Understanding Basic Wastewater NPDES Permit Parameters

Dr. Jason R. Barrett
Associate Extension Professor
Mississippi Water Resources Research Institute

Agenda

1. Why was the NPDES Permit Created
2. Wastewater System Parameters
3. Wastewater System Inspections
4. The Inspections Steps and Reports

NPDES Permit

- The Clean Water Act (CWA) of 1972
  - "created to address water pollution by regulating point sources that discharge pollutants to water of the United States"

Wastewater System Parameters

- Flow
- pH
- Dissolved Oxygen (DO)
- Biochemical Oxygen Demand (BOD)
- Total Suspended Solids
- Nitrogen
- Phosphorus
- Fecal Coliform

Clean Receiving Stream

What is Flow?

Flow

The amount of wastewater discharged from a wastewater facility.

Importance

- Determines the capacity of the treatment facility
- Shows the amount of water being discharged into streams and rivers

Power of Hydrogen (PH)

PH

The Hydrogen Ion expression in a solution.

A range from 0 – 7 – 14

Acidic < 7

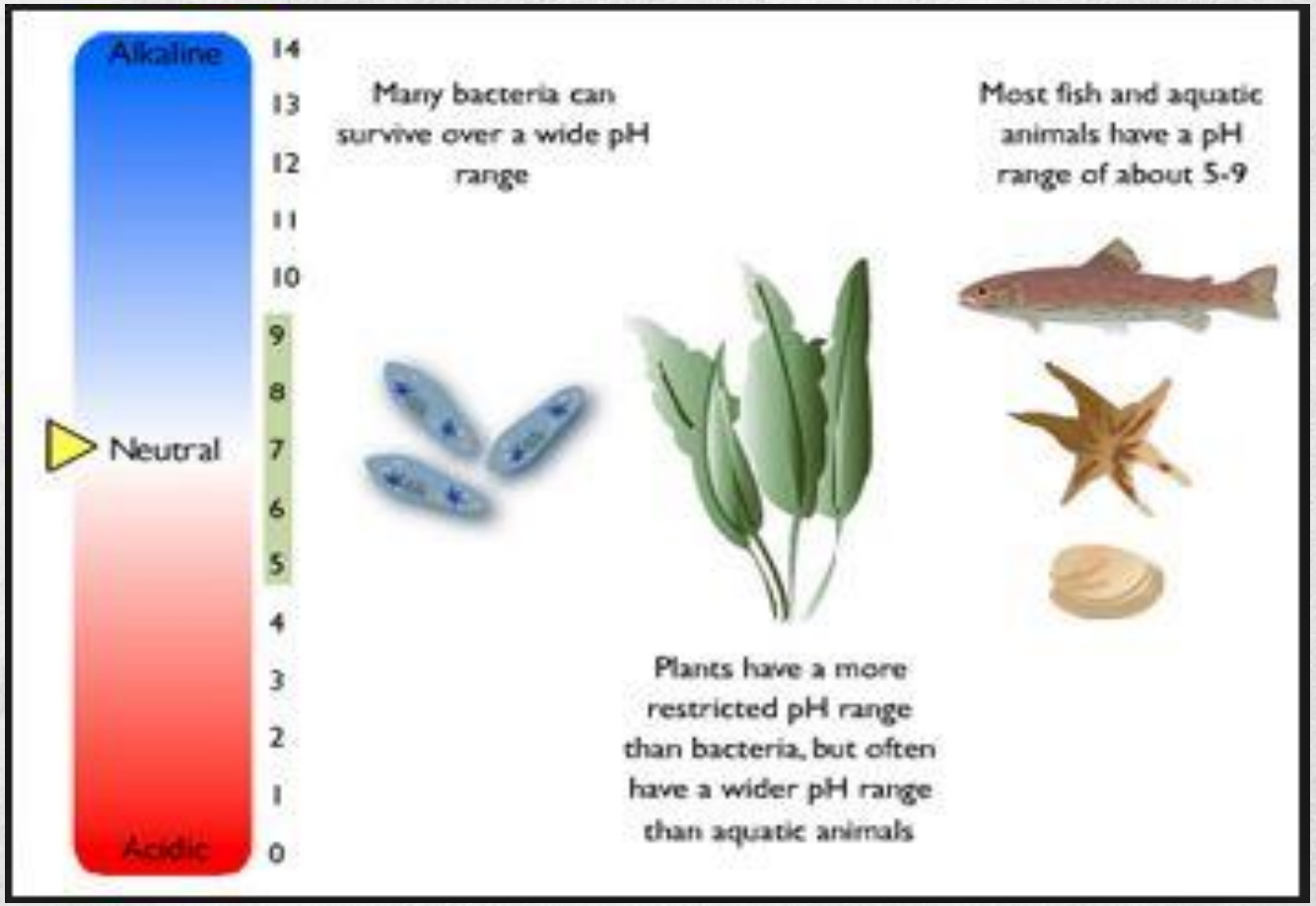
Basic > 7

Importance

- Assist with bonding and settling of metals
- Prevention of killing good bacteria in the treatment process

(needs to be neutral or basic)

PH


Alkaline
Neutral
Acidic
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
Many bacteria can survive over a wide pH range
Most fish and aquatic animals have a pH range of about 5-9
Plants have a more restricted pH range than bacteria, but often have a wider pH range than aquatic animals

Dissolved Oxygen (DO)

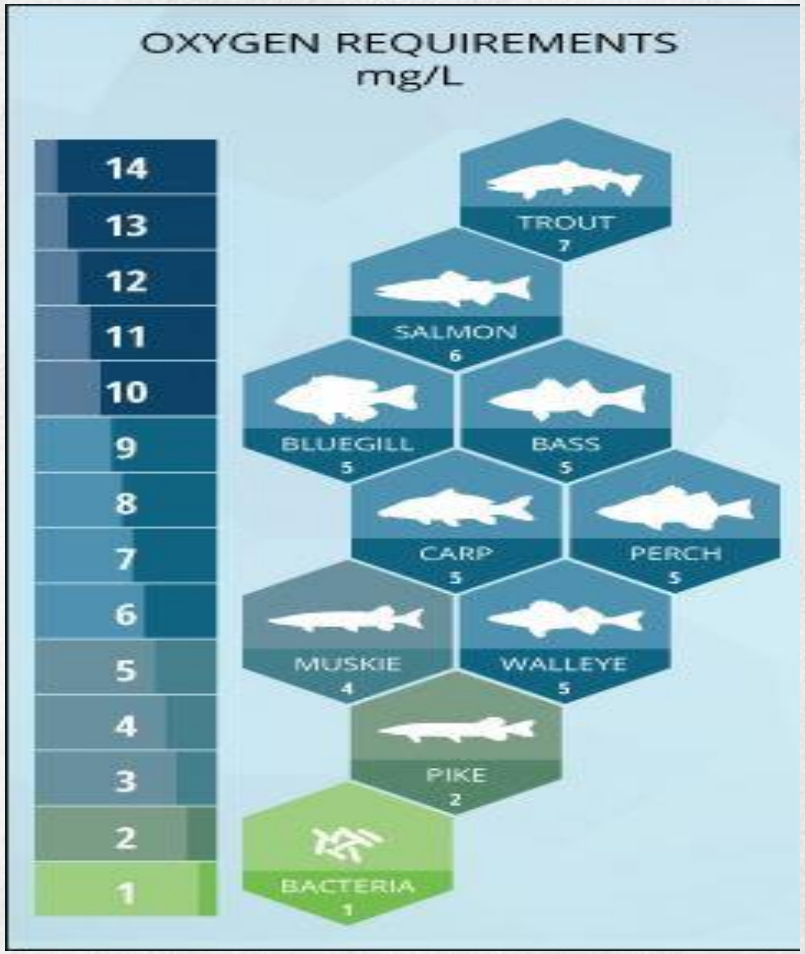
DO

The free Oxygen dissolved in water or waste water.

Importance

- Essential for the survival of ALL aquatic organisms.

Dissolved Oxygen



Biochemical Oxygen Demand(BOD)

BOD

An indirect measure of the organic strength of waste water. Based on the amount of oxygen used by microorganisms over a 5 day period

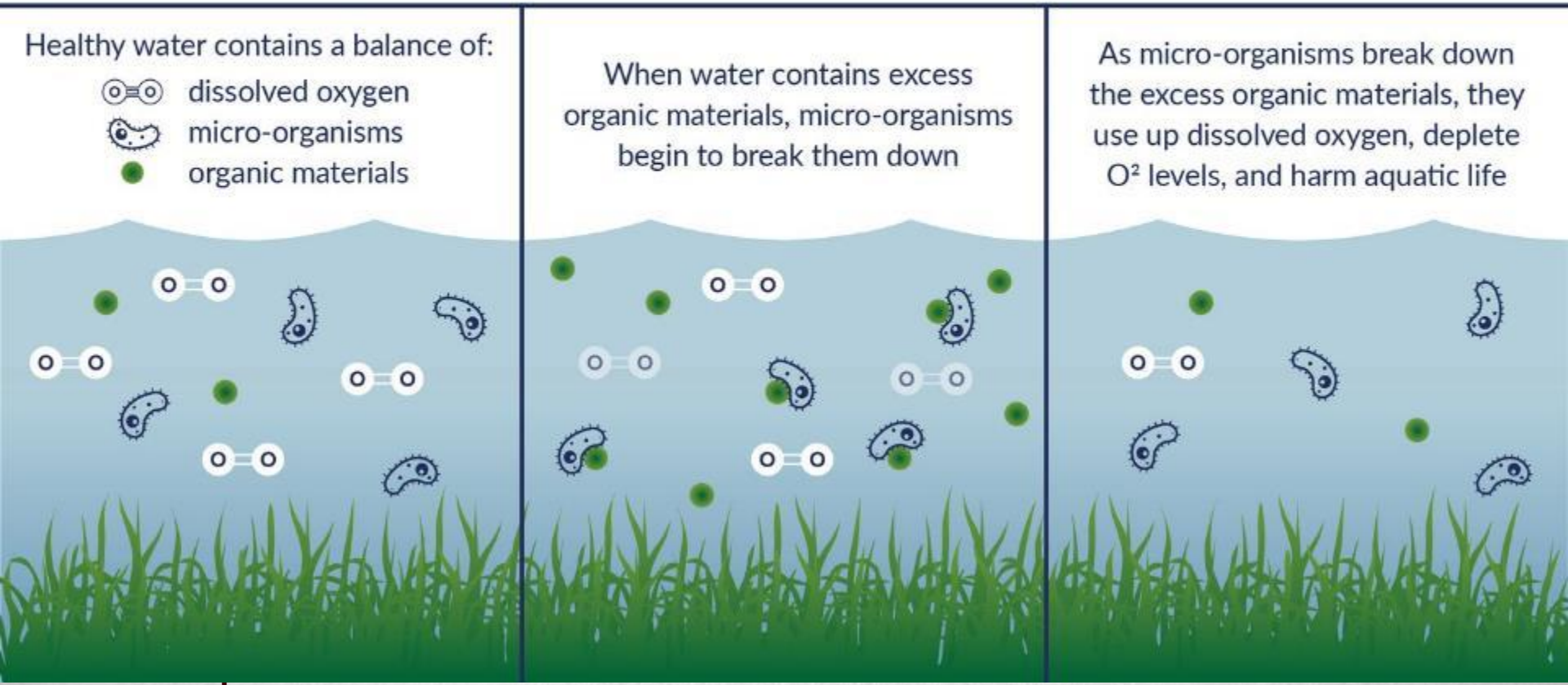
Importance

- Represents the quantity of oxygen which is consumed in the course of aerobic process of decomposition

Biochemical Oxygen Demand(BOD)

WHAT IS BIOCHEMICAL OXYGEN DEMAND (BOD)?

BOD: the amount of dissolved oxygen that microorganisms need to break down organic materials in water



Total Suspended Solids (TSS)

TSS

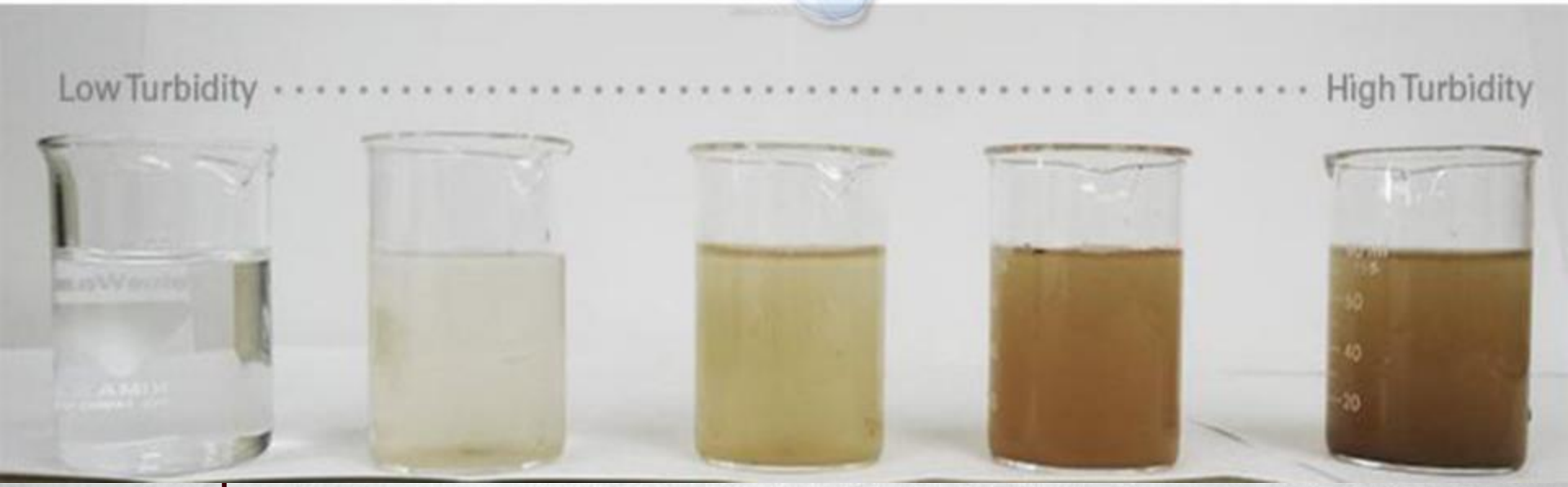
The solid matter that is suspended in wastewater and will not pass through a filter. Consists of both organic and inorganic solids.

Importance

- Solids in water that can be trapped by a filter
- Can cause problems for stream health and aquatic life

Total Suspended Solids (TSS)

What is
Total suspended solids (TSS)
How to lower &
calcluate it



Ammonia Nitrogen (NH3)

NH3

The amount of ammonia in the waste water. Ammonia creates an oxygen demand in the receiving stream.

(when PH is neutral or acidic)

Importance

- May create a gradual change of a water body into a marsh, meadow, then forest
- Can lead to algae blooms then to oxygen depletion

(too much can be bad)

Total Nitrogen

Total Nitrogen

The combination of all Nitrogen compounds.

Importance

- Most municipal treatment plants look at a single form of Nitrogen
- Nitrate, Nitrite, and/or Ammonia

Effects of Nitrogen

Phosphorus

Phosphorus

A nutrient used by organisms to grow. Not all permits have limits, most are required to monitor and report.

Importance

- Can trigger algae growth
- May deplete oxygen in the streams

Effect of Phosphorus

Fecal Coliform

Fecal Coliform

Bacteria found in the intestinal tract of man and animals. This indicates presence of pathogens.

(Future permits will focus on E.Coli)

Importance

- Most common microbiological contaminant of natural waters
- May cause disease in humans

Effect of Fecal Coliform

Chlorine Residual

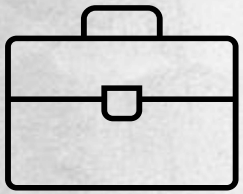
Chlorine Residual

The amount of chlorine remaining in waste water after disinfection.

Importance

- Residual shows that all bacteria has been killed and that a trace of the amount of chlorine remains

Importance to a Municipality

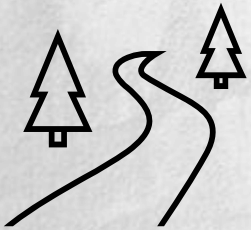


Legal Requirement

-Water is the most life sustaining substance

Essential Resource

-Streams integration with the hydrologic cycle



Multiple Uses

-Drinking, industrial, and recreational purposes

Wastewater System Inspections

Type of Inspections, The Inspections, and Preparing for Inspections

Types of Inspections

Compliance Overview Inspection (COI)*	Compliance Monitoring Inspection (CMI)*	Compliance Evaluation Inspection (CEI)
Sanitary Sewer Overflow (SSO) Inspection*	Complaint Investigation	Compliance Assistance Visit or Reconnaissance Inspection (RI)

Compliance Overview Inspection (COI)

Purpose

- Used to determine compliance with permit
- Conducted by Regional Office staff
- Scheduled in advance for the fiscal year
  - Frequency depends on the size of the facility (Major or Minor)
  - Usually not triggered by non-compliance

Inspection

- Will inspect:
  - Treatment System
  - Discharge Point
- Records Review
- Report forwarded to Environmental Compliance and Enforcement Division (ECED) to review

Compliance Monitoring Inspection (CMI)

Purpose

- Used to determine compliance with effluent limitations in the permit
- Conducted by Regional Office staff
- Collect samples of discharge
  - Sometimes will sample influent
  - Compare results to past DMRs and permit limits

Inspection

- Sometimes conducted simultaneously with a COI
  - May inspect the treatment system and/or review records
- Report and lab results forwarded to ECED to review

Sanitary Sewer Overflow Inspection (SSO)

Purpose

- Conducted simultaneously with a CEI at municipalities
- Collection System
  - Manholes
  - Pump stations
  - Sewer lines

Inspection

- Records Review
  - Bypass reports
  - Maintenance logs
  - SSO response plan
  - Plans for sewer improvements
- Will be asked to fill out a "SSO Inspection Evaluation"

SSO Inspection: Possible Causes

- Blockage
- Sewer Defects
- Improper Sewer Designs
- Line Breaks
- Power Failures
- Vandalism

EPA CMOM Program

- Sanitary Sewer Overflows (SSO's) are a violation of the Clean Water Act
- CMOM-Capacity, Management, Operations and Maintenance is meant to help municipalities to:
  - Better manage, operate, and maintain collection systems
  - Investigate capacity constrained areas of the collection system
  - Respond to sanitary sewer overflow (SSO) events
- EPA Region IV-SSO National Enforcement Initiative
- Guides and self-evaluation checklists are available online

Inspection Steps

The Inspection

- Site Entry
  - Inspection and Entry Condition of Permit
    - The permittee shall allow any authorized Commission representative to enter the permittee's premises at any reasonable time, to have access to and copy any applicable records, to inspect process facilities, treatment works, monitoring methods or equipment or to take samples, as authorized by Section 49-17-21 of the Code. In the event of investigation during an emergency response action, a reasonable time shall be any time of the day or night. Follow-up investigations subsequent to the conclusion of the emergency event shall be conducted at reasonable times. [WPC-1 Chapter One Section IV.A(17)]

The Inspection

- Opening Conference
  - Introductions
  - Between Inspector and Operator or Owner of facility
    - Inspector Will Discuss:
      - Reason
      - Specific areas
      - Samples
      - Records
      - Contact information

The Inspection

- Tour of Facility
  - From influent to the effluent
    - Upsets?
    - Bypasses, overflows or leaks?
    - Is all equipment operational?
    - Do you have back-up power?
    - Any changes since last inspection?
    - Any odors detected?
    - How knowledgeable is the operator of the treatment process?
    - Condition of the grounds and access road?
    - Floating solids or foam or abnormal colors?

The Inspection

- Tour of Facility
  - Discharge point
    - Is it easily accessible?
    - Where and how are samples collected?
    - How is flow measured?
    - What color is it?
    - Are there visible or floating solids?
    - Is it foamy?
    - Is an odor detected?
    - What is the condition of the receiving stream?
    - For a CMI, will take sample

The Inspection

- Tour of Facility
  - Lab
    - Is it clean and organized?
    - Are the standards used for testing available?
    - Are there any expired products, such as buffer solutions?
    - How are the records organized?
    - Who is completing the testing?
    - How are materials stored?

The Inspection

- Records Review
  - 3 years worth of records
    - Discharge Monitoring Reports
    - Analytical Results (for ALL monitoring)
      - Chains of Custody
    - Operator's Logbook
    - Calculations
    - NPDES Permit
  - Remember: Organization is <u>important</u>!
  - Inspector may ask for copies of any records reviewed
  - Some records can be kept electronically…but should be printable

The Inspection

- Closing Conference
  - Between inspector and owner or operator
  - The inspector will discuss:
    - Areas of concern and recommendations based on what was observed
    - Whether additional documents or records need to be sent to inspector
    - Whether a follow-up inspection will be conducted and when
  - The inspector will not discuss:
    - Enforcement Actions and penalties

The Inspection Report

Written by the inspector to summarize the inspections

- Pictures
- Observations
- Conclusions
- Recommendations

Reviewed by ECED

- If violations were noted during inspection, the report is sent with a Notice of Violation
- Required to respond and correct the violations

Common Violations and Errors

Site Tour

- Broken/malfunctioning equipment
- Site unsecured
- Wrong Sampling procedures or flow monitoring location
- Operator not certified

Records

- Calculation Errors
  - Using average flows instead of instantaneous flow to calculate loadings
- Missing/Incomplete Records
- No Operator logbook
- Chains of Custody incomplete or missing
- Disorganization

How YOU Can Be Prepared for an Inspection

-Keep records up-to-date, organized and know where they are kept

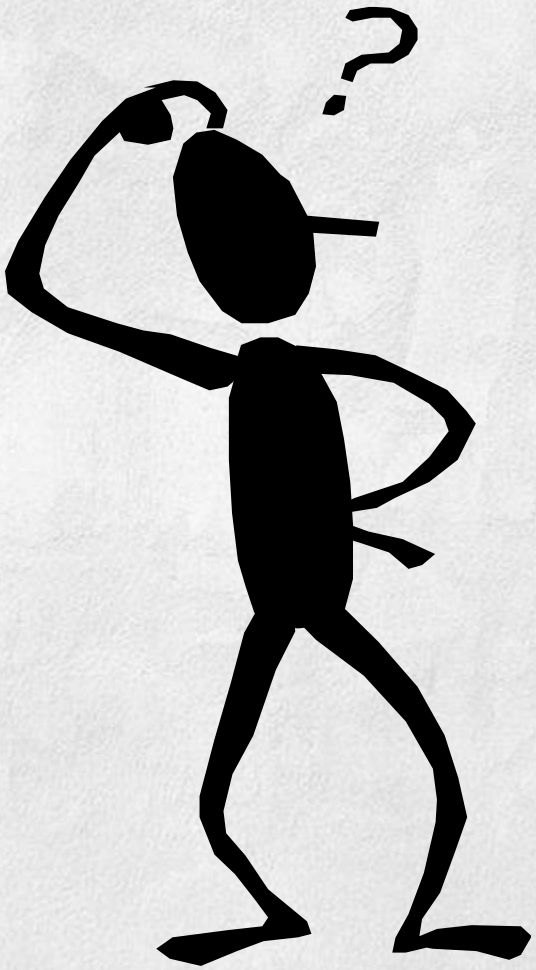
Throw anything older than three years away (if you want to keep older records, keep them separate from the most recent documents)

-Be aware of all things happening at your facility
-Keep the site maintained and easily accessible

-Proper Operation Maintenance and Replacement Condition of your permit.

The permittee shall at all times properly operate, maintain, and when necessary, promptly replace all facilities and systems of collection, treatment and control

Questions?



Contact Information

Dr. Jason R. Barrett
Associate Extension Professor

Mississippi Water Resources Research Institute
Mississippi State University Extension
133 Scales Building
Mississippi State, MS 39762
662.325.1788 phone
Jason.barrett@msstate.edu
Twitter: @WSPBarrett