From Sample to Report: Making Sense of Wastewater Data



NOWRA Mega Conference

October 2026

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About Me

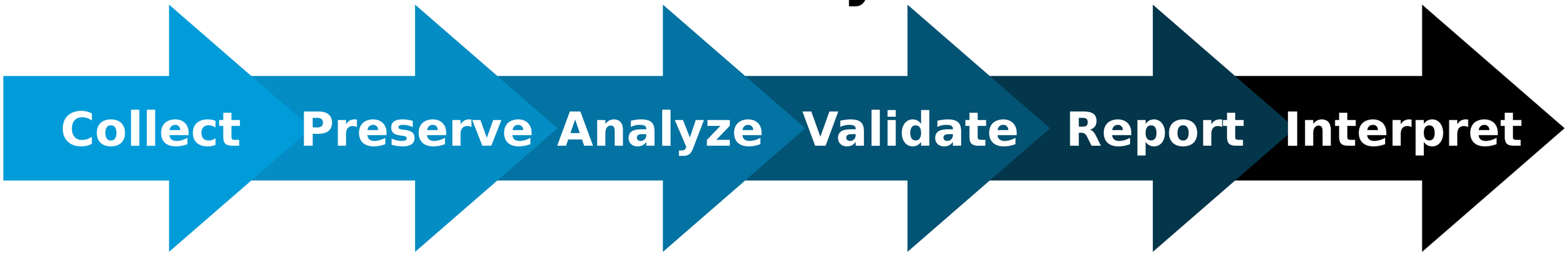


Brenda Leaz-Cresie, MSc

- Director of Strategic Accounts, Anua
- 20 Years soil & water analytical testing (ASTM / Standard Methods)
- 10+ years of on-site wastewater industry experience
- Municipal wastewater bench-scale treatability studies
- BSc & MSc in Environmental Science & Management (Texas A&M / UMUC)

From Sample to Decision

Every number on a laboratory report has a history.



The interpretation is only as strong as the steps that came before it.

Why Report Literacy Matters

Real-world example

- A system can be performing properly while the paperwork says otherwise.
- Scan QR code to view the presentation’s sample report



Presentation Inspiration

Duplex Community in North Central Mississippi

- **Situation**
  - Called on-site to troubleshoot ammonia non-compliance
- **Solution**
  - Did a test strip
- **Results**
  - Rest strip had favorable results
- **Conclusion**
  - Lab reports were being misinterpreted

Discussion Points

What You'll Learn Today

1. **Understanding Wastewater Parameters:** Why we
2. measure them
3. **Sample Integrity:** Collection, holding, and preservation
4. **Reading Reports:** Units, limits, and qualifiers
5. **Data Context:** Operations vs. compliance

Preventing Misinterpretation: Avoiding false alarms

Understanding Wastewater Parameters

- Why do we test?
- What do we measure?
- What do the common parameters tell us?



Testing Purpose

Start with the question the data must answer.

Treatment Performance

Removing intended contaminants?

Compliance

Meeting required standards?

Troubleshooting

What changed and where?

Baseline / Trend

Stable over time?



Every useful report relies on understanding what we test in wastewater and why it matters.



Parameters

Common wastewater parameters tell different parts of the story.

BOD
Biodegradable organic load

TSS
Suspended solids / solids carryover

Supporting Parameters
pH, temperature, dissolved oxygen, alkalinity, and others

Pathogens / Indicators
Microbiological risk indicators

Nutrients
Nitrogen and phosphorus forms

Interpretation Mindset

Do not interpret every parameter in isolation.

1 result	**=**	**clue**	**several results**	**= pattern**

Interpretation Mindset

Example:

Elevated BOD
+
Elevated TSS

Investigate more than BOD

Interpretation Mindset

Context matters:

Sampling location

Operating conditions

Historical data

Applicable requirements

These affect how a result should be understood.

Sample Integrity





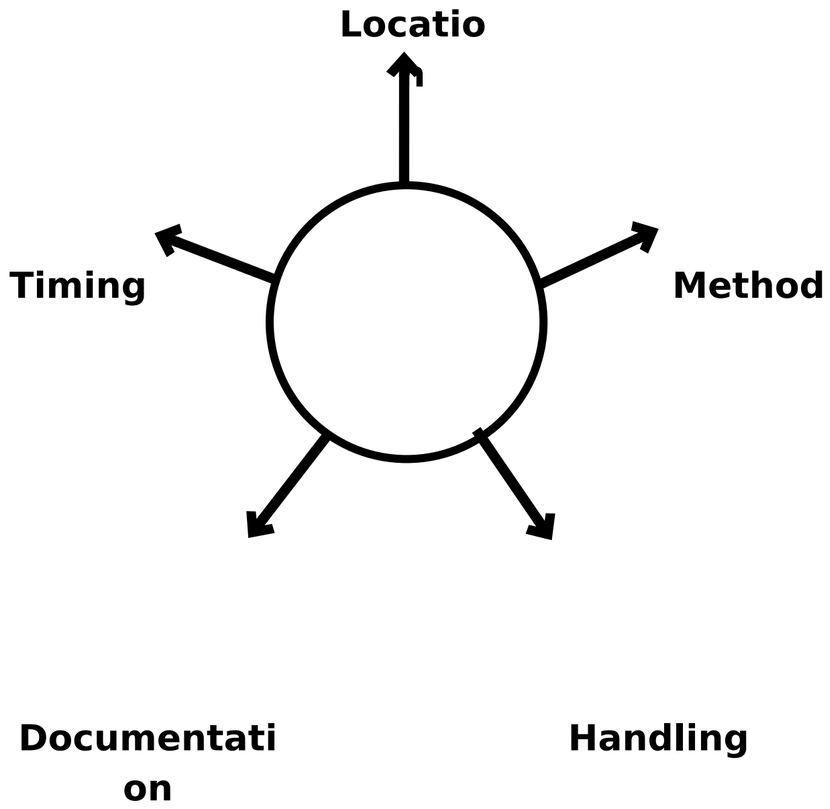


A **reliable sample** is important. The lab analyzes the sample it receives, not the wastewater we hoped we collected.

Sampling

What makes a sample representative?

- Correct sampling location
- Appropriate timing and sample type
- Adequate mixing / representative conditions
- Clean technique & contamination control
- Clear documentation of unusual conditions



Grab vs. Composite Samples

Grab

- Represents a **specific point in time**
- Used when:
  - time matters
  - parameters can change rapidly

Composite

- **Combines mulitple aliquots** over a period to represent **average conditions**
- Requires additional planning & handling

Sample type depends on the monitoring objective, method and applicable requirements.

MICRO-METHODS LABORATORY, INC.

Chain of Custody Record

6500 Sunplex Drive, Ocean Springs MS 39564
(228) 875-6420
www.micromethodslab.com

Lab ID# MS00021
LELAP ID # 01960
TNI ID # TNI01397

Print Form

M-M Lab WO #

Company Name: Brenda Faz
Address:

Project Manager: Brenda Faz
Purchase Order #:
Mail Address: bjmartinez@yahoo.com
Sampler Name Printed: A M in
Sampler Name Signed:

Turn Around Time & Reporting
Our normal turn around time is 10 working days

_x_Normal _Next Day* _2nd Day* _Other*
*All rush order requests must be prior approved.
_Phone _Mail _Fax _Email

yes Requested

QC Level: Level 1 Level 2 Level 3

Preliminary Analytical

BRE-3540

Sample Identification	Sampling Date/Time	Matrix Code	Preservative	# of Containers	Grab (G) or Composite (C)	Ammonia as N	BOD	COD	Total phosphorus	Field Test ID#	Field Test ID#	Field Test ID#	Field Test ID#
Blank	7-20-26/1400	SL		3	G	X	X	X	X				
BRE-TC1	7-20-26/1400	SL		3	G	X	X	X					

Received on Ice: Y N Thermometer# Cooler # Temp Corrected °C
Date & Time: Sampled By:

Matrix:
W = Water
DW = Drinking Water
S = Solid
SO = Soil
SE = Sediment
L = Liquid
A = Air
O = Oil
SL = Sludge

Preservation:
1= H_2SO_4
2= H_3PO_4
3=NaOH
4=$ZnC_4H_{10}O_6$
5=$ZnC_4H_{10}O_6$ & NaOH
6=HNO_3
7=$Na_2S_2O_3$
8=HCl
9=$NaHSO_4$

All Temps are Corrected Values

	Printed Name	Signature	Company	Date	Time
Relinquished by					
Received by					
Relinquished by					
Received by					
Relinquished by					
Received by			Project Name:		

Notes:

by

Received

Project #:

Samping Handling

Bottle
Correct container / sterile where required

Preservation
Method-specific chemical or physical preservation

Temperature
Maintain required conditions during transport

Holding Time
Analysis must occur within applicable window

A technically precise analysis cannot repair a compromised sample.

Sampling Problems

Common sampling problems to catch early:

Wrong bottle or preservative

Incorrect sampling point

Incomplete labeling

Contaminated equipment

Sampling Problems

Common sampling problems to catch early continued:

Improper cooling

Collection time not recorded

Holding time exeeded

Unusual conditions not documented

General Wastewater Compliance Table

Parameter	Required Container	Field Preservation	Max Holding Time
pH	Plastic (Polyethylene) or Glass	None (Analyze immediately)	**15 minutes**
Chlorine, Total Residual	Plastic or Glass	None (Analyze immediately)	**15 minutes**
Dissolved Oxygen (DO)	Glass bottle & top (Winkler)	None (Probe) or Fix on-site	**15 minutes** (Probe) / 8 hours (Winkler)
BOD / CBOD	Plastic or Glass	Cool ≤ 6°C	**48 hours**
Total Suspended Solids (TSS)	Plastic or Glass	Cool ≤ 6°C	**7 days**
Total Dissolved Solids (TDS)	Plastic or Glass	Cool ≤ 6°C	**7 days**
Fecal Coliform / E. Coli	Sterile Plastic or Glass	Cool < 10°C + $Na_2S_2O_3$ (if chlorinated)	**8 hours** (6 hrs to lab / 2 hrs for lab setup)
Ammonia / TKN	Plastic or Glass	Cool ≤ 6°C + H_2SO_4 to pH < 2	**28 days**

Total Phosphorus	Plastic or Glass	Cool ≤ 6°C + H_2SO_4 to pH < 2	**28 days**
Nitrate + Nitrite	Plastic or Glass	Cool ≤ 6°C + H_2SO_4 to pH < 2	**28 days**
Nitrate (alone) / Nitrite (alone)	Plastic or Glass	Cool ≤ 6°C	**48 hours**
Oil & Grease (HEM)	Wide-mouth Amber Glass	Cool ≤ 6°C + HCl or H_2SO_4 to pH < 2	**28 days**
Metals (except Mercury)	Plastic or Glass	HNO_3 to pH < 2	**6 months**
Mercury (Total)	Plastic or Glass	HNO_3 to pH < 2	**28 days**
Volatile Organics (VOCs)	40 mL Glass VOA Vials	Cool ≤ 6°C + HCl to pH < 2 (Zero Headspace)	**14 days** (7 days if unpreserved)

Critical Sampling Rules for NELAP Compliance

- **The "Cool ≤ 6°C" Rule:** Samples must be cooled to **above freezing but ≤ 6°C** during transit. Per TNI standards, if samples arrive at the lab on the same day they were collected, they are acceptable if they are on ice and the cooling process has begun.

Reading Reports







Inside the lab, every step works together to transform your sample into defensible data.

Laboratory Process

From receiving bench to final report.



Each step creates information that may appear somewhere in the final report or case narrative.

Quality Control

Purpose: Did the analytical process behave as expected?

Blanks
Check for contamination

Duplicates
Check reproducibility

Control Samples
Verify method performance

Calibration Checks
Confirm instrument response

Spikes
Evaluate recovery / matrix effects

Data Validation

Before release, the data are reviewed in context.

- Were holding times met?
- Did quality-control results meet criteria?
- Was dilution or reanalysis required?
- Was the result within the calibrated range?
- Were interferences or sample-condition issues observed?
- Does the result need a qualifier or comment?
- Clean technique & contamination control
- Clear documentation of unusual conditions

Anatomy of a Lab Report

Fields on Report	Questions to Ask:
• Sample / Project info • Collection info • Analyte • Result • Units • Reporting limit • Method • Qualifier / comments	• Is this the right sample? • What was measured? • Which number is the result? • What units apply? • Are there limits, flags, or comments?

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7648 Hickory Ridge Dr.
Denham Springs LA, 70706

Project:Preliminary Analytical
Project Number:BRE-3540
Project Manager:Brenda Faz

Reported:
07/30/2026
11:24

BRE-TC1
2607365-02
(Water)

Analyte	Result	MRL	Units	Dil	Batch	Analyst	Date Time Prepared	Date Time Analyzed	Method	Qualifiers
Classical Chemistry Parameters										
Ammonia as N	***68.7***	10.1	mg/L	100.0	6G24016	CDV	07/24/2026 09:10	07/24/2026 14:41	Lachat 10-107-06-1-I SM	
Biochemical Oxygen Demand	***8230***	4000	"	1.0	6G21068	JAV	07/21/2026 15:11	07/26/2026 13:30	5210B 2016	
Chemical Oxygen Demand	***14300***	1920	"	250.0	6G23006	DLW	07/23/2026 08:45	07/23/2026 15:35	EPA 410.4 1993	
Metals by EPA 200 Series Methods										
ICP-AES										
Phosphorus 178.284 [Axial]	***25.8***	0.050	mg/L	1.0	6G24009	CLV	07/24/2026 11:30	07/28/2026 10:44	EPA 200.7 Rev 4.4	

First Question to Ask

Is this the sample you think it is?

- Client / project
- Laboratory sample ID
- Sampling location
- Matrix
- Collection date and time
- Received date and time

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date/ Time Sampled	Sampled by	Date/ Time Received
Blank	2607365-01	Water	07/20/2026 14:00	Alyssa Martin	07/21/2026 08:08
BRE-TC1	2607365-02	Water	07/20/2026 14:00	Alyssa Martin	07/21/2026 08:08

Sample Receipt Conditions

Date/Time Received: 7/21/2026 8:08:00AM

Received by: Sarah E. Tomek

Date/Time Logged: 7/21/2026 8:16:00AM

Shipped by: Client Delivery

Submitted by: Alyssa Martin

Logged by: Sarah E. Tomek

Cooler ID: client cooler

Receipt Temperature: 6.8 °C

Cooler Custody Seals Present	No	Received on Ice but Not Frozen	Yes
Containers Intact	Yes		No
COC/Labels Agree	Yes	No Ice, Short Trip	No
Labels Complete	Yes	Obvious Contamination	No
COC Complete	Yes	Rush to meet HT	Yes
Volatile Vial Headspace >6mm	No	Received within HT	Yes
Field Sheet/Instructions Included Samples	No	Proper Containers for Analysis Correct	Yes
Rejected/Documented in Log	Yes	Preservation	Yes
Temp Taken From Temp Blank	No	Adequate Sample for Analysis Sample Custody Seals Present Samples	No
Temp Taken From Sample	No		
Container Temp Taken From	Yes		

Interpreting Values

- **Not every number** on the report **is “the result”**
- **Values** may appear near each other but they **are not interchangeabl**

Reporting Limit
The laboratory threshold used for reporting.

Measured Result
The analytical value reported for the sample.

Operational Target
A performance goal used to manage the process.

Compliance Limit
A regulatory or permit threshold, if applicable.

Units & Reporting Limits

Units and reporting limits can change the interpretation.

Check the Units:

- mg/L, µg/L, MPN, CFU cannot be compared casually
- Confirm unit before comparing a result to a target or form

Read “Less Than” Carefully:

- A non-detect or “<” value ≠ zero
- It is a limit of measurement or reporting

Qualifiers & Comments

They are part of the results. A number without its qualifier can be an incomplete interpretation.

- Estimated result
- Holding-time exception
- Dilution
- Matrix interference
- Quality-control exception
- Sample-condition issue

Qualifier codes vary by lab.
Use the definitions supplied with the report.

CASE NARRATIVE SUMMARY

All reported results are within Micro-Methods Laboratory, Inc.defined laboratory quality control objectives unless detailed in narrative summary or identified as qualifications. NOTE: All results listed on this report are calculated on a wet weight basis (as received by the laboratory) unless otherwise noted in the analysis qualification sections.

Summary Comments: ***No Summary Comments***

COD-EPA 410.4 1993

Qualifiers:

M1 MS/MSD Recovery limit exceeded.

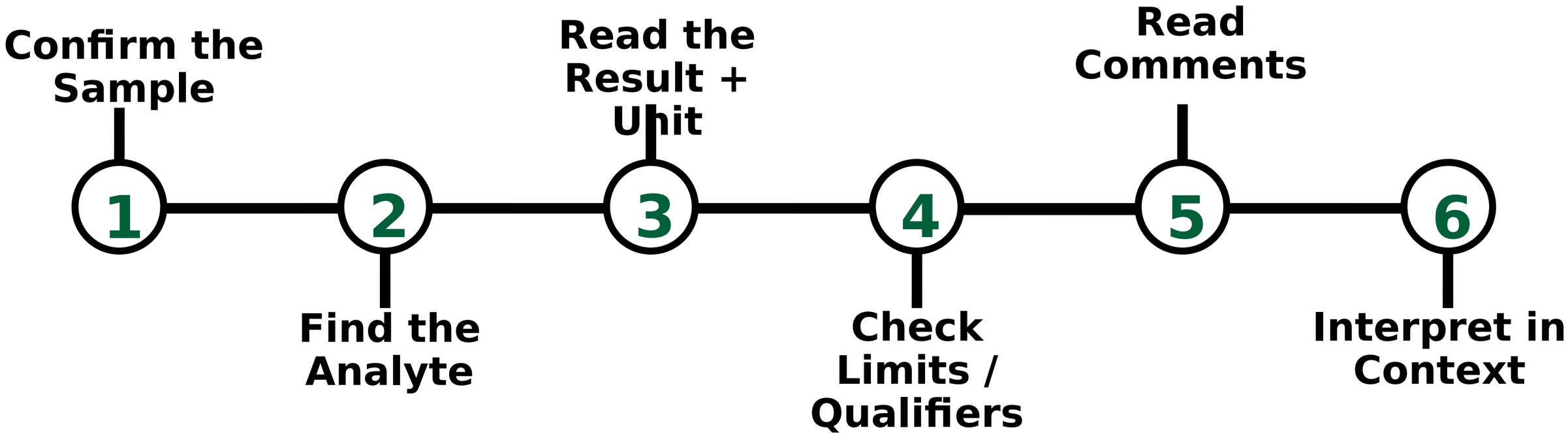
Chemical Oxygen Demand

6G23006-MSD1



A **consistent** reading routine **reduces** the chance of selecting the wrong value simply because it is prominent on the page.

Systematic Report Reading



Data Context



Interpret Results in Cont

Related Parameters

Do other results support the same conclusion?

Historical Trend

Is this normal for this system and reason?

Operating Conditions

What was happening when the sample was

Requirements

Which regulation, permit, or operating target applies?

Application

Operational Interpretation

- What is happening in the treatment process?
- Does the system need investigation or adjustment?

Compliance Interpretation

- What requirement applies?
- Which result belongs on the form?
- How must the result be reported?

The same laboratory report may support both conversations, but the questions are different.

Lab Report Walkthrough

- Confirm sample identity
- Locate requested analytes
- Read result + units
- Check reporting limits and qualifiers
- Review comments / narrative
- Discuss operational or compliance meaning

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Real-World Application

Case Study: When the system was not the problem.

- **Duplex Community in North Central Mississippi**
  - What was entered
  - What should have been used
  - Why did the mistake happen
  - What did the data actually show?

Laboratory Process

From receiving bench to final report.



When the data does not make sense, clarify before assuming the treatment system has failed.

When to Contact the Lab

- Unclear qualifier or comment
- Unexpected reporting limit
- Sample receipt concern
- Method or unit question
- Unexpected result
- Need for reanalysis or clarification

The laboratory is a technical resource, not merely the place that sends the PDF.

Five Takeaways

1. Good data starts with **representative**
2. **sampling**
3. **Understand parameter goals**
4. **Review full reports:** results, units, limits, &
5. notes

Contextualize data operationally &



Closing Thought

Data Needs Context: Wastewater numbers are only as good as the sample, testing method, and interpretation.

THANK YOU

Questions?

Contact Me

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