

Northwest Fish Culture Conference

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Eradication of Whirling Disease at Leadville NFH Using Microscreen Filtration and Ultra-Violet Radiation

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Fisheries Design Center

**AZ, NM, NV, UT, WA, BC*

Leadville NFH

- *Constructed in 1889*
- *Elevation 10,000 ft*
- *Provides mitigation fish for the Fryingpan-Arkansas project*



Turquoise Lake

- Whirling disease was detected at Leadville NFH in 1995
- USFWS subsequently confirmed that whirling disease pathogens were entering the facility from Turquoise Lake
- State whirling disease policy would not allow the hatchery to plant in the Fryingpan basin

Difficult decision

- Leadville NFH is a unique facility with significant historic value
- The hatchery is strategically located to provide fish for the Arkansas-Fryingpan basin
- USFWS decided to pursue a treatment system to keep the facility in operation

Options considered

AVOID IT

- Springs
- Rock Creek
- New Well

REMOVE IT

- Media Bed Filtration
- Fixed Media Filtration

DEACTIVATE IT

- Chlorine
- Ozone
- Ultra-Violet

System design criteria

- Gravity flow system
- Capacity to treat up to 3,000 gpm
- Ability to treat 2,000 gpm with any one treatment element down
- Provide full bypass during power failure
- ~~Guaranteed 100% effective protection when in operation~~
- Highest level of protection feasible using the best available technology

Equipment specifications

Microscreen Filters

- 60-micron drum filters for pre-screening of large debris
- 10-micron disc filters for the primary barrier to WD organisms (TAMS)

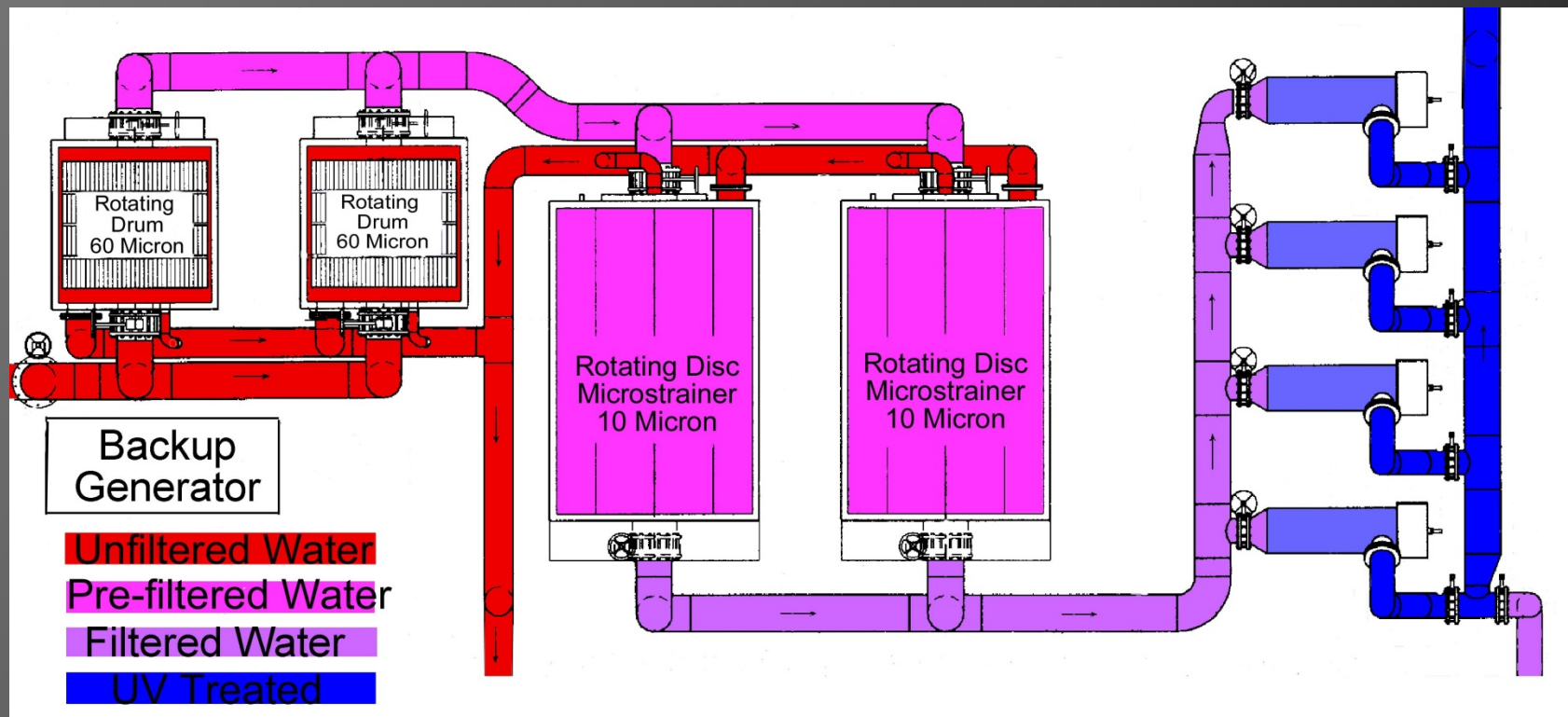
Ultra-Violet Disinfection Reactors

- Low-pressure high-intensity amalgam lamps
- 120,000 $\mu\text{Ws}/\text{cm}^2$ dose at design maximum flow rate

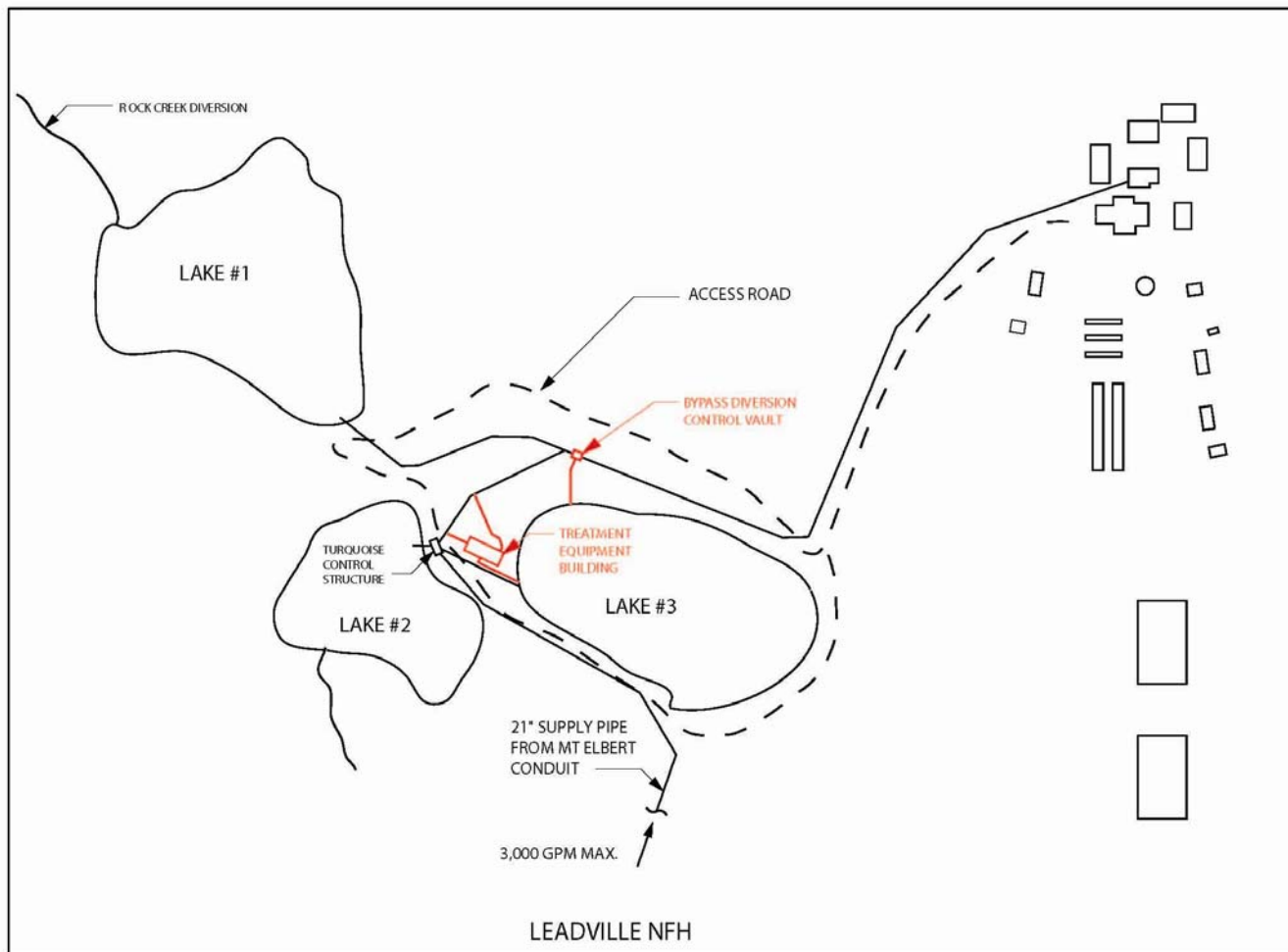
UV Dose

- Hoffman's research in the 70's provided strong evidence that 35,000 $\mu\text{Ws}/\text{cm}^2$ prevented occurrence of spores
- In 1999, Hedrick demonstrated 100% kill of TAMs at a dose of 1,300,000 $\mu\text{Ws}/\text{cm}^2$
- USFWS decided to proceed with a conservative dose capability of 120,000 $\mu\text{Ws}/\text{cm}^2$

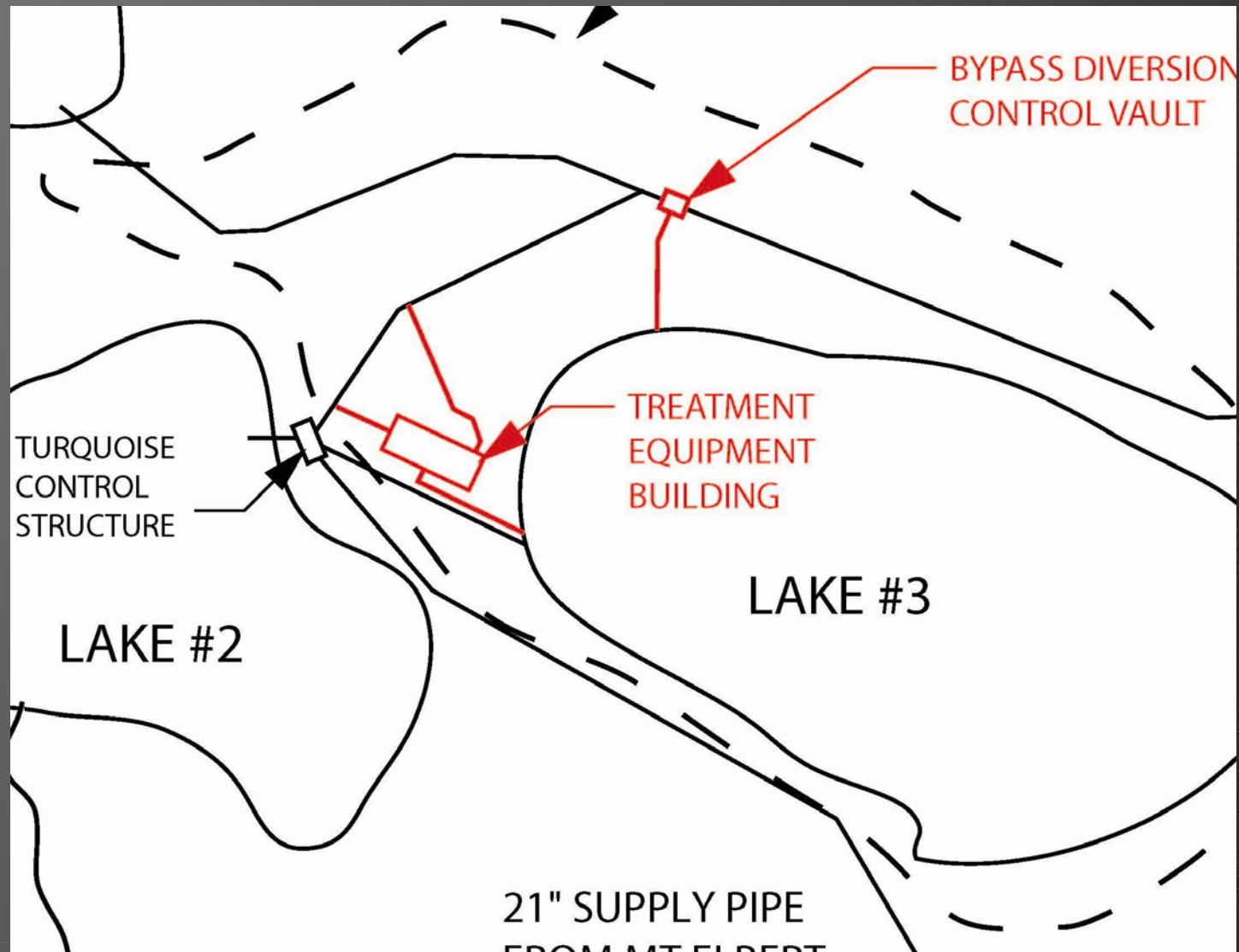
Treatment equipment configuration



Site piping configuration



Site piping configuration



System controls

- Low UV Intensity (<102% at sensor)
 - No interruption of flow
 - UV systems automatically switch to full power
 - Alarm sounds to notify personnel
- Critical UV Intensity (<100% at sensor) or Lamp Failure
 - Activates automated valves at the Bypass Control Vault
 - Alarm sounds to notify personnel
 - Personnel respond to the Treatment Building to isolate the affected UV unit
 - Bypass Control Vault valves automatically restore flow to hatchery once the affected UV unit is isolated
- Power Failure
 - Trips valves at Bypass Control Vault
 - Flow automatically restored once generator is up and UV units have successfully restarted

Treatment Building

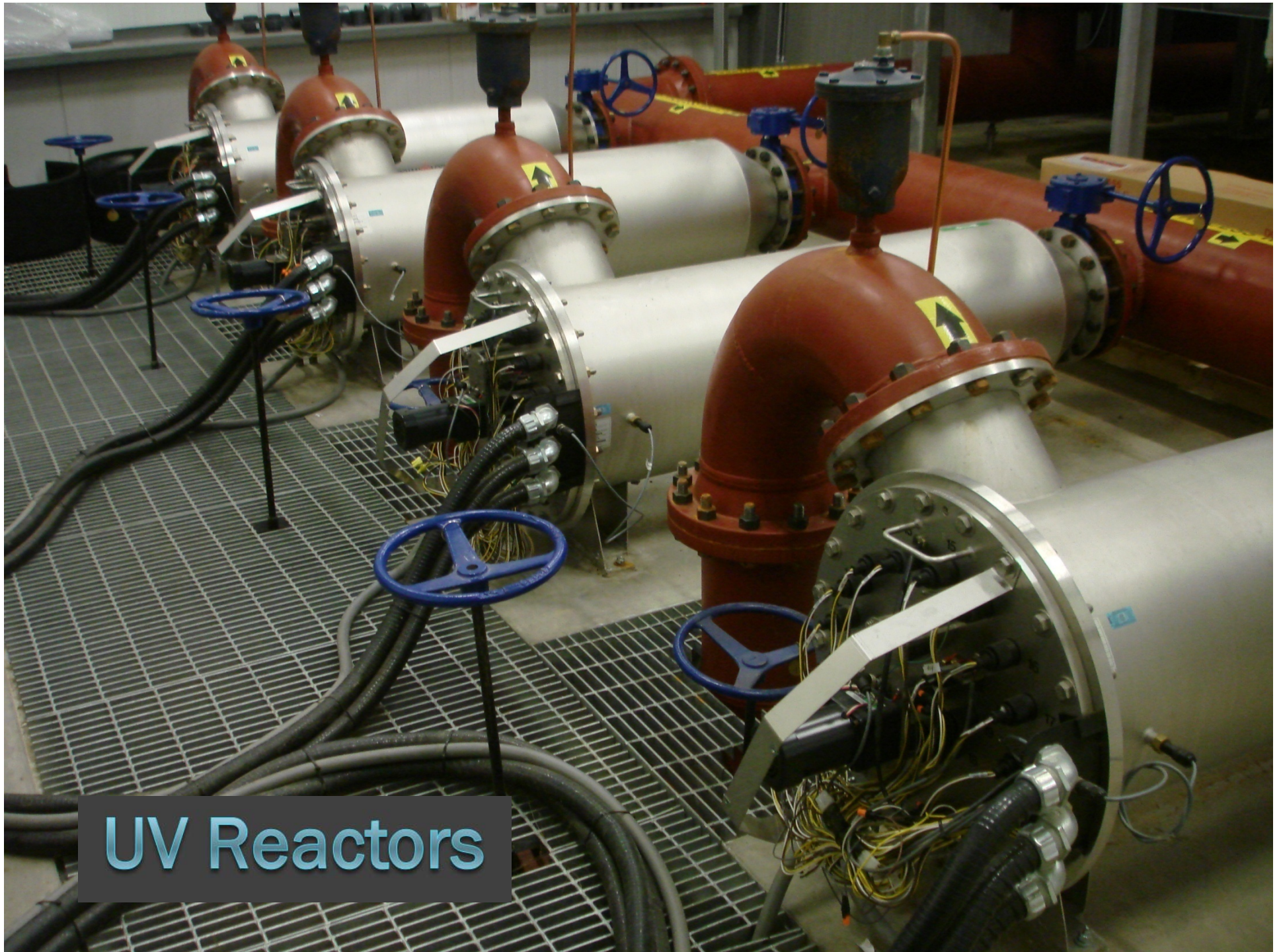


Roughing Filters (60-micron drum)



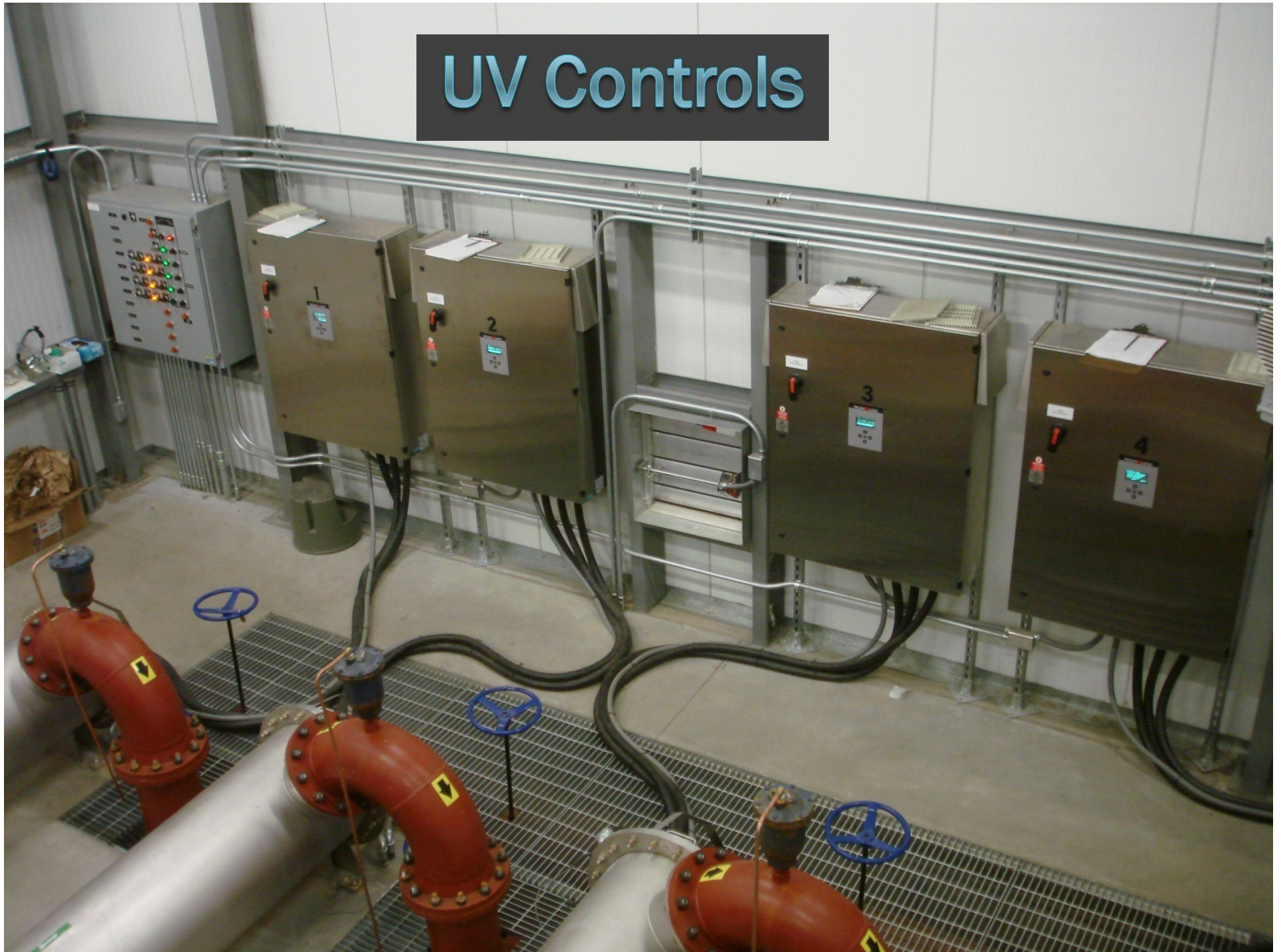
Main Filters (10-micron disc)





UV Reactors

UV Controls





Bypass Control Valves

Back in Business!





Leadville



National Fish Hatchery

*U.S. Fish and Wildlife Service
Department of the Interior*