

# Backflow Prevention at Wastewater Facilities

By:

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**King County**

# Topics Covered

- Case studies
  - West Point Treatment Plant
  - South Plant
  - Alki Storm Water Treatment Plant
  - Black Diamond Pump Station
  - Interurban Pump Station
  - North Beach Pump Station / CSO Facility

# Purpose

- Several WWTP and pump stations built 50+ years ago
- Codes for potable (utility) water supply separation have changed
- Facilities do not meet current code
- “Tagged” by local AHJ
- WTD has several examples that will be reviewed in this presentation

# West Point Treatment Plant

- Constructed in mid-1960's
- Property owner was U.S. Government (Army)
- 5 water systems
  - City water – CW
  - Potable water – C1
  - Process water – C2
  - Washdown/flushing water – C3
  - Irrigation water - C4
- Original remote offsite reservoir supplies C1 & C2

# West Point Existing Reservoir



West Point Wastewater Treatment Plant

Water mains

C1/C2 Water Reservoir



Google



# West Point Existing Reservoir

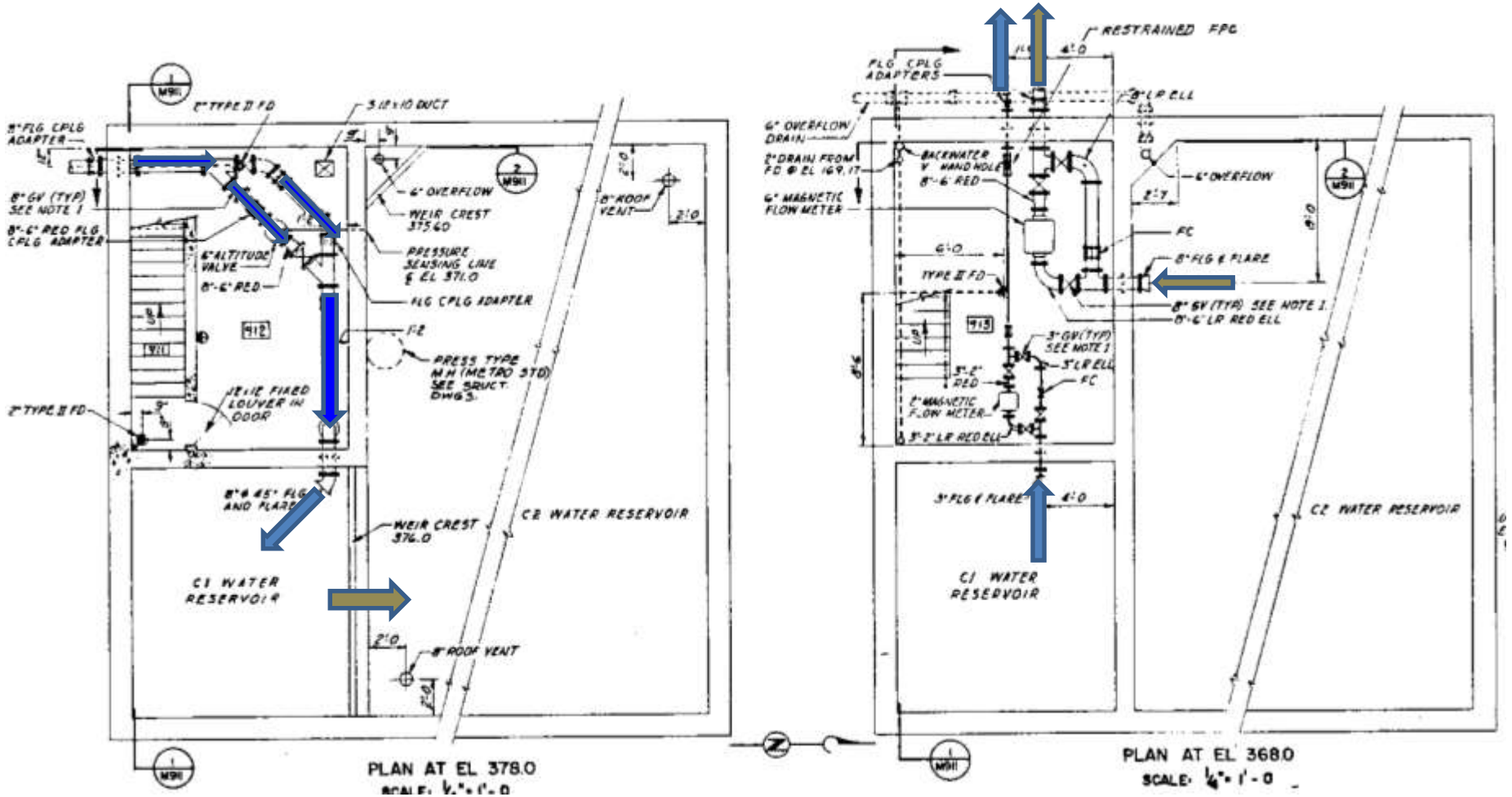


# Issues

- Buried reservoir
- Air gap  $< 2x$  inlet pipe diameter
- Inadequate drain – to the beach
- C2 reservoir can back up into C1
- Difficult entry to reservoirs and mechanical space
- Coordination with Seattle Parks
- Reservoir is in Park easement



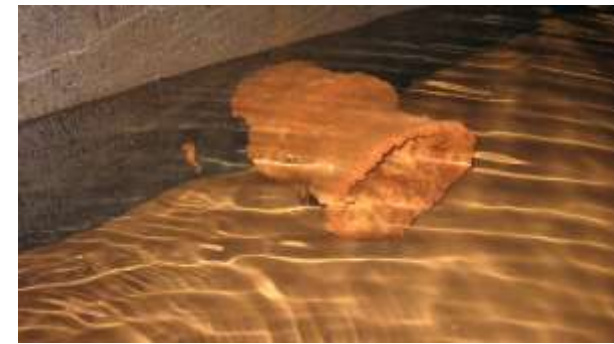
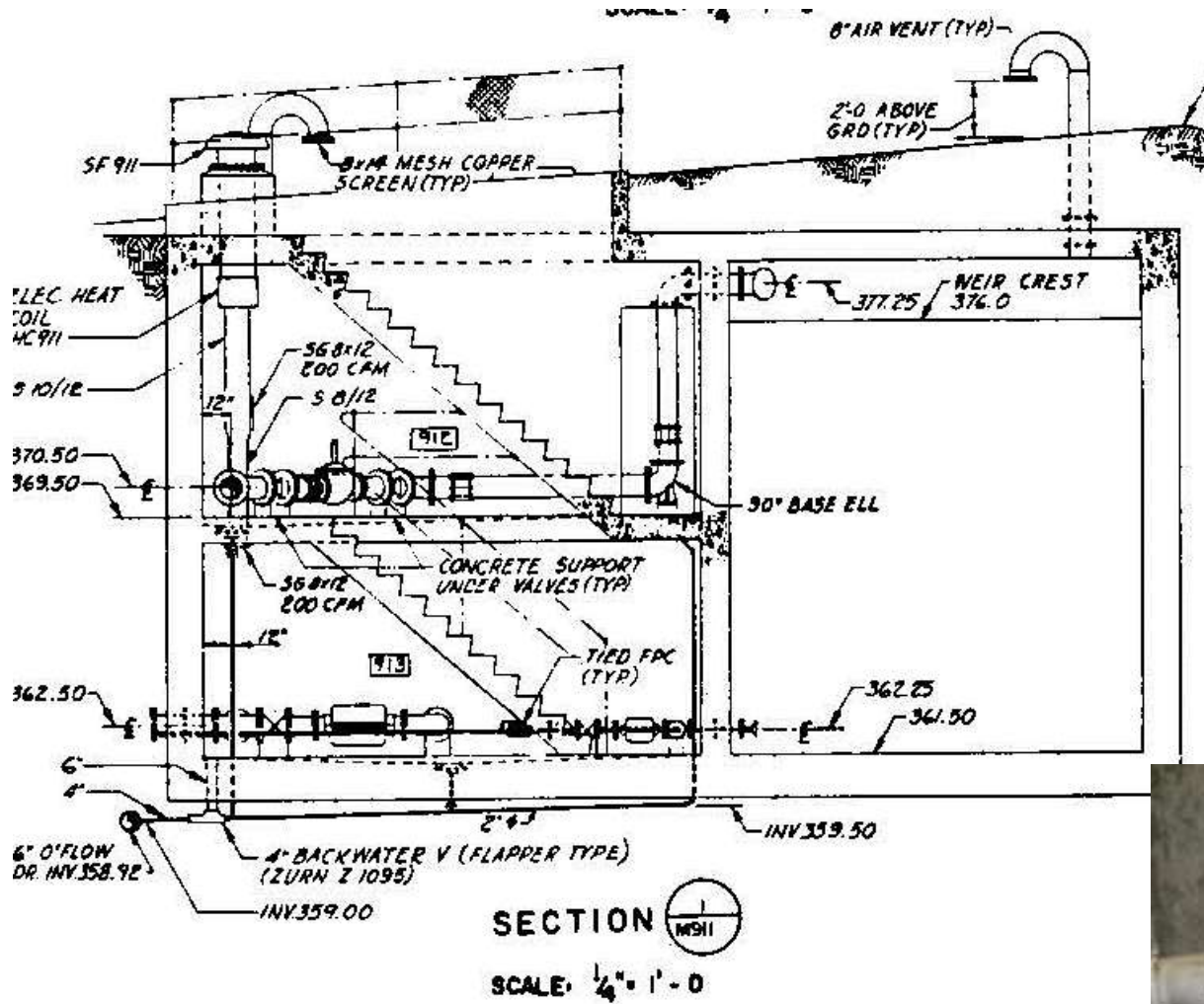
# West Point Existing Reservoir



C1 Capacity – 171,000 gallons, 32'w x 52'l x 13.75'd –  $Q_p = 1,100$  gpm  
 C2 Capacity – 18,400 gallons, 12.16'w x 14' l x 14.5'd -  $Q_p = 100$  gpm



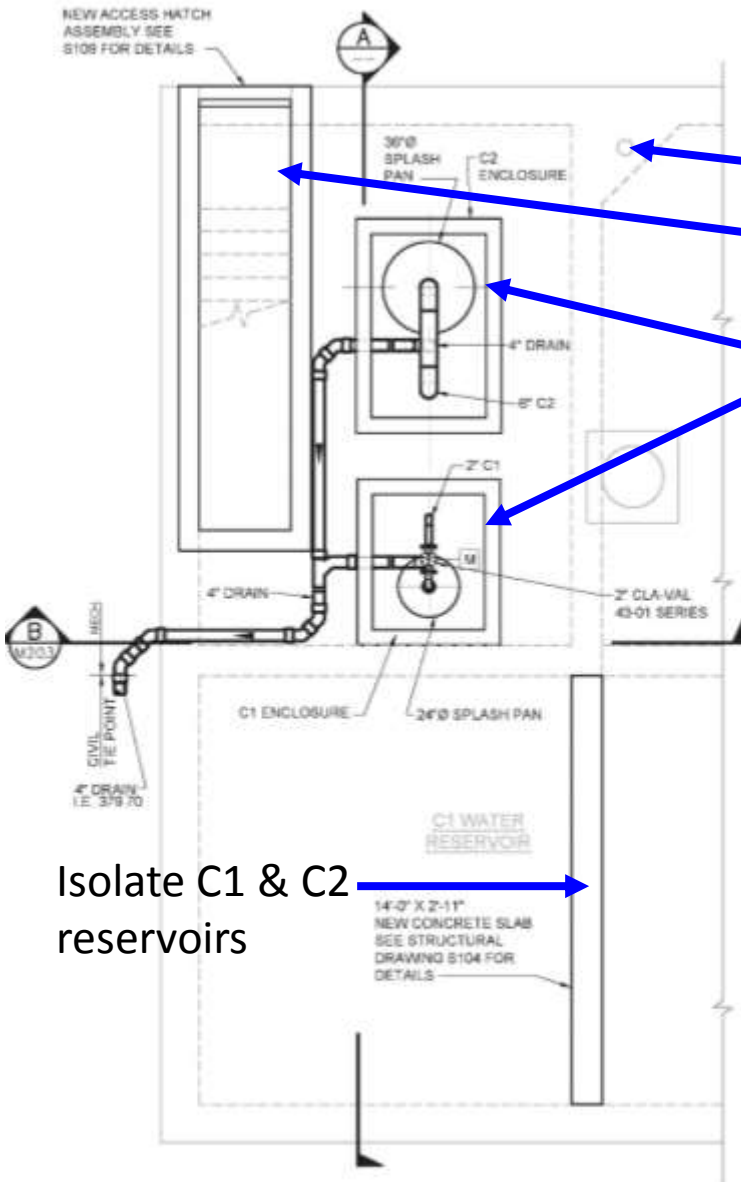
# West Point Existing Reservoir



# Planned Modifications

- Separate above grade supply points
- Separate C1 & C2 reservoirs
- New overflow
- New separate gasketed access hatches
- New mechanical room hatch
- Structural modifications to roof
- New overflow

# Proposed improvements

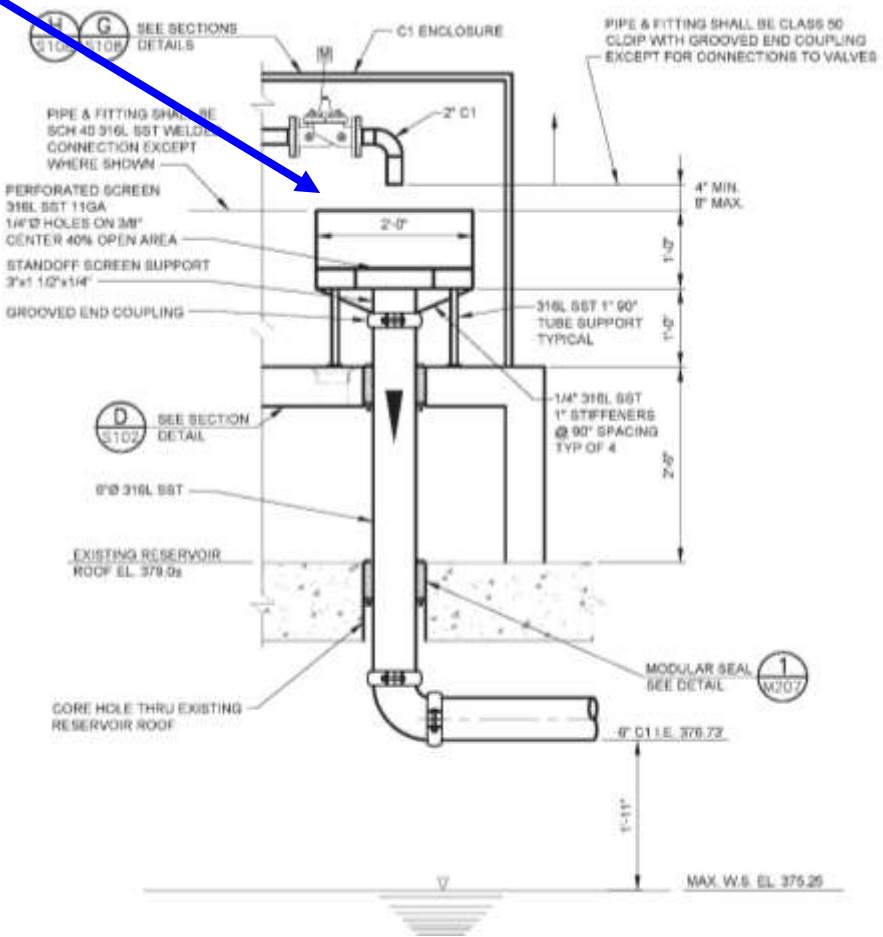


Plug old overflow

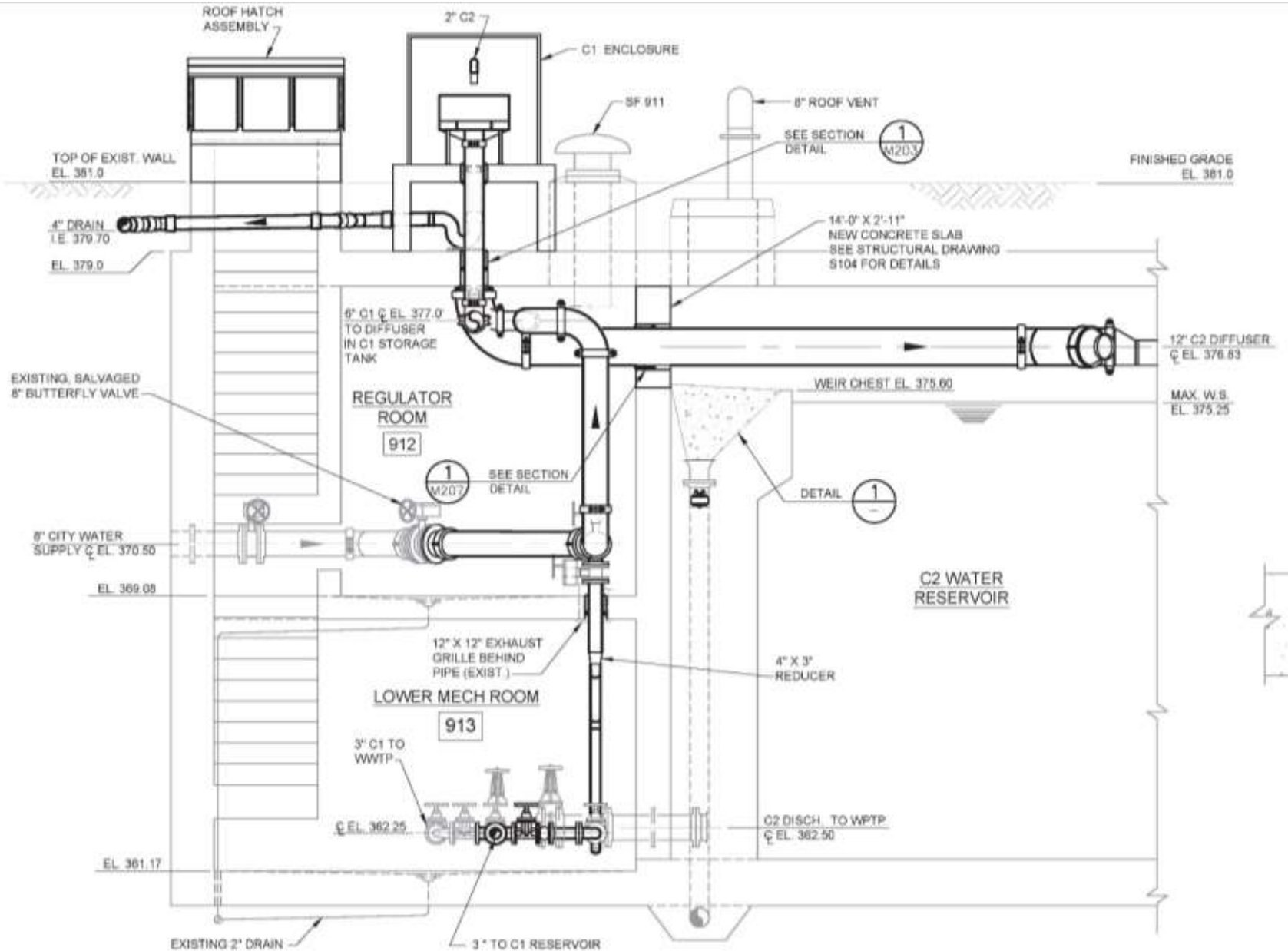
Secure entry hatch

Separate air gaps

Isolate C1 & C2 reservoirs

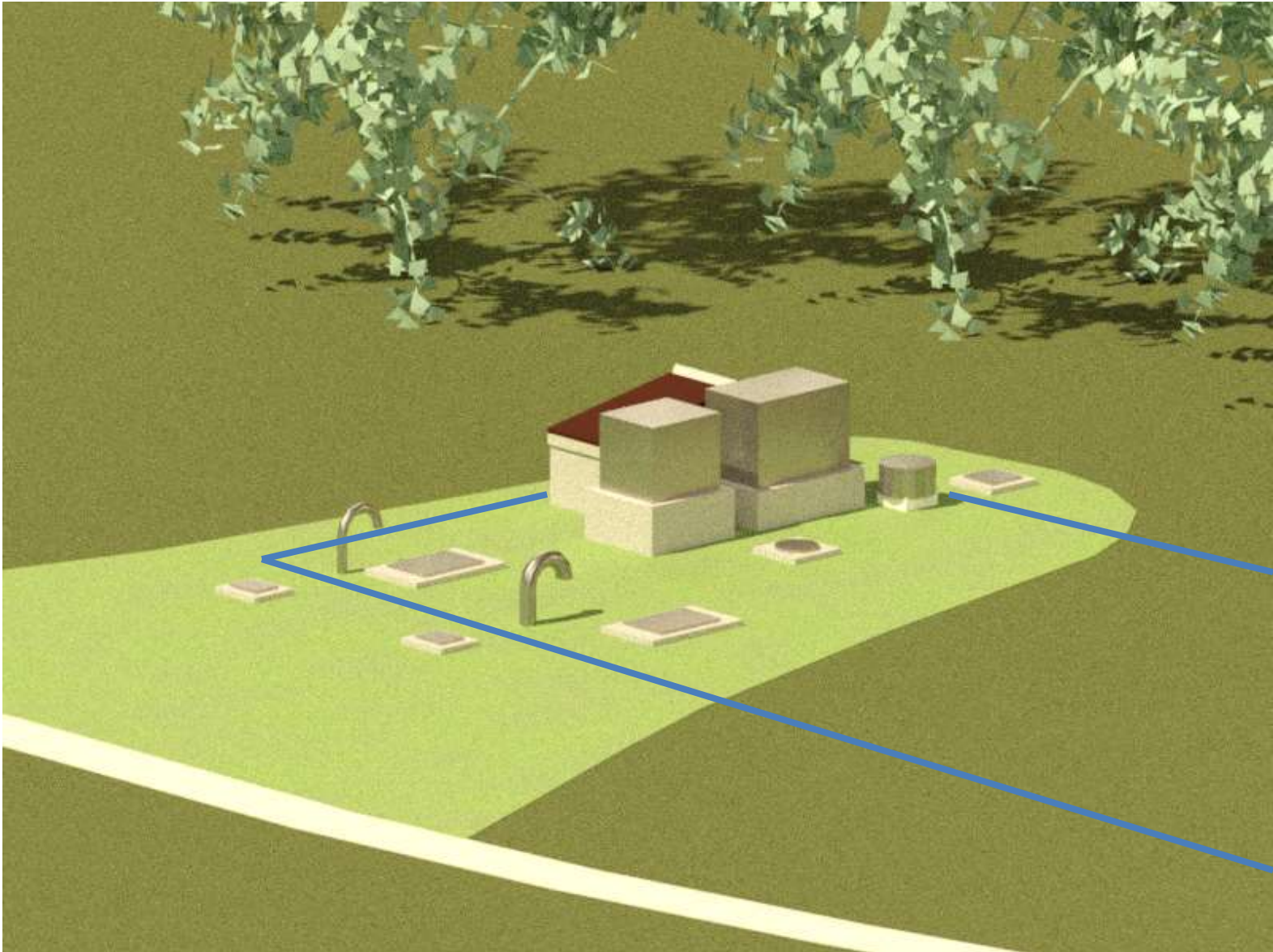


# Proposed Improvements





# Perspective





# Perspective



# South Plant

- Also built in the mid-1960s
- Two compartment water tower on site
- Utility supply feeds plant potable tank
- Overflows to process water tank
- Similar multiple water systems on site
- Insufficient air gap



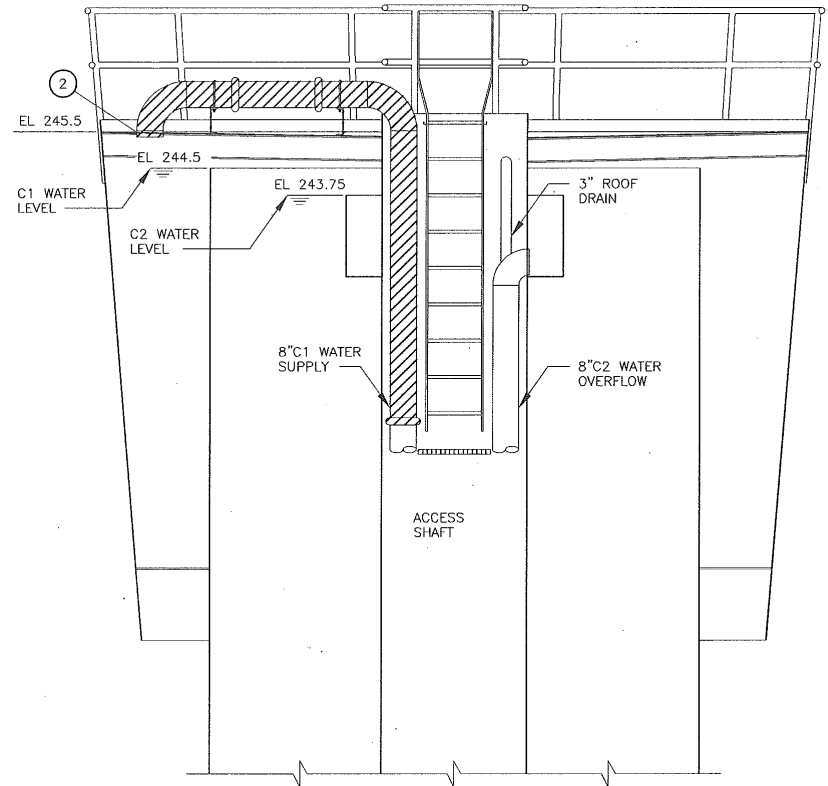
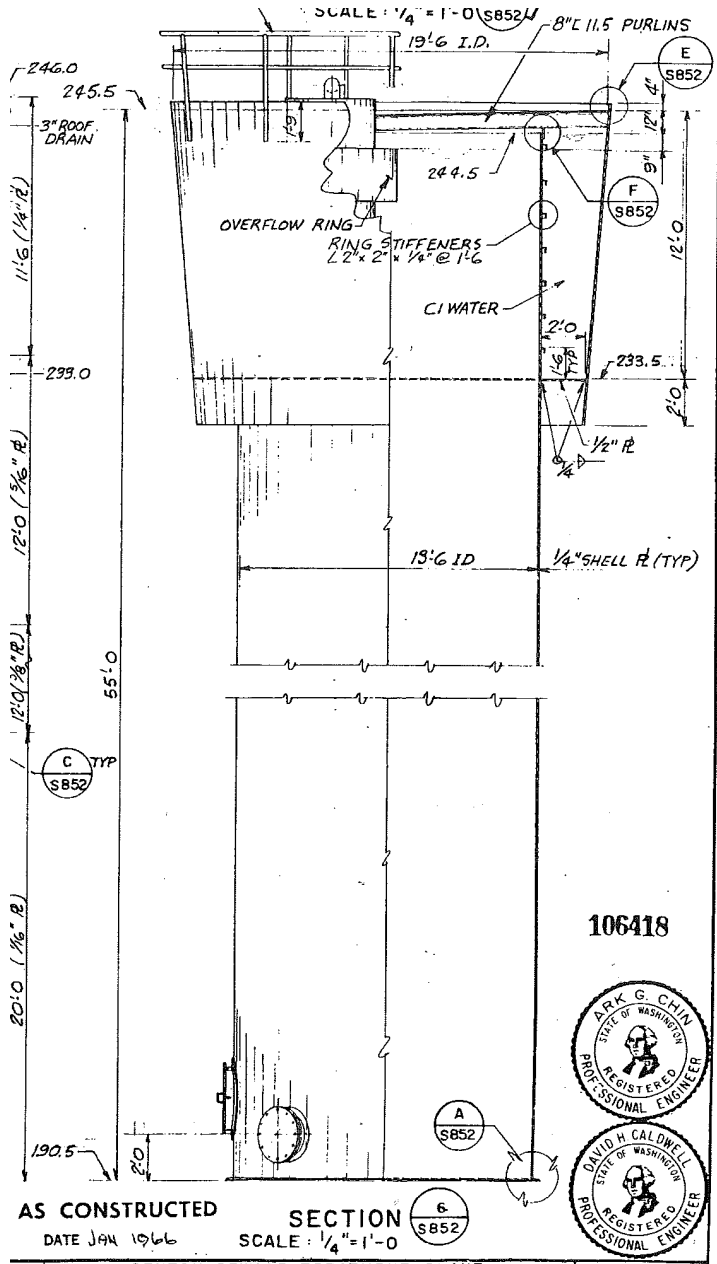
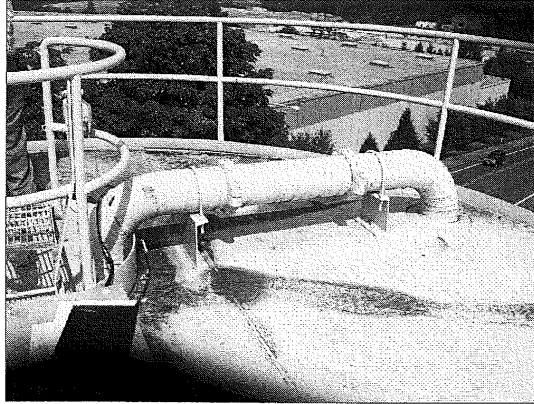
# South Plant Water Tank





# Existing Tank

C1 Capacity – 31,000 gallons  
 C2 Capacity – 22,000 gallons



# Modifications



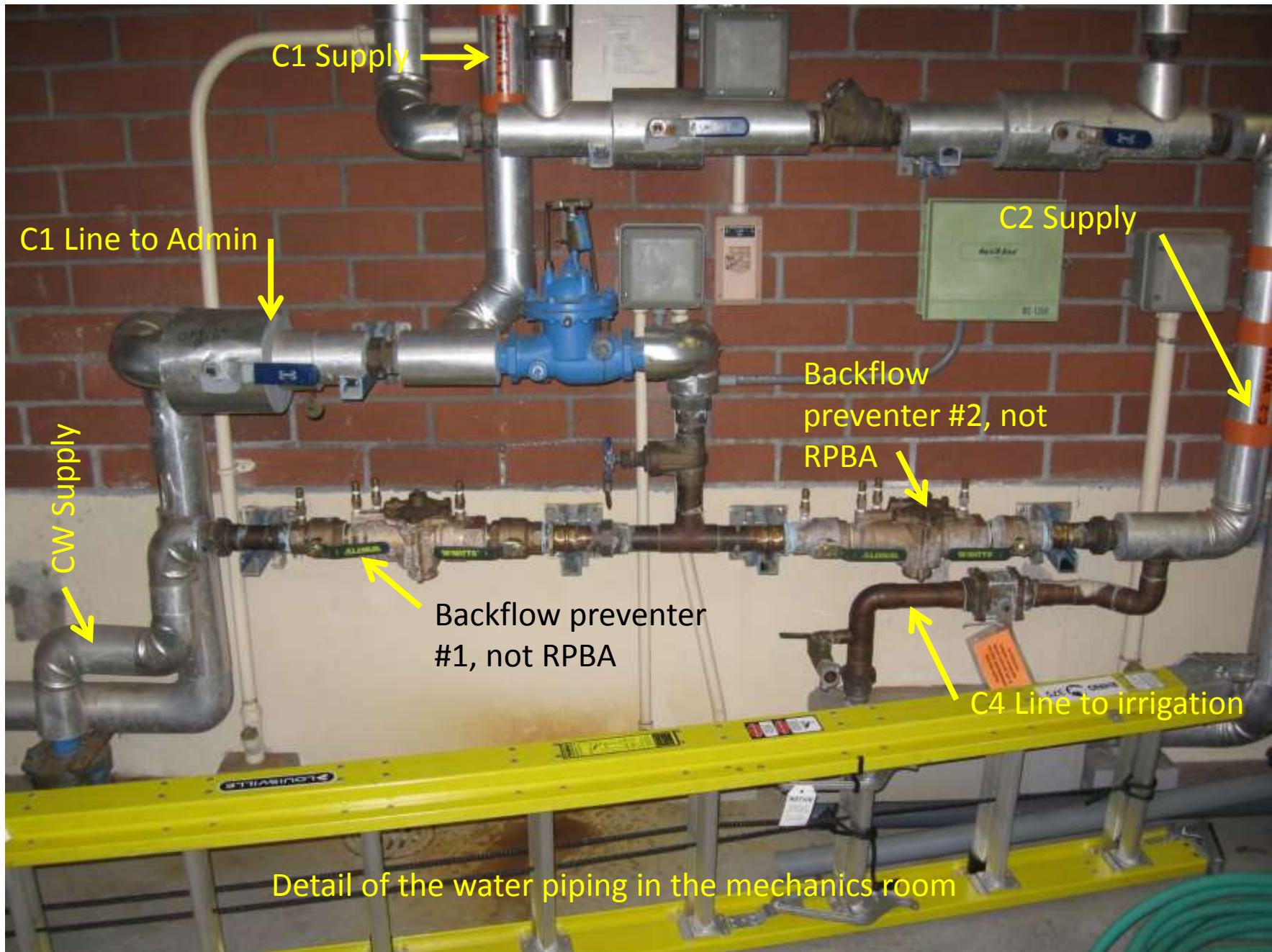
# Alki Storm Water Treatment Plant

- Previously a primary treatment plant
- Converted to CSO – intermittent use
- Dechlorination system had issues
- Built new dechlor system that needed carrier water for sodium bisulfite
- Potable water connection to the chemical room, turn into process water with air gap
- Package C2 system less expensive than extending C2 from clarifier building

# Alki CSO – Old Chem System







C1 Supply →

C1 Line to Admin ↓

CW Supply ↓

Backflow preventer #1, not RPBA

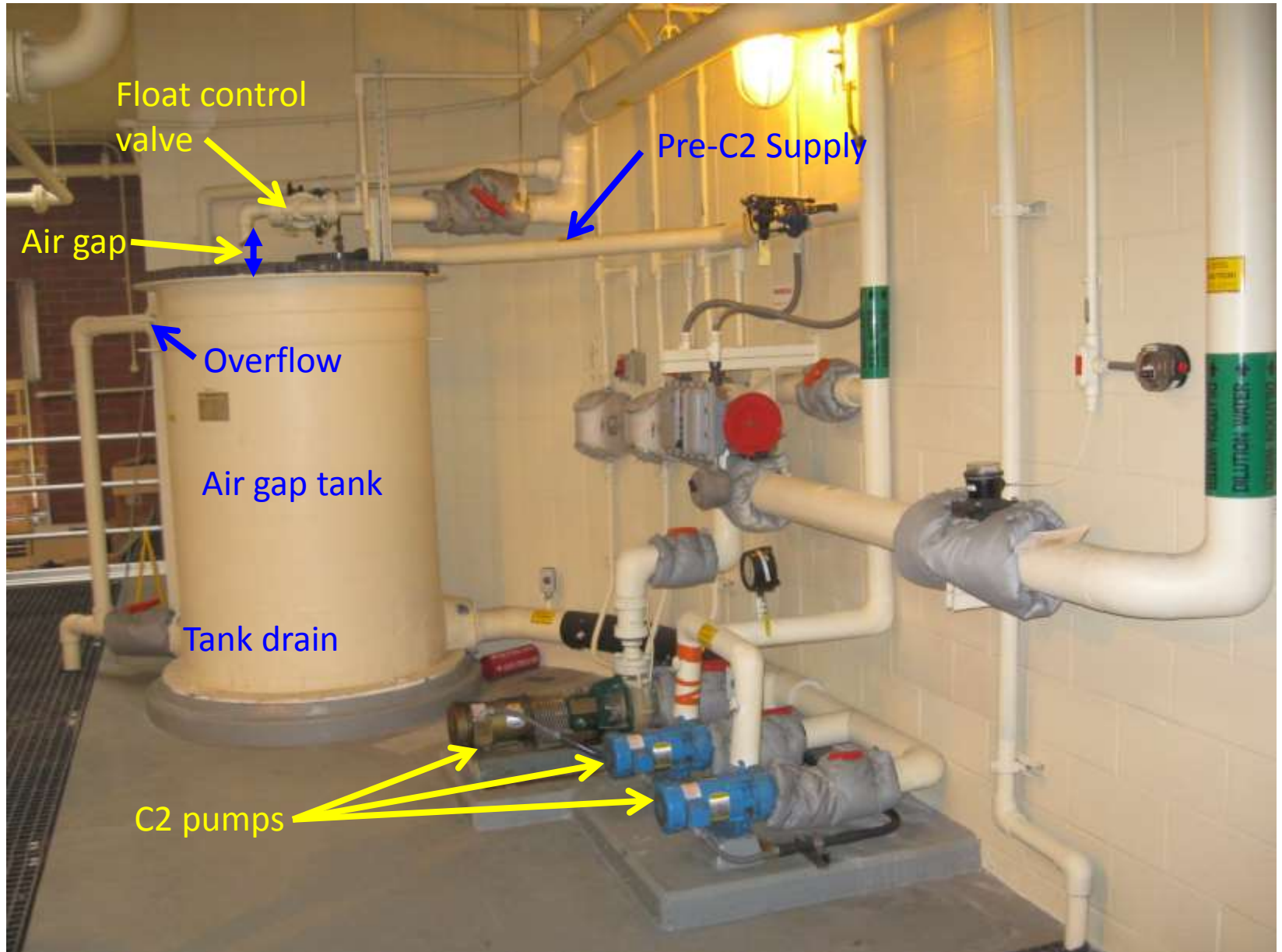
Backflow preventer #2, not RPBA ↓

C2 Supply ↓

C4 Line to irrigation ↓

Detail of the water piping in the mechanics room

# Alki CSO – Existing C2 System







# Alki CSO – New Dechlor Chem Room





# Alki CSO – Dechlor Chem Room C2 System

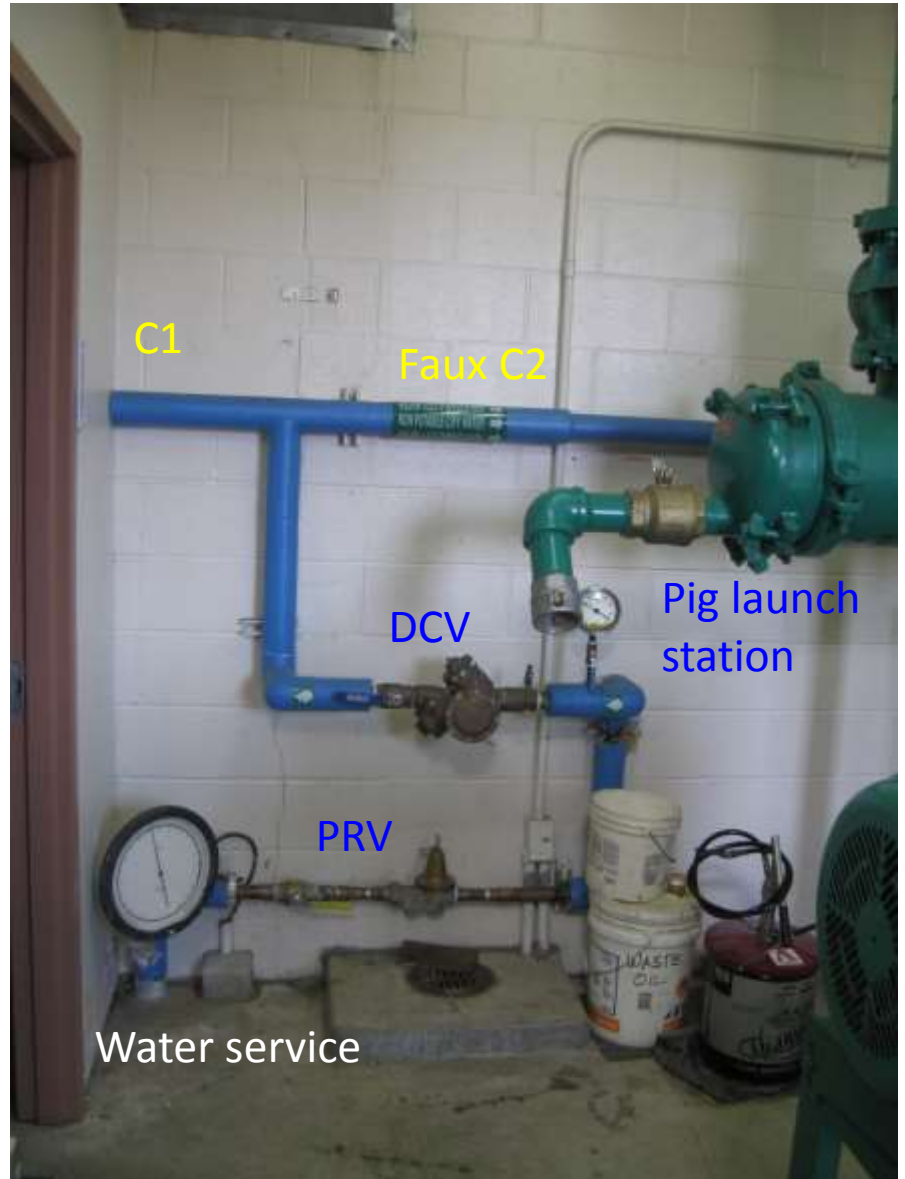


# Black Diamond Pump Station

- WTD operates this pump station owned by the City
- Potable and process pressurized by same CW service
- Needed an air gap for process water (pump seal water & flushing)
- Limited space

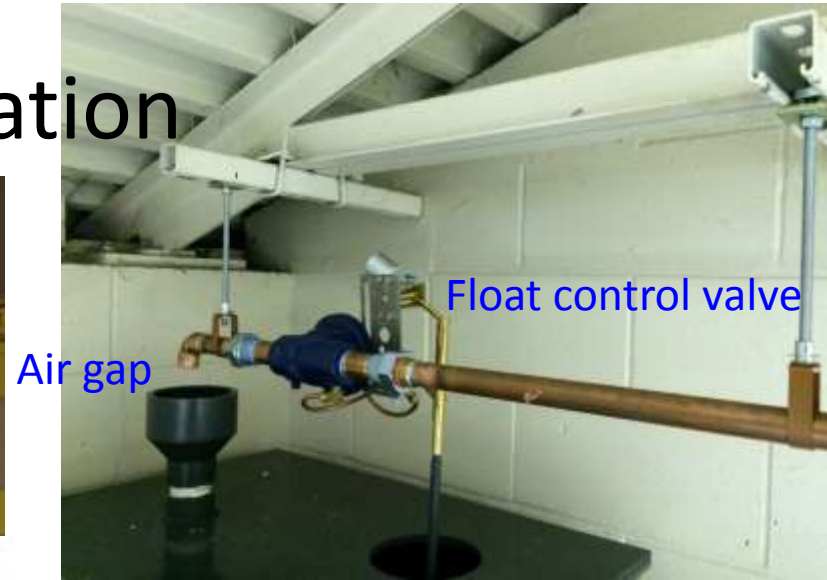


# Black Diamond Pump Station

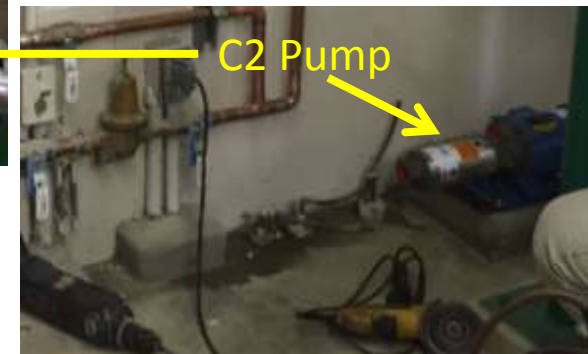




# Black Diamond Pump Station



# Black Diamond Pump Station



# Interurban Pump Station

- Built in the 1980's
- BFPV & air break tank below grade
- City of Tukwila utility and inspector
- Requested BFPV outside near the water meter
- Several alternatives considered inside and outside the building





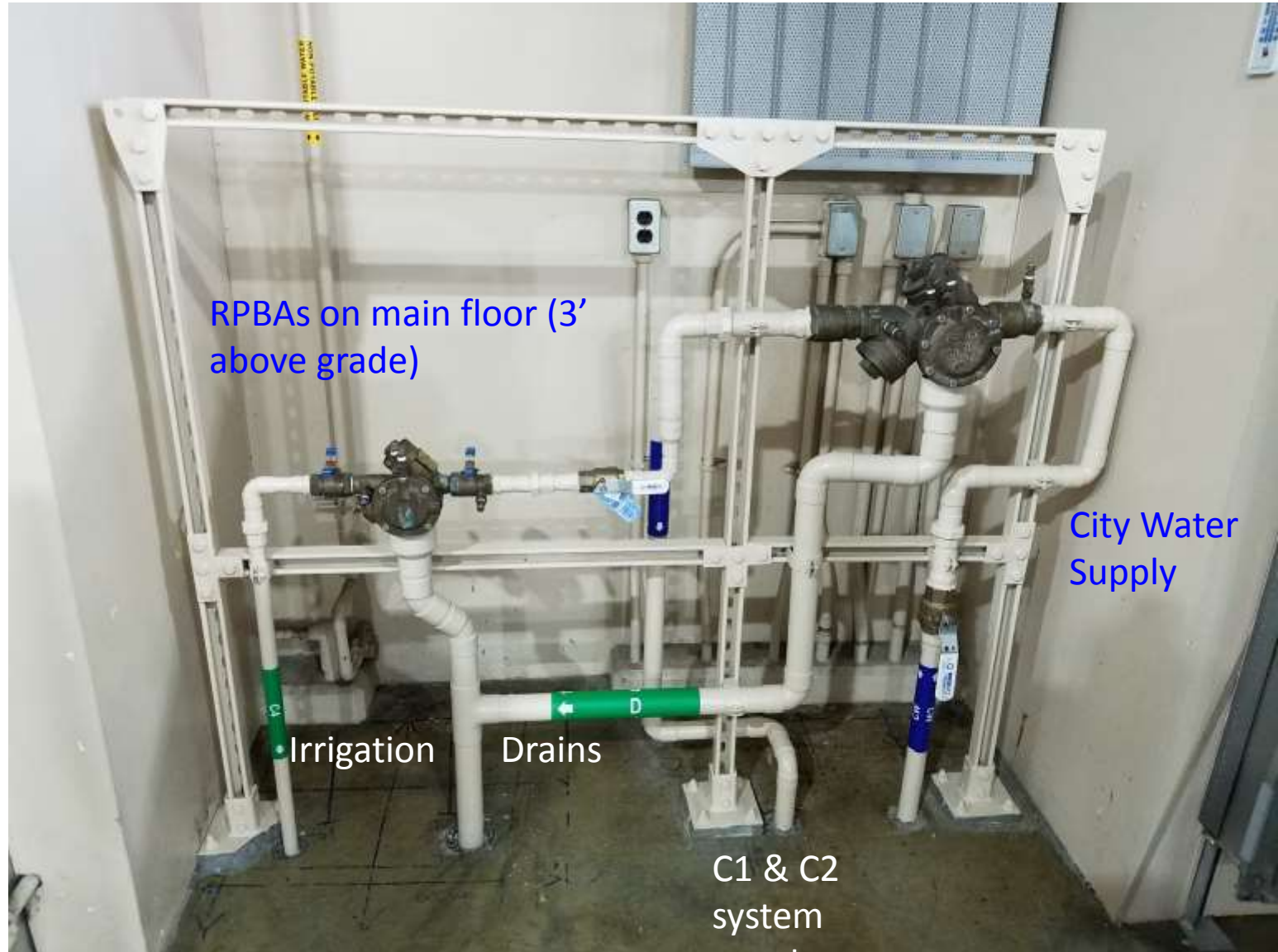
# Interurban Pump Station



C2 air gap tank (pumps out of view to the right)



# Interurban Pump Station





# North Beach Pump Station & CSO Facility

- Originally a primary WWTP for a sewer district
- Built in the 1930's
- Metro/WTD took over in 1960's and turned the facility into a pump station flowing to Carkeek PS
- CSO storage facility construction lead to NBPS upgrade including utilities
- Previous air break underground

# NBPS Photos





C3 system below grade

Water from air gap above grade

Air gap above grade

Control panel

Splash guard

Air gap

Vertical turbine duplex pumps

Hydropneumatic tank

Air gap tank



# Conclusions

- With passage of time and changes in codes it is prudent to review existing backflow prevention measurers to be sure they meet current standards
- Facility mission and needs also evolve and we need to reevaluate backflow protection
- You can try to invoke the “grandfather” clause but is it the right thing to do for protecting water quality?

# Questions?



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