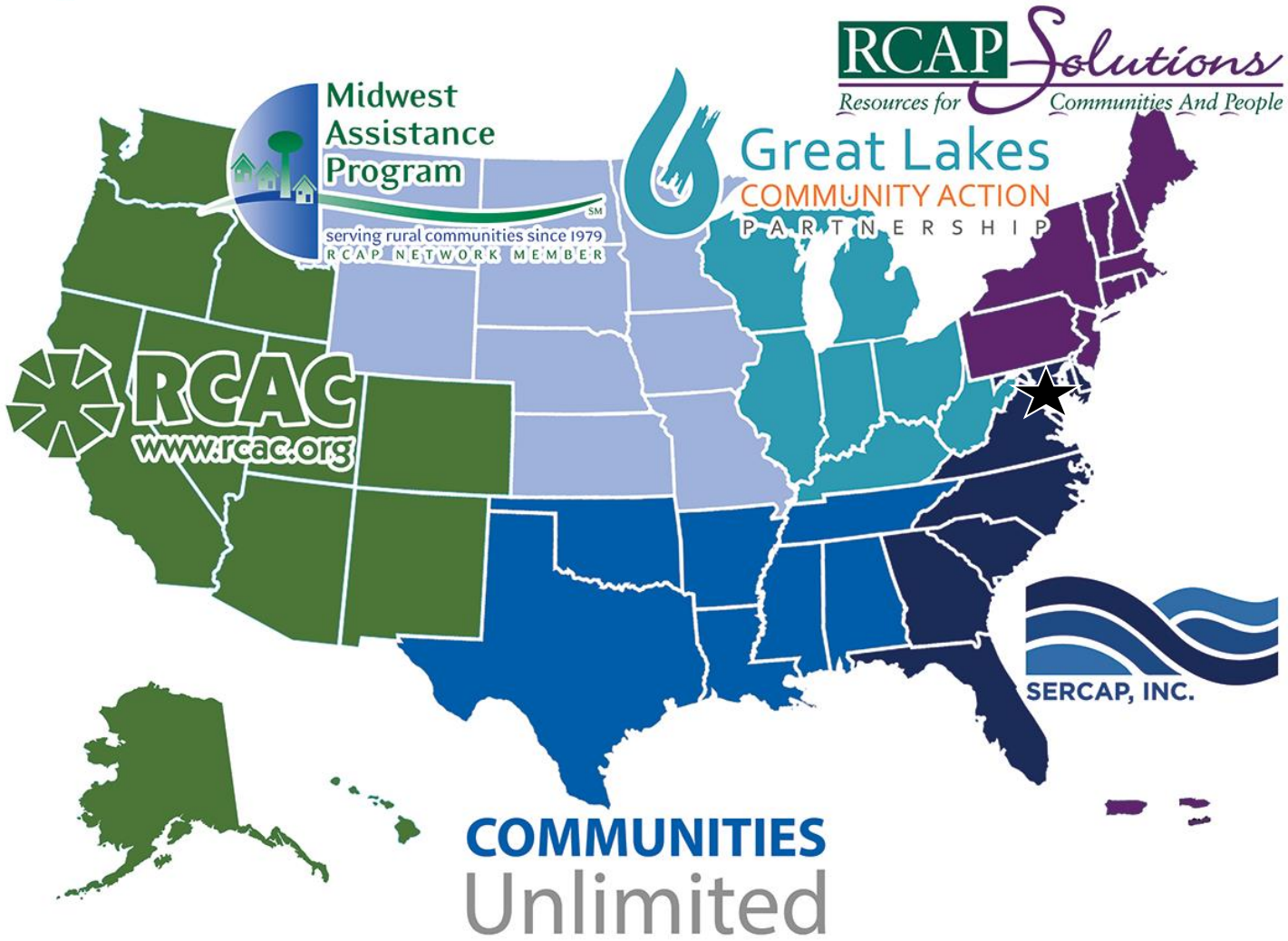
RCAP
Rural Community Assistance Partnership



★ **RCAP National Office**
1701 K St. NW, Suite 700
Washington, D.C. 20006
www.rcap.org

Western RCAP
Rural Community Assistance Corporation
www.rcac.org

Midwestern RCAP
Midwest Assistance Program
www.map-inc.org

Southern RCAP
Communities Unlimited
www.communitiesu.org

Great Lakes RCAP
Great Lakes Community Action Partnership
www.glcap.org

Southeastern RCAP
Southeast Rural Community Assistance Project
www.sercap.org

Northeastern RCAP
RCAP Solutions
www.rcapsolutions.org

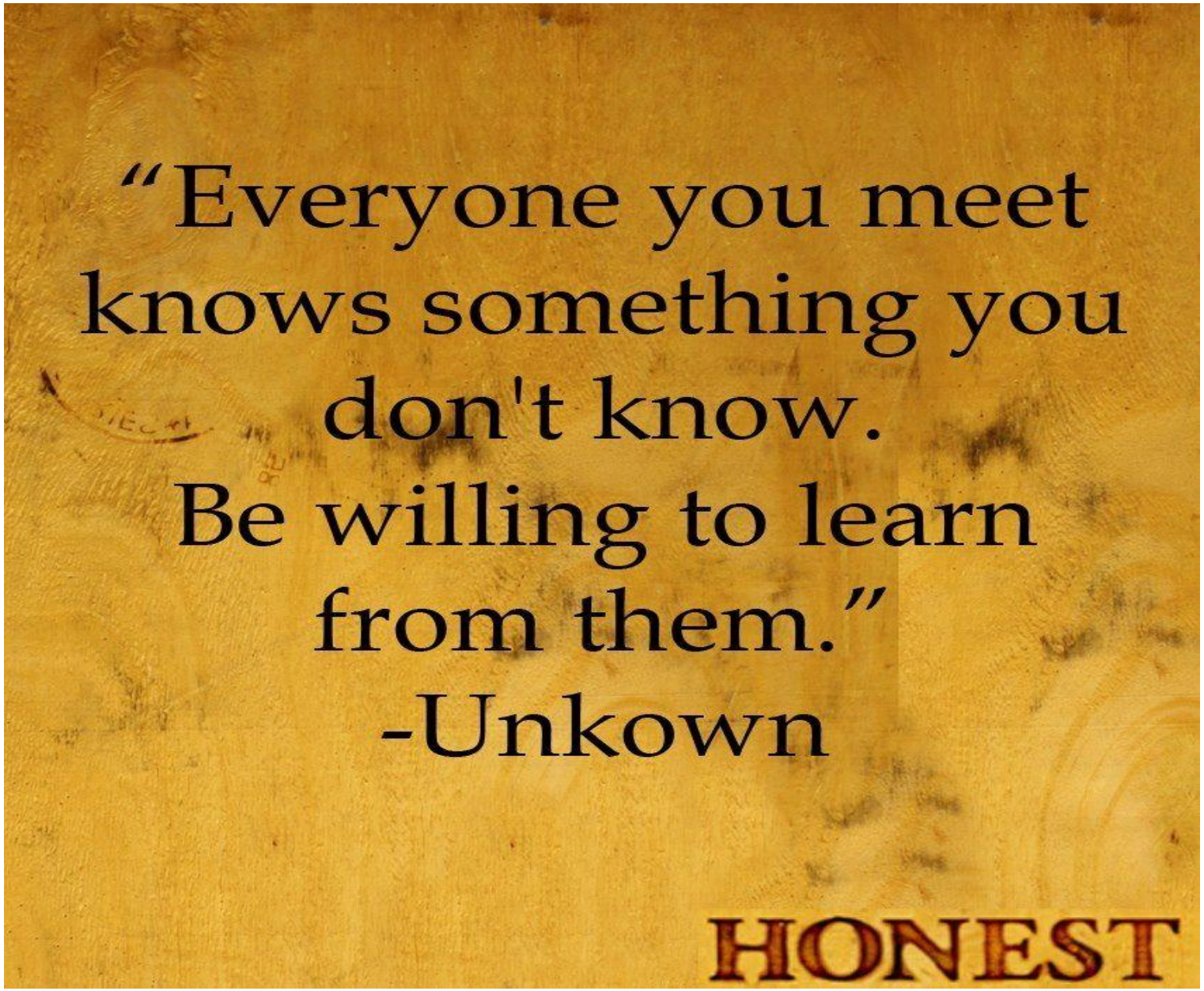
"Improving Rural Quality of Life"

Preliminary Treatment it's Impacts

- Presentation by: Cary Houchins and Randy Welch, SERCAP
- Technical Assistance Provider
- 913-216-0917
- chouchins@map-inc.org

Feel free to stop and ask questions as they come up

This training is best accomplished when it is a two way process


"Everyone you meet
knows something you
don't know.
Be willing to learn
from them."
-Unkown
HONEST

Introductions

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Todays Items for Presentation/Discussion

Preliminary Treatment Consists of Items 1 through 5

1. Bar Screens and Trash Racks
2. Screens, either coarse screens, fine screens or micro-screens
3. Grinders, macerators or comminutors
4. Grit Removal
5. Add-On Devices, compactors, washers and conveyors

Todays Items for Presentation/Discussion, continued

Collection system components, Consists of Items 1 through 5

1. Sewer system
2. Building services
3. Collection system
4. Lift Stations
5. Controls for lift stations

Wastewater Treatment

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Knowing Your Head-Works: Pitfalls in Preliminary Treatment

Reasons Why!

- The "headworks" of a wastewater treatment plant is the initial stage of a complex process.

- This process reduces the level of pollutants in the incoming domestic and industrial wastewater to a level that will allow the treated wastewater or effluent to be discharged into a stream, river or lake.

- This treated effluent also may be sprayed onto dedicated land areas where it is used for the irrigation of crops and even golf courses.

- The complete process includes preliminary treatment, primary treatment, secondary treatment and often tertiary treatment.

Reasons Why!

The treatment processes of a wastewater plant have become more and more sophisticated and the performance of the headworks is more important than ever.

The function of them is to remove inorganics such as sticks, egg shells, stones, grit and sand from the wastewater stream to protect and reduce wear on the downstream process equipment.

Equipment in the headworks may include pumps, mechanical screens, screening compactors, grit removal systems and grit washing systems.

We Do Not Want This!

Screening System

Collection Systems

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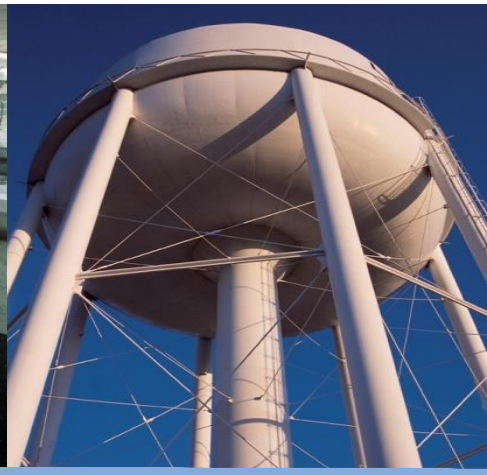
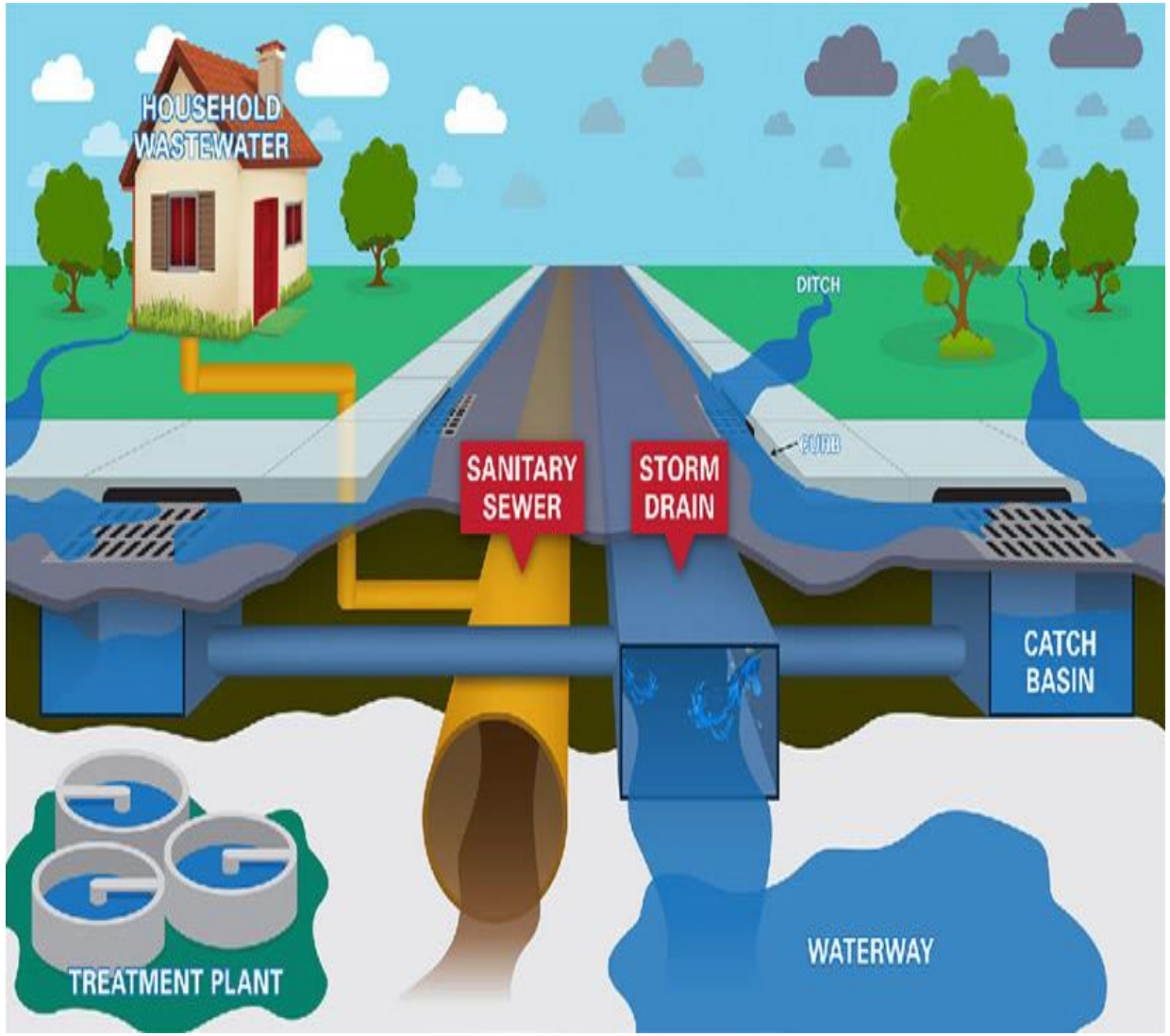


3 Types of Collection Systems

- Storm Sewers
- Combined Sewers
- Sanitary Sewers



Discussion: What type is your collection system?

What is Wastewater?

Our goal is to provide a good quality effluent to protect the population, our customers and the health of them and our environment!

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Operators

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Cleaning Out Debris, WHY?

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Some facilities utilize lift station wet wells as a method of preliminary treatment.

A holding tank equalization tank or septic tank is often utilized and can also be effective.

Oil and grease separators have also been utilized as preliminary treatment devices.

Time for a Poll Question

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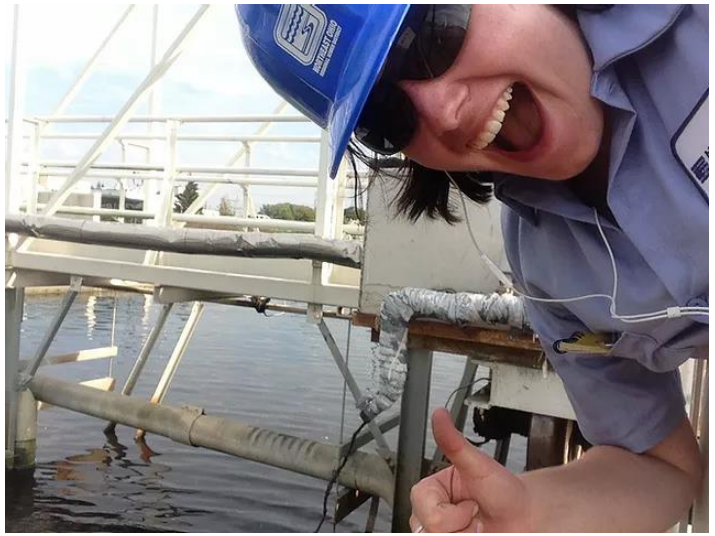
Operator's Responsibilities



Treatment Processes

- Preliminary
- Primary
- Secondary
- Advanced / Tertiary
- Disinfection
- Dechlorination
- Solids handling

Preliminary Treatment

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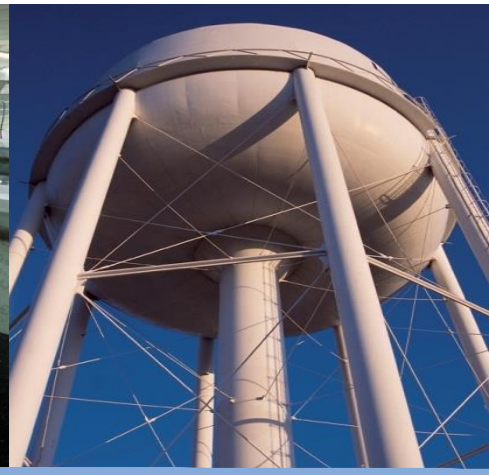


Distinction between Preliminary Treatment and Pretreatment

What types of Equipment is Associated with Preliminary Treatment

Trash Racks

Screens, either coarse screens, fine screens or micro-screens

Grinders, macerators or comminutors

Grit Removal

Add-On Devices, compactors, washers and conveyors

Collection system components

The Purpose of Preliminary Treatment

These screenings and accumulated grit sources can impair downstream treatment plant processes

Equipment necessary to remove screenings, solids and grit that enters into the wastewater treatment facility from the collection system

The debris can damage equipment

The materials can clog downstream piping, pumps and valves

The material can cause undue wear to the system components thus creating increased maintenance and associated treatment costs

Manual Bar Screen

Can we remove to much on the influent to our main process tanks?

What are the requirements in our downstream processes?

Time for a Poll Question

BOD5 Ranges; Weak, Medium or Strong

a) 100 to 160
b) 160 to 230
c) 230 to 300
d) 300 or above

TSS Ranges; Weak, Medium or Strong

a) 100 to 140
b) 140 to 240
c) 240 to 310
d) 310 or above

TP Ranges; Weak, Medium or Strong

a) 2 to 8
b) 8 to 15
c) 15 to 25
d) 25 or above

TN Ranges; Weak, Medium or Strong

a) 10 to 25
b) 25 to 40
c) 40 to 90
d) 90 or above

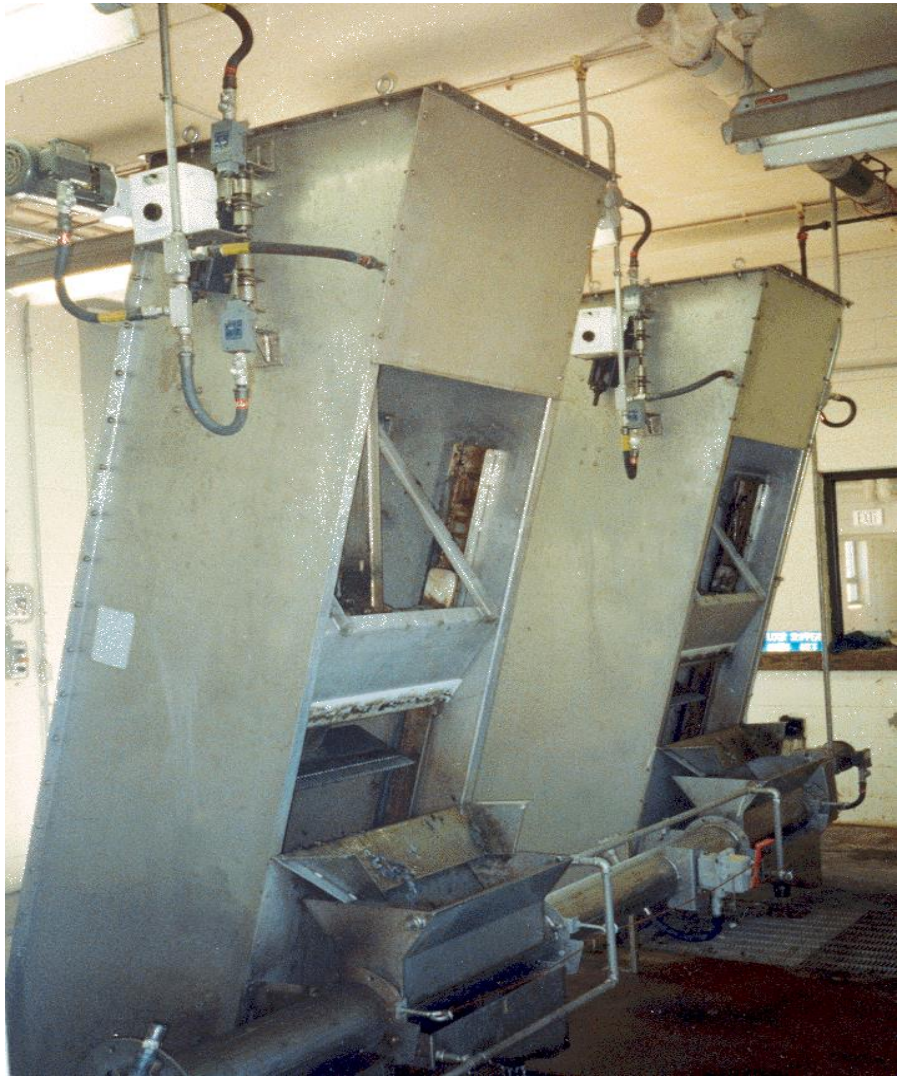
Parameter	Average	Dilute	Weak	Moderate	Strong
BOD5					
TSS					
TN					
TP					

Trash Rack

Bar Screen or Trash Rack?

Automatic Bar Screen Versus Manual Bar Screen

Bar screens



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Bar screens

Typical Rake Mechanism

Wear Points

Single Rake Bar Screen

Screens with conveyor

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Inspections of Screening Equipment

- Spacing of screening bars outside the range of 0.25 to 2.0 inches
- Surcharge conditions in the influent sewer lines
- Excessive screen clogging
- Excessive buildup of debris against screen
- Oil and grease buildup
- Excessive scouring velocities through the screen during cleaning
- Improper disposal of screened material
- Excessive odors
- Pass through of grease and debris that shows up in the final effluent

Maintenance of Bar Screens

1. Conduct a Visual overview of the Equipment
2. Conduct necessary cleaning of the unit
3. Inspect the unit during operation
4. Verify that the tines are not bent and worn
5. Check for unusual noises, vibrations, alarm conditions and leaks
6. Grease the Bearings
7. Replace any auto-lubrication cannisters
8. Change the Oil in the Gearbox
9. Confirm that the chain is properly tensioned and fully supported by the chain guides
10. Lubricate the chain
11. Ensure the Rake Properly Engages in the Bar Rack
12. Confirm that the scraper engages the Rake properly

Maintenance of Bar Screens, continued

1. Overhaul the gear reducer per manufactures guidance
2. Inspect electrical switches, pilot lights, safety shutdowns, level sensing devices, overload protections and motor starters
3. Drain channel, clean and inspect. Remove all accumulated debris
4. Verify that the tines are not bent and worn
5. Check condition of bars, guides guide rails and brackets
6. Check channel seals for wear and damage
7. Ensure seals provide full contact with channel walls and screen side frames
8. Confirm that the chain is properly tensioned and fully supported by the chain guides
9. Adjust top mounts and support brackets along with anchor points
10. Ensure the Rake Properly Engages in the Bar Rack
11. Confirm that the toe plate is set properly and not worn and fully anchored

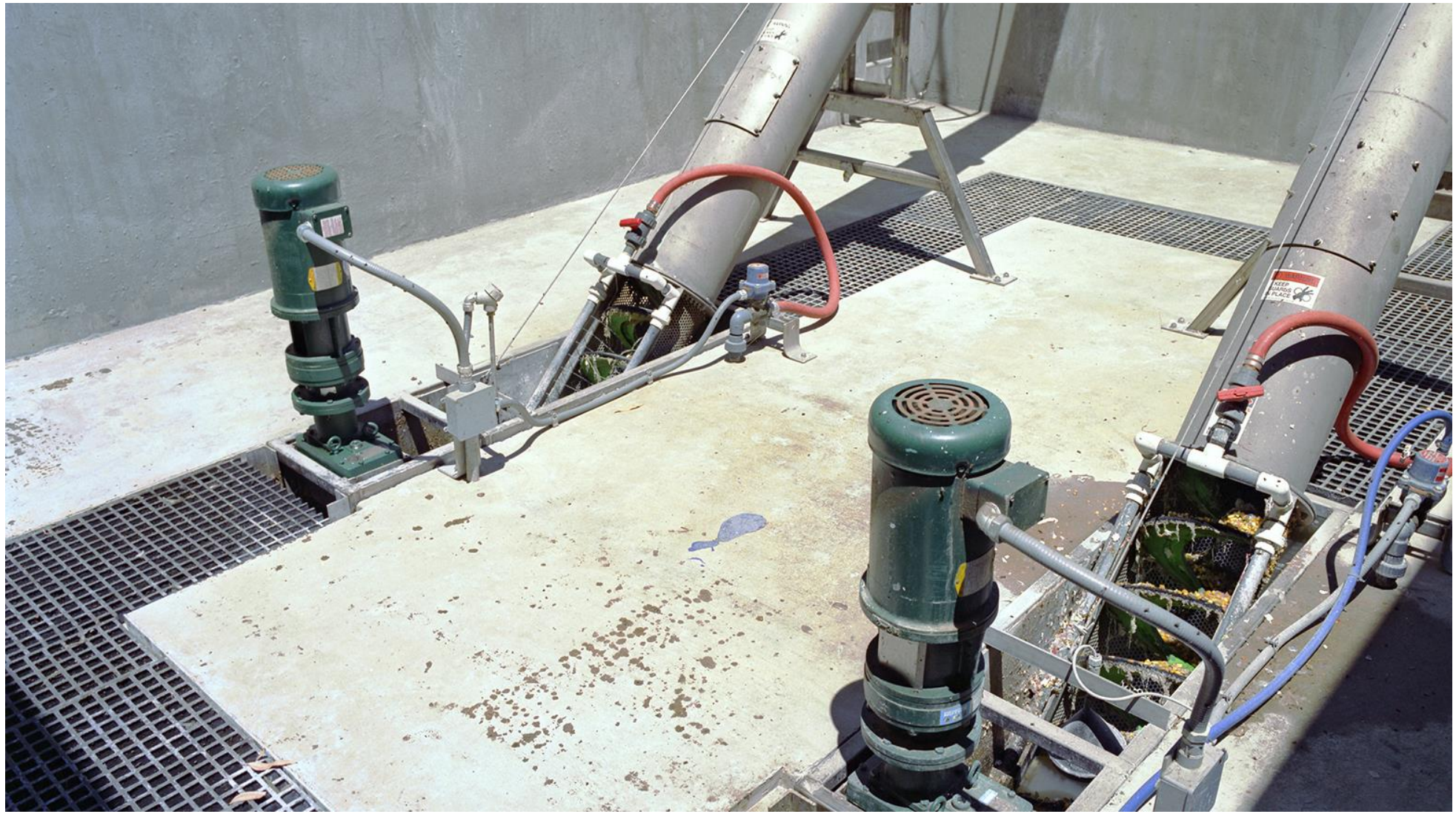
Time for a discussion question

- What items should you ask your customers not to flush?

What Not to Flush

- Baby wipes, disinfectant wipes, etc.. (even if they are “flushable”)
- Facial tissues, Q-tips, cotton balls
- Napkins, paper towels
- Dental Floss
- Egg shells, nutshells, coffee grounds
- Fats, oils, greases
- Hair, condoms
- Cigarettes, gum, kitty litter, Band-Aids, Rx pills,
- Poisons and household hazardous wastes

Fine screens



Auger and Perforated Basket

Maintenance of Fine Screens

1. Conduct a Visual overview of the Equipment
2. Conduct necessary cleaning of the unit
3. Inspect the unit during operation
4. Check for unusual noises, vibrations, alarm conditions and leaks
5. Grease the Bearings
6. Change the Oil in the Gearbox
7. Confirm that the chain is properly tensioned and fully supported by the chain guides
8. Ensure the Auger Properly Rides in the Transport Tube
9. Confirm that the scraper or brushes are not worn
10. Inspect the wear bars
11. Motor amp draws, insulation resistance checks

Grinder

Grinder Types

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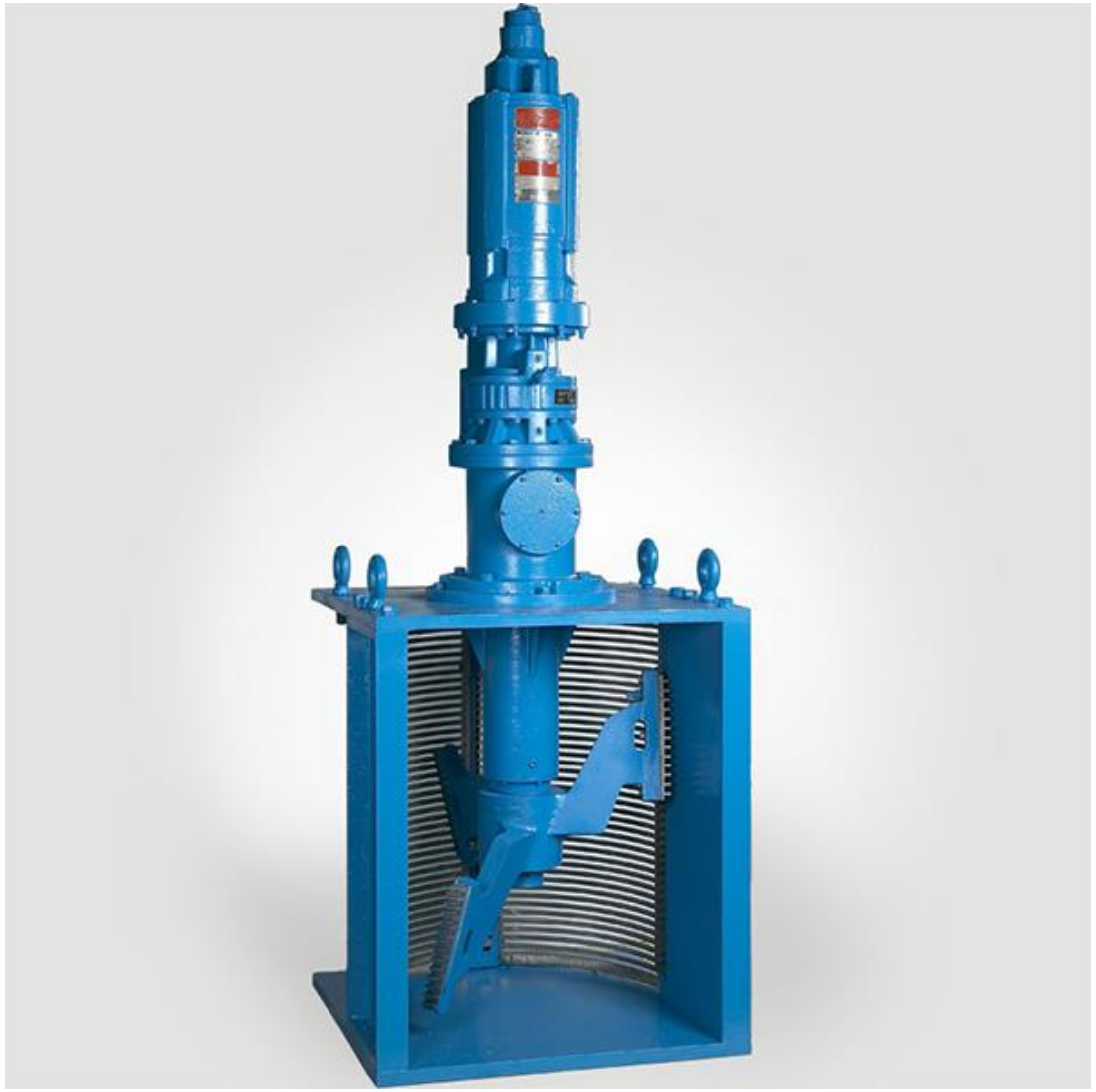
Comminutor, this type is a Dimminuntor



Wet well with Grinder

Shredding/Grinding Inspections

- Blockage in sludge pumps or lines
- Bypass of shredding/grinding equipment
- Equipment removed or inoperable

Maintenance of Grinder Equipment

1. Conduct a Visual overview of the Equipment
2. Conduct necessary cleaning of the unit
3. Inspect the unit during operation
4. Check for unusual noises, vibrations, alarm conditions and leaks
5. Grease the Bearings
6. Change the Oil in the Gearbox
7. Confirm that the grinders are not worn
8. Ensure the Teeth Properly Engage
9. Measure the stack height and check for wear
10. Confirm that the motor amp draw is within range
11. Insulation resistance checks of the motor windings

Time for a poll question

What is most of your grit made of?

- Sand
- Silt
- Clay
- Coffee grounds
- Egg shells

Types of grit collection equipment:

Aerated grit chambers

Vortex type grit collectors

Detritus tanks

Horizontal flow grit chambers

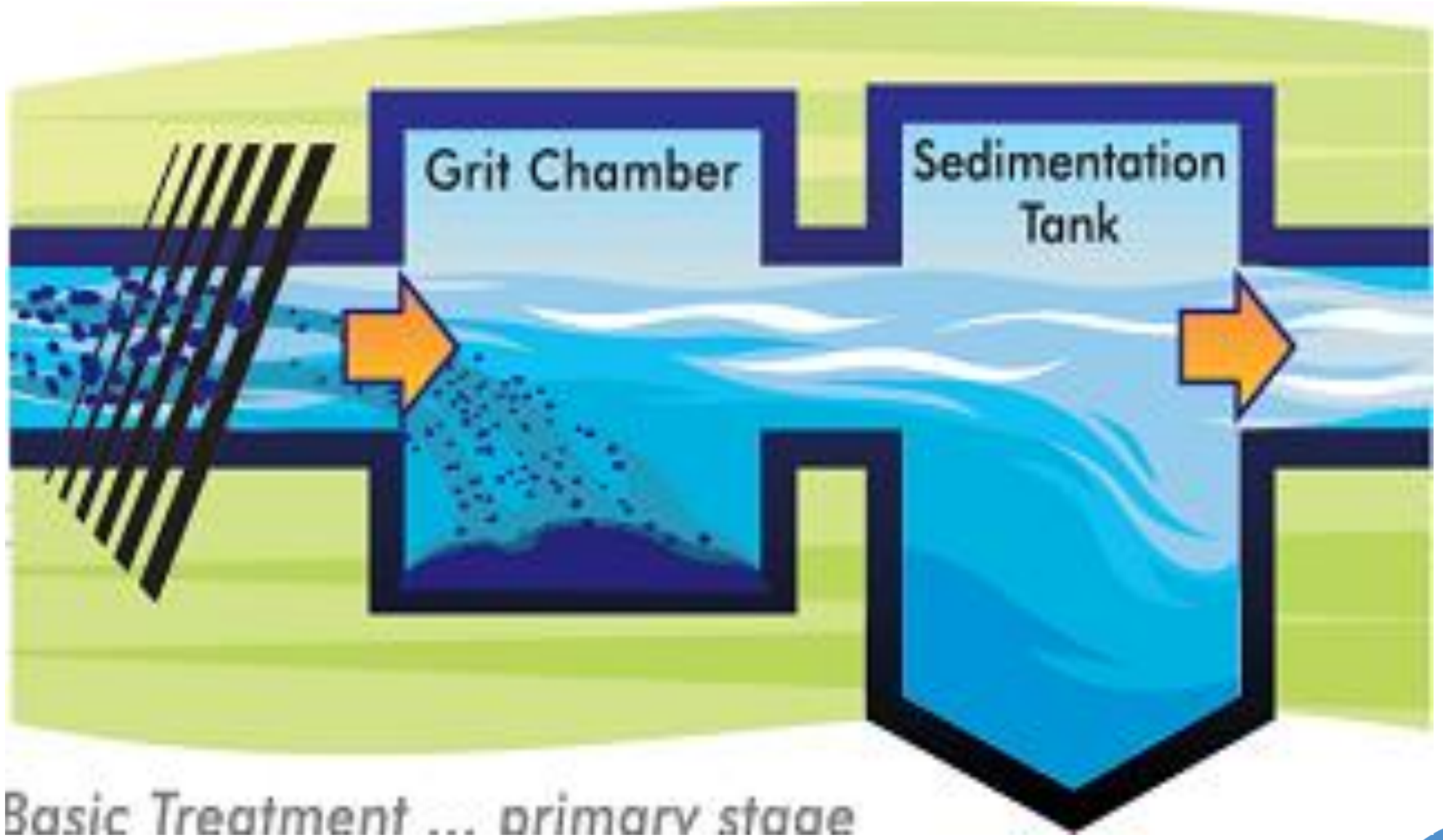
Jet induced vortex separator

Hydro cyclones

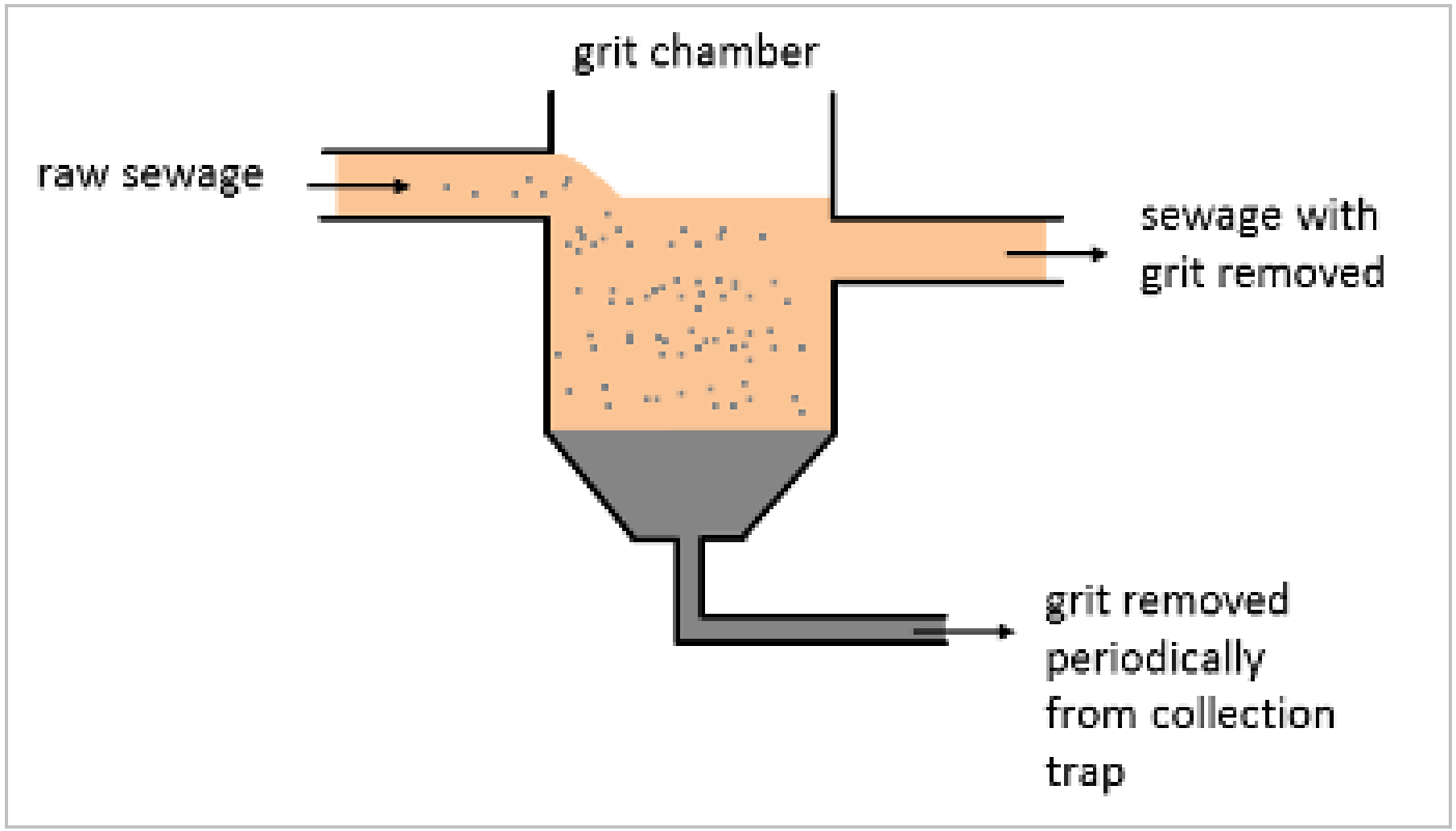
Classifier and Fine Screen

Grit Removal Equipment

Primary


Grit Chamber
Sedimentation Tank
Basic Treatment ... primary stage

Grit Removal



Grit Removal Inspections

- Velocity-controlled grit removal processes with wastewater velocity exceeding or significantly less than 1 foot per second.

- Grit chamber clogged or subject to odors.

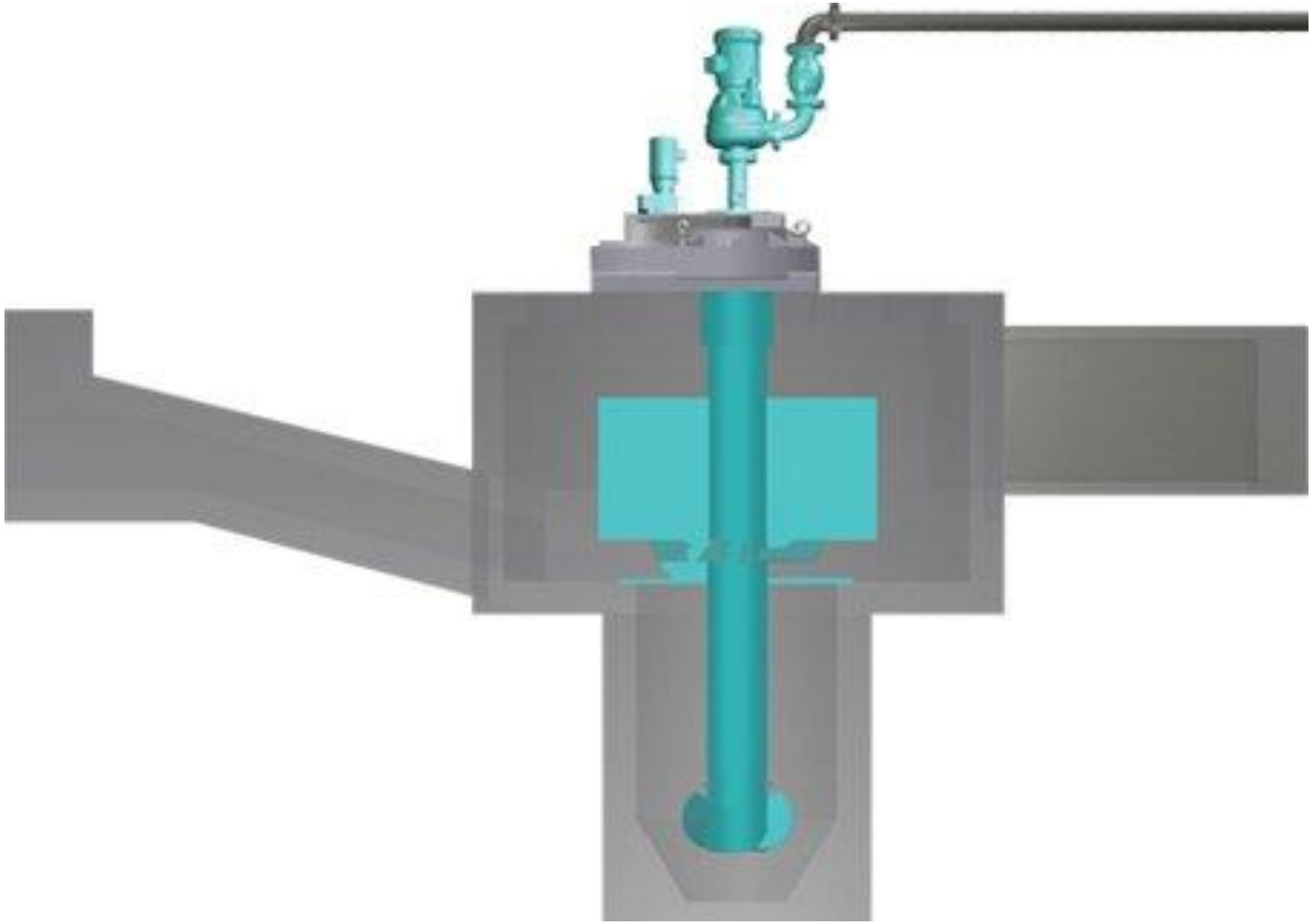
- Clogging in pipes and sedimentation basin sludge hoppers.

- Less than typical grit accumulation in subsequent processes.

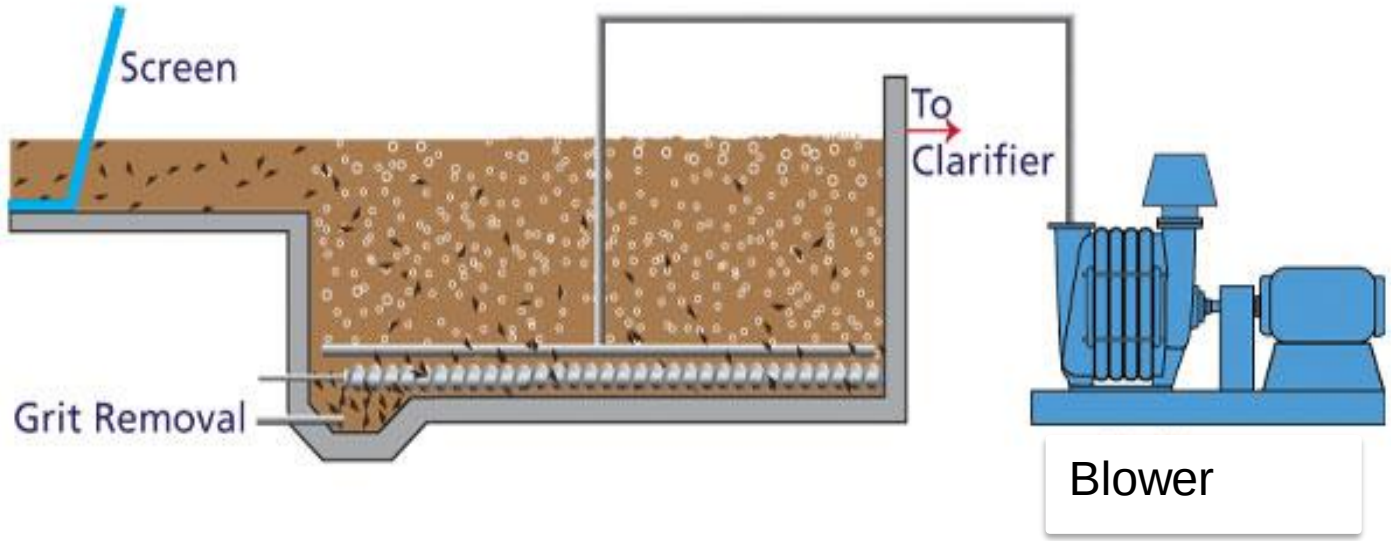
- Inoperable air diffusers leading to excessive organic content of grit.

- Wear of grit removal/handling equipment.

- Excessive odors in grit removal area.



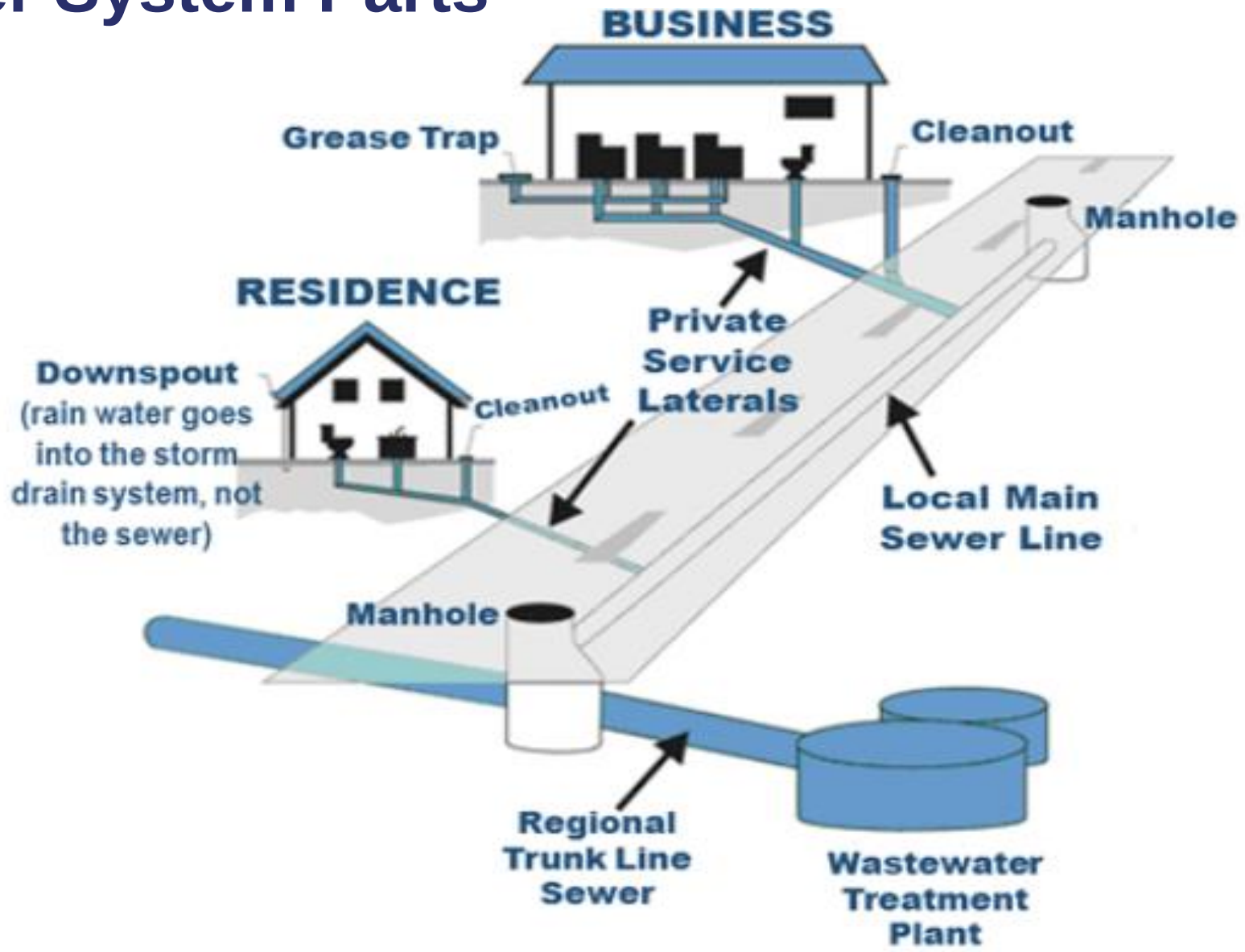
Aerated Grit Chamber



Preventative Maintenance

- Refer to O&M manual for complete instructions.
- The Bull-gear Unit
  - Change the oil in the spring and fall.
  - Verify on bull-gear plate and O&M manual to determine if the gear reducer is permanently lubricated or requires maintenance.
  - Check for oil leaks on the drive tube which is indication of an overfilled bull-gear unit.

Basic Sewer System Parts



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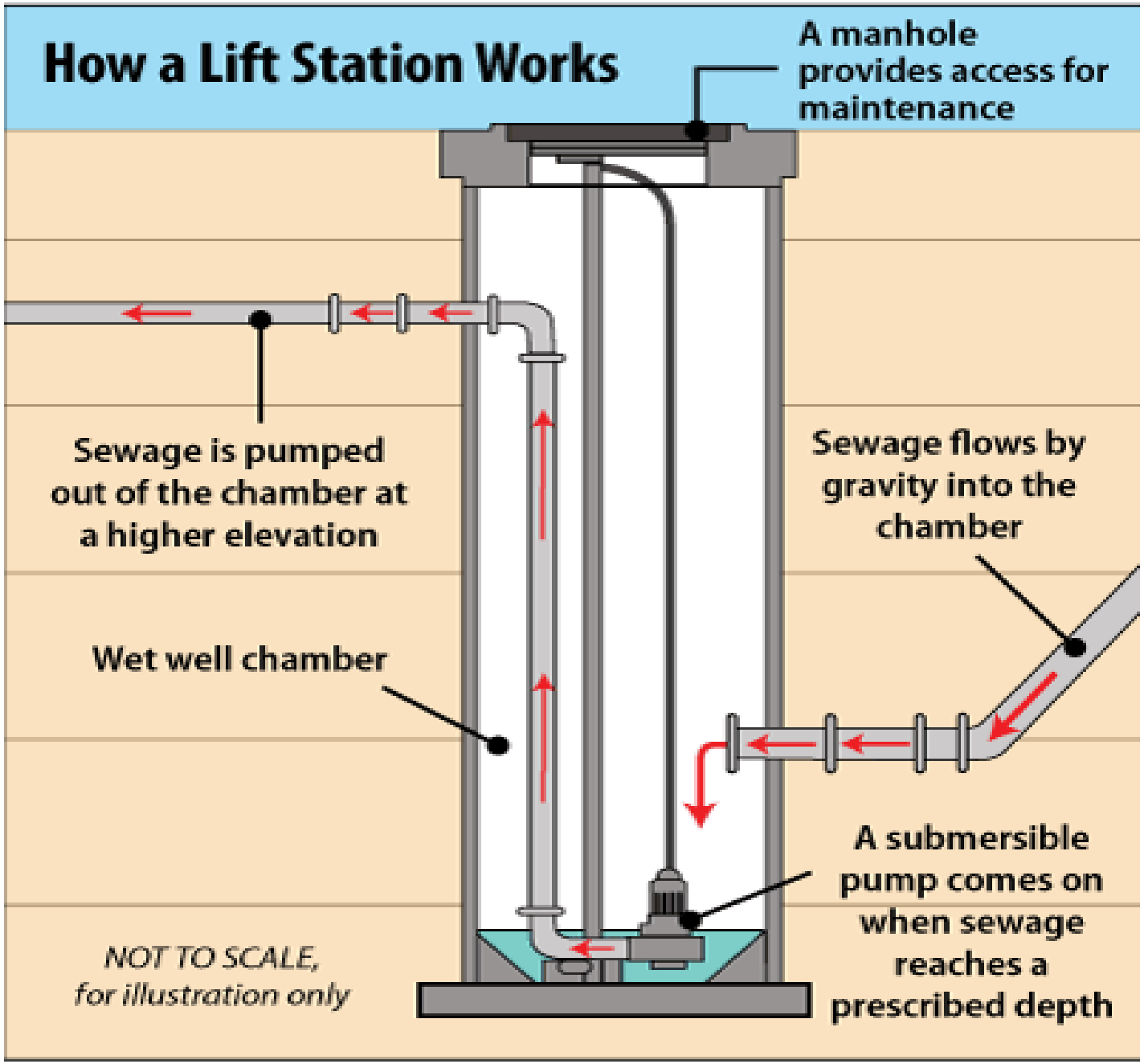
Sewer Pipe Types

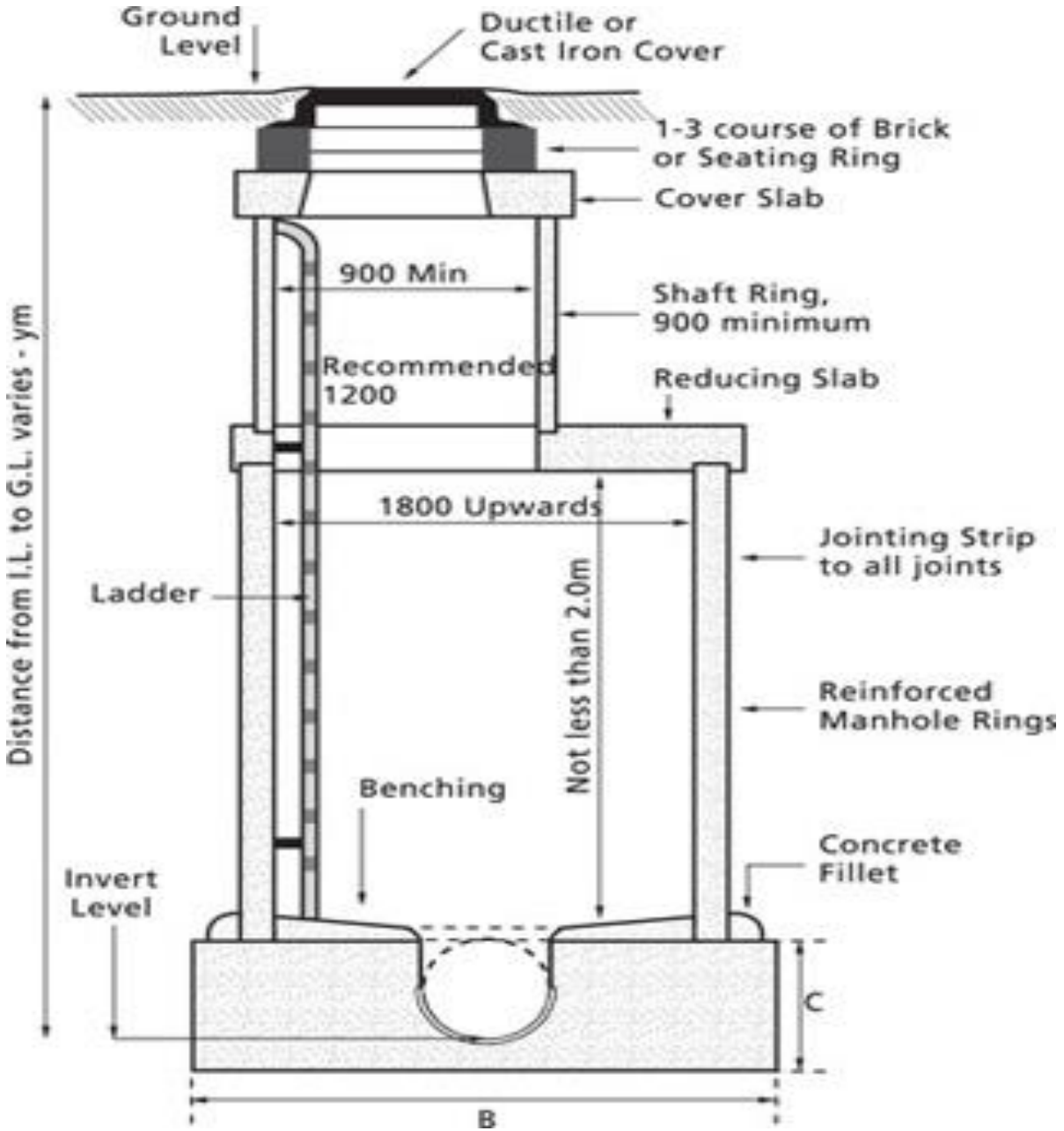
- Asbestos Cement Pipe (ACP)
- Cast or Ductile Iron Pipe (CIP and DIP)
- Polyvinylchloride Pipe (PVC)
- Concrete Pipe (CP)
- Vitrified Clay Pipe (VCP)
- High Density Poly Ethylene (HDPE)

Lift Stations

- Why do we place lift stations within the collection system?
- Does every system need a lift station?
- What type of lift station do you have in your community?


How a Lift Station Works
A manhole provides access for maintenance
Sewage is pumped out of the chamber at a higher elevation
Sewage flows by gravity into the chamber
Wet well chamber
A submersible pump comes on when sewage reaches a prescribed depth
NOT TO SCALE, for illustration only

Manhole


Ground Level
Ductile or Cast Iron Cover
1-3 course of Brick or Seating Ring
Cover Slab
900 Min
Shaft Ring, 900 minimum
Recommended 1200
Reducing Slab
1800 Upwards
Distance from I.L. to G.L. varies - ym
Ladder
Not less than 2.0m
Jointing Strip to all joints
Reinforced Manhole Rings
Benching
Concrete Fillet
Invert Level
C
B

F.O.G.

Cleaning the Collection System

Televising Collection Systems

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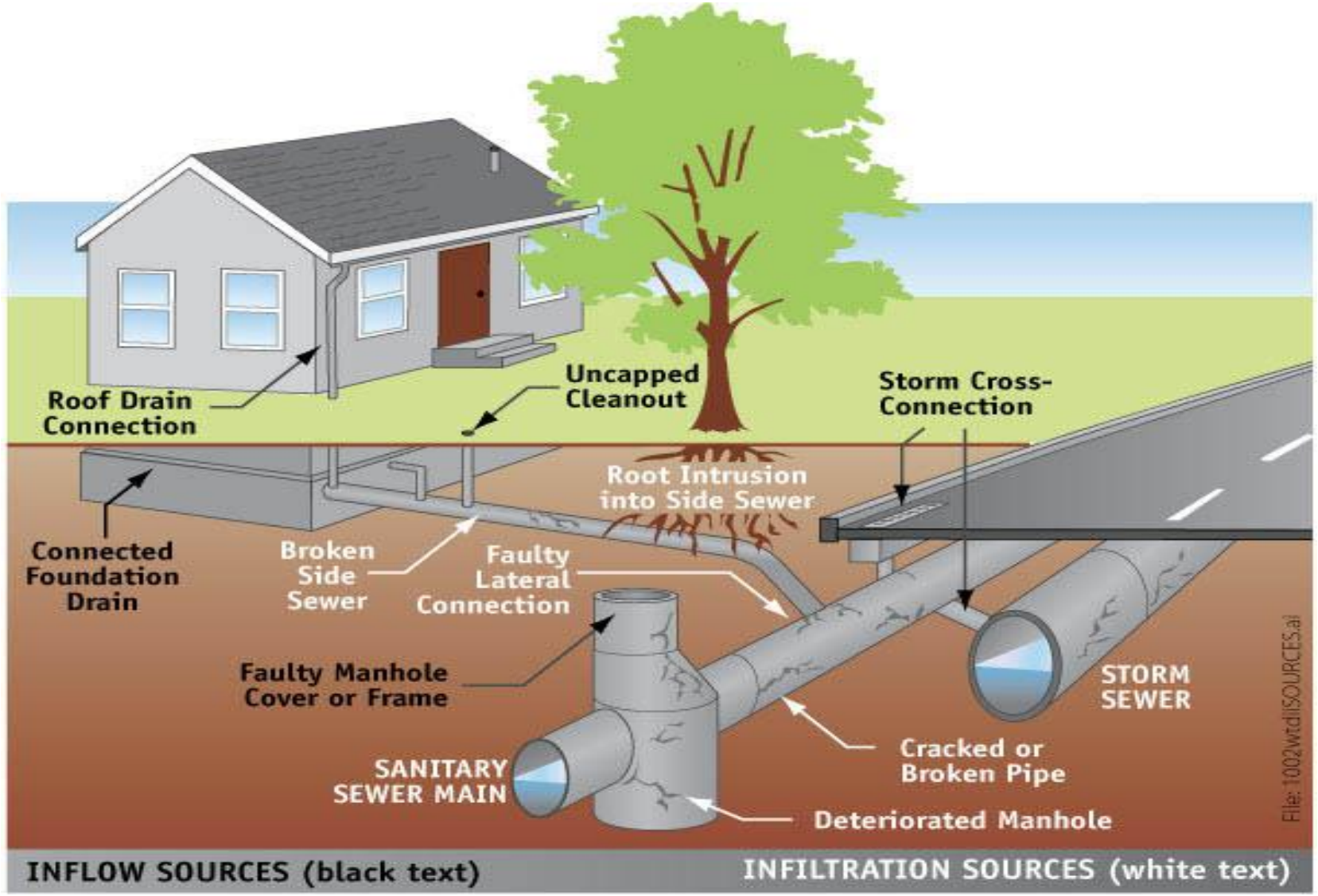
Inflow and Infiltration (I & I)



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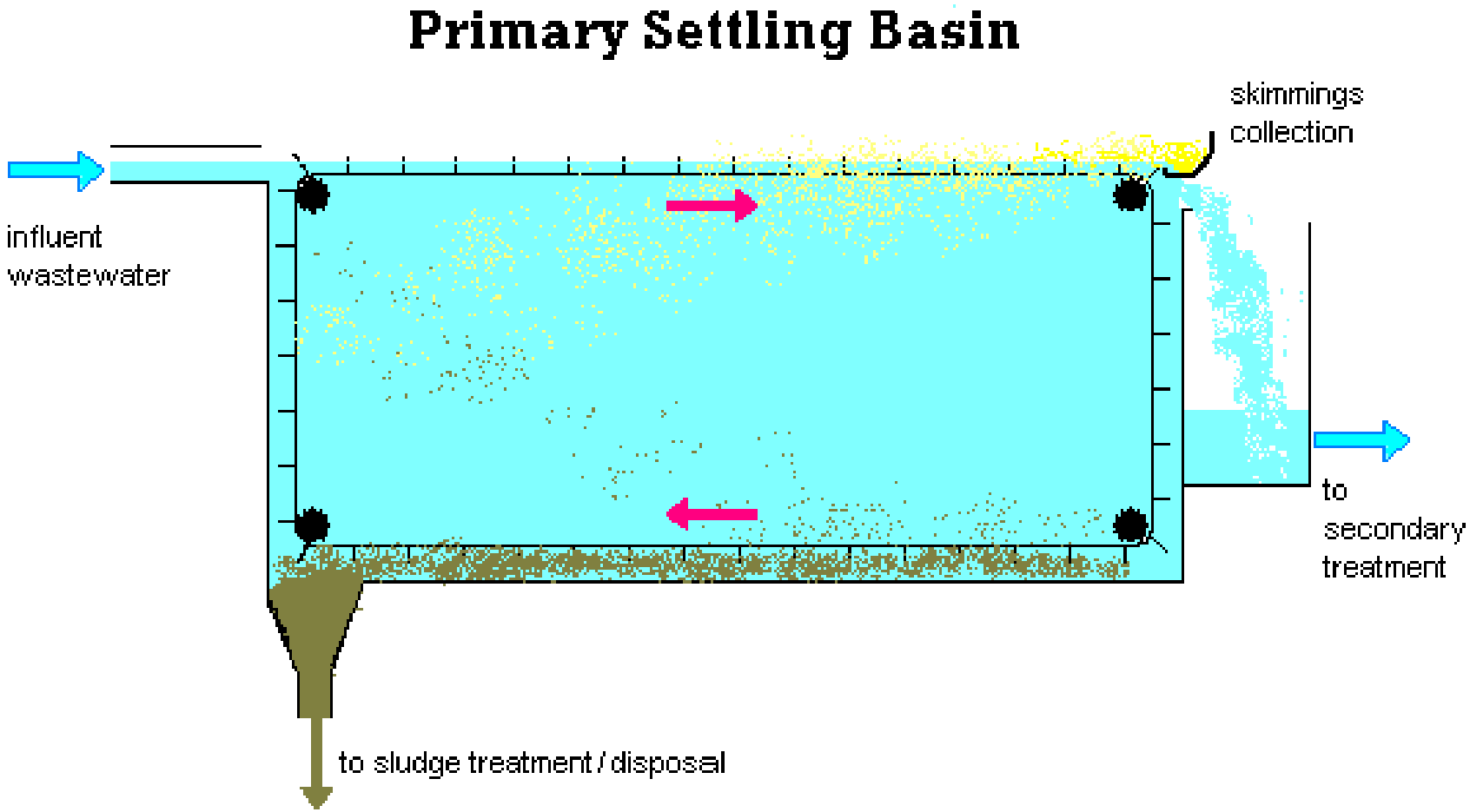
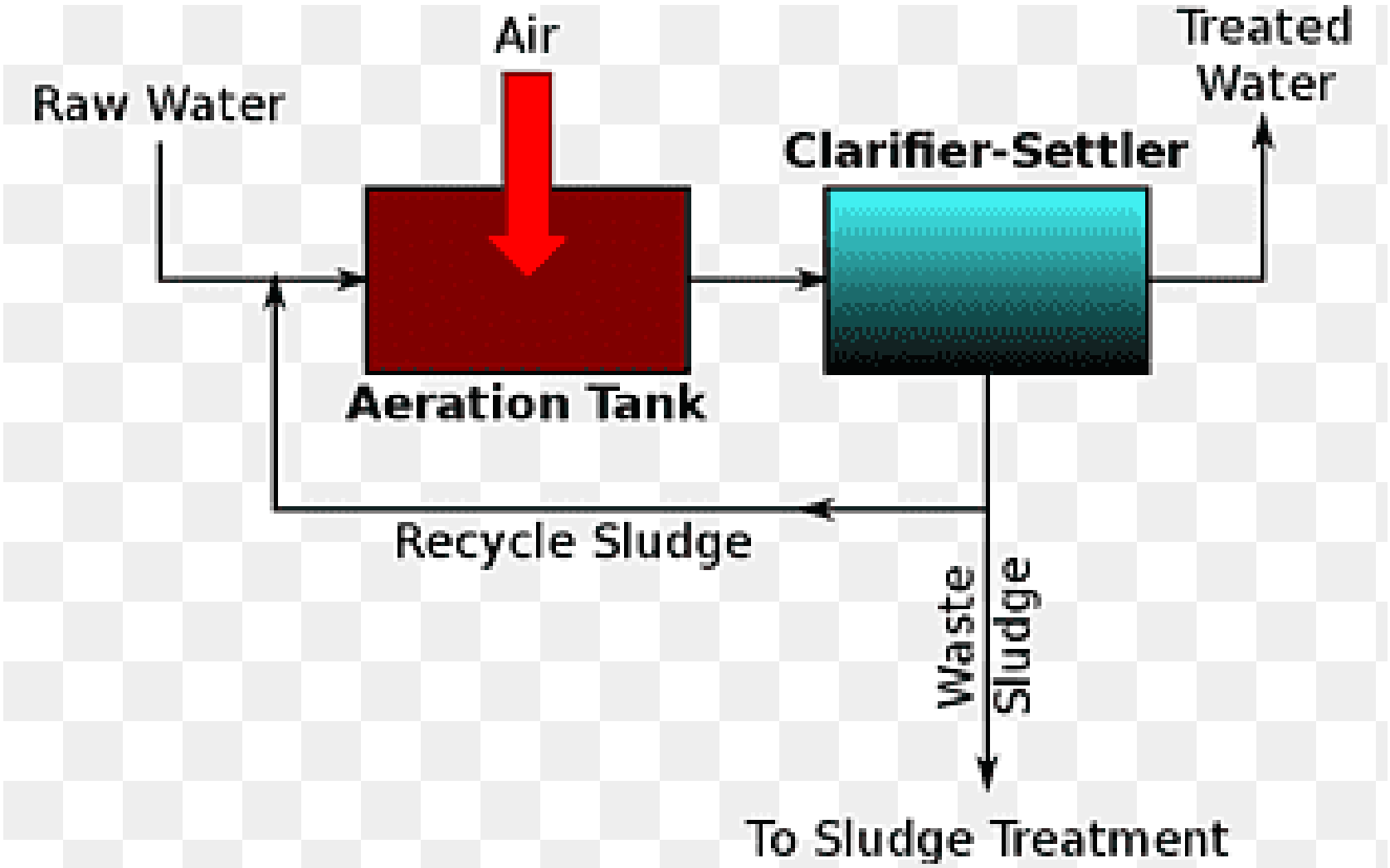
Parshall Flume

Parshall Flume

Primary Treatment



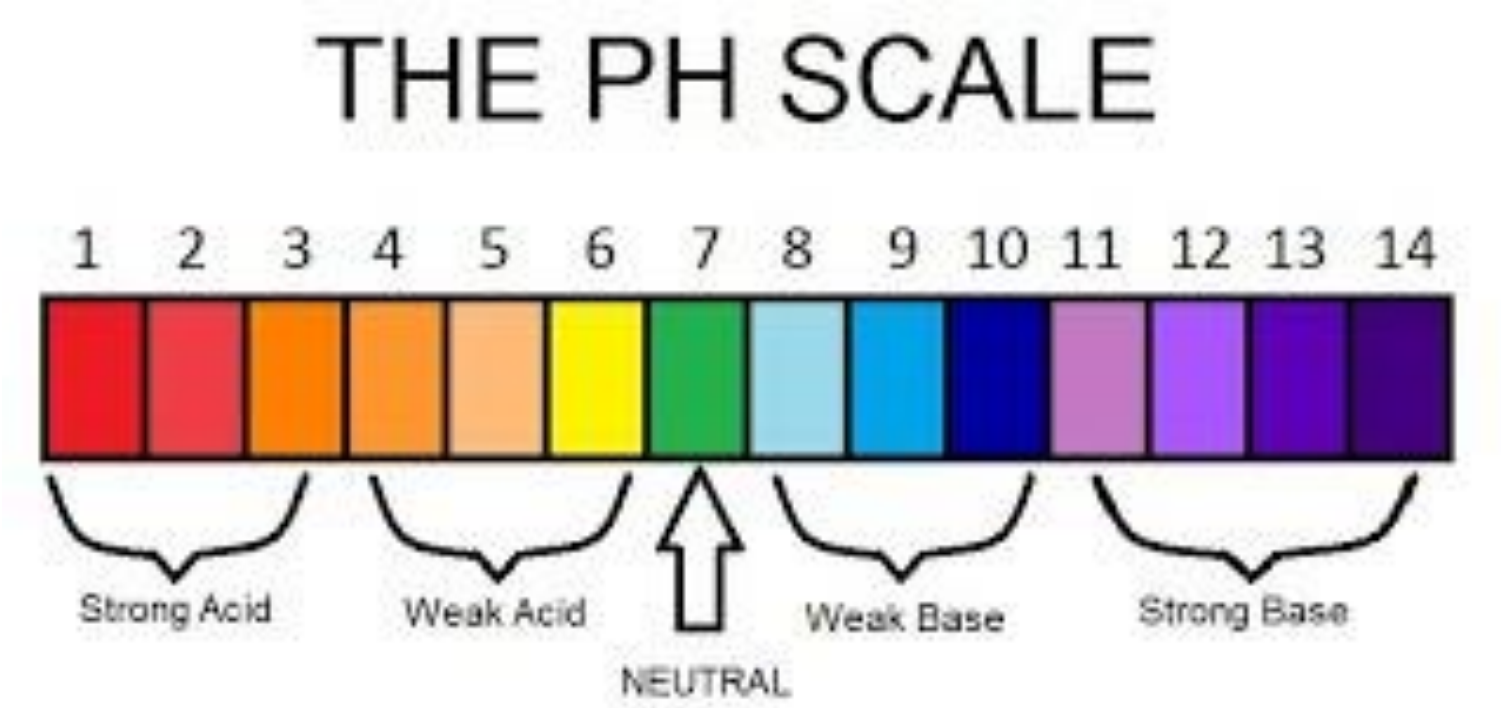
Secondary Treatment



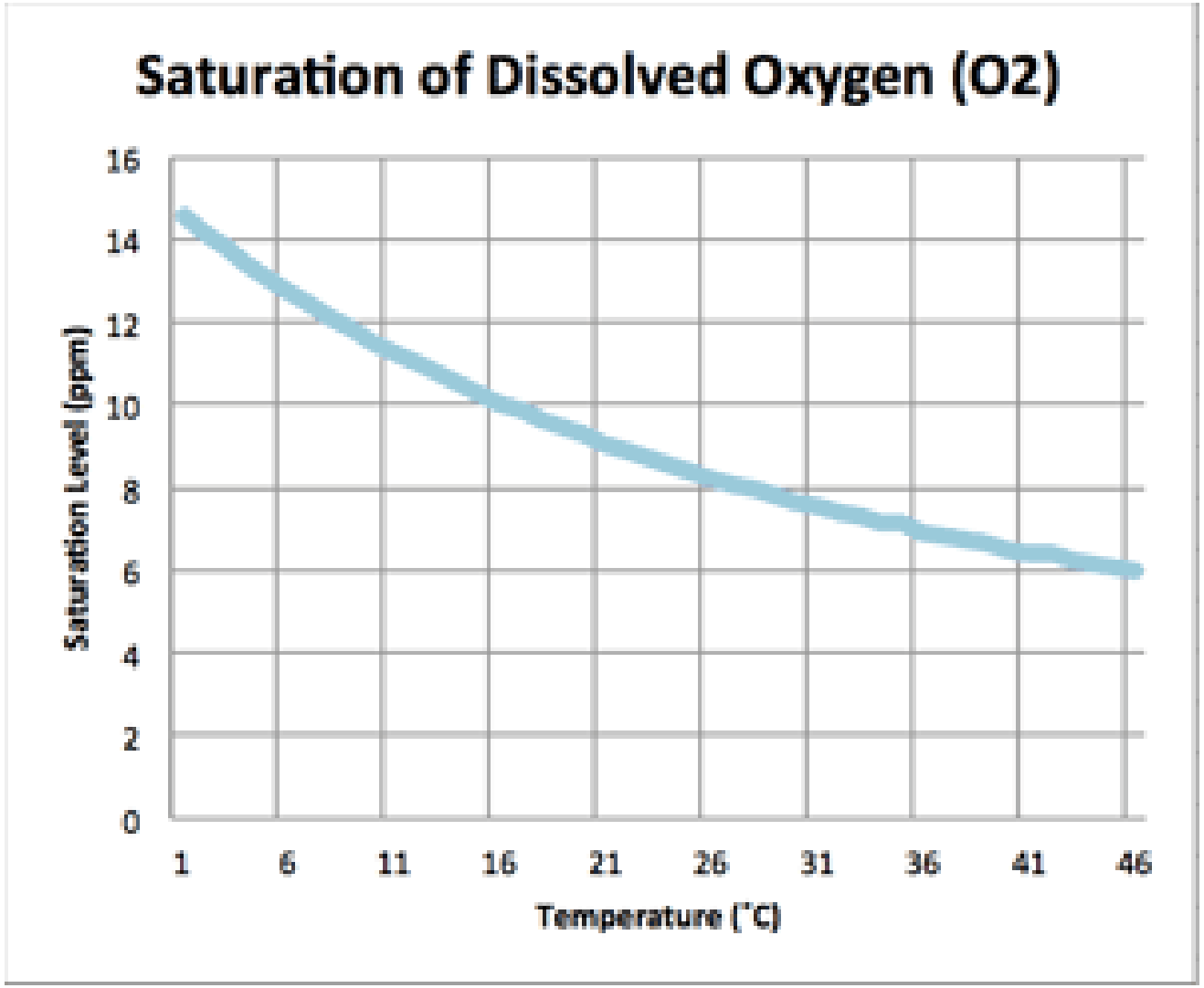
Chemical Influences

- Loading
- Alkalinity
- pH
- Salinity
- Toxicity
- Composition of Liner and Dikes

pH


THE PH SCALE
1 2 3 4 5 6 7 8 9 10 11 12 13 14
Strong Acid
Weak Acid
NEUTRAL
Weak Base
Strong Base

Dissolved Oxygen



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Temperature

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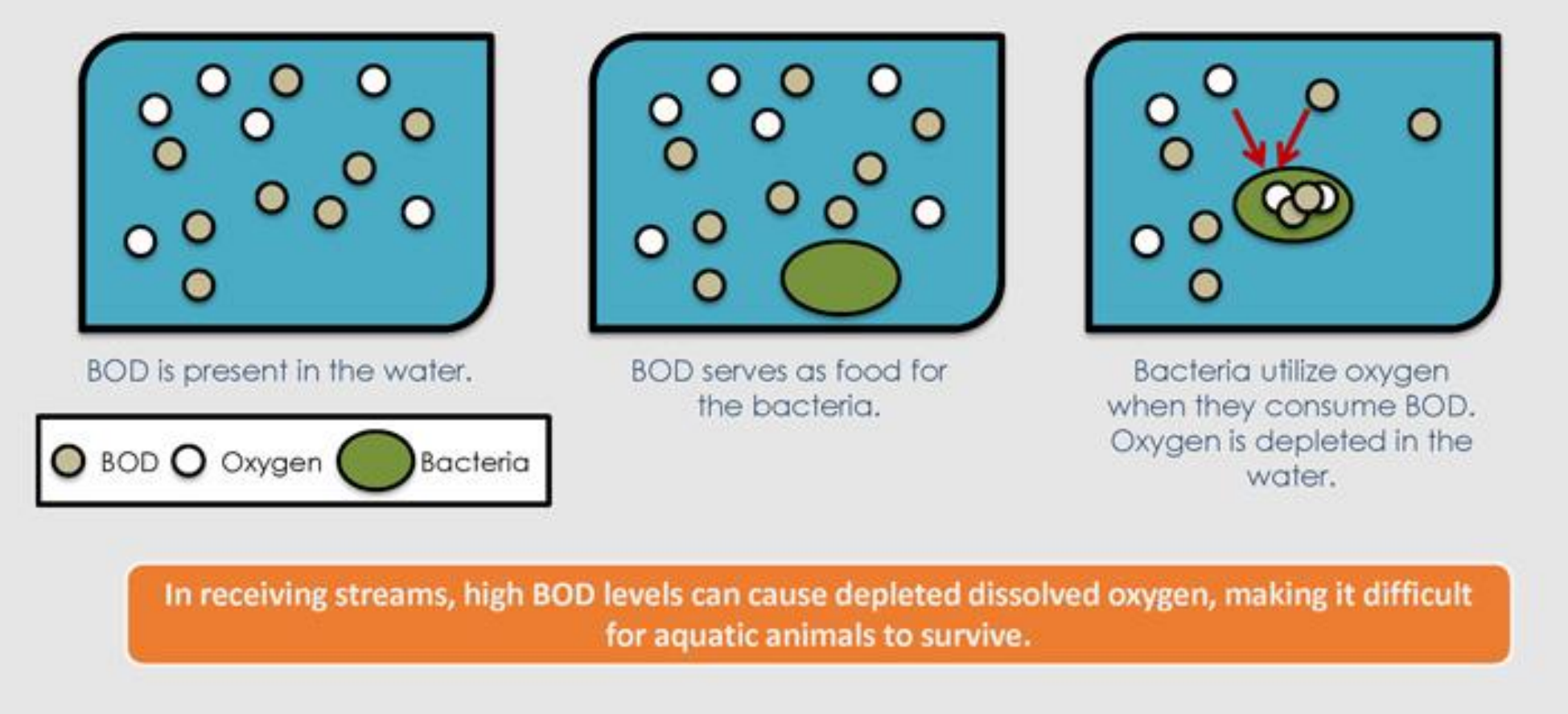
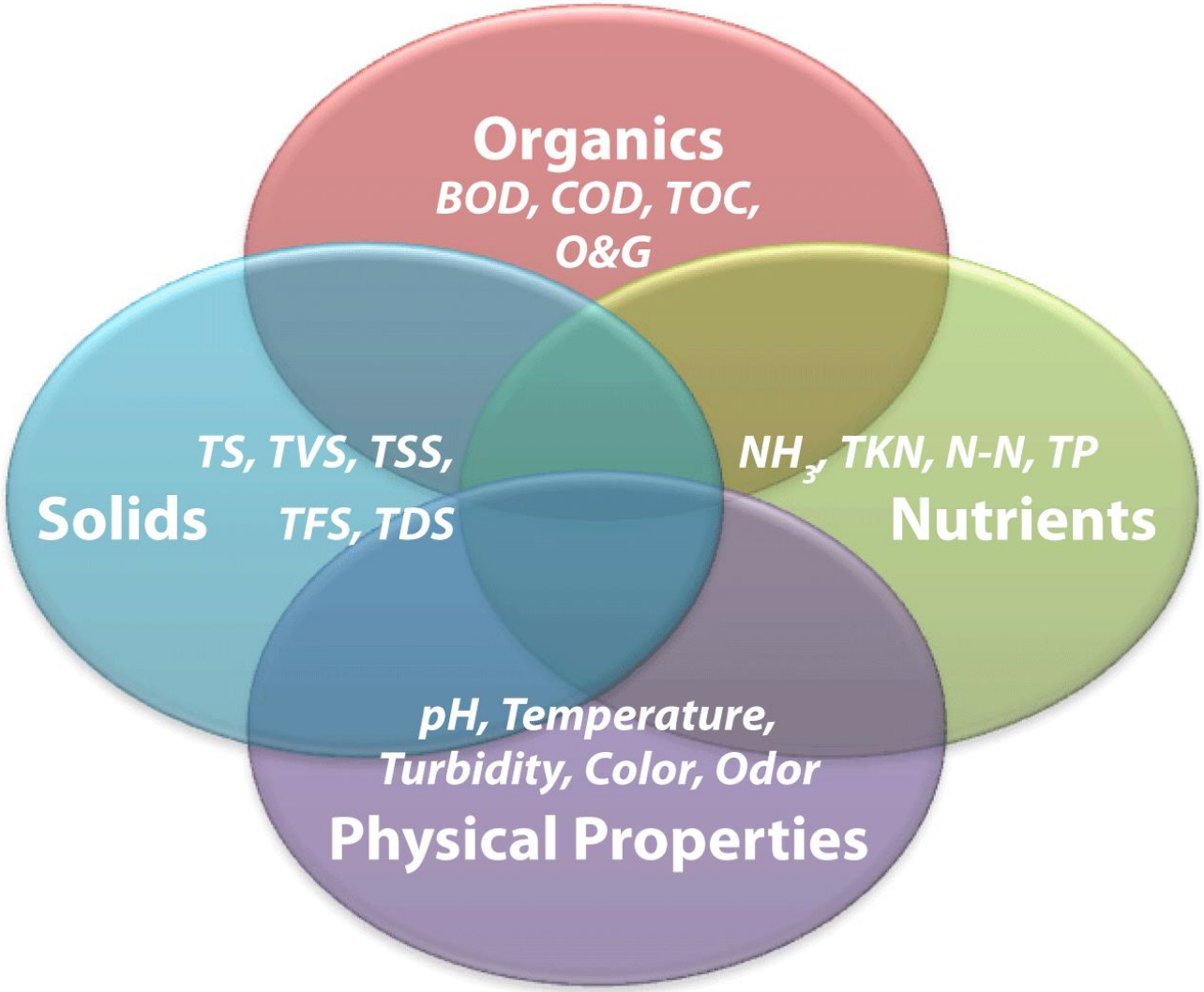
BOD


BOD is present in the water.
BOD serves as food for the bacteria.
Bacteria utilize oxygen when they consume BOD. Oxygen is depleted in the water.
BOD
Oxygen
Bacteria
In receiving streams, high BOD levels can cause depleted dissolved oxygen, making it difficult for aquatic animals to survive.

Time for a poll question

What is the most important test an operator should routinely complete?



DO Measurement

Source: Hach

Diffused Aeration

Source: © http://northcowichan.bc.ca

pH / Temp Measurement

Source: © Hach

BOD Measurement

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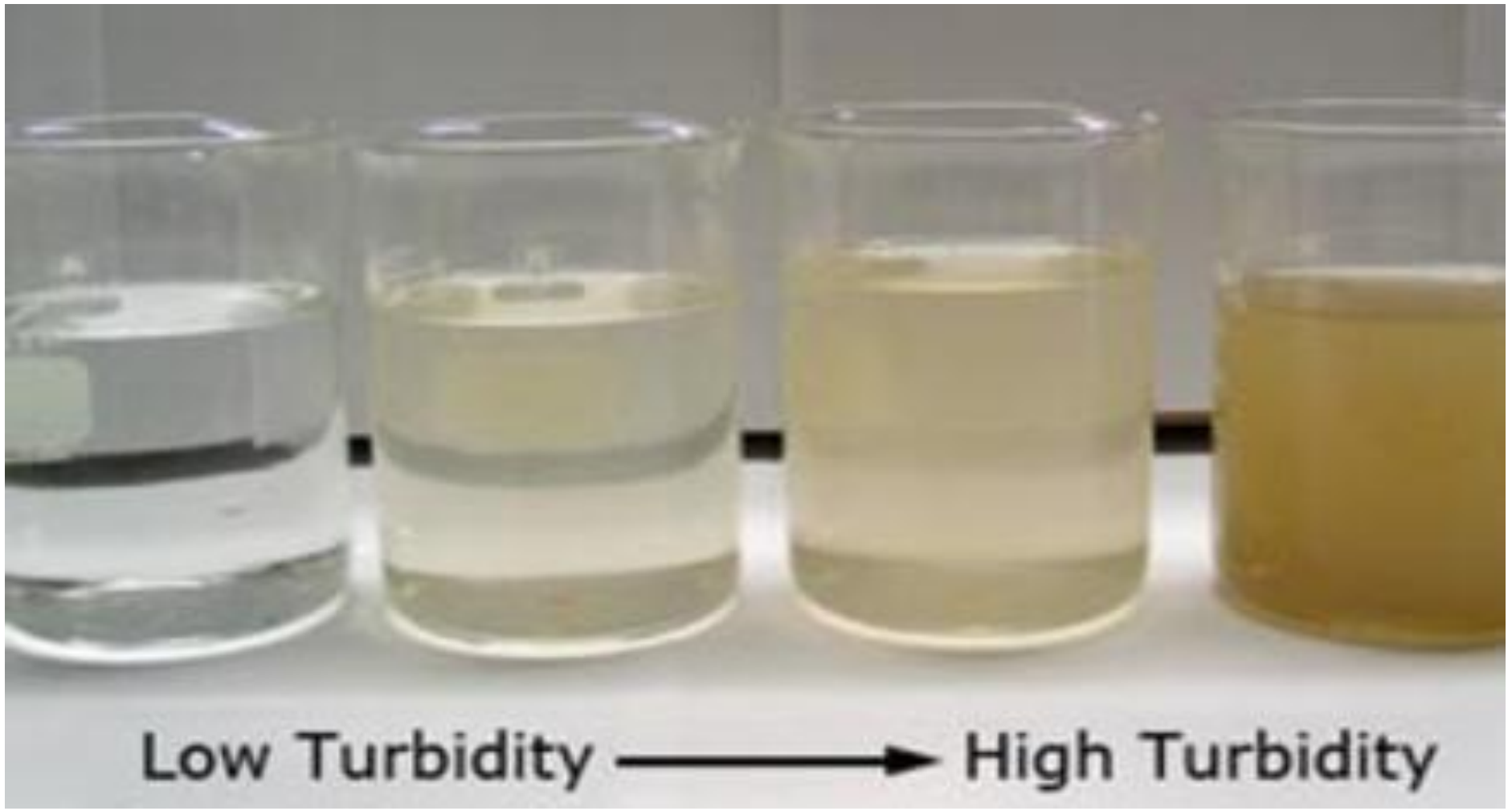
TSS Measurement



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Valve Covers