


# Taking Control of Your System – Methods and Tips for Water & Wastewater System Assessments, Compliance and Future Planning



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H2M Engineers

“You can do what I cannot do.  
I can do what you cannot do.  
Together we can do great things”

*-Mother Teresa*

# CLASS AGENDA

Operations Compliance Overview / WQAA: Asset Management

Sampling and Data Collection

Treatment and Chemistry

# OPERATIONS OVERVIEW

Goal - Effective Operations/Planning to avoid:

- Health and Environmental Issues
- Non-Compliance
- Costly Emergency Responses
- Customer Dissatisfaction (Bad Press)

# Self Assessment Sample Questions Operation

Do the water/wastewater operator(s) have a copy of the engineer's as-built drawing of the treatment facility and distribution/collection system? OR can you get a copy when needed?

Does the water/wastewater system have Standard and Emergency Operating Plans?

Who has copies? Are they reviewed? Is training available? Are new employees provided copies?

Have consumers expressed any complaints with the taste or odor of the water over the last three years?





CNN.com



[www.dailymail.co.uk](http://www.dailymail.co.uk)



Waterlogic.com

## Louisiana officials say efforts to combat saltwater intrusion will help delay drinking water impacts

Municipal water systems in some communities south of New Orleans, however, are still expected to become inundated in the coming weeks.

Nbcnews.com

# Self Assessment Sample Questions

## Asset Management

- Does the water/wastewater system have an inventory of the assets of the system and their condition?
- Is the condition of water/wastewater system components assessed on a regularly scheduled basis?
- Does the water/wastewater system have a Capital Improvements Plan that covers at least the next three (3) to five (5) years? Ten (10) Years?









# SAMPLING AND DATA COLLECTION

- Drinking Water Samples
  - Compliance
  - Operational/Treatment
- Wastewater Samples
  - Compliance
  - Operational/Treatment
- Using the Data
  - Optimizing water and wastewater treatment
  - Tracking and Maintaining compliance

# Sample Collection Basics

What samples are you collecting?

What samples are you required to collect?

Why are you collecting any other samples?

When are you collecting your samples?

When do you review the data?

What do you have to do if ....?

# I don't know, we have always collected...



Check your Water Allocation Permit for any sampling requirements.

Check any BSDW Treatment Permits for sampling requirements.

Check any NJPDES/MUA permit requirements.

Think about any Operational samples you choose to collect.

The rest may be from earlier sampling requirements, and not needed.



# NJDEP Water Watch



Drinking WaterWatch from the NJDEP enables users to view drinking water information for NJ water systems. If you have any questions, contact the Bureau of Safe Drinking Water at (609) 292-5550 or click on the link found at the bottom of the page.

If you do not know the exact PWSID or system name, you can use "%" as a wildcard in any field. For example 0702%, would result in NJ0702001, NJ0702301, etc. or %smith% would result in smithfield, camp smith, etc. You do not need to place text in all fields.

**Enter information into one of the fields below...  
then click SEARCH**

Public Water System  
Identification Number  
(PWSID)

0102%, 1111001, %337  
Typing the "NJ" is not needed.

Water System Name

Atlantic%, %NJ%, %american%,  
etc.

Water System Type

C: community  
NTNC: nontransient noncommunity  
NC: transient noncommunity

Water System Status

ALL  Active  Inactive

Search

Clear

[View water quality results by laboratory and/or by water system](#)

**Monitoring Schedule for ATLANTIC CITY MUA (NJ0102001)**

**Routine Total Coliform**

Schedule Starts	Schedule Ends	Sampling Period	Requirements
07/01/2006	Continuous	1/1--12/31	120 Sample(s)/MN

**Stage 2 DBP Schedules**

DBP	Sample Point ID	Site	Schedule Starts	Schedule Ends	Warmest Month	Required Months to Sample In	Requirements
HAA5	SOUTHRN CAFE	201 MELROSE AVE	10/01/2012	Continuous	October	April, July, October, January	1 Sample(s)/QT
TTHM	SOUTHRN CAFE	201 MELROSE AVE	10/01/2012	Continuous	October	April, July, October, January	1 Sample(s)/QT
HAA5	ACMUA OFC	ACMUA OFC	10/01/2012	Continuous	October	April, July, October, January	1 Sample(s)/QT
TTHM	ACMUA OFC	ACMUA OFC	10/01/2012	Continuous	October	April, July, October, January	1 Sample(s)/QT
HAA5	BELLA CONDO	BELLA CONDO	10/01/2012	Continuous	October	April, July, October, January	1 Sample(s)/QT
TTHM	BELLA CONDO	BELLA CONDO	10/01/2012	Continuous	October	April, July, October, January	1 Sample(s)/QT
HAA5	JEFF TWR	JEFFRIES TOWERS	10/01/2012	Continuous	October	April, July, October, January	1 Sample(s)/QT
TTHM	JEFF TWR	JEFFRIES TOWERS	10/01/2012	Continuous	October	April, July, October, January	1 Sample(s)/QT

**Contaminant Groups**

Sample Point ID	Analyte Group	Schedule Starts	Schedule Ends	Monitoring Period	Sampling Year	Requirements
DS	IRON-MANGANESE	01/01/2006	Continuous	Anytime	2023	4 Sample(s)/YR
DS	LEAD AND COPPER	01/01/1997	Continuous	6/1--9/30	2023	30 Sample(s)/Every 3Y
IN001017	DBP PRECURSOR	01/01/2002	Continuous	Anytime	2023	1 Sample(s)/Month
TP001005	INORGANICS	01/01/2002	Continuous	Anytime	2023	1 Sample(s)/YR
TP001005	REGULATED PFAS	01/01/2021	Continuous	Anytime	2023	1 Sample(s)/QT
TP001005	RADIOLOGICALS	01/01/2008	Continuous	Anytime	2023	1 Sample(s)/Every 6Y
TP001005	SECONDARY	01/01/2002	Continuous	Anytime	2023	1 Sample(s)/YR
TP001005	EDB AND DBCP	01/01/2021	Continuous	Anytime	2023	1 Sample(s)/QT
TP001005	VOCS FEDERAL	01/01/2002	Continuous	1/1--3/31	2023	1 Sample(s)/YR
TP001005	VOCS STATE	01/01/2002	Continuous	1/1--3/31	2023	1 Sample(s)/YR

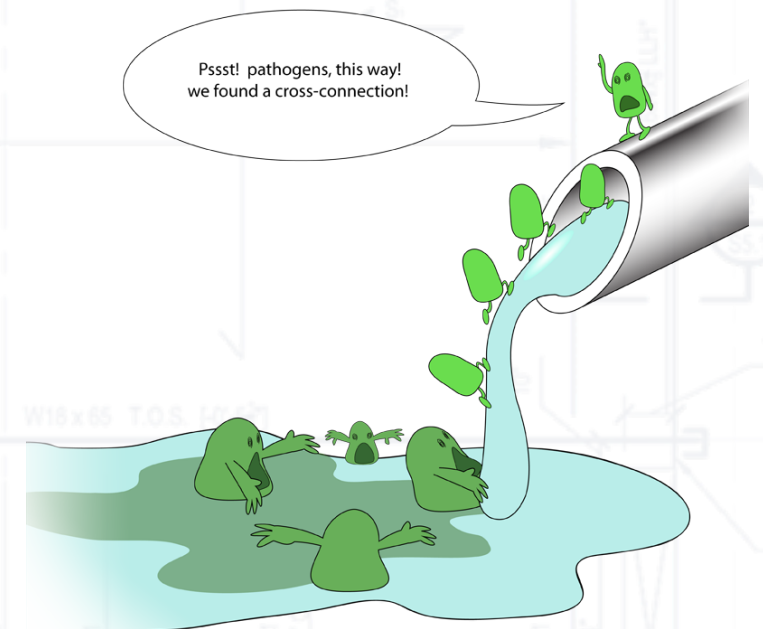
# Safe Drinking Water Act

## Distribution System Sampling Rules Other Sampling

- Total Coliform Rule
- Disinfection Residual
- Disinfection Byproducts Rule
- Lead and Copper Rule
- Ground Water Rule
- LT2 - Surface Water Treatment
- UCMR
- Emerging

## Point of Entry Sampling Rules

- Nitrate
- Volatile Organics/Synthetic Compounds
- Inorganics/Secondary's
- Radiologicals



# SDWA Triggers for Immediate Action

- Routine Total Coliform sample is total positive.
- E. Coli in repeat or source sample.
- Nitrate MCL Exceedance.
- Waterborne Disease Outbreak/Emergency
- Turbidity (if no filtration)
- Chlorine Dioxide MRDL Exceedance



# Using the Data


Data should be reviewed promptly to be effective for maintaining system quality.

Review data to confirm proper treatment operation.  
Confirm data is accurately reported to the NJDEP by the required deadline.

Review data to note possible changing conditions before there is a water quality issue.

Review data to confirm that no MCLs or permit limits are exceeded.

# Lead and Copper

- Lead and Copper Rule (1991 and still changing):
  - EPA Service Line Inventory by 10/16/2024.
  - NJ Replacement of all Lead Service Lines (including galvanized) by July 2031
- Lead and Copper Rule Improvements (LCRI) in progress
  - **Webinar on Preparing Communities to Engage in EPA's Upcoming Proposed LCRI Regulatory Process:** EPA is hosting a webinar on October 17, 2023 (2-3pm EDT) to provide information to the public on how to participate in the rulemaking process and how to offer EPA input on the proposed LCRI once it is published. Learn more and register [here](#) .

<https://www.epa.gov/ground-water-and-drinking-water/lead-and-copper-rule-improvements>

# Water and Wastewater Treatment Chemistry

# 1<sup>st</sup> Module – Surface Water



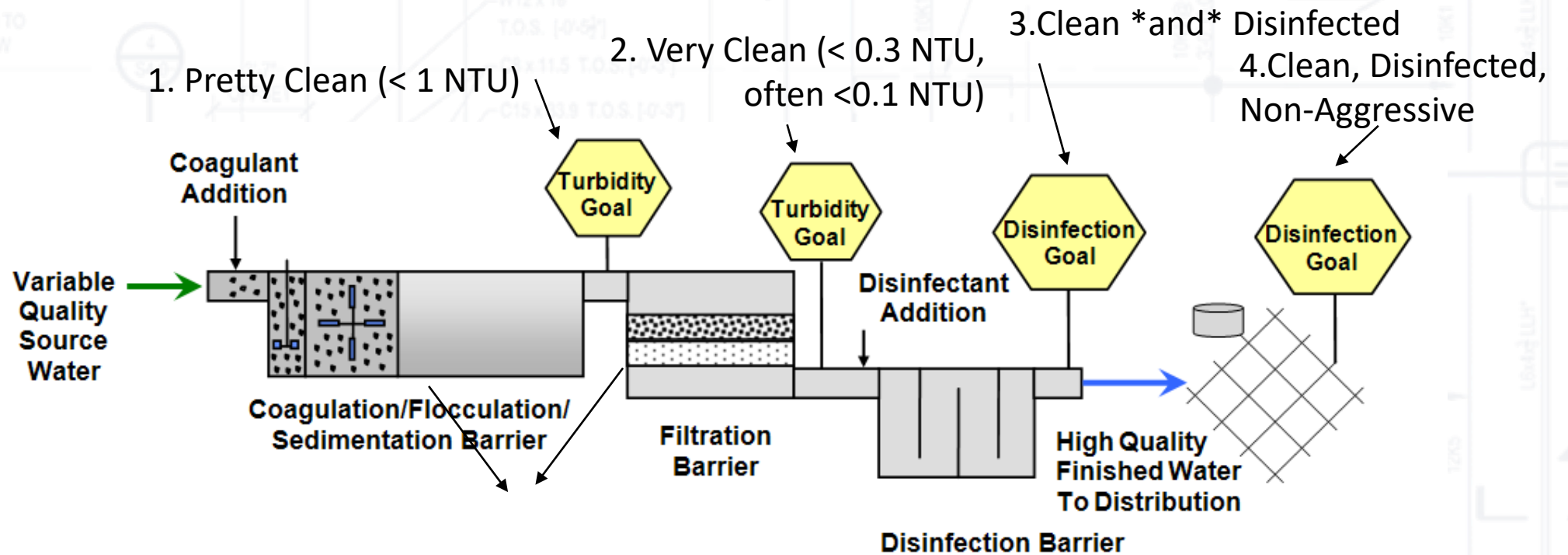


# Water and Wastewater Treatment

- SWTP is a multi-step reactor
- Original Intent:
  - Big goal: Remove turbidity
  - i.e., make “cleaner” water
  - Clearer – “turbidity” is cloudiness
  - Turbidity measures opacity
  - Surrogate for most organic and inorganic contaminants listed in the SDWA
- Modern Regulations:
  - Remove/oxidize organics (prevent DBP formation)
  - Remove or inactivate microbials...
    - Giardia
    - Cryptosporidium
    - Viruses



# Process Monitoring – With Goals



Fate of Waste Streams: Liquid waste from filter BW's is decanted and recycled. Sludge from clarifiers and BW settling is settled/thickened, then the thickened sludge is pressed. Liquid recycled is limited to < 10% of overall plant flow (but typ. 2-3%).

# Regulations – SWTR Overview

Killing or neutering  
microbials (note “log  
removal” concept) –multi-  
barrier approach gives log-  
removal or inactivation  
credits for traditional  
treatment, plus CT based on  
different oxidants, or UV

Turbidity Performance  
(next slide)

DBP’s – balancing oxidant use  
against generation of  
carcinogens

APPLICABILITY: PWSs that use surface water or ground water under the direct influence of surface water (Subpart H) that practice conventional or direct filtration.		Final Rule Dates			
		SWTR 1989	IESWTR 1998	LT1ESWTR 2002	FBRR 2001
Population Served	≥10,000	✓	✓		✓
	< 10,000	✓	N/A (except for sanitary survey provisions)	✓	✓
Regulated Pathogens	99.99% (4-log) removal/inactivation of viruses	✓	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR
	99.9% (3-log) removal/inactivation of <i>Giardia lamblia</i>	✓	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR
	99% (2-log) removal of <i>Cryptosporidium</i>		✓	✓	Regulated under IESWTR & LT1ESWTR
Residual Disinfectant Requirements	Entrance to distribution system (≥0.2 mg/L)	✓	Regulated under SWTR	Regulated under SWTR	
	Detectable in the distribution system	✓	Regulated under SWTR	Regulated under SWTR	
Turbidity Performance Standards	Combined Filter Effluent	✓	✓	✓	
	Individual Filter Effluent		✓	✓	
Disinfection Profiling & Benchmarking	Systems must profile inactivation levels and generate benchmark, if required		✓	✓	
Sanitary Surveys (state requirement)	CWS: Every 3 years NCWS: Every 5 years		✓	Regulated under IESWTR	
Covered Finished Reservoirs/Water Storage Facilities (new construction only)			✓	✓	
Operated by Qualified Personnel as Specified by State		✓	Regulated under SWTR	Regulated under SWTR	Regulated under SWTR



# Regulations – SWTR - Turbidity

<b>Turbidity: Monitoring and Reporting Requirements</b>				
<b>Turbidity Reporting Requirements</b> <i>(Reports due by the 10<sup>th</sup> day of the following month the system serves water to the public.)</i>	<b>Monitoring/ Recording Frequency</b>	<b>SWTR As of June 29, 1993</b>	<b>IESWTR ≥ 10,000 people As of January 1, 2002</b>	<b>LT1ESWTR &lt; 10,000 people As of January 1, 2005</b>
<b>CFE 95% Value</b> Report total number of CFE measurements and number and percentage of CFE measurements ≤ 95 <sup>th</sup> % limit.	At least every 4 hours*	≤ 0.5 NTU	≤ 0.3 NTU	≤ 0.3 NTU
<b>CFE Maximum Value</b> Report date and value of any CFE measurement that exceeded CFE maximum limit.	At least every 4 hours*	5 NTU	1 NTU Contact state within 24 hours	1 NTU Contact state within 24 hours
		Contact state within 24 hours		
<b>IFE Monitoring</b> Report IFE monitoring conducted and any follow-up actions.	Monitor continuously every 15 minutes	None	Monitor–exceedances require follow-up action	Monitor–exceedances require follow-up action. Systems with 2 or fewer filters may monitor CFE continuously in lieu of IFE.

\*Monitoring frequency may be reduced by the state to once per day for systems serving 500 or fewer people.



# Design Criteria - Overview

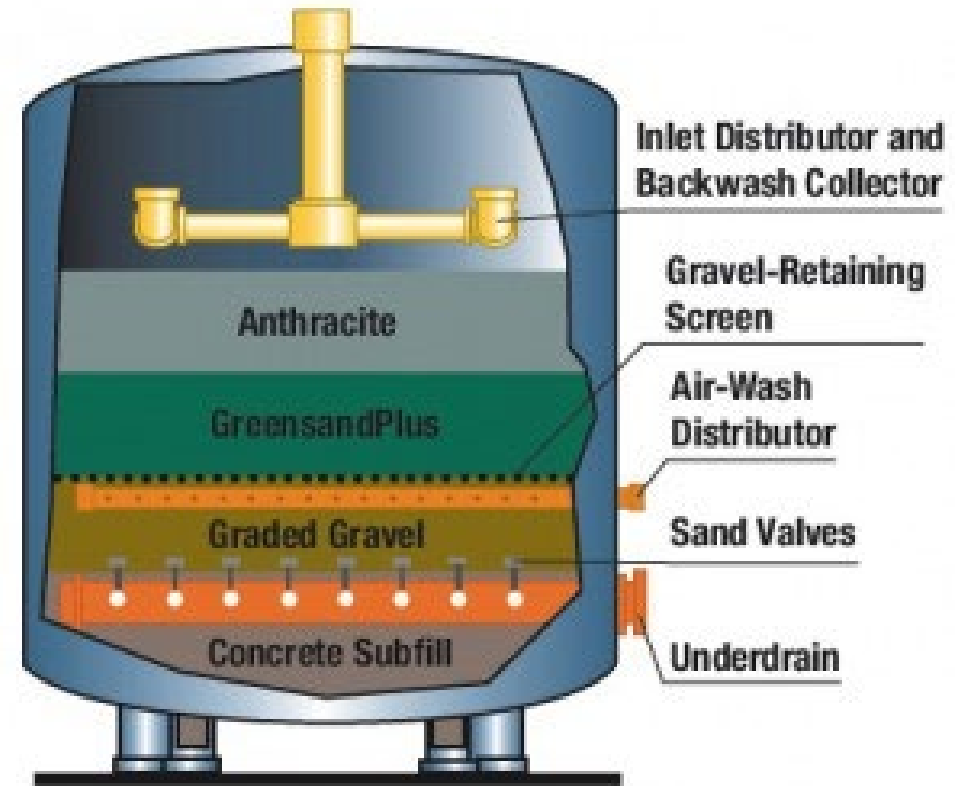
- More similar to wastewater treatment plant than typ. groundwater
- 1<sup>st</sup> thought: what's my source?
  - River – higher “flashy” turbidity, sedimentation or ballasted flocculation
  - Reservoir or Lake – lower more consistent turbidity, algae, T/O probs, sedimentation or flotation (DAF)
  - Seawater – Coarse Screening → Pre-Treatment → RO

# 2<sup>nd</sup> Module – Groundwater

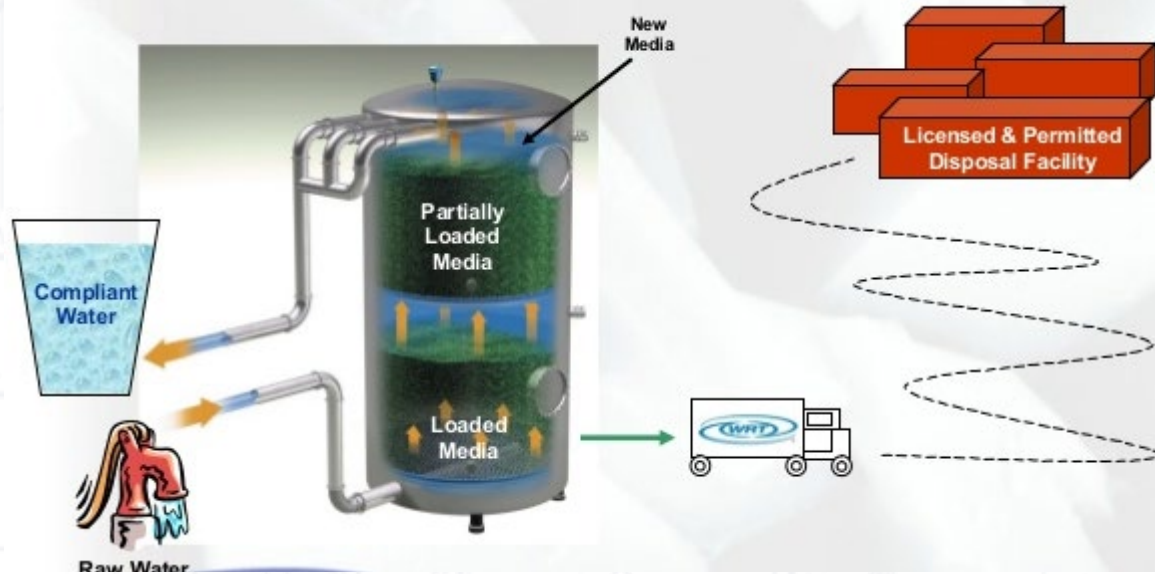


# Groundwater – Typical Processes

- Oxidation
- Filtration
- Adsorption
- Ion Exchange
- Air Stripping
- Clarification (rare)



# Adsorption



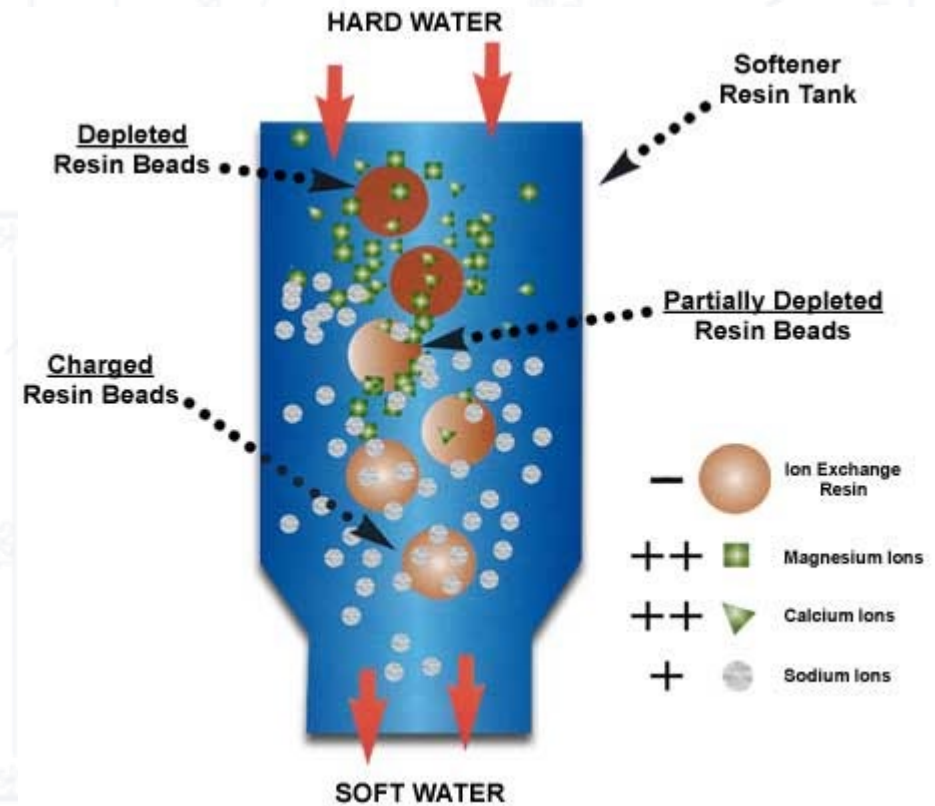
- Different from sieving
- Adsorbing contaminants onto pore sites on the media... the full bed depth is used, and contaminant saturation is typically monitored at regular stations across the depth of the reactor bed

- Typically used to remove organic compounds that cannot easily be stripped or some taste/odor compounds (examples: MTBE, iPMP, PFOA)
- Can either be backwashed, or if contaminants are hazardous waste (ex. Radionuclides), taken offsite and disposed of, or “reactivated” (for GAC, this means heated to a high temp)



# Ion Exchange

- Often used for removal of dissolved metals (Fe, Mn, Ca, Mg)
- Should be familiar – this is home water softener technology, on an industrial scale
- Uses brine-saturated resin to drive dissolved metals out of solution in exchange for sodium
- Okay expect in populations with cardiac conditions or high blood pressure (example: nursing homes)
- Sometimes used for radionuclide removal, depending on chemical species



# Groundwater – Process Control

- Process control is much simpler in groundwater treatment
- You're usually operating under pressure, so level control is not a concern
- Significantly lower bar to reach in terms of worry about microbial removal/inactivation
- Water quality is monochromatic
- Temperatures is usually very consistent 50-55 F

# 3<sup>rd</sup> Module – Wastewater



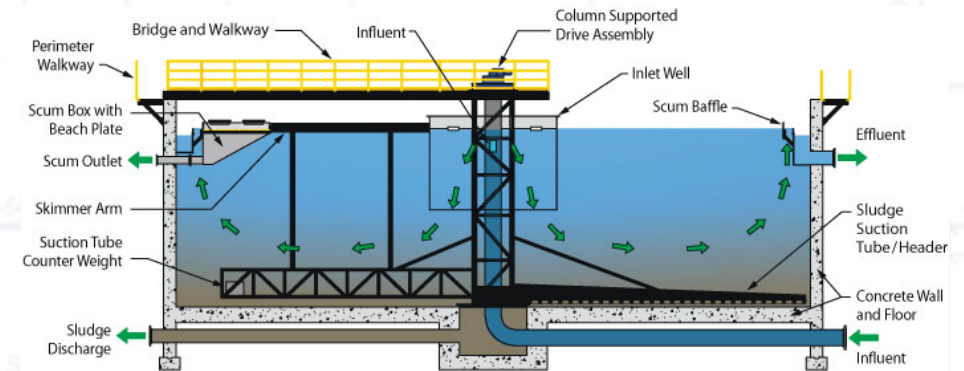
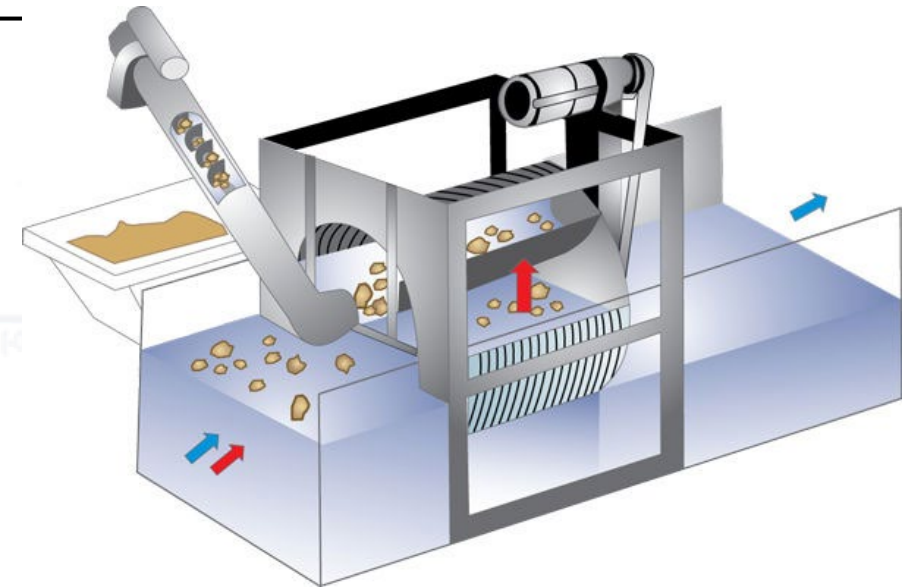
# Wastewater – Intro and Objectives

- Big picture – trying to take human-generated liquid water waste, and condition it back to match the chemical quality of its receiving water body
- “Put it back the same way you found it”
- This is traditionally broken into three major processes:
  - Primary Treatment – removal of larger solids
  - Secondary Treatment – removal of “oxygen demand”
  - Tertiary Treatment – recent, removal of nutrients
  - Then disinfection and discharge



# Wastewater – Primary Treatment

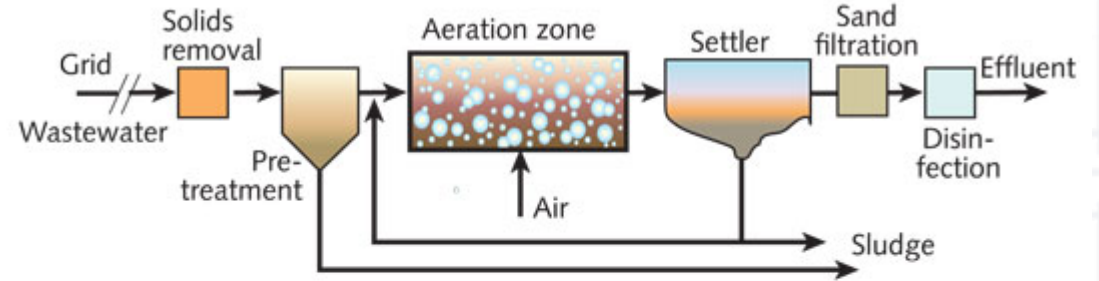
- This is where the majority of TSS removal occurs
- Wastewater collection system brings liquid waste by gravity and/or pumps to common influent chamber
- Plant then typically flows by gravity to discharge
- First stop is the “headworks” where large particulate matter is screened out, channeled to a dumpster or holding area, and carted to landfill in batches
- Then, simple clarification is performed...
  - Materials heavier than water sink (grit)
  - And materials lighter than water (fat, oils grease) are allowed to float to form a scum)
- Grits and scum are then removed, concentrated, and carted away



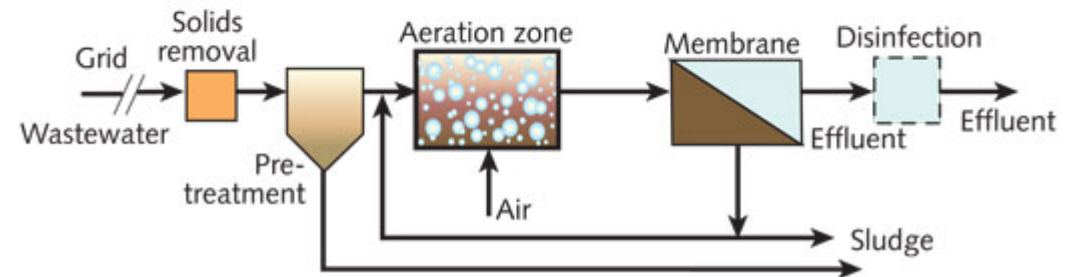
# Wastewater – Secondary Treatment

- This is where the majority of BOD removal occurs
- Biological treatment process
- Uses aerobic bacteria to consume carbon
- Air is fed as a process fluid
- The biomass is settled and a fraction of it is returned to re-seed the treatment process (“return activated sludge”)

(a) Activated Sludge Treatment (AST) Process

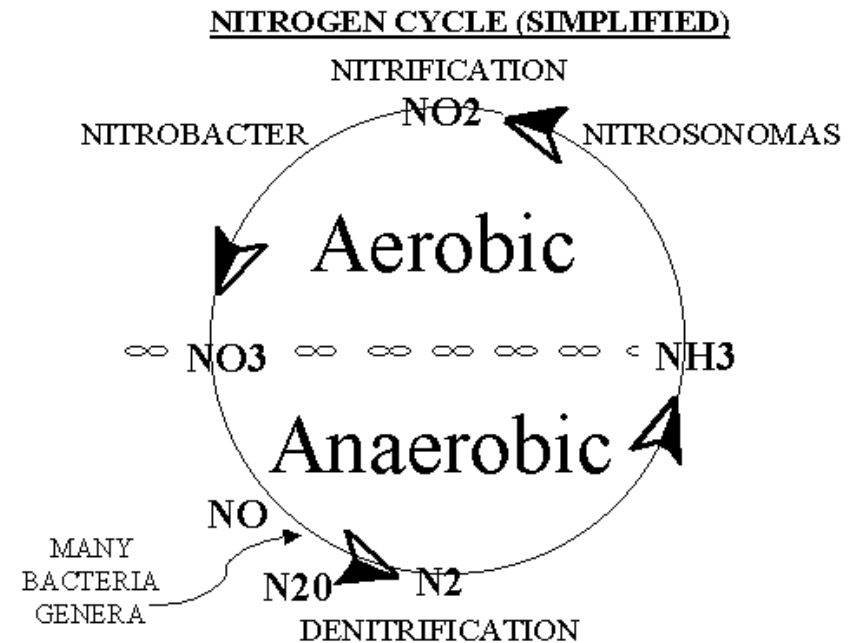


(b) Membrane Bioreactor (MBR) process



# Wastewater – Tertiary Treatment

- Nutrient removal
  - Nitrogen and Phosphorus
  - These nutrients promote overgrowth of aquatic weeds, blue-green algae
- Nitrogen - removed via biological oxidation of nitrogen from ammonia to nitrate (nitrification), followed by denitrification, the reduction of nitrate to N<sub>2</sub> gas. Nitrogen gas is released to the atmosphere.
- Phosphorus – Can be removed either biologically or by chemical precipitation



# Other New and/or Upcoming

- EPA 8/17/23 EPA Releases Initial Nationwide Monitoring Data on 29 PFAS and Lithium
- NJDWQI – 1,4 Dioxane and Cyanotoxins
- EPA March 3, 2023 - EPA Takes Action to Improve Cybersecurity Resilience for Public Water Systems
  - EPA 7/12/23 Cyber Security Rule paused
- EPA AWIA 10/23/18 RRA, ERP Certifications – next cycle deadlines start March 31, 2025



# Any Questions?

## Contact Information:

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