Overview
Sampling Protocols and Methods

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Aqua Test Inc.

- Formed in 1986
- Primary function was operation of commercial wastewater treatment Systems
- Operate approximately 1.5 Million GPD
- Certified Environmental Testing Laboratory
Sampling Overview

- Minimum level of credentials/certifications
- Understand the purpose of wastewater sampling
- Typical Sample Parameters
- Equipment
- Identify proper sample collection and handling procedures.
- Documentation related to sampling event
Credentials/ Certifications

- Locally recognized training facility
- Manufacturer rep
- Credibility
- Defensibility
Sampling purpose

- System operation
- Troubleshooting
- Manufacturers requirement
- Compliance for regulatory purposes
Sample Purpose Dictates

- Analysis methods
- Timing of sampling
- Sampling location
- Sample collection
- Sample containers
- Sample volume
- Sample transport
- Laboratory
- Interference
The Goal of Any Sampling Event?

- Representative
- Reproducible
- Defensible
- Useful
System Operation - Nutrient Removal

- Field kits are a viable option
  - Non compliance
  - Information is available immediately
  - System “tweaks” occur immediately
Compliance Monitoring: Biological

- System usage - peak flow
  - Day after Thanksgiving
- Is the site operating properly?
  - Disinfection equipment working
  - Blowers are on
- Laboratory sample acceptance times
- Distance from site to lab
Manufacturers Requirements:

- System guarantees
- Surrogate testing
  - Field testing of a constituent
  - Lower cost
Minimum Equipment and Tools

- Gloves
- Safety Glasses
- Disinfection solution
- Sampling Equipment
- Field instruments / Chemistry Kits
- Sample Bottles with labels and documentation
- Distilled water
- Cooler with blue ice
- Imhoff cone
• Thermometer

• Tool used to measure sludge levels

• Sample collection tool

• Imhoff cone
- Distilled water wash bottle
- DO and Temp meter
- pH measuring device
• DO test kit—
  1 to 12

• Pocket pH meters & buffer for calibration in the field

• DO test kit—
  0 to 1
Typical Sample Constituents

- BOD$_5$
- CBOD$_5$
- TSS
- F.O.G.
- Cl$^-$
- Nitrogen Species, TKN, NO$_3$, NH$_3$
- Phosphorous
- Biological
  - Fecal and/or Total Coliforms
Sample containers

- Types of containers
  - Glass
  - Polyethylene
- Test specific
- Check with laboratory
- Clearly label the sample container with water proof markings
- Water tight
Sampling requirement examples

- **Biochemical oxygen demand (BOD)**
  - Container - polyethylene or glass
  - Preservation - 4°C (ice)
  - Maximum holding time - 48 hours

- **Oil and grease (FOG)**
  - Container - glass
  - Preservation - 4°C and add HCl or H₂SO₄ to pH<2
  - Maximum holding time - 28 days

- **Fecal coliforms**
  - Container - polyethylene or glass
  - Preservation - 4°C and 0.008% Na₂S₂O₃
  - Maximum holding time - 6hrs
Sample volume

- Test dependent
- Rule of thumb
  - Quart/Liter
- Check with laboratory
- More tests = more sample
- Cleaner water = more sample
- Fill the container
  - No air gap
Composite, integrated, and grab sample

- **Grab sample**- one sample taken from one point and time
  - Gives an idea of what is happening right then
- **Integrated sample**-
  - Combination of grab samples collected at the same time but at different locations.
- **Composite sample**-
  - Multiple samples taken from one point at multiple times and integrated together for analysis
  - Pulled from a location that provides a composite.
  - Multiple grab samples at different flow periods.
  - Averaging over the course of a day
Grab vs. Composite Sampling
• A septic tank is a composite sample
  - Typical septic tank is 1000 gallons
  - Typical daily flow is 200 gpd
  - This provides a 5 day composite sample
A system operating at design flows of 450 gpd will have an approximate 2 day composite sample
Grab sampling is considered controversial by some

- No standardized protocol
- Varying Detention Times affect results
- Peak vs. low flow affect results
Composite Sampling

- Typically used in wastewater treatment process
- Requires expensive equipment
- Labor intensive
- Method chosen is time or flow paced
Comparison of Grab and Composite samples

- A grab sample is a single sampling event
- A composite sample may be developed from multiple grab samples or through a composite sampler
<table>
<thead>
<tr>
<th>Analytical Constituent Requirements</th>
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</thead>
<tbody>
<tr>
<td><strong>Grab Required</strong></td>
</tr>
<tr>
<td>Alkalinity</td>
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<tr>
<td>Oil &amp; Grease</td>
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<tr>
<td>Dissolved Oxygen</td>
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<tr>
<td>pH</td>
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<tr>
<td>Temperature</td>
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<td>Biological</td>
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<td>Sample I.D</td>
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<tr>
<td>Initial Grab</td>
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<td>Mid Point Grab</td>
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<tr>
<td>Composite Sample Based on Grabs</td>
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<tr>
<td><strong>Composite</strong></td>
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<tr>
<td><strong>Flow Weighted Composite</strong></td>
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<tr>
<td><strong>Daily Flow</strong></td>
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</tbody>
</table>
Sampling safety

- Use proper Personal Protection Equipment
  - Gloves
- Never enter confined spaces
- Be cautious of toxic gases
- Disinfect hands and equipment
Usually samples are collected from the following points:

- Pressure distribution - pump tank
- Gravity system - outlet of the septic tank
- Propriety system - use manufacturers’ recommendations
Influent vs. effluent

- Influent samples are collected from the beginning of a component.
- Effluent sample is collected from the outlet of a component.
Sampling location

- Depends on test
- Process performance
- Best – external sampling port
- Outlet baffles
- Discharge from system
- Consistency
Sampling port for gravity line

2" drop recommended

4"

12"

6"
Sample collection

- Selecting right tool for the job.
  - Sludge judge
  - Dip stick
  - Sample bottle
  - Dipper
  - Vacuum pump
- Use clean collection equipment
- Collect from “cleanest” end first
Outlet Baffles and Test Ports:

- Care must be taken not to entrain Bio-growth
- Use an Imhoff Cone
Onsite analysis methods

- Dissolved oxygen
  - Measured at sample source
- pH
- Temperature
- Turbidity
- Chlorine residual
- Odor
Laboratory analysis methods

- BOD$_5$
- CBOD
- COD
- Solids
- TSS
- TN
- TP
- Chloride
- Alkalinity
- FOG
- Fecal / Total Coliforms
Sampling documentation

- Chain of custody
  - Name of person collecting sample
  - Each person having custody (w/ date and time)
  - Sample number
  - Sample description
  - Qc/Qa
  - Required for lab validation of results
A sample is in your “custody” when:

- It is in your actual physical possession.
- It is in your view, after being in your physical possession.
- It was secure beyond a reasonable doubt if not in your view.
# Chain of Custody Record

This information will be used for reporting/billing

<table>
<thead>
<tr>
<th>Lab Use</th>
<th>Sample ID/Collection Point</th>
<th>Date</th>
<th>Time</th>
<th>Comp.</th>
<th>Grab</th>
<th>No. of bottles</th>
<th>INSTRUCTIONS: use one line per sample &amp; indicate tests to be performed by checking appropriate boxes</th>
</tr>
</thead>
</table>

- **BOD**
- **TSS**
- **O&G**
- **pH**
- **FC**
- **TC**
- **TKN**
- **NH3-N**
- **NO2**
- **NO3**

- Notes

**Samplers Signature:** ____________________________

**Print Name:** ____________________________

**Relinquished To Lab By:** ____________________________

**Special Instructions - Client:** ____________________________

**Shipped Via:**

- [ ] UPS
- [ ] Hand
- [ ] Other

**Temperature Acceptable:**

- [ ] Yes
- [ ] No
Sample transport

- Ice chest w/ ice
  - Label cooler “not for food”
- Check with lab for constraints on analysis
- Maximum holding time
  - Test must be started w/in the time requirement
- Document COC
Laboratory

- Standard methods
- Testing methods
- Data range
  - Non-detection
  - Greater than X
  - Too numerous to count
- Purpose of the data
- Lab accreditation
  - Check for specific test
Summary

- Sample purpose
- Analysis methods
- Timing of sampling
- Sampling location
- Sample collection
- Sample containers
- Sample volume
- Sample transport
- Laboratory
- Interference
Thank You!