Recycled Water Contractor Training

DENVER WATER

RECYCLED WATER SYSTEM

The Right Water

The Right Use

Training Objectives

- **What is recycled water and why use it?**
- **How is it treated and distributed?**
- **What are the requirements, rules & regulations associated with it?**

Recycled Water

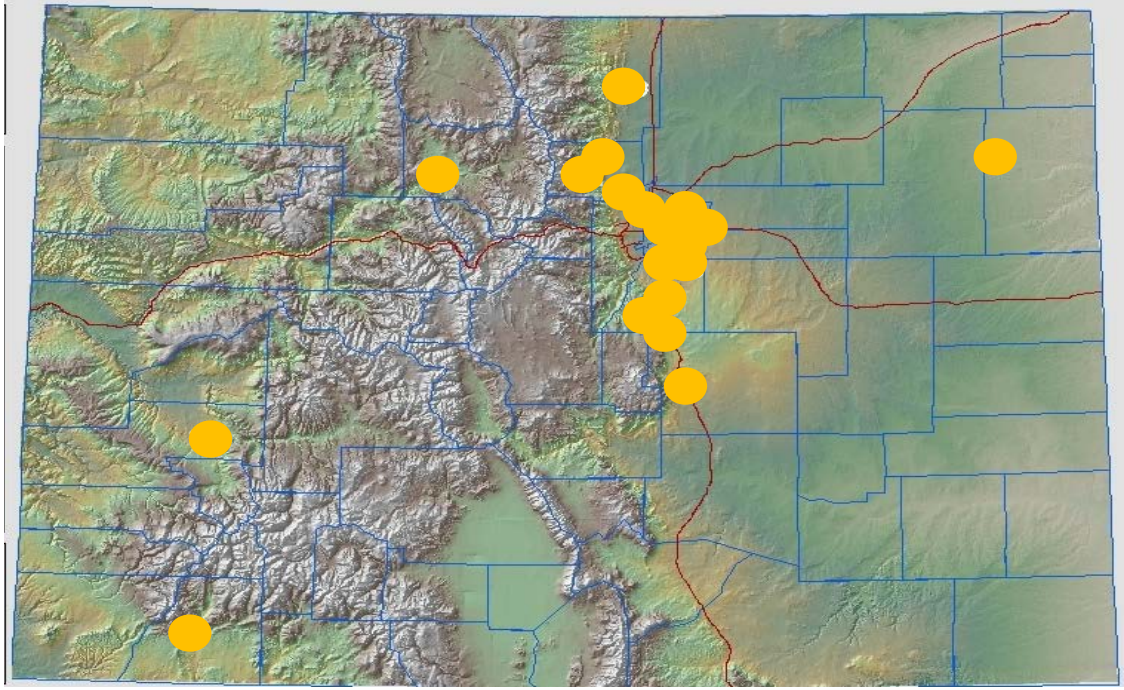
What is it?

- Treated wastewater for irrigation and some industrial & commercial uses. Interchangeable with ‘reclaimed,’ ‘reuse’ and ‘new’ water.

What is it not?

- Gray water: Untreated water from showers, clothes washers, and faucet uses. Kitchen sink and toilet water are excluded.

Historical Usage



Locally

- Nearly 2 dozen Colorado communities
- Almost half a century in Colorado Springs
- Since 2004 in Denver

Nationally

- > 100 years for crop irrigation
- > 70 years for landscape irrigation
- > 40 years for drinking water augmentation

Why Recycled Water?

- Lessens load on drinking water system
- Delays requirement for developing new drinking water supplies
- Required for sustainable growth
- Lower cost alternative to customers
- Blue River decree
- Colorado River Cooperative Agreement
- Right water for the right use

Blue River Decree

Successive Use Project

Potable Reuse Demonstration Project

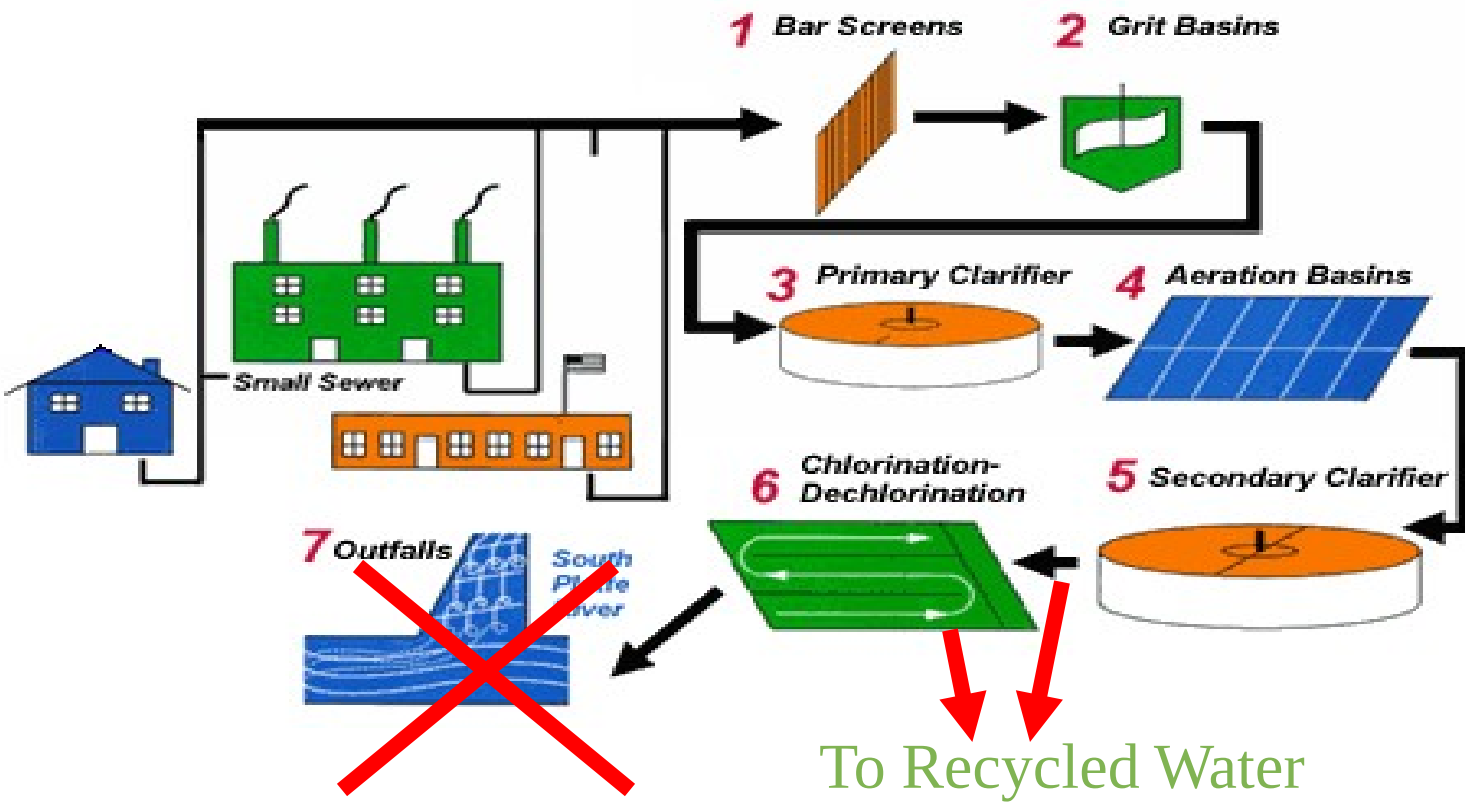
Recycling Plant Commissioned

1955 1960 1970 1980 1990 2004

DENVER WATER RECYCLED WATER SYSTEM

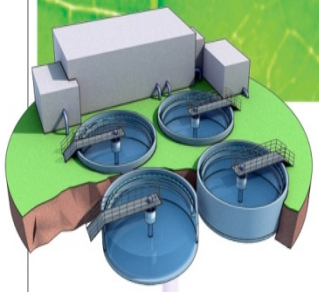
Source Water

Metro Wastewater Treatment Plant



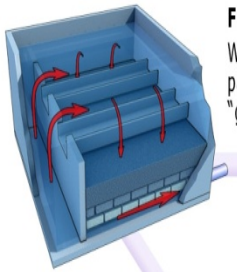
DENVER WATER

Recycling the right water for the right use.



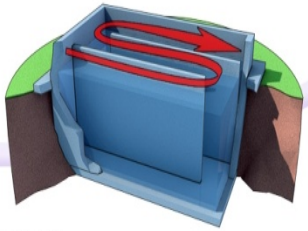
Metro Secondary Clarifier

A quantity of treated wastewater from Metro Waste is captured just before it is discharged into the river and is pumped to Denver Water's Recycled Water Plant.



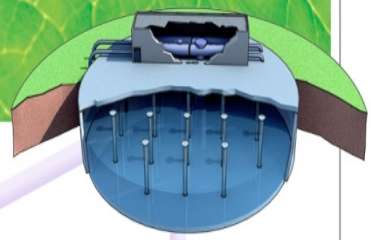
Filter Beds

Water filters through anthrocite particles. Remaining sediment "gets trapped."



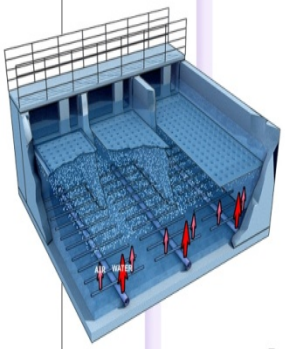
Contact Basin

Water flows through a series of baffled walls, which allows chlorine to react with the water for at least 30 minutes.



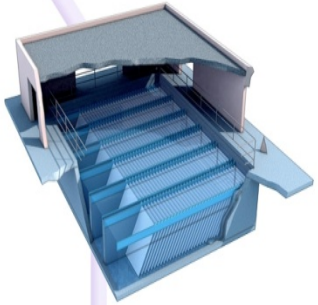
Finished Water Reservoir

The treated water is stored in a 300 foot wide, 23 foot deep reservoir which holds 11 million gallons of water.



Biological Aerated Filter Building

Ammonia eating bacteria catch a ride on polystyrene beads, filtering the water as they go.

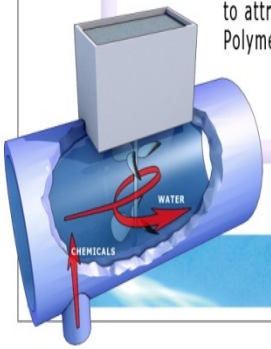


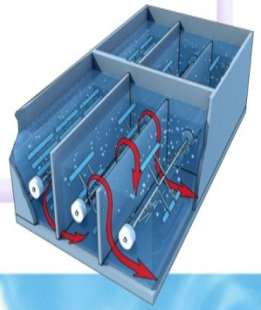
Sedimentation Basin

Water moves up a series of closely spaced plates causing sediment to fall to the bottom.

Rapid Mix Room

A coagulant is added at this point to attract particles to one another. Polymers aid in the process.





Flocculation

Paddles force collision of particles to further bind them together. Water turbulance is decreased by reducing the surface area on the paddle wheels. This allows snowflake like particles to grow even bigger and heavier.

Recycled water will go to irrigate parks, golf courses, schools, commercial applications, etc., providing the capacity to "free up" enough raw water resources to serve 35,000 households annually.

This saves water in Colorado!

Distribution System

- > 30 Miles of Pipe
- 2 - Pump Stations
- 2 - Storage Reservoirs
- Potable Water Back-up at Capital Hill with Air Gap
- Purple Pipes & Wrap
- Purple Valves
- Purple Meters

Distribution System

- **Manhole Rings & Covers**
  - Stamped “Non-potable water”
  - Painted Entirely Purple

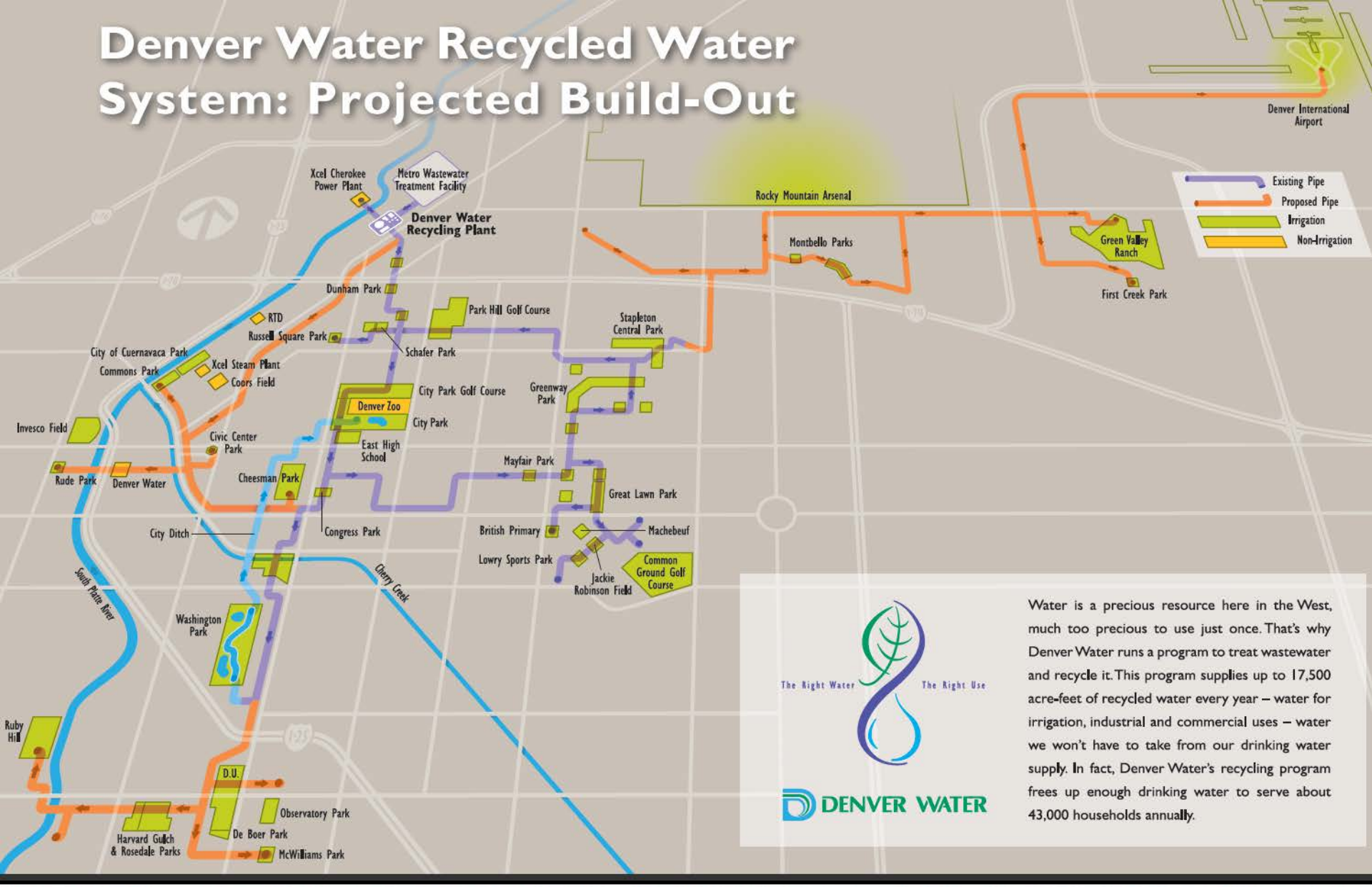
- **Valves**
  - Triangular Lids (Purple)

- **Pentagon nuts**
  - Open left

- **Purple Lids (Irrigation)**

- **Water Quality Sampling Point**

Denver Water Recycled Water System: Projected Build-Out



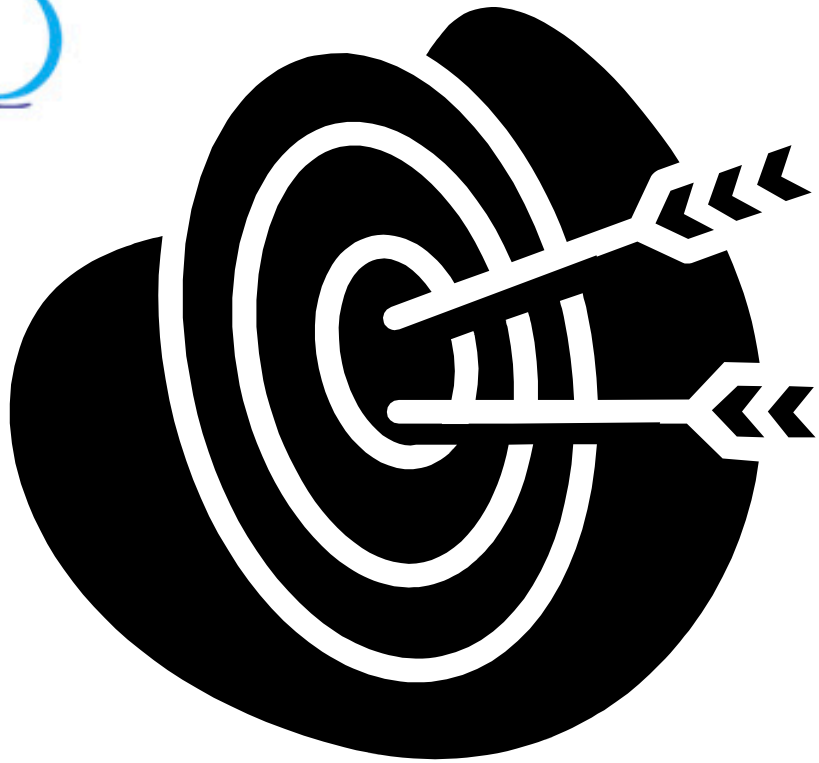
The Right Water The Right Use

DENVER WATER

Water is a precious resource here in the West, much too precious to use just once. That's why Denver Water runs a program to treat wastewater and recycle it. This program supplies up to 17,500 acre-feet of recycled water every year – water for irrigation, industrial and commercial uses – water we won't have to take from our drinking water supply. In fact, Denver Water's recycling program frees up enough drinking water to serve about 43,000 households annually.

DENVER WATER RECYCLED WATER SYSTEM

Future Plans



17,500 ac-ft/yr

Finish by 2020

REQUIREMENTS, RULES AND REGULATIONS

DENVER WATER

RECYCLED WATER SYSTEM

The Right Water

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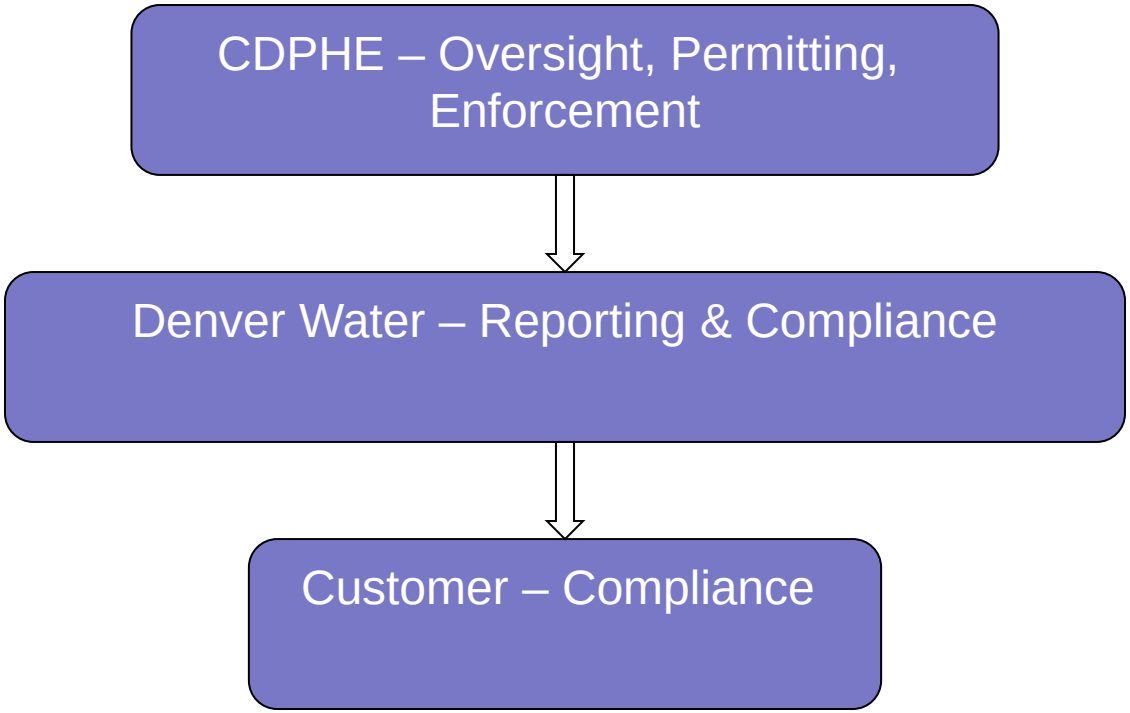
State Regulations



Regulation 84 Minor Violations

- Modifications/ repairs not distinguished as recycled water
- Application or permeable storage within 100’ of domestic water source
- Irrigation above agronomic rate
- No signage
- No backflow prevention on potable water
- Supplementing recycled water with other water sources without approved backflow prevention

Regulation 84 *Serious* Violations

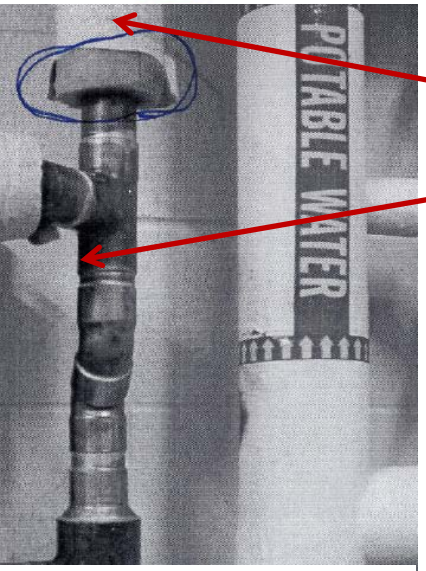
- **Discharge to surface water (includes storm water)**
- **Cross-connection without backflow prevention**

➢ **Provide verbal report to CDPHE within 24 hours**

➢ **Provide written report to CDPHE within 5 business days of verbal report**

Example Violations

Pooling



Recycled Water

Potable Water

Cross Connection

Run-off

No Signage

Spill Reporting to State

- **<u>Any</u> spill reaching a water of the state* must be reported immediately**
  - ***Lake, reservoir, river, canal, ditch, stormwater conveyance, wetlands, groundwater**
- **Spill Hotline: 877-518-5608**
- **Spill Guidance: http://www.cdphe.state.co.us/wq/WhatsNew/SpillGuidanceDocument.pdf**

Spill Reporting to Denver Water

- **Any spill shall be reported immediately to:**
  - **Abigail Holmquist**
    - **303-628-7010**
    - **Abigail.Holmquist@denverwater.org**
  - **Tom Mountfort**
    - **303-628-6342**
    - **Tom.Mountfort@denverwater.org**

Recycled Water Hygiene & Maintenance Practices

- **Use separate tools for recycled water OR disinfect tools after using on recycled water**
- **Don’t drink recycled water**
- **Wash hands thoroughly after working with recycled water systems**
- **Minimize volatilization exposure to workers**

Operating Rules and Engineering Standards

Operating Rules – Chapter 4

- Obtain approval from Denver Water & CDPHE for modifications to recycled water system
- Plan review submission requirements

Operating Rules and Engineering Standards

Engineering Standards – Chapter 11

- All Engineering standards apply. On recycled water projects, Chapter 11 overrules in case of conflict
- Conduits and mains will be colored purple integrally or poly wrapped and have warning “Caution: Recycled Water-Do Not Drink” stamped or embossed continuously on both sides of the pipe or on polywrap
- Cement-mortar lining not allowed
- Line valves at most 2500’ apart
- Dead-end main blowoff valves will be at least 6”
- 3” wide purple warning tape w/ black lettering saying “Caution: Recycled Water-Do Not Drink” placed in trench 1’ above pipe

Operating Rules and Engineering Standards

Engineering Standards – Chapter 11

- Separation from potable & sanitary sewer pipes:
  - Potable: 10 foot horizontal separation, 1 foot above or below recycled water mains
  - Sanitary Sewer: 10 foot horizontal separation, 1 foot above or below recycled water mains
- Valve box covers shall be triangular, purple and cast with the words “recycled water”
- Valve operators will open counter-clockwise with pentagonal nut
- Valves, operators, air-relief valves and blowoffs will be colored purple and labeled with “recycled water facilities” tags of inert plastic

Operating Rules and Engineering Standards

Engineering Standards – Chapter 11

- Manholes are purple and have “Recycled Water” cast or molded on the top
- Curb stop box and meter pit covers will be purple, triangular and cast with the words “Recycled Water”
- Service lines larger than 2” will need 4” roadway covers
- Meters shall be purple and tagged with “recycled water” and the meter address
- Meters and control valves will be installed in different vaults
- Control valve vaults will have locking, door-type hatches

Operating Rules and Engineering Standards

Engineering Standards – Chapter 11

- Potable water back-up only available via Denver Water distribution system
- Dual supply systems not allowed without Denver Water approval
- Pumping & storage not allowed without Denver Water approval
- Public access to all recycled water system components must be restricted
- Wash-down hydrants, blowoff hydrants, blowoff on strainer, etc shall be located below grade in locking containers
- Exposed service piping shall be spirally wrapped with warning tape.

Flushing/Dewatering Disposal

- **Recycled Water:**
  - **Sanitary sewer with permit**
  - **Land apply to permitted recycled water user with permission**
  - **Haul off**
- **Potable Water:**
  - **Storm sewer per normal flushing procedures**

Project Checklist Items

- Camera or inspector inspection
- Pressure testing
- Flushing with 3 pipe volumes (potable preferred in case of failure)
- Water quality testing for turbidity and pH during flush

Recycled Water Conversion

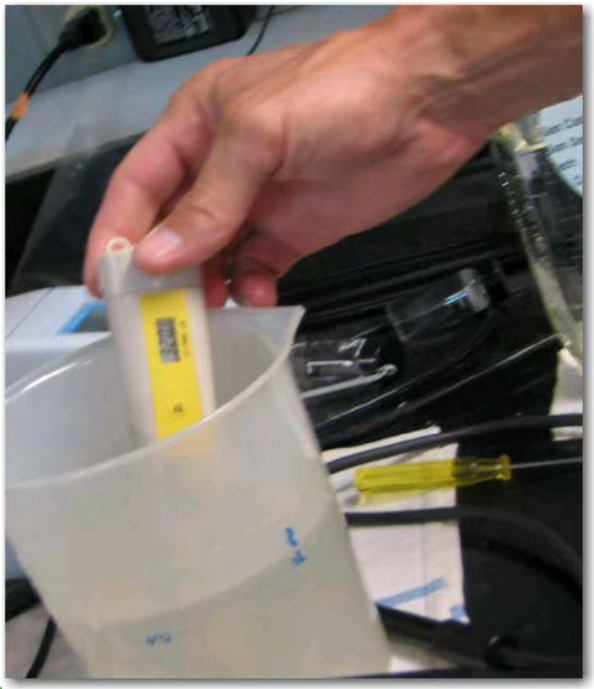
Service Connection

Tap Cut

1. **Physical Disconnection**
2. **Disinfection**
3. **Install Blind Flange**

Cross-connection Testing

1. **All zones of irrigation system will be *<u>thoroughly</u>* flushed**
2. **Conductivity will be measured to ensure recycled water is the source**
3. **Irrigation shut-off valves will be operated to ensure potable (or other) water is not supplying the system**



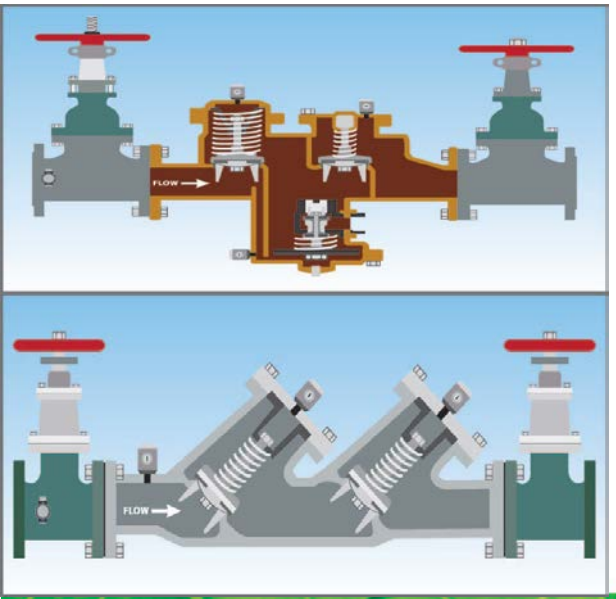
Cross-connection Control

- **Backflow protection required on the following commercial water service lines**
  - **Domestic**
  - **Fireline**
  - **Irrigation**
  - **Recycled***
  - **Residential with Auxiliary Source**

Recycled water service lines require a BFPA if chemical injection is used, pumps are installed, if the existing or proposed system poses a risk to the integrity of the recycled water system.

Backflow Prevention Assemblies

BFPA's are used to protect a public water system from potential cross-connections within a private plumbing system. They must be USC certified, installed per manufacturer's recommendations at least 5' downstream of meter and tested annually.



- **Reduced pressure principle: used for high hazard applications, must be installed above grade in heated enclosure**
- **Double-check: used in low hazard applications, can be installed below grade**

Summary

- Recycled water – treated for specific uses
- Dedicated distribution system
- Systems must meet Denver Water Engineering Standards & adhere to Operating Rules
- Regulated by CDPHE
- Provides benefits to end-user & community