



Distribution System Management

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ILLINOIS RURAL WATER ASSOCIATION



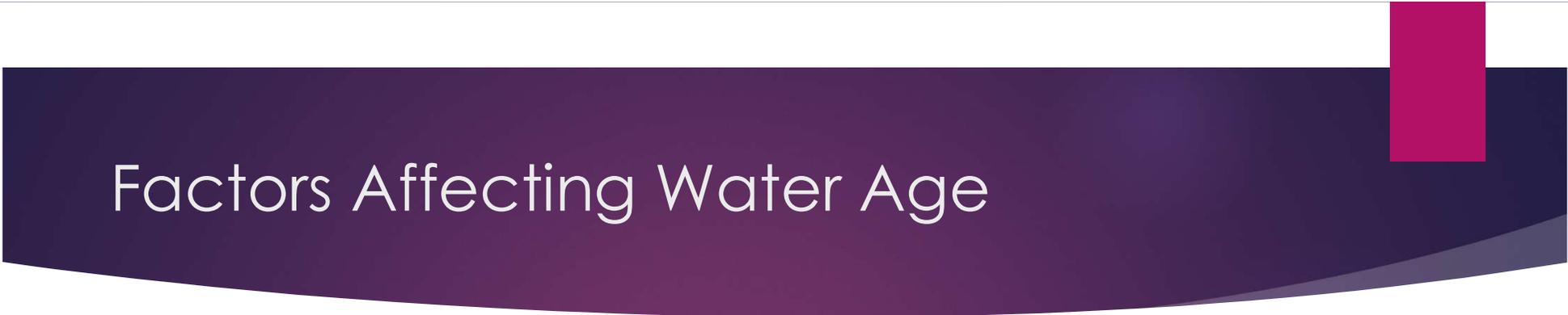
Water Age (Your worst enemy)

- ▶ Age is the number one factor in degradation of water quality
 - ▶ Depletion of disinfectant residuals
 - ▶ Increased levels of disinfection byproducts (TTHMs / HAAs)
 - ▶ Increased microbial growth (nitrification, legionella, pseudomonas)

What is Water Age?

- ▶ The time water resides in the distribution system prior to use!





Factors Affecting Water Age

- ▶ Low water usage
- ▶ Overdesign of piping and storage structures
- ▶ Poor water circulation
 - ▶ Dead-end distribution mains
 - ▶ Dead-ends created through closed distribution valves
 - ▶ Distribution air blocks
 - ▶ Stratification of storage tanks

Created Dead Ends



What Else Happens With Old Water?

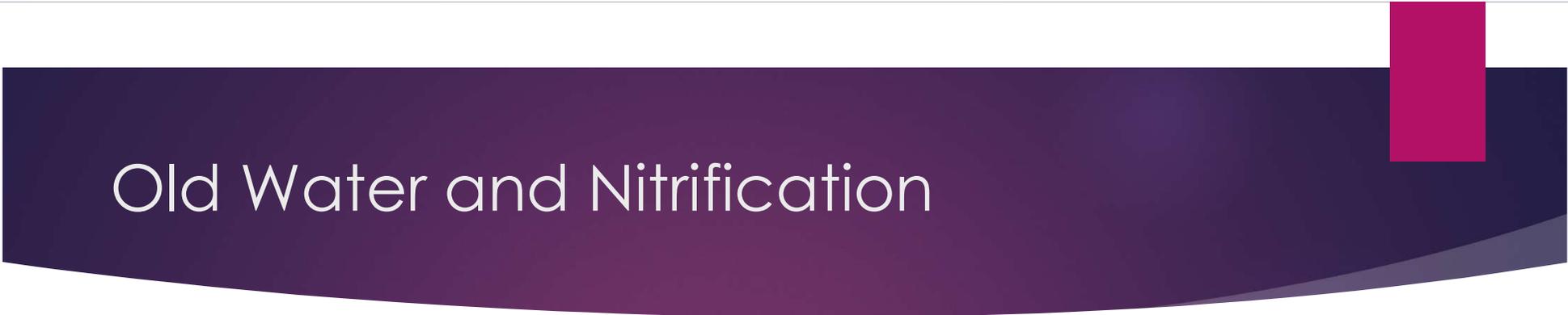
- ▶ Chlorine reacts with organic and inorganic matter in sediment and depletes chlorine residuals: creating an environment for additional biological/microbial growth
- ▶ Growth – Chlorine = MORE GROWTH
- ▶ Side Note: Microbial growth can alter water chemistry and cause the leaching of metals from pipe scales

LEAD and COPPER

More About Poor Circulation

- ▶ Creation of additional sediment through corrosion products and particulate matter





Old Water and Nitrification

- ▶ Systems using monochloramines for disinfection can see nitrification in portions of the systems with longer residence times and increased water temperature.
- ▶ NITRIFICATION ACTION PLANNING: Like it or not – great tool for monitoring and addressing areas where nitrification may be occurring.
- ▶ It's Nitrification and Legionella season!!!

A Little Side Note

- ▶ If your system has naturally occurring ammonia in the raw water source, know where you are on the curve (Breakpoint or chloramines)



How do I find my problem areas



Questions
are
guaranteed in
life;
Answers
aren't.

Finding Problem Areas

- ▶ Review monitoring data at different locations – disinfectant residuals, DBP levels, bacteriological sample results, nitrite/nitrate levels
- ▶ Look for trends in customer complaints
- ▶ Monitor water quality at suspect areas: dead-end mains and storage facilities



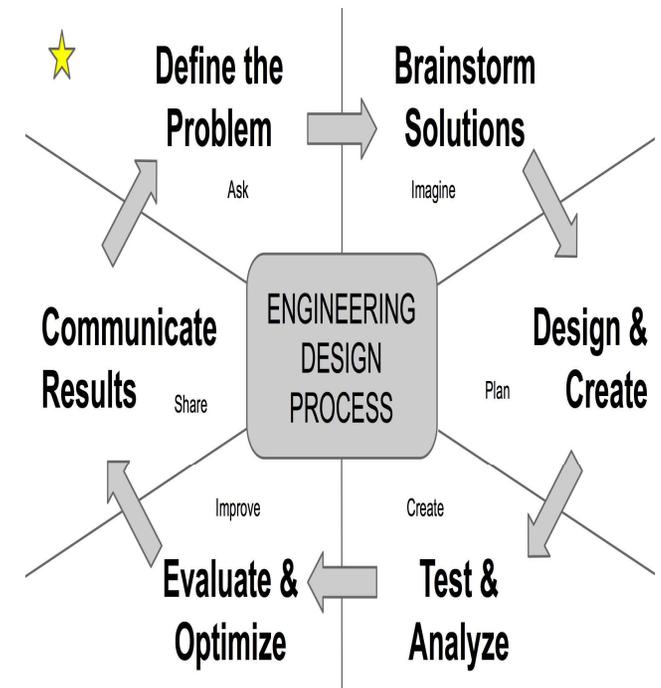
Finding Problem Areas

- ▶ **Monitor water temperature in storage tanks to identify thermal stratification**
- ▶ **Hydraulic Modeling: to better understand where the oldest water exists and the impacts of changes in water demand and tank operating conditions - \$\$\$**

Strategies for Water Age Management

► Design Strategies

► Operational Strategies



Design Strategies

- ▶ **Use hydraulic models and usage data to determine appropriate size water mains and storage tanks**
- ▶ **Install tank mixing devices and/or optimize tank inlets and outlets to improve water circulation**

Design Strategies

- ▶ **Eliminate dead-end water mains – looping**
- ▶ **Install monitoring equipment to monitor disinfectant residuals at storage tanks and other strategic locations**
- ▶ **Install air valves at high points in the system to eliminate accumulated air (can block or reduce water flow)**

Operational Strategies

- ▶ **Optimize tank operating levels to insure adequate water turnover**
- ▶ **Routinely clean tank interiors**
- ▶ **Use gentle flushing to remove stagnant water and restore residuals**
- ▶ **Routinely monitor residuals at tank outlets and dead-end areas and low water usage areas**

Operational Strategies

- ▶ Exercise valves to maintain valve operation and verify valves are operating in the proper position
- ▶ Identify valve repair needs
- ▶ Use hydraulic models to evaluate flow direction and flow rates and perform a water age analysis

Operational Strategies

▶ KNOW YOUR SYSTEM



Are there regulatory requirements?



Safe Drinking Water Act (SDWA)

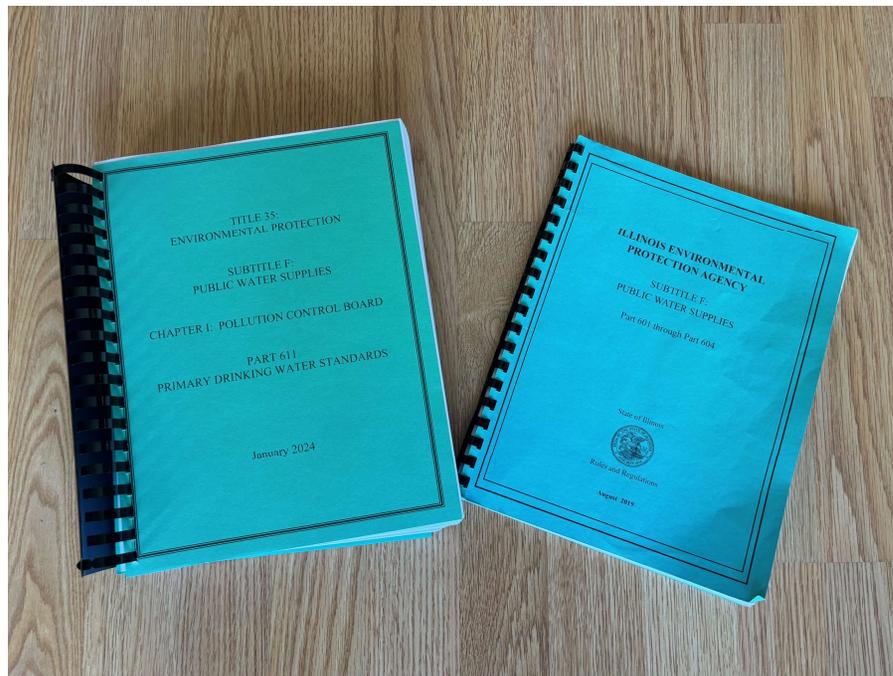
- ▶ **Surface Water Treatment Rules** - minimum residuals, TOC removal, bacterial requirements, etc.
- ▶ **Disinfectants and Disinfection Byproduct Rules** – maximum disinfectant residuals, concentration limits for DBPs
- ▶ **Ground Water Rule** – reduce disease incidence associated with harmful microorganisms in drinking water



Safe Drinking Water Act (SDWA)

- ▶ **Revised Total Coliform Rule – microbial water quality in distribution, sanitary defects, and assessment/find & fix**
- ▶ **Lead and Copper Rule – corrosion control in the distribution system and action levels**
- ▶ **Establishes requirement for states to conduct sanitary surveys**

State Requirements?



Subtitle F: Part 601

601.101(b): The finished water delivered to any user at any point in the distribution system must contain no impurity at a concentration that may be hazardous to the health of the consumer or that would be excessively corrosive or otherwise deleterious to the water supply. Drinking water delivered to any user at any point in the distribution system must contain no impurity that could reasonably be expected to cause offense to the sense of sight, taste, or smell.

Subtitle F: Part 602

- ▶ Establishes and enforces minimum standards for the permitting of a community water supply
- ▶ No person shall construct, install, or operate a community water supply without a permit granted by the Agency
 - ▶ Construction
 - ▶ Operating
 - ▶ Algicide
 - ▶ Aquatic Pesticide
 - ▶ Special Exception Permits

Subtitle F: Part 611

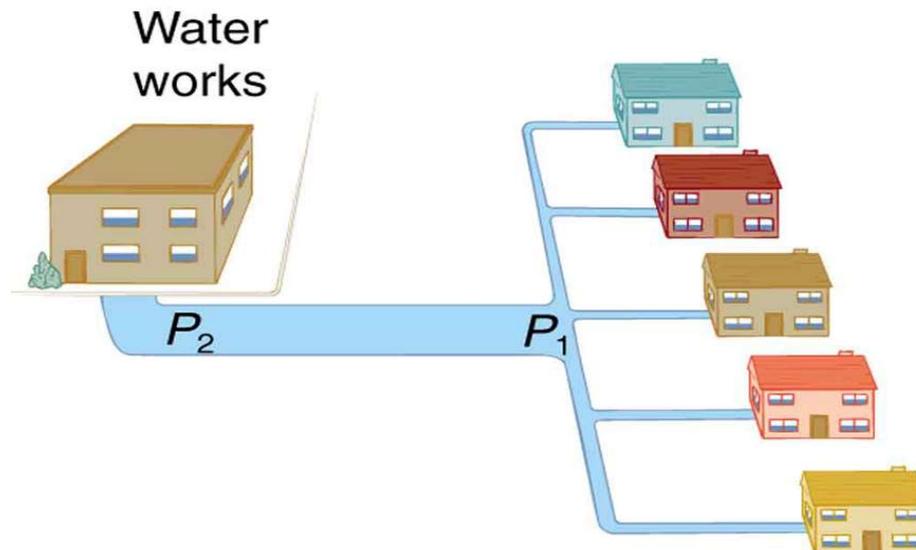
- ▶ **Primary Drinking Water Standards**
- ▶ **Basically mirrors the requirements of the Safe Drinking Water Act with a few exceptions**

Subtitle F: Part 604

- ▶ Establishes the design, operational, and maintenance criteria for owners, operators, and official custodians of community water supplies:
 - ▶ Source
 - ▶ Treatment
 - ▶ Distribution - more to come
 - ▶ Pumping
 - ▶ Storage
 - ▶ Monitoring

Subtitle F: Part 604 (cont'd)

► Water main vs. Service line



Water main vs. Service Line

- ▶ **Section 604.1455 Water Service Line**
- ▶ a) A community water supply must not supply water through a water service line to more than a single property, dwelling or rental unit.
- ▶ b) If a pipe from the water main or source of potable water supply is accessible to more than one property, dwelling or rental unit, the pipe will be considered a water main subject to all permitting requirements of 35 Ill. Adm. Code 602.
- ▶ ***c) A pipe is accessible when it crosses the property boundary of another landowner to reach the property, dwelling or rental unit being served.***

What's Next?

- ▶ Section 604.1415 System Design
- ▶ b) Diameter of Water Mains
- ▶ 1) The minimum size of water main that provides for **fire protection** and serving fire hydrants must be of **6-inch** diameter. Larger size mains will be required if necessary to allow the withdrawal of the required fire flow while maintaining the minimum residual pressure specified in subsection (a).
- ▶ 2) The minimum size of water main must be **4-inch** nominal diameter in **distribution systems serving incorporated areas, subdivisions or other closely situated housing or commercial units.**
- ▶ 3) The minimum size of water main must be **3-inch** nominal diameter in distribution systems serving **rural areas where service connections are widely spaced**, water usage per service is low, and rates of flow are slow.

What if I have undersized water mains?

▶ **Section 604.145 Exceptions for Community Water Supplies**

a) **A community water supply operating before July 26, 2019 is not required to modify or replace components to meet the requirements of this Part if:**

- 1) **the requirements of 35 Ill. Adm. Code 611 are met; (MCLs met)**
- 2) **the requirements of Sections 604.205, 604.230 and 604.1210 are met; (adequate source and pumping redundancy)**
- 3) **water pressure meets the standards of Section 604.1415(a)(1); and (maintain minimum 20 psi)**
- 4) **the components were permitted or no permits were required at the time of construction**

I'm Done!...Questions?

