



Basic Sample Collection and Handling Techniques

Michael Schueller & Jim Luzier

State Hygienic Laboratory at the University of Iowa

2017 SHL Fall Symposium

September 28, 2017



Limnology Section

- Ankeny and Coralville
- Perform surface water, wastewater, and biological sampling.
- Perform WET testing.
- Perform work for state and federal agencies, cities, and private clients.



Compliance Sampling Inspections





Toxicity/WET Testing





Basic Sample Collection and Handling Guidelines

- Representative samples.
- Sampling locations.
- Sampling techniques.
- Sample types.
- Sample preservation, volume, holding time.
- Containers
- Documentation.
- Submitting samples.
- Submitting samples for WET testing.



Representative Point

A representative point is defined in the Federal Register as a location in process waters or wastewaters where specific conditions or parameters are measured that adequately reflect the actual condition of those waters or wastewaters.



Representative Time

- Need to consider time of day and day of week.
- Monday is washday.
- Kill day at a local packing plant.
- Non-production days.
- Limited shifts.



Influent Sampling Locations

- Collect from permitted/representative location.
- Collect from areas of high, turbulent flow.
- Sampling points should be above return lines.
- Make sure sampling equipment does not interfere with flow measuring devices.



Influent Sampling Locations

- After the comminutor (in the absence of grit chamber).







Influent Sampling Locations

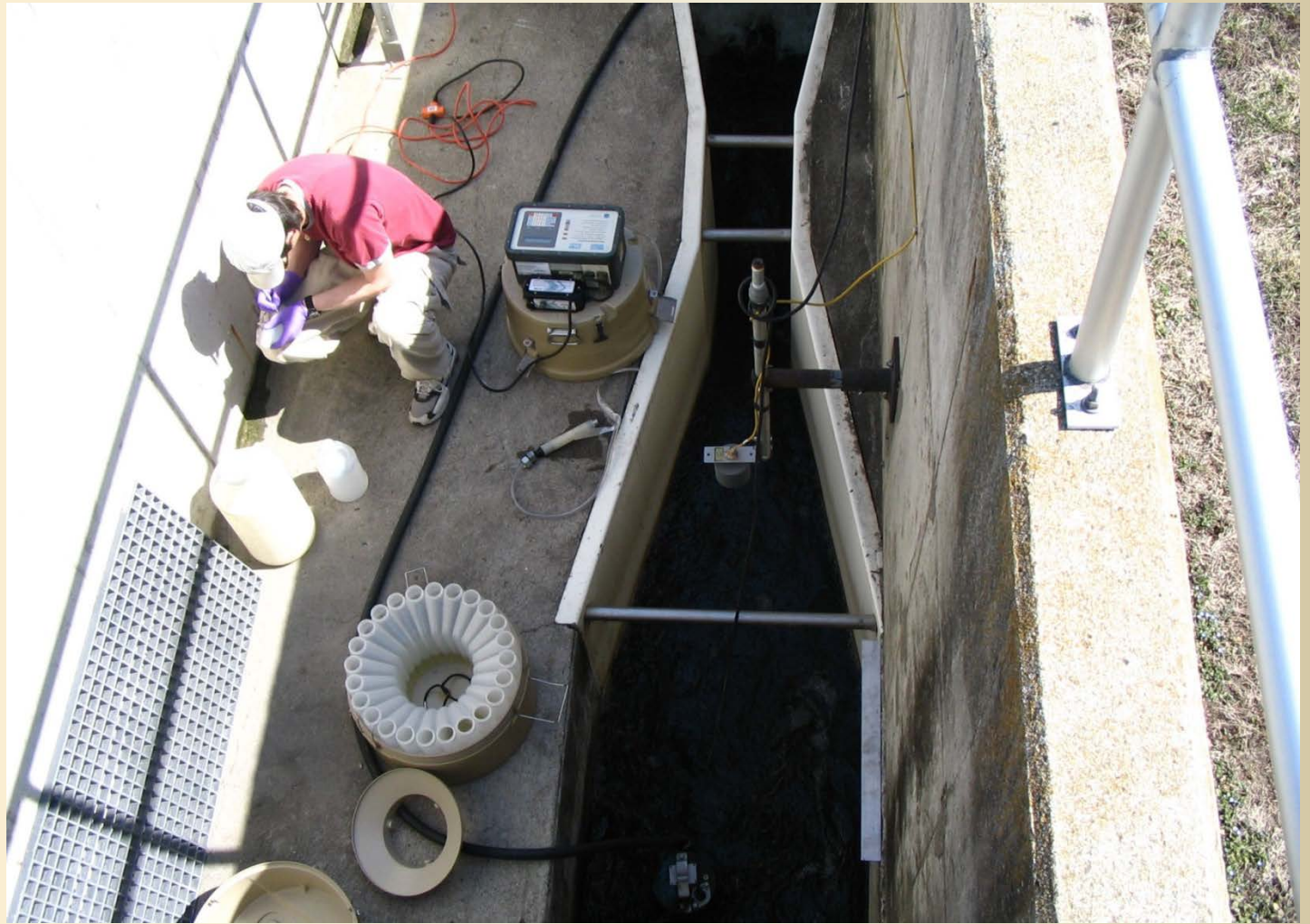
- After the comminutor
- After the bar screen





Influent Sampling Locations

- After the comminutor
- After the bar screen
- Flume throat





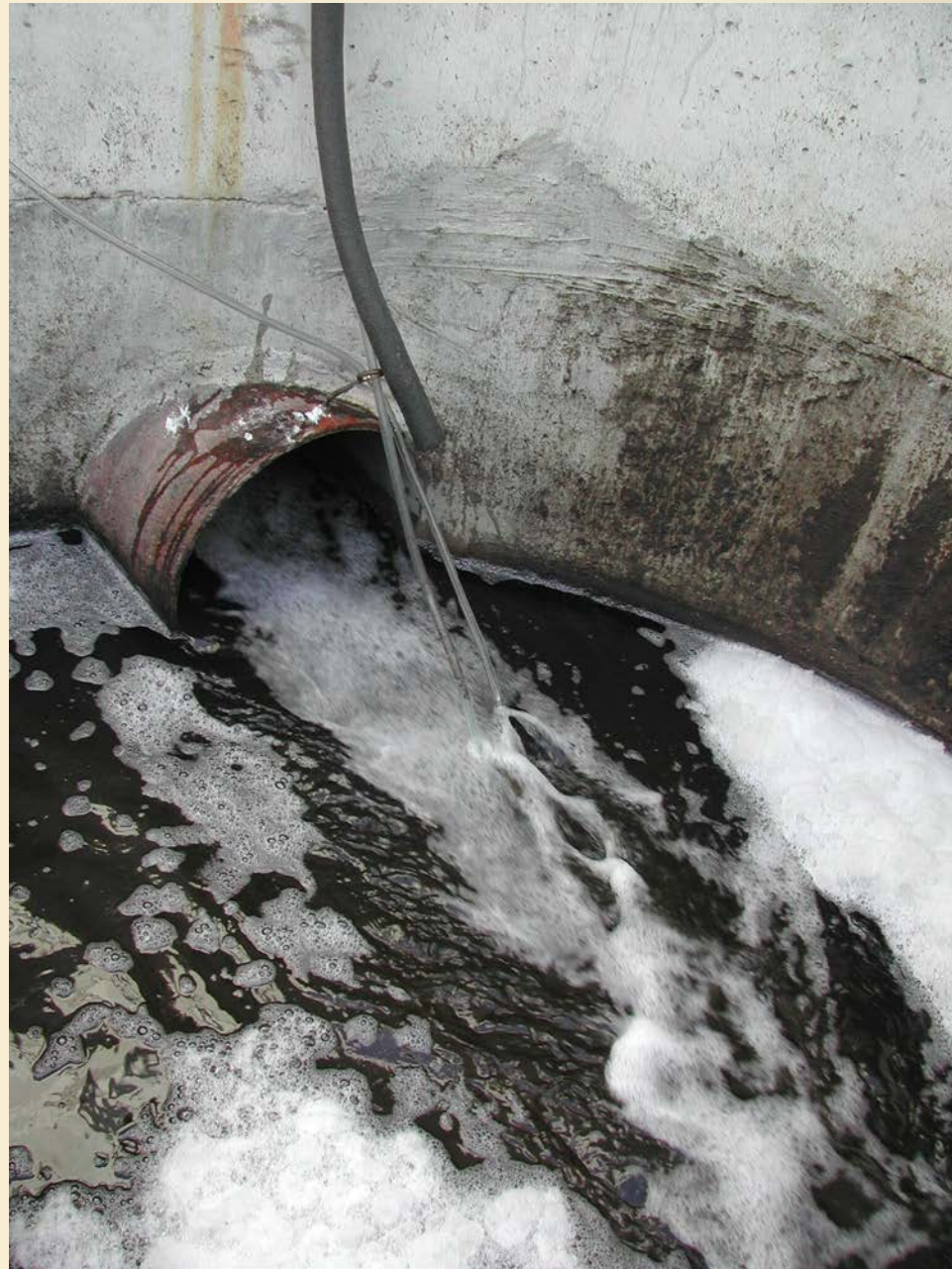
Influent Sampling Locations

- After the comminutor
- After the bar screen
- Flume throat
- Pump wet well (if turbulent)
- After pump wet well (upstream collection lines, tanks, distribution box)
- Aerated grit chamber
- Last process in a manufacturing operation



Effluent Sampling Locations

- Sample from location specified in permit.
- Most representative point after final treatment, downstream from all entering wastestreams.
- As near to the end of discharge pipe as possible.





Sampling Techniques

- Manual (grab or composite samples)
- Automatic samplers (grab, continuous or composite samples)
- Use method specified in permit.
- Some parameters should not be collected with an automatic sampler.



Manual Samples

- Take samples at permitted/representative location.
- Collect where wastewater well mixed.
- Avoid collecting large particles and objects.
- Face upstream, move upstream.
- Use special sampling device or collect with sample container.



Automatic Samples

- Take samples at permitted/representative location.
- Collect where wastewater well mixed.
- Collect near center of flow channel at mid-depth.
- Individual portions should be at least 100 ml.
- Velocity/tubing diameter.
- Time of sample collection begins when the last aliquot is dispensed.
- Some parameters should not be collected with an automatic sampler (coliforms, oil and grease, etc.)



Clean your sampling equipment!

Sampling equipment, whether a rope and bucket used for collecting grab samples or the tubing and bottles used in an automatic sampler, need to be cleaned or replaced regularly to prevent sample contamination.



Sample Types

- Grab Sample - Provides a "snapshot" of conditions when that sample was collected.
- Composite Sample - Represents the average characteristics of the waste stream during the time period sampled. Takes more time, effort and equipment. Not suitable for all analytes.



Grab Samples

- Individual samples collected over not more than 15 minutes when conditions are constant.
- Provide information about a specific time.
- Useful when the stream does not flow continually, such as batch dumps and metal platers.
- When the waste characteristics are relatively constant, for example lagoon dischargers.
- Parameters may change with storage or are not amenable to compositing (pH, DO, TRC, oil & grease, bacteria).
- Information on minimum or maximum or variability is desired.
- Corroborate composite samples.







Composite Samples

- Represents the average characteristics of the waste stream during the time period sampled.
- Samples are collected over time by continuous sampling or by mixing discrete samples.
- Should contain a minimum of eight discrete samples.
- Used to determine average concentration over a given time span.
- Use to calculate mass/unit time loading.
- Used when wastewater characteristics are highly variable.





Compositing Methods

- Time Composite
- Flow-Proportional Composite
- Sequential Composite
- Continuous Composite



Time Composite

- Constant sample volume, constant time interval between samples.
- Do not need special equipment.
- Requires no flow measurement.
- If flow is highly variable it may not be representative.
- Manual or automatic.



Flow-Proportioned Composite Method 1

- Constant time interval between samples, proportional sample volume.
- Manually composite samples from flow chart.
- Requires less equipment.
- Manual or automatic.





Flow-Proportional Composite Method 2

- Constant sample volume, variable time interval.
- Minimal manual effort.
- Requires accurate flow measuring equipment.
- Manual or automatic.



Flow or Time Composite?

- For most purposes a flow composite sample is preferable to a time composite sample.
- Unless the flow varies $>10\%$ over a twenty-four hour period there is no advantage to using a flow composite over a time composite sample.



Splitting a Composite Sample





Comparison of Split Samples



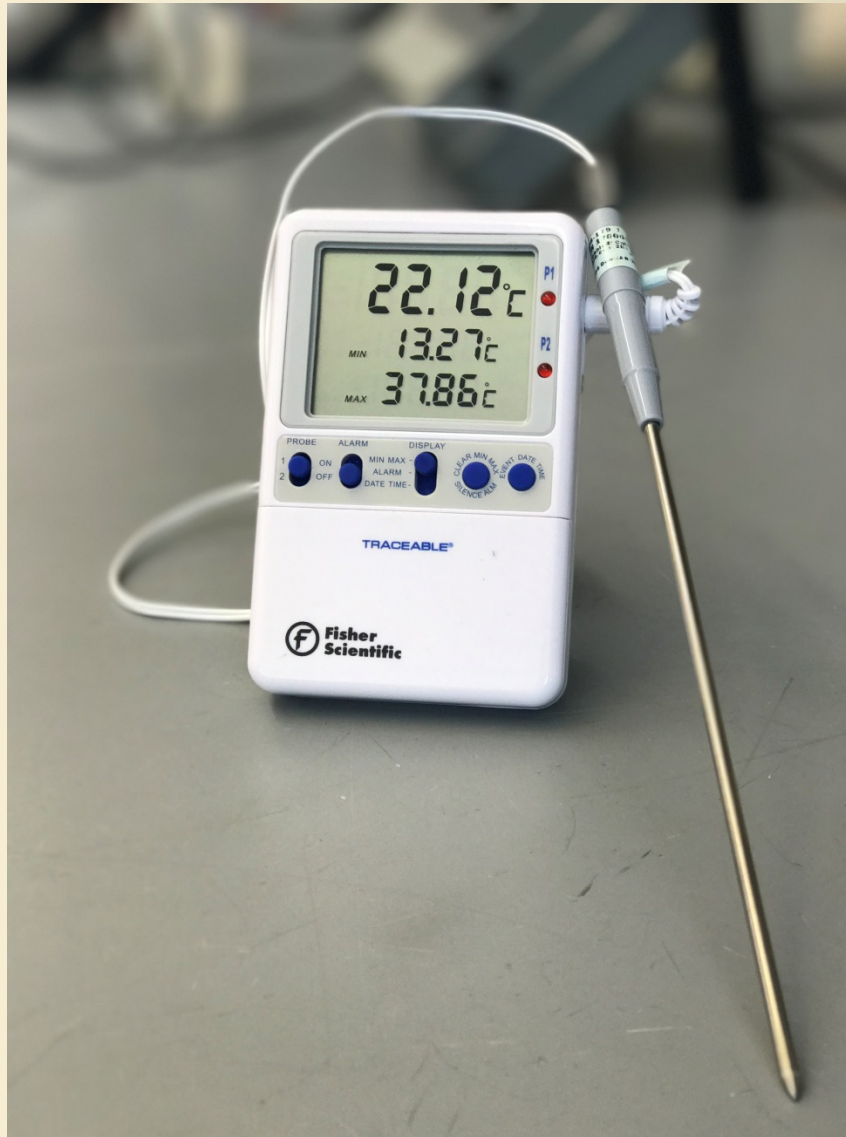


Field Measurements

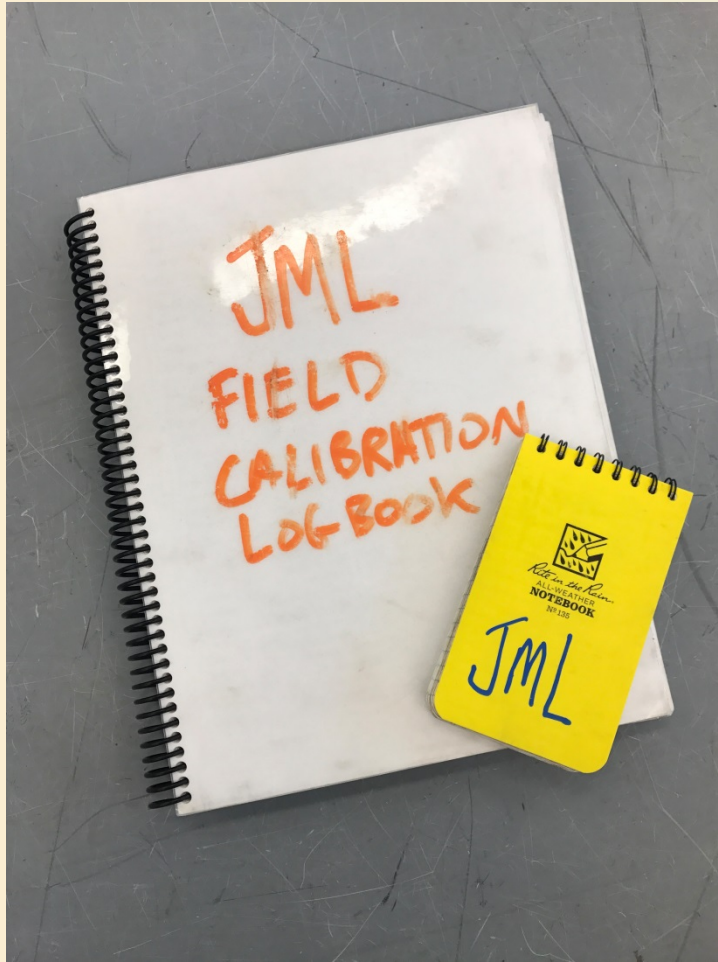
- Common field measurements:
 - Dissolved oxygen
 - pH
 - Temperature
 - Total Residual Chlorine (TRC)
- Variety of methods, models, and manufacturers.
- Calibration/Certification
- Record keeping











Date: _____	Time: _____	Site: _____	Collector: _____
pH meter #: _____	pH Calibration: 4 [] 7 [] 10 [] Slope: _____		Sample Temp: _____ °C
DO meter #: _____	DO Calibration: _____ mg/L @ _____ °C		Sample pH: _____
Turbidimeter #: _____	GELEX standards 0-10 _____ 0-100 _____ 0-1000 _____	Sample DO: _____ mg/L	
USGS: _____	SHIFT: _____	FLOW: _____	Sample Turb: _____ NTU

Date: _____	Time: _____	Site: _____	Collector: _____
pH meter #: _____	pH Calibration: 4 [] 7 [] 10 [] Slope: _____		Sample Temp: _____ °C
DO meter #: _____	DO Calibration: _____ mg/L @ _____ °C		Sample pH: _____
Turbidimeter #: _____	GELEX standards 0-10 _____ 0-100 _____ 0-1000 _____	Sample DO: _____ mg/L	
USGS: _____	SHIFT: _____	FLOW: _____	Sample Turb: _____ NTU

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USGS: _____	SHIFT: _____	FLOW: _____	Sample Turb: _____ NTU

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pH meter #: _____	pH Calibration: 4 [] 7 [] 10 [] Slope: _____		Sample Temp: _____ °C
DO meter #: _____	DO Calibration: _____ mg/L @ _____ °C		Sample pH: _____
Turbidimeter #: _____	GELEX standards 0-10 _____ 0-100 _____ 0-1000 _____	Sample DO: _____ mg/L	
USGS: _____	SHIFT: _____	FLOW: _____	Sample Turb: _____ NTU





Sample Preservation

In most cases, wastewaters contain one or more unstable pollutants that require immediate analyses or preservation. The rate of change of pollutant concentration is influenced by temperature, pH, bacterial action, concentration and inter-molecular reactions. Since treatment to fix one constituent may affect another, preservation frequently necessitate the collection of multiple samples or the splitting of a single sample into multiple parts.



Sample Preservation

- Keep samples cool (4 °C), even when using an automatic sampler.
- pH adjustment
- Chemical treatment
- Holding times begin when last aliquot is collected.
- When using an automatic sampler, chemical treatment can begin after last aliquot is collected.



Important Reminder Regarding Sample Volume

Samples that appear “clean” typically require more sample volume for analysis than samples that appear “dirty” .

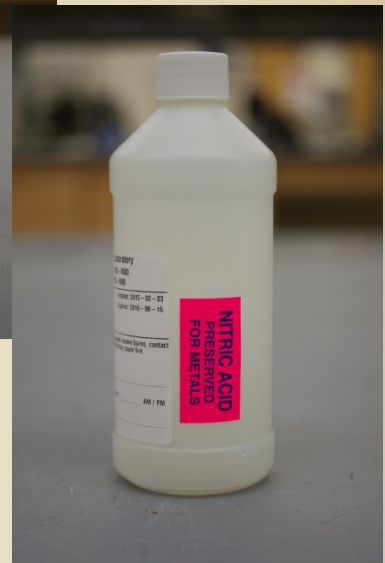
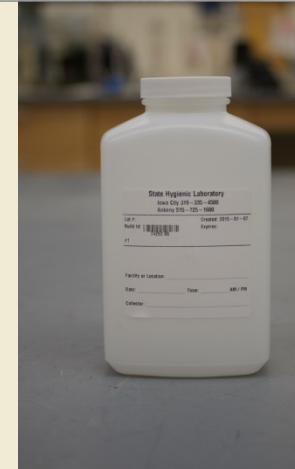
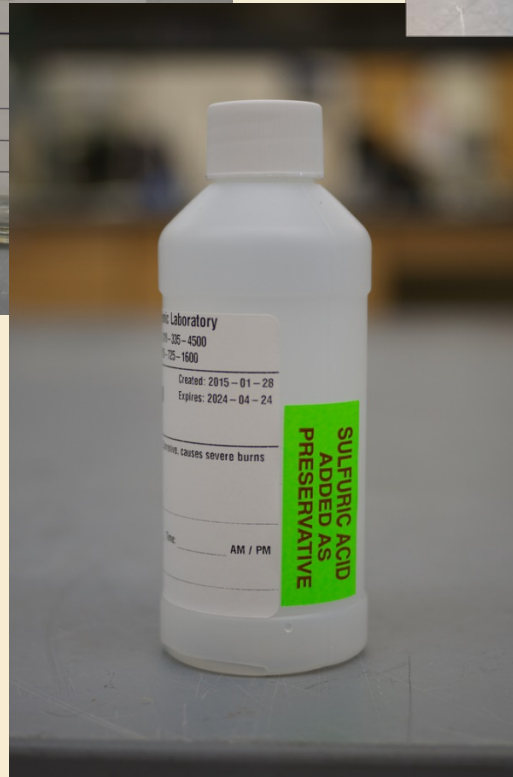
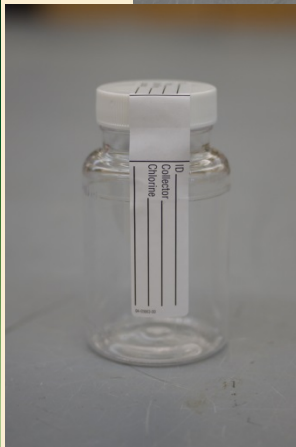
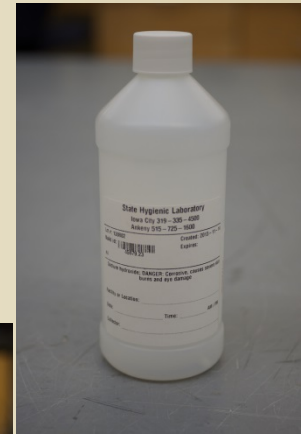
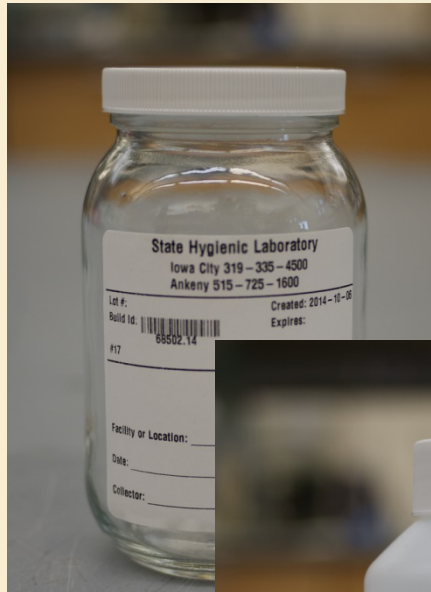


Tests with Short Holding Times

- Bacterials – MFC, enterococci, E.coli – ideally < 6 hrs
- BOD – All types - <48 Hours
- Hex Cr - <24 Hours
- Filterable (Ortho) P - <24 Hours
- Turbidity - <24 Hours
- Nitrite N - <48 Hours

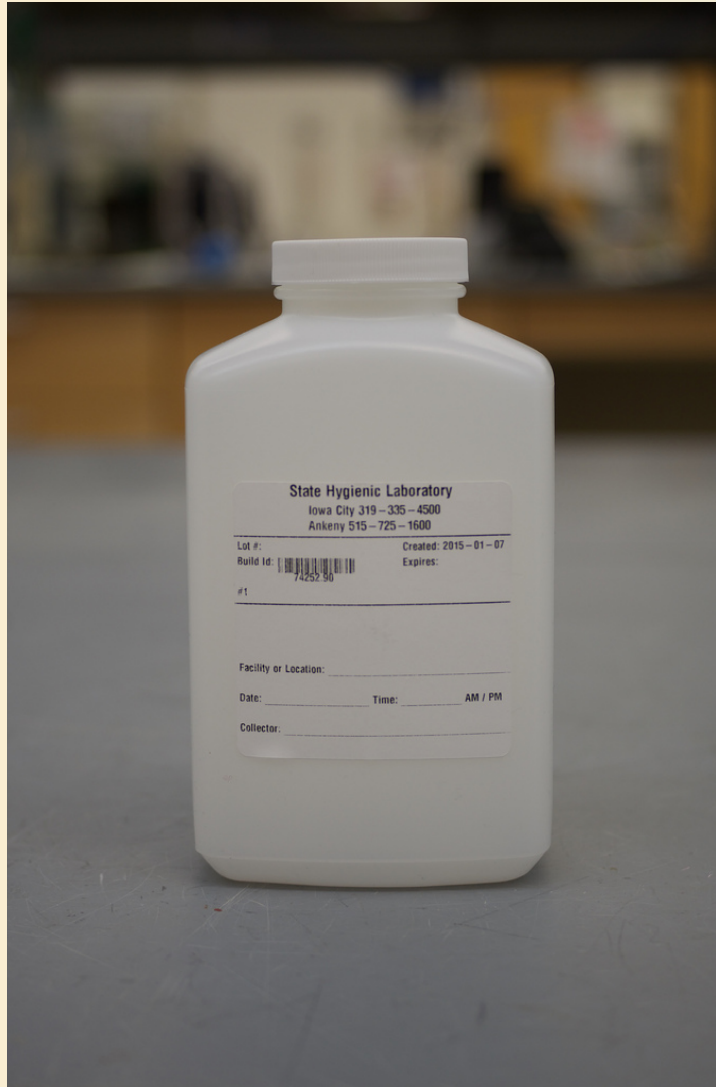


Sample Bottles





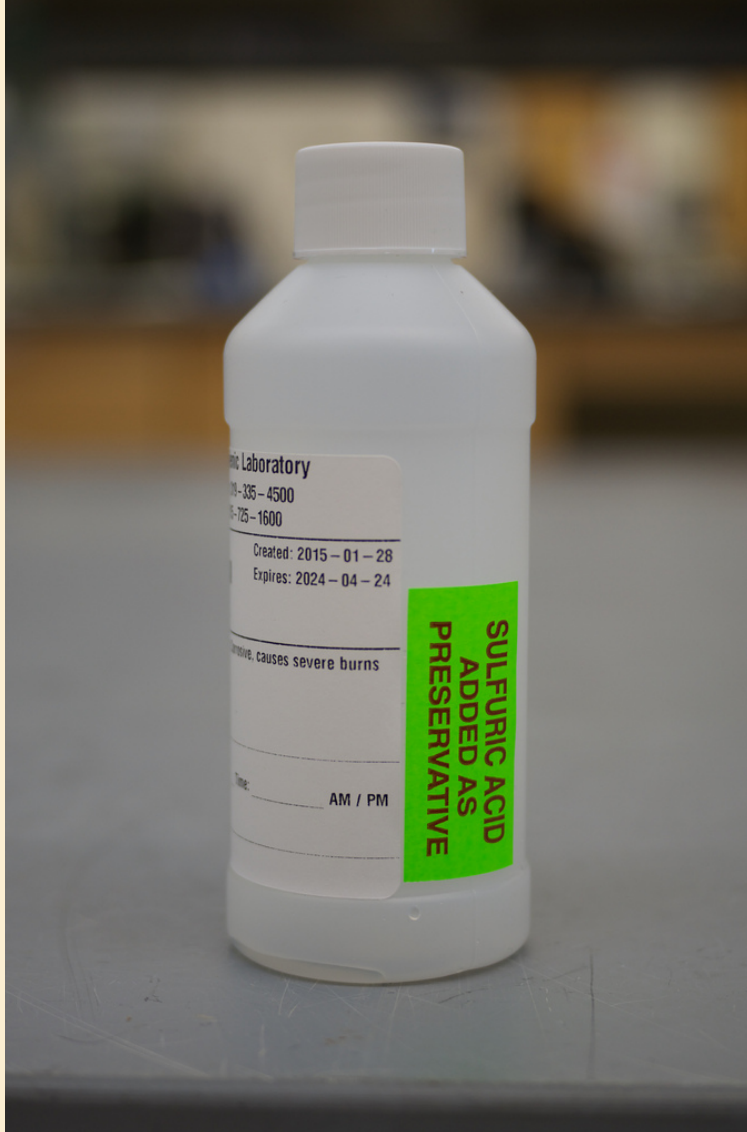
Number 1



- 1000 ml plastic
- Used for BOD, solid series, multi-analyte samples



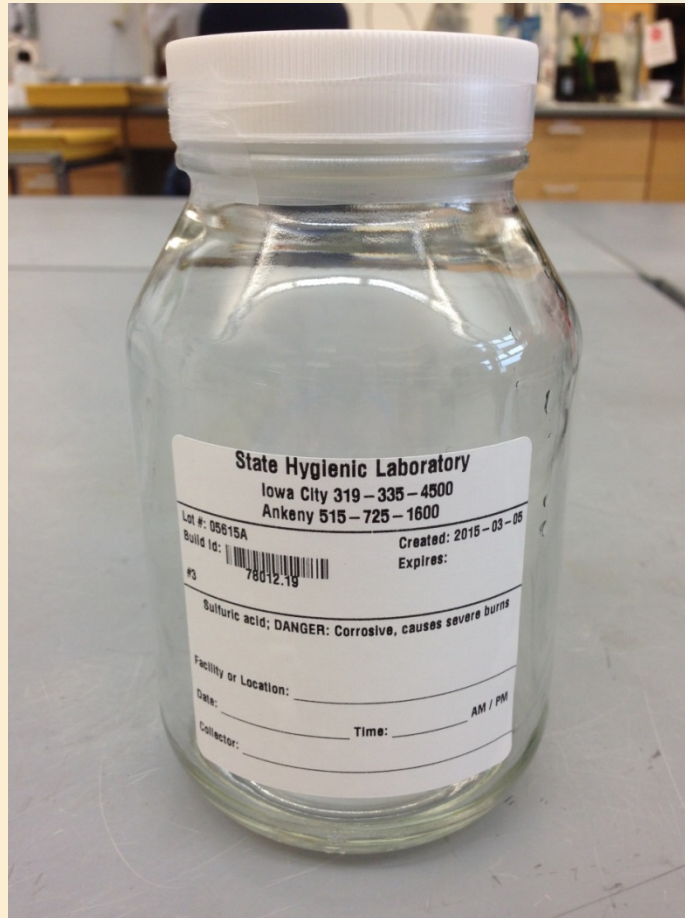
Number 2



- 250 ml plastic with sulfuric acid
- Used for:
 - Ammonia Nitrogen
 - TKN
 - Nitrate + Nitrite N
 - Total P



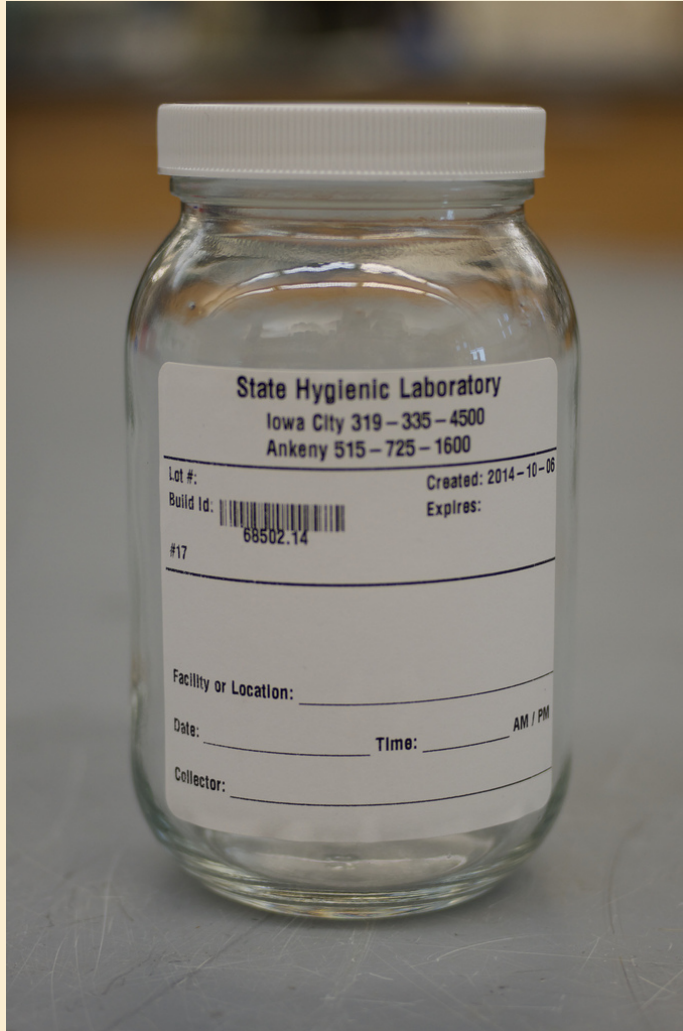
Number 3



- 1 liter glass with sulfuric acid.
- Used for oil & grease analysis.



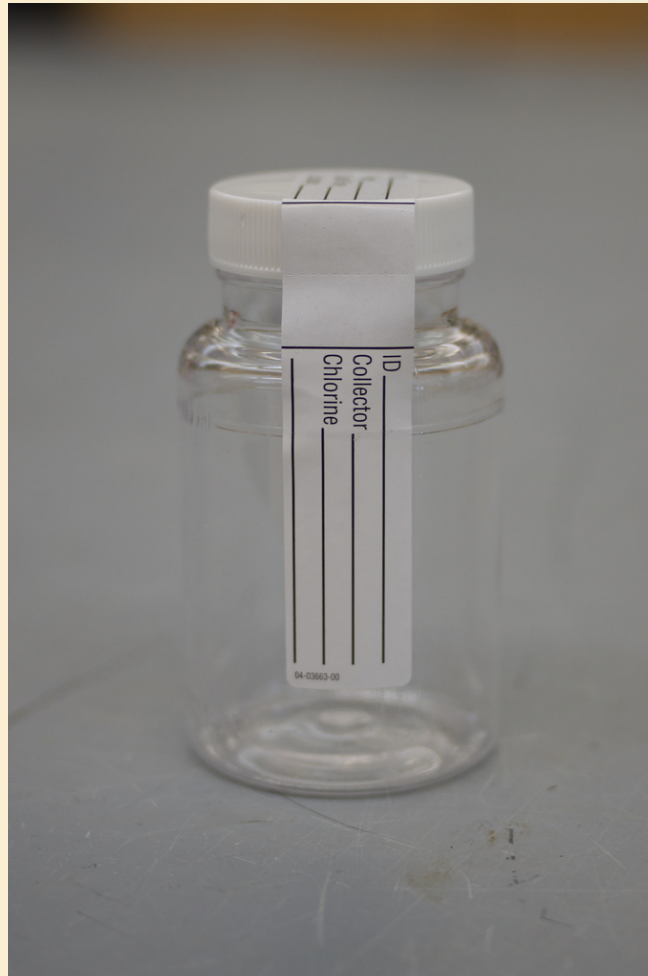
Number 17



- 1 pint glass
- Collection of Sludges



Number 32



- Sterile 125 ml plastic
- Used for:
 - Fecal coliforms
 - E. coli
 - Enterococci



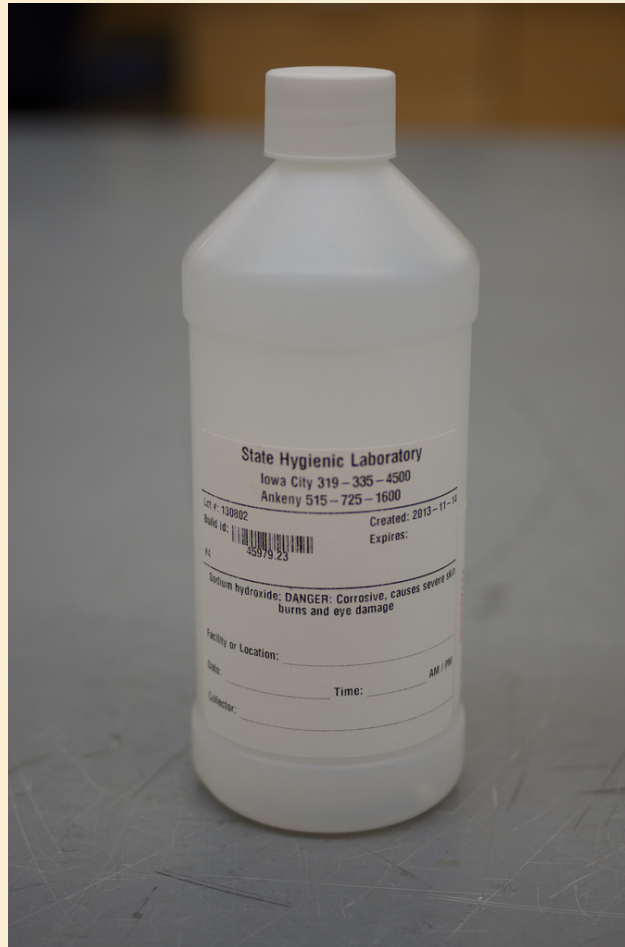
Number 7



- 500 ml plastic with nitric acid.
- Used for most metals (i.e. Cd, Cr, Ni, Cu, Pb, Zn & Ag).
- Not to be used for Cr6



Number 4



- 500 ml plastic with sodium hydroxide pellets.
- Used for cyanide analysis.

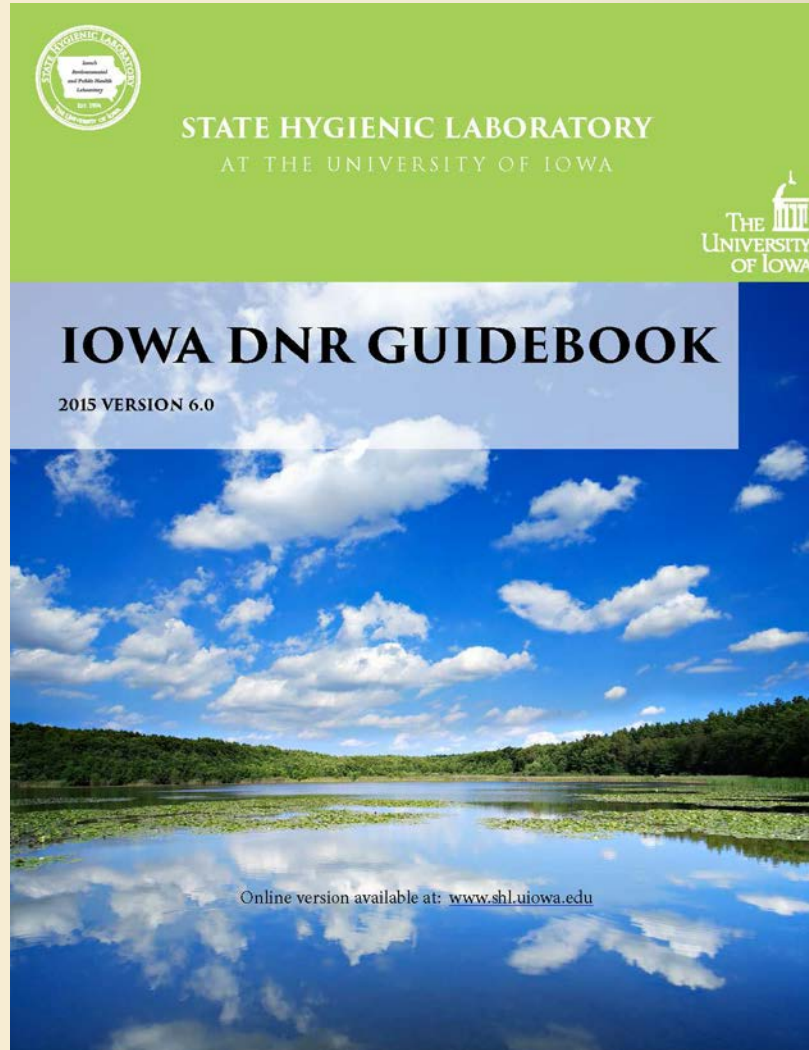


Cubitainer





http://www.shl.uiowa.edu/publications/IDNR_Guidebook.pdf





Sampling Information Needed

- Facility name and location
- Site location
- Bottle number
- Collector's name
- Date and time
- Grab or composite (with time and volume information)
- Preservative




Order #: 106338 


Pages in Order: 1 of 1

Containers in Order: 2

REPORT TO:

422 
 JOHN MILLER
 SHL LIMNOLOGY
 2220 S ANKENY BLVD
 ANKENY, IA 50021-

BILL TO:

422 
 JOHN MILLER
 SHL LIMNOLOGY
 2220 S ANKENY BLVD
 ANKENY, IA 50021-

Requested Analyses/Tests

BOD, Ammonia-Nitrogen.

Complete or correct the following information

Collected Date: **2016-04-07**

yyyy-mm-dd

Collected Time: **13:00**

24 hour format hh:mm

Client Reference: _____

Is Hazardous: _____

Collector: **luzier, jim**

Print last, first name

Location: **outfall #0001 grab sample**

kitchen sink, plant tap, etc.

Location City: **ANKENY**

Collector Phone: **515-725-1638**

000/11-2222

Description: **wastewater**

Environmental
Sample Collection Form

State Hygienic Laboratory

Lakeside Laboratory
 1838 Highway 86
 Milford, IA 51351-7267
 Phone # 712-337-3869

Ankeny Laboratory
 2220 S. Ankeny Blvd.
 Ankeny, IA 50023-8093
 Phone # 515-725-1600
<http://www.shl.uiowa.edu>

U of I Research Park
 2480 Crosspark Road
 Coralville, IA 52241-4721
 Phone # 319-335-4600 or
 800-421-IOWA



EN 062015

Chain of Custody/Tracking Signatures

Relinquished By: _____

Date/Time: _____

year / mm / dd Military Time

SHL Sample Receiving Custodian: _____

Date/Time: _____

year / mm / dd Military Time

Relinquished By: _____

Date/Time: _____

year / mm / dd Military Time

SHL Sample Receiving Custodian: _____

Date/Time: _____

year / mm / dd Military Time

For SHL Use Only -- Please do not write below this line

Received By: _____

pH: _____

Evidence of Tampering: Yes No

Evidence of Cooling: Yes No

Date Printed: 2016-04-04

Temperature (Celsius): _____

Bottles Received: _____

Thermometer ID: _____

FOR INTERNAL USE ONLY

FOR INTERNAL USE ONLY

FOR INTERNAL USE ONLY





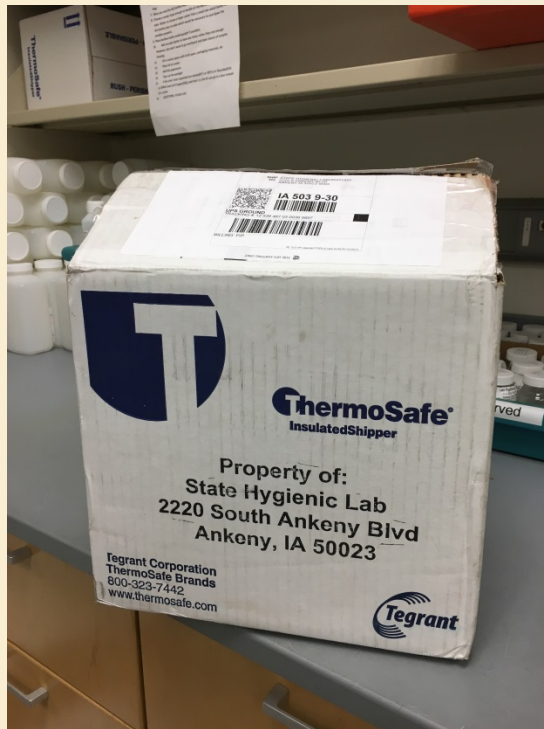
Sample Information and Identification

- Provide complete and accurate information for each sample.
- Use moisture resistant labels and ink.
- A unique bottle number should be associated with the bottle and data sheet.
- Any unusual circumstances should be identified.
- If legal action is possible, remember to include a chain of custody form.



Sample Submission Guidelines

- Samples should be shipped in a cooler with wet ice or ice pack.
- Temp upon receipt $\leq 6^{\circ}$ C.
- Glass bottles should be packed to avoid breakage.
- Paperwork should be filled out completely.
- If required, samples should be clearly identified as "RUSH".





Other Sample Submission Tips

- Ship time sensitive samples so they arrive within holding time.
- Include cell phone number.
- Ice samples, even if delivering same day.
- Ice packs: put in deep freeze, use all provided.
- Sample Receiving staffed until 5:00 PM, but arrangements can be made for after hours deliveries.



Sample Submission Outside of “Normal Hours”

If possible, samples submitted to the laboratory outside of normal working hours, 8:00 AM to 5:00 PM, need to be arranged in advance. Please contact the lab to make the necessary arrangements. The Ankeny lab is staffed 24/7, but you will still need to contact us for a delivery after hours.



WETT Samples

- Previous clients are sent a reminder letter.
- Tests are only set up on Tuesdays and Wednesdays.
- 36 hour holding time; ship using overnight courier.
- Expand cubitainer and fill completely, expelling all air.
- Call if you have any problems or questions.
- 515-725-1648



Where to find us - Ankeny

2220 S. Ankeny Blvd
Ankeny, IA 50023

515-725-1600 (main)
515-725-1642 (fax)

Contacts: Don Simmons, Jessie
Elliot, Brian Wels, Jim Luzier, Misty
O'Leary



Where to find us - Coralville

University of Iowa Research Park
2490 Crosspark Road
Coralville, IA 52241

515-335-4500 (main)

515-335-4555 (fax)

800-421-4692 (toll free)

Contacts: Susie Dai, Sherri Marine,
Michael Schueller



If it's an Emergency call
the SHL Duty officer!

319-335-4500

Ankeny Duty Officer
515-975-5374



You can find us on the
web at:

www.shl.uiowa.edu





Questions?