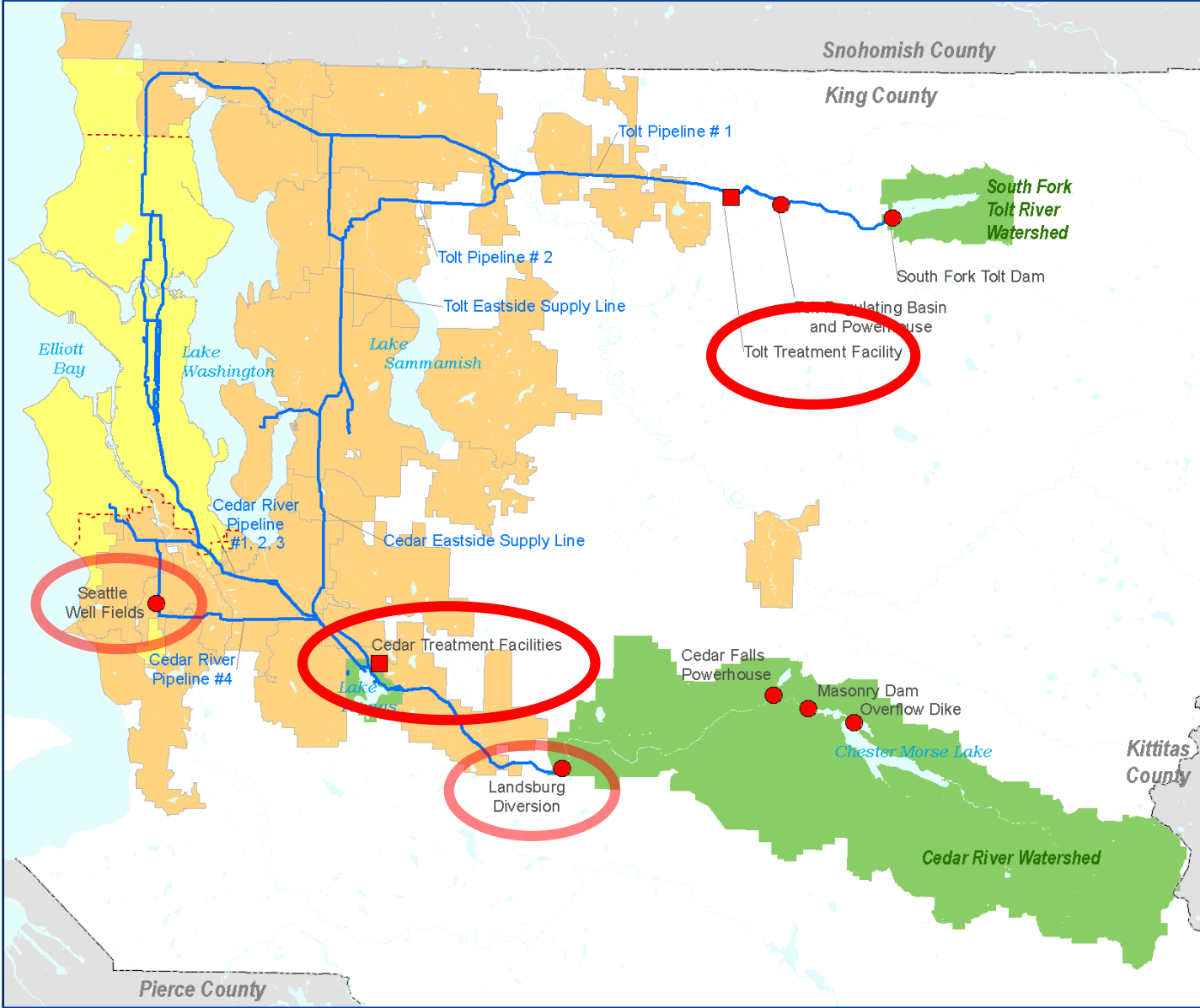
- Public Health Protection
- Regulatory Compliance
- Aesthetics/Taste & Odor



Public Health Protection & Regulatory Compliance

- Microbiological Safety
 - Remove and disinfect pathogens (*Giardia*, viruses, *Cryptosporidium*)
 - Surface Water Treatment Rule
- Chemical Safety
 - Make water less corrosive to building plumbing (lead and copper)
 - Lead and Copper Rule
 - Control disinfection by-products
 - Disinfection By-Product Rule

Where is the water treated?



Treatment Facilities - Background

- Tolt Treatment Facility
 - Started in 2001
 - 120 mgd capacity
 - Operated by American Water
- Cedar Treatment Facility
 - Started in 2004
 - 180 mgd capacity
 - Operated by Jacobs
- DBO = Design, Build, Operate



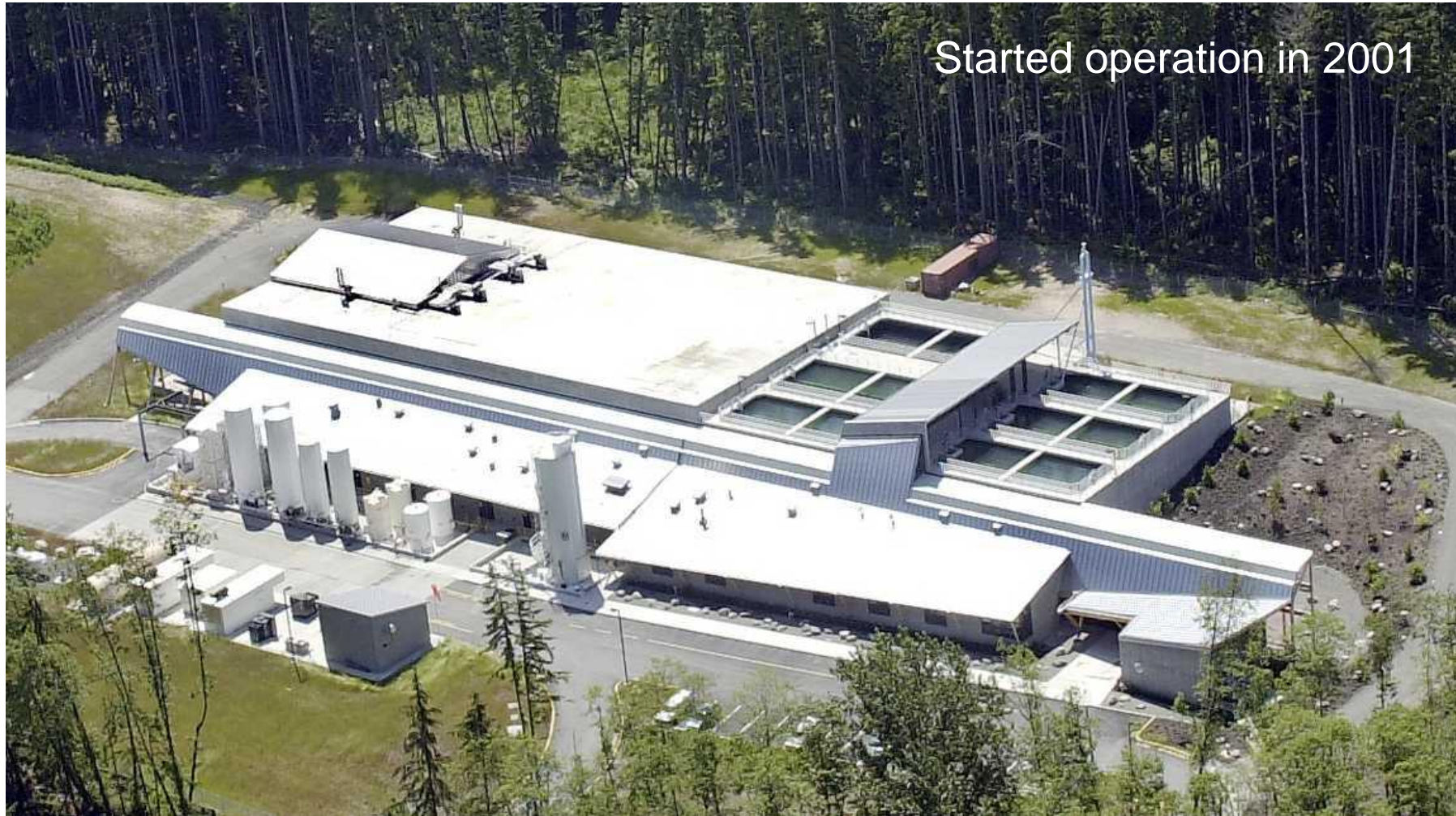
How is the water treated?

- Filtration (Tolt) / Unfiltered (Cedar)
- Disinfectants
- pH and alkalinity adjustment
- Fluoride

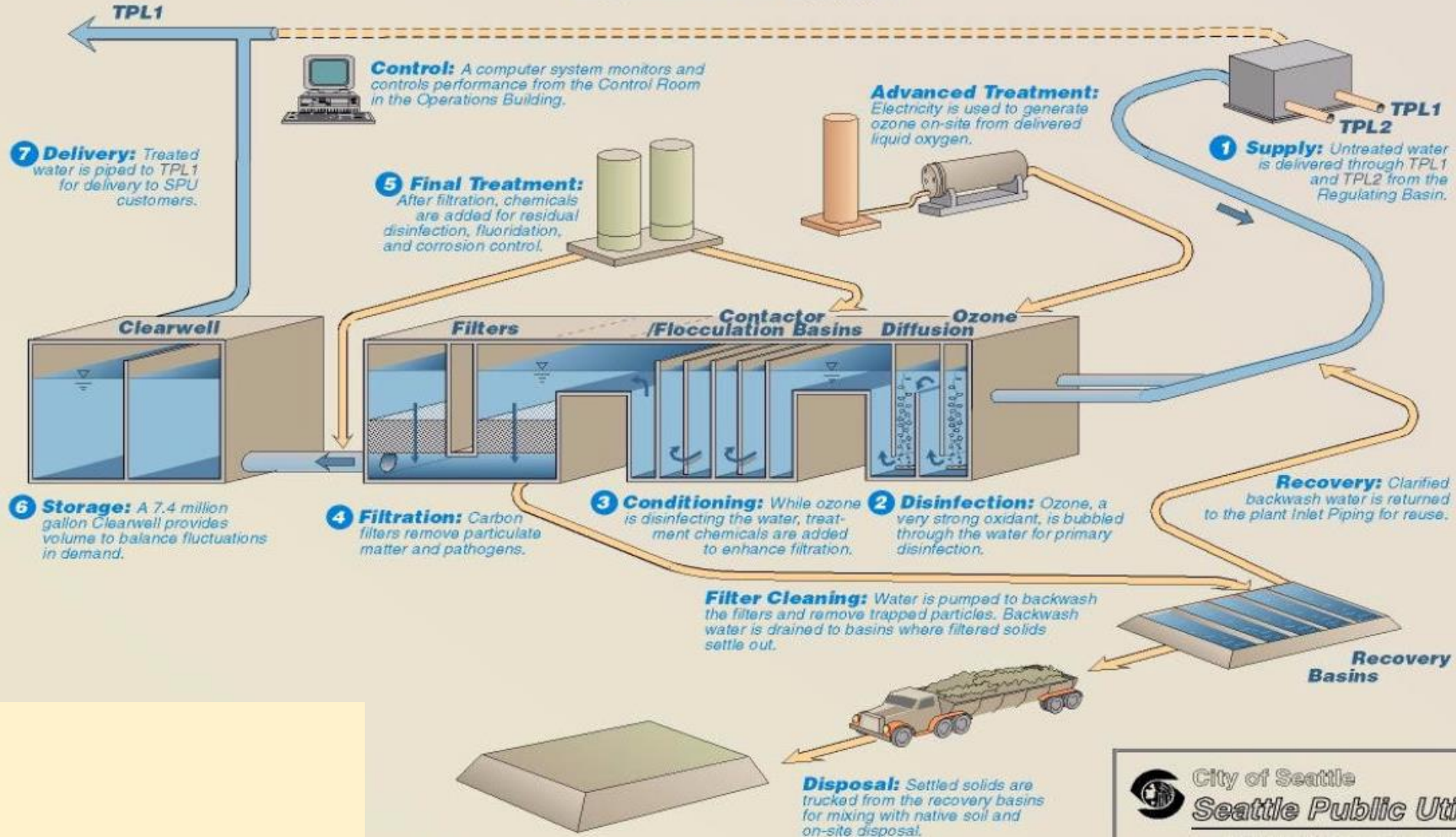
Tolt - source of supply



Tolt Treatment Facility

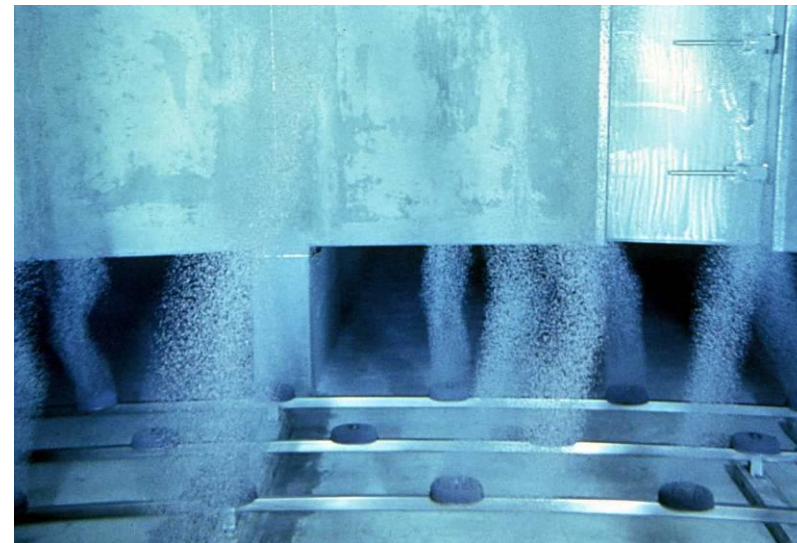


Tolt Treatment Facility Treatment Process



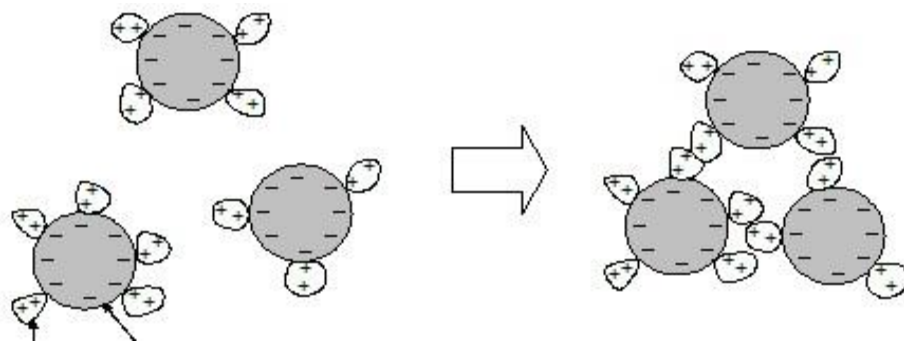
Ozonation

- Oxygen (O₂) + Electricity = Ozone (O₃)
- Disinfection (*Giardia* & viruses)
- Taste & odor reduction



Coagulation & Flocculation

- Chemical addition and slow mixing
- Conditions particles and colloids for filtration (microbes, dirt, natural organics, etc.)



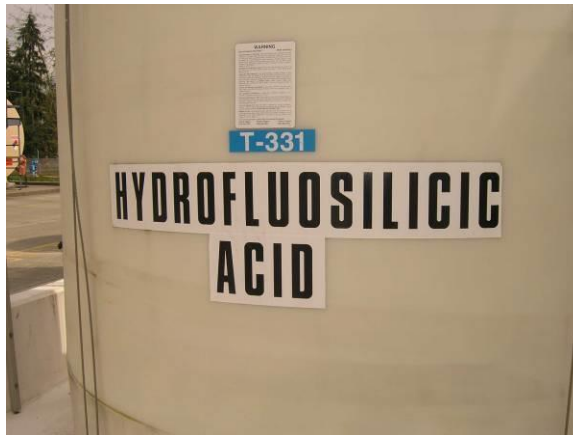
Filtration

- Six-foot deep granular media
- Turbidity and particle counts
- Backwash and filter-to-waste



Corrosion Control & Fluoridation

- Lime and carbon dioxide
 - for pH and alkalinity adjustment (corrosion control)
- Fluoridation for dental health



Chlorination

- Disinfection of viruses
- Chlorine residual for distribution systems
- Contact time and operating storage



Other Details

- SCADA System
- Instrumentation and laboratory
- Backup power



Cedar - Source of Supply

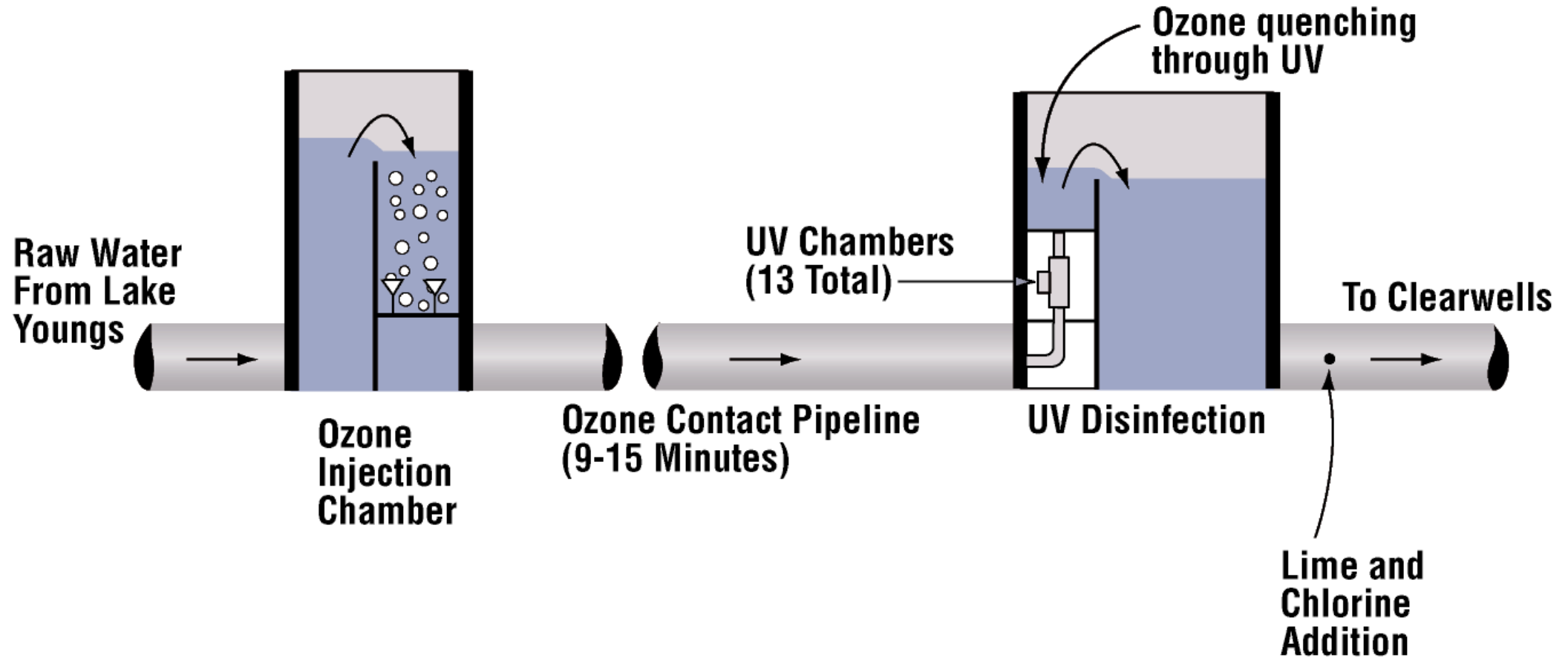
- Highly protected mountain watershed
- Cedar River diversion
- Lake Youngs storage



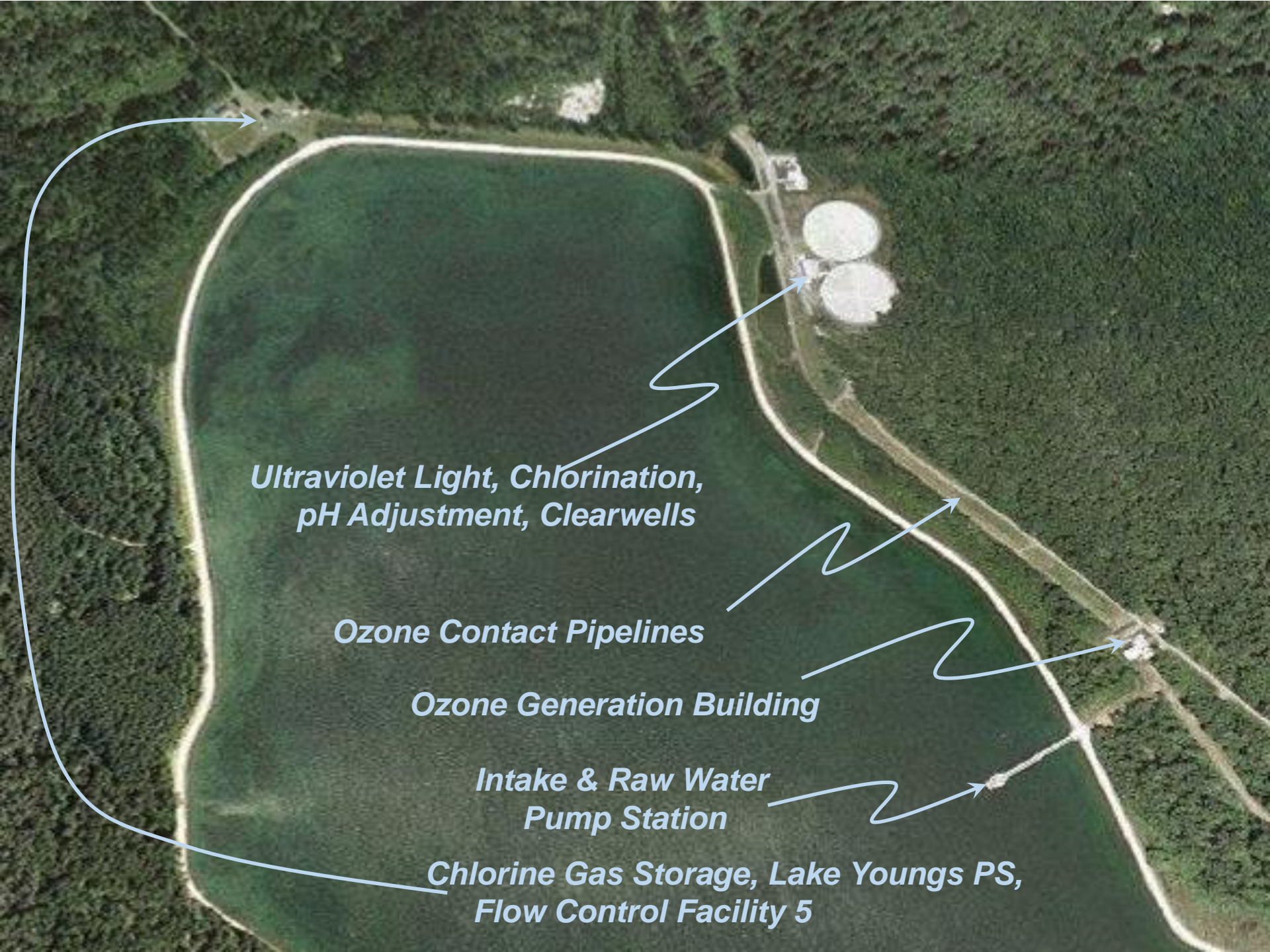
Cedar Treatment Facility – Regulatory Context

- Unfiltered – few water utilities qualify
 - Portland, San Francisco, New York City, and Boston
- Unfiltered with Limited Alternative to Filtration:
 - Watershed Control
 - Source water turbidity (less than 5 NTU)
 - Disinfection greater than provided with conventional filtration + chlorination
 - Annual on-site inspections

Cedar Treatment Facility - treatment processes



Cedar Treatment Facility - site layout



*Ultraviolet Light, Chlorination,
pH Adjustment, Clearwells*

Ozone Contact Pipelines

Ozone Generation Building

*Intake & Raw Water
Pump Station*

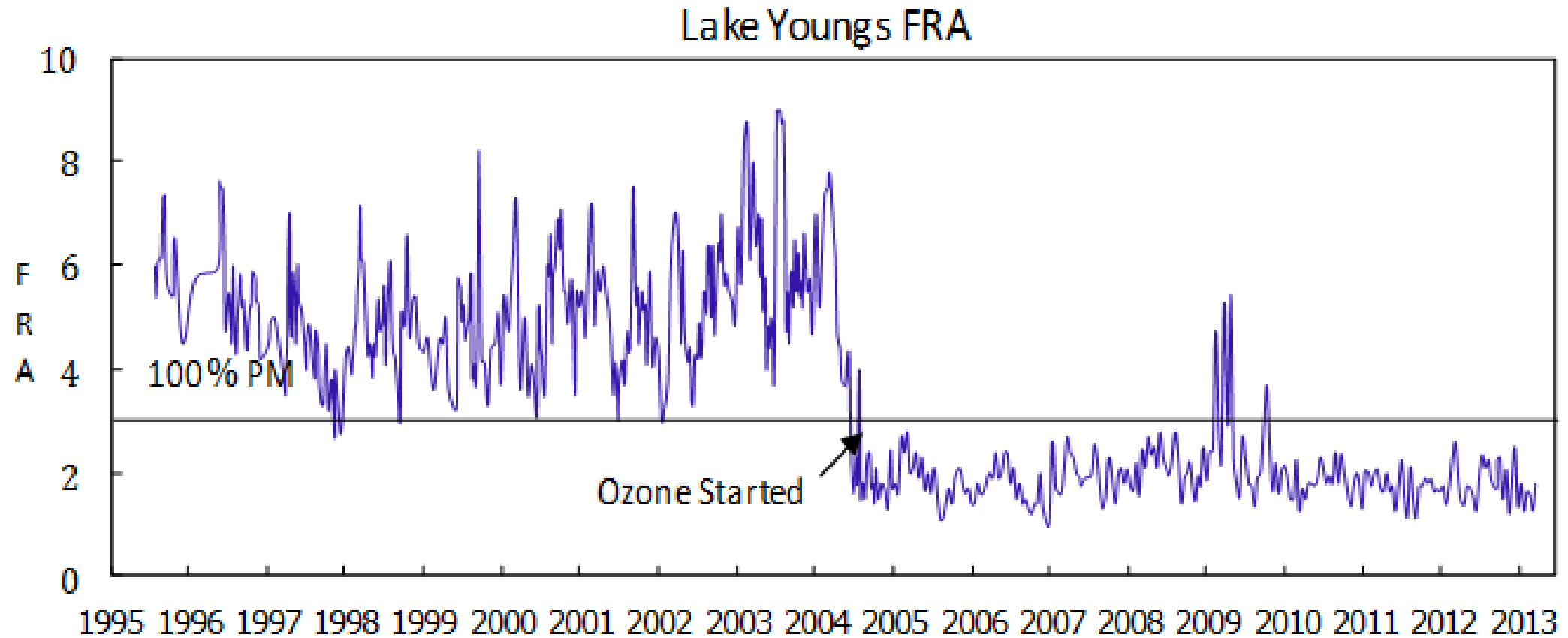
*Chlorine Gas Storage, Lake Youngs PS,
Flow Control Facility 5*

Ozonation

- Oxygen (O_2) + Electricity = Ozone (O_3)
- Disinfection (*Giardia* & viruses)
- Improves Taste & Odor



Ozonation - taste & odor



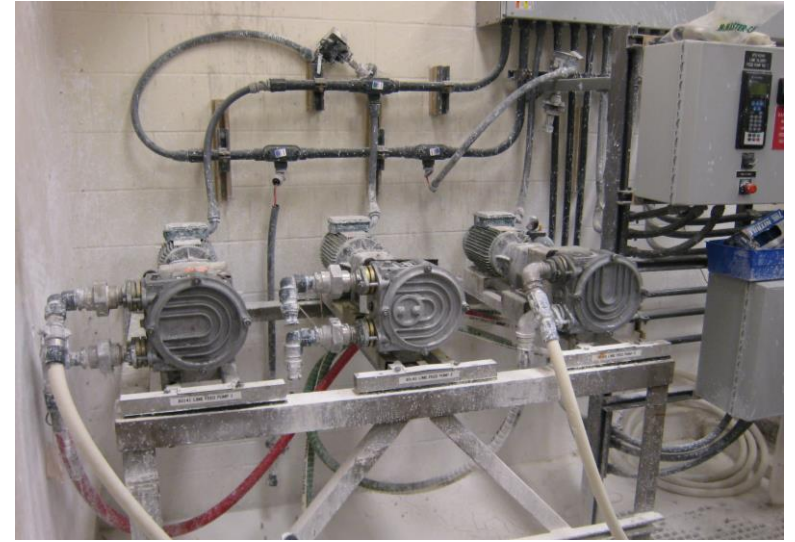
Ultraviolet Disinfection

- Disinfection (*Cryptosporidium* & *Giardia*)
- UV light denatures DNA, rendering organisms unable to replicate



Chlorination & pH adjustment

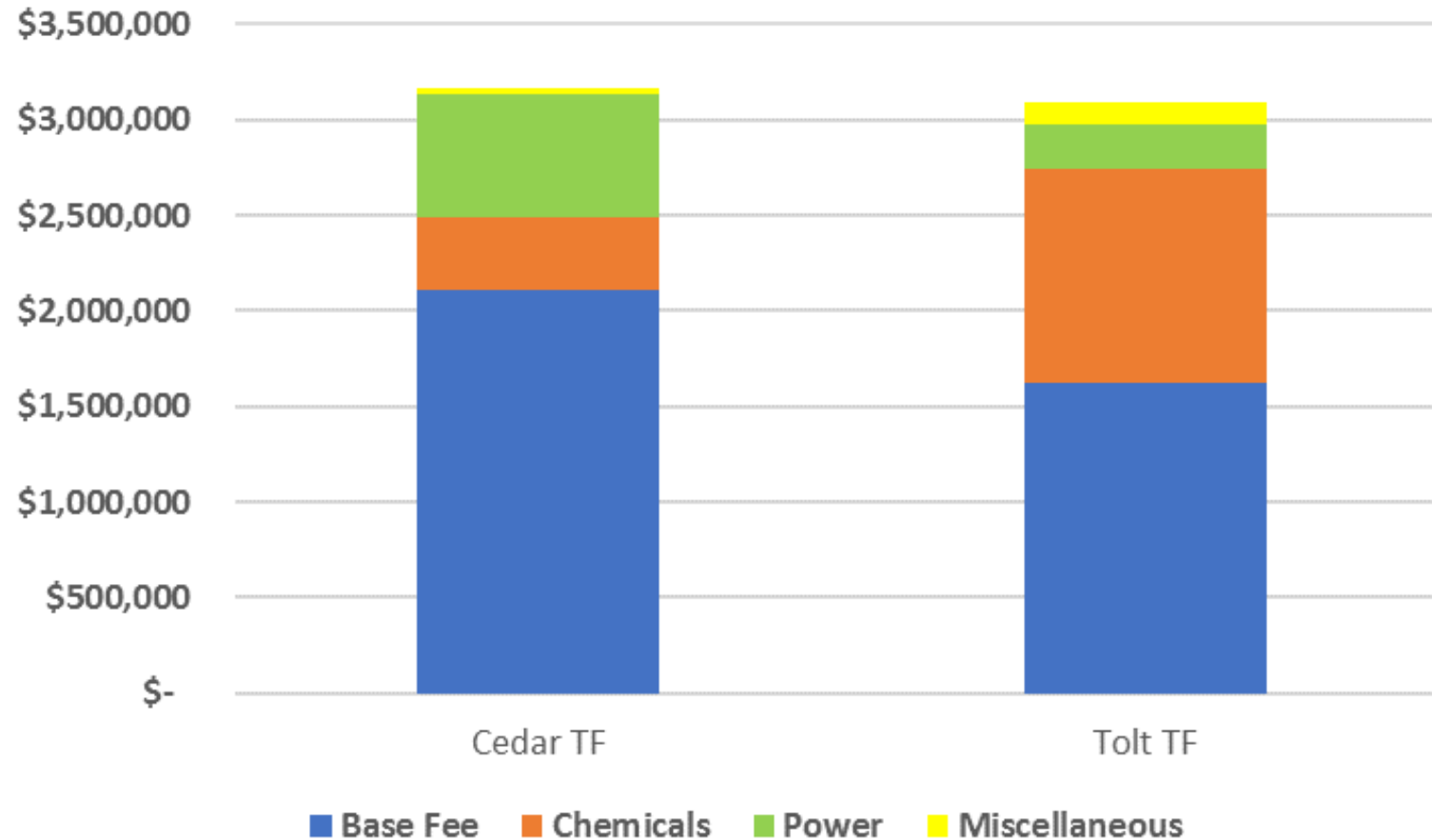
- Disinfection of *Giardia* & viruses
- Chlorine residual for distribution system
- Lime for pH adjustment



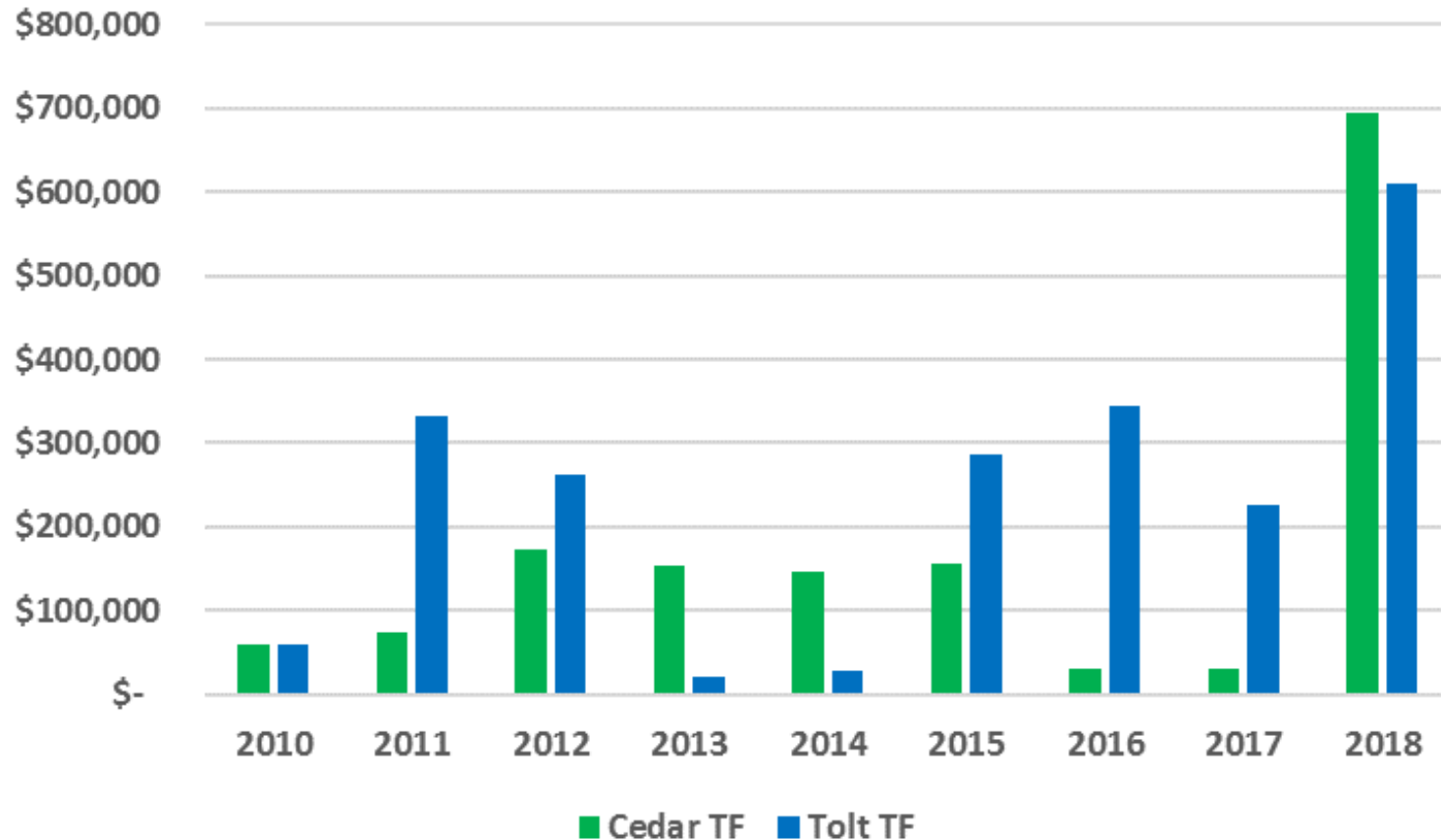
Staffing

- 24/7
- Operator certification

Treatment Facilities - Operating Costs

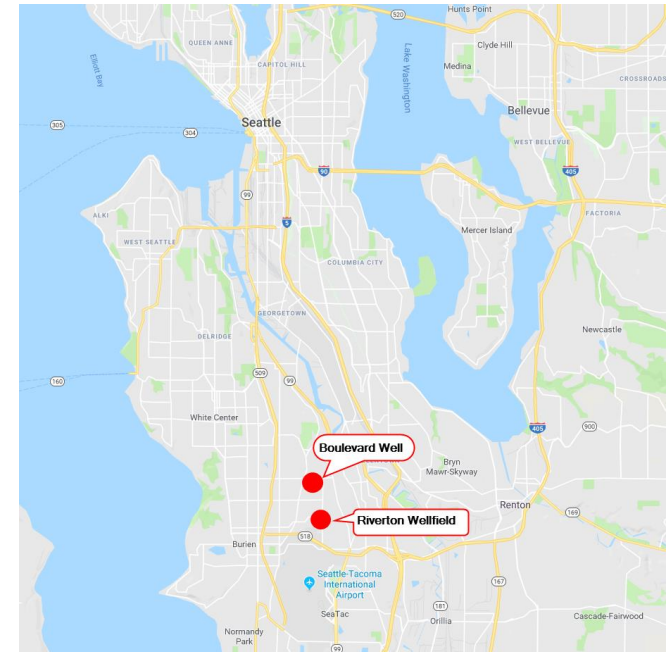


Treatment - Major Maintenance Costs



Seattle Wells

- Blended 20-50% well water with Cedar River Water
- Well site treatment includes:
 - Sodium hypochlorite (chlorine)
 - Sodium hydroxide (for pH adjustment).
 - Fluoride
- Objective of treatment is to match the Cedar source quality, but wells have much higher mineral content.



Rechlorination

- Boost and maintain chlorine in large storage reservoirs
- Uses liquid chlorine (sodium hypochlorite)
 - Delivered
 - On-site generation



Questions?

