Laboratory Services Overview

Commission Meeting
July 31, 2025

Madison Metropolitan Sewerage District

Scope of Work

- WPDES permit compliance
- Plant process control
- Service charge calculations
- Environmental sampling and testing
- Industrial Pretreatment/Hauled Waste analyses
- Collaborative research efforts

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Certifications

Wisconsin DNR Laboratory Certification Program (WDNR Lab ID: 113002230)

- Mercury
- Ammonia as N
- Hexavalent Chromium
- Kjeldahl Nitrogen, Total; Phosphorus, Total
- Nitrate + Nitrite
- Orthophosphate
- Residue – TSS/VSS; TS/VS; TDS
- Ag, As, Cd, Cr, Cu, Pb, Mo, Ni, K, Se, Na, Zn
- Chloride, Nitrate, Sulfate
- (Carbonaceous) Biochemical Oxygen Demand (BOD/CBOD)

Department of Agriculture, Trade, and Consumer Protection (DATCP ID: 115122)

- Milk, Food, and Water Lab – bacteria

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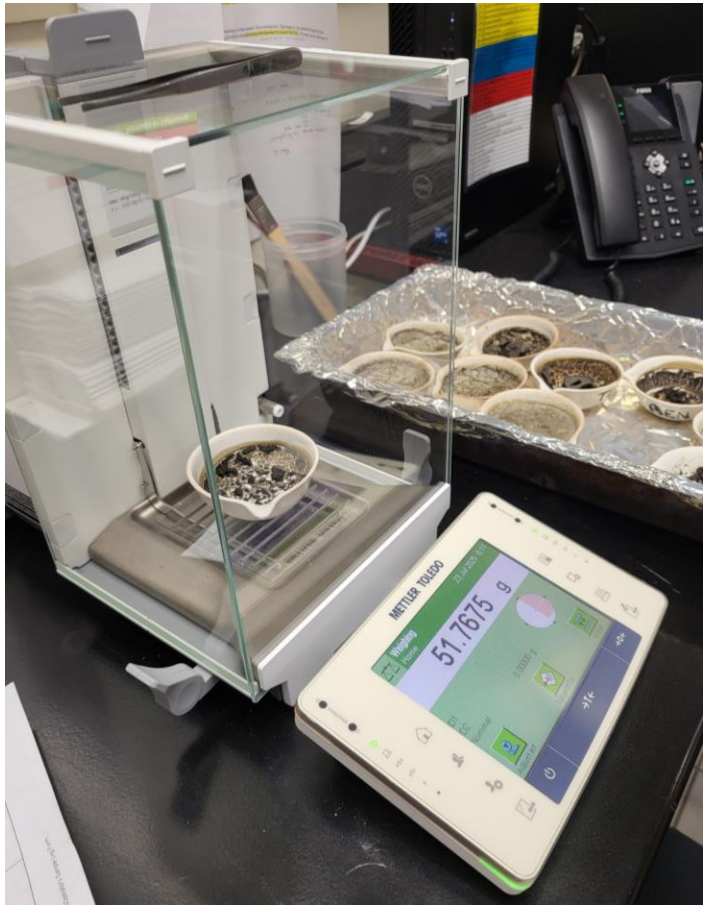
The Main Lab: Solids

- Measures the quantity and type of solids in wastewater and sludge

- Suspended Solids:
  - TSS (Total): solid particles in water
  - FSS (Fixed): inorganic/non-combustible fraction
  - VSS (Volatile): organic/biodegradable fraction

- TS/FS/VS: includes both suspended and dissolved solids



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The Main Lab: BOD/CBOD

- Measures how much oxygen microbes use to break down organic matter in water

- BOD (Biochemical Oxygen Demand): total oxygen used to break down both carbon and nitrogen-based material
- CBOD (Carbonaceous BOD): focuses on carbon-based pollutants only

- Helps to evaluate:
  - Evaluate organic pollution levels
  - Monitor wastewater strength
  - Measure treatment effectiveness

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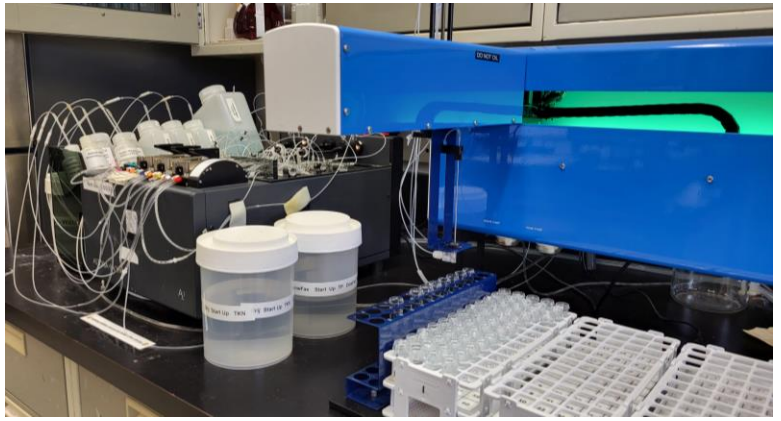
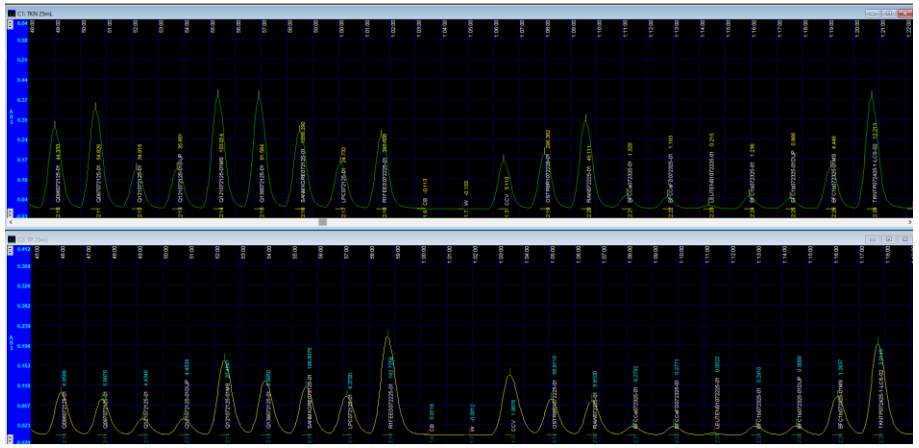
Automated Chemistry

- Utilizes an autoanalyzer to test a wide range of analytes



- How does it work?
  - Mixes sample with reagents in a continuous stream
  - A chemical reaction occurs, causing a color change
  - The color change is measured, giving an analyte concentration



- Used for:
  - Ammonia-N
  - Nitrate + Nitrite
  - Ortho-Phosphate
  - Total Phosphorus
  - Total Kjeldahl Nitrogen (TKN): ammonia + organic nitrogen
  - Hexavalent Chromium (Cr6)

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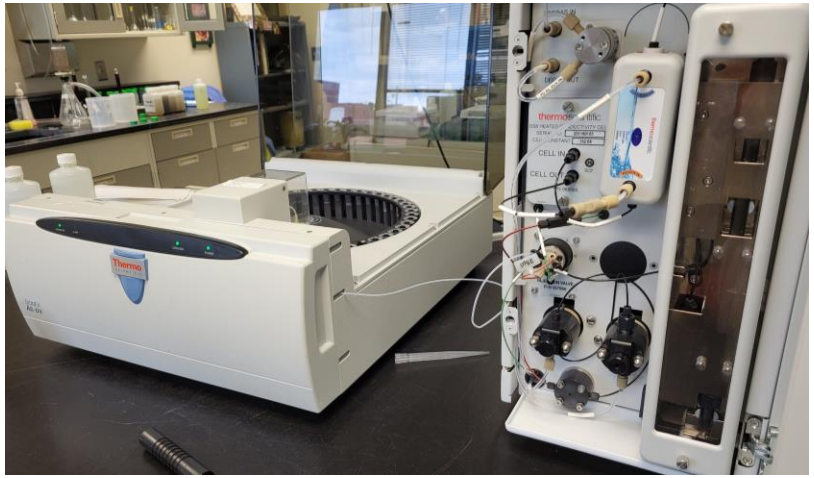
Chromatography

Ion Chromatography (IC)

- Chloride, nitrate, sulfate



Gas Chromatography (GC)

- Volatile Fatty Acids

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Metals

- Inductively Coupled Plasma – Optical Emission Spectroscopy (ICP-OES)
  - Detects metals/minerals
  - Fast, accurate, test multiple elements at once
  - Atomizes and then ionizes samples
  - Samples emit light at various wavelengths

- Mercury (Hg) analyzer
  - Converts Hg in a sample to gas
  - Excites the Hg with a UV light
  - Measures fluorescence

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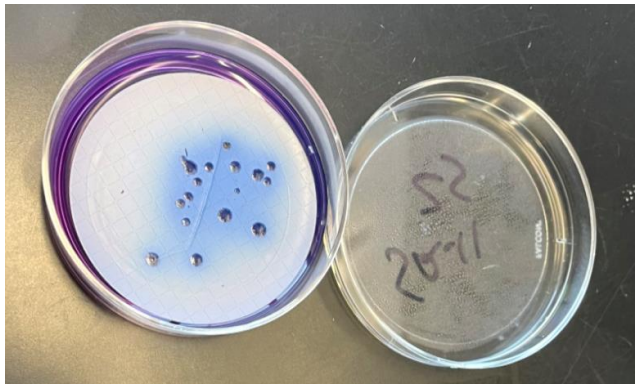
Microbiology

- Membrane filtration for total/fecal coliforms (for now)
  - Filter sample through a sterile filter, trapping bacteria
  - Place filter on sterile media and incubate, allowing present bacteria to grow



- Colilert method for total coliforms and E. coli (next permit)

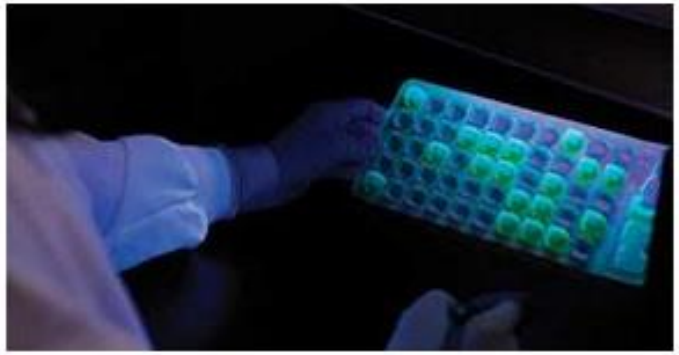


Photo (above) from IDEXX.com

- Biosolids analyses – multiple tube fermentation technique

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2024 Lab Analyses

- In 2024, the MMSD lab performed 63,241 analyses on 13,602 samples

Parameters	Quantity
Nutrients (TKN, TP, NH3-N, PO4-P, WEP)	19,059
Solids (Suspended, Total, Dissolved)	19,347
(Carbonaceous) Biochemical Oxygen Demand	4,603
Anions (Cl, NO3-N, NO3+NO2, NO2-N, SO4)	5,183
Field Measurements (pH, TEMP, COND, DO)	3,540
Metals	7,363
Bacteria (FCOLI, TCOLI, ECOLI)	1,411
Volatile Fatty Acids (VFA)	1,039
Misc. Testing (Alkalinity, Density, Chlorophyll, WET)	1,696

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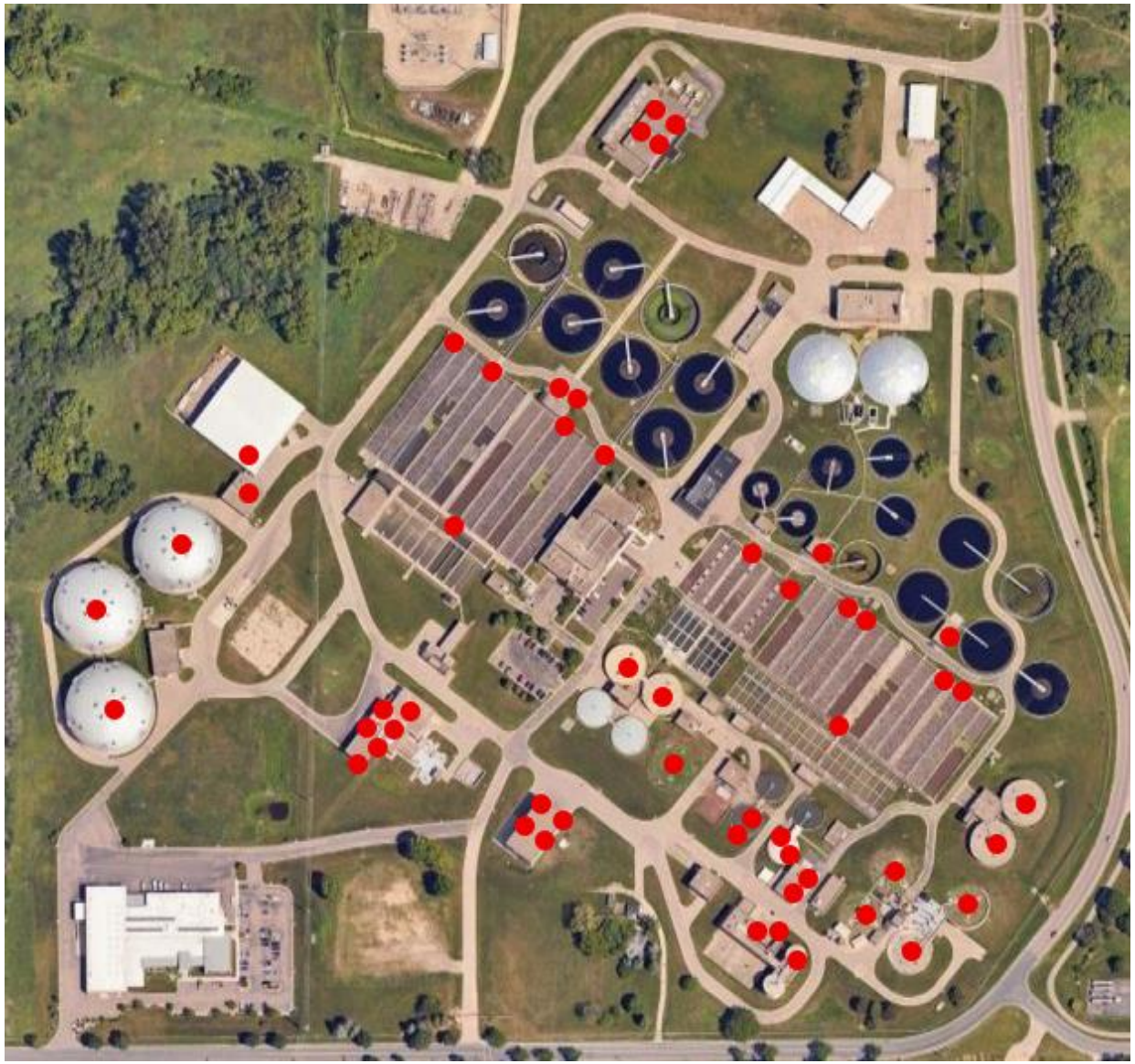
Process Control



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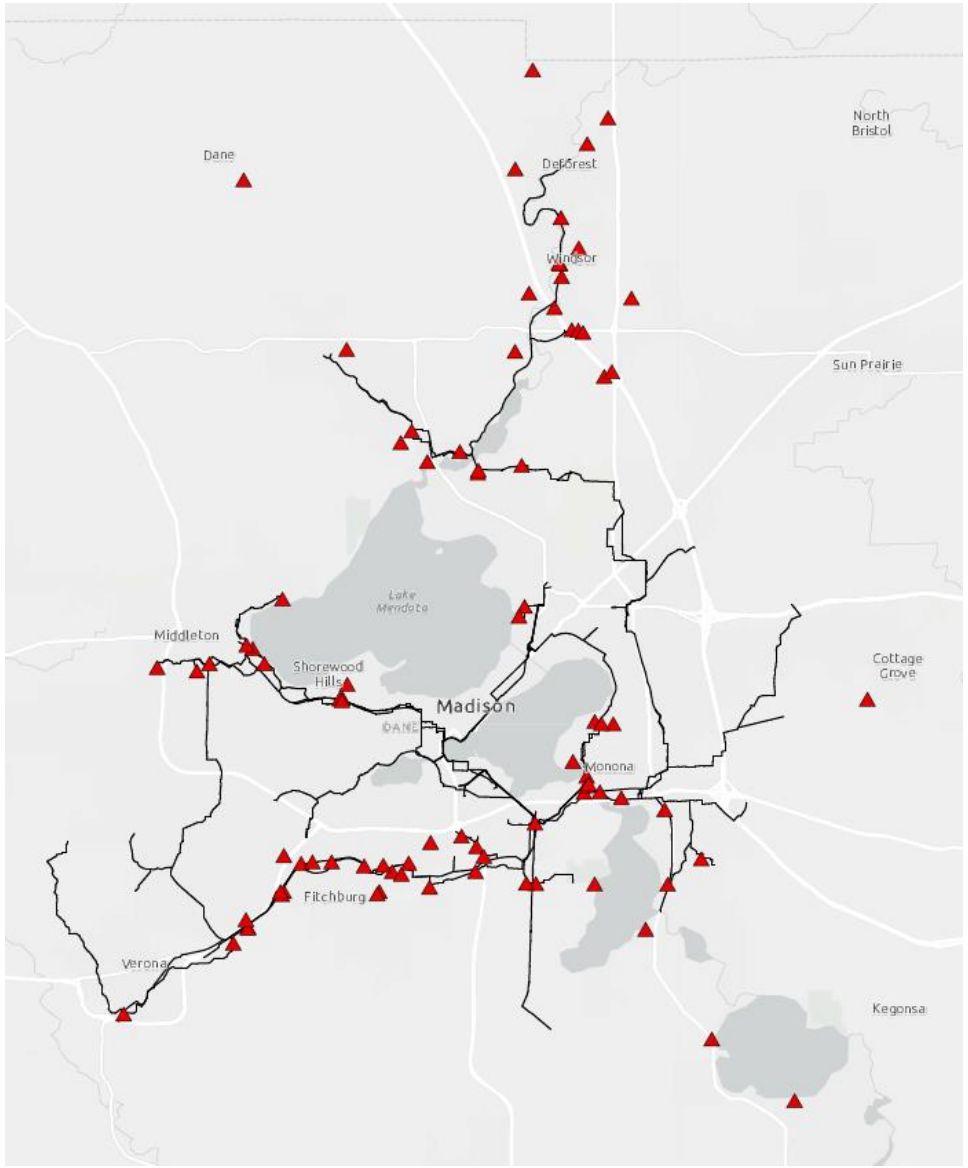
Service Charge Calculations



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Planning for the Future – Lab Assessment

- Project Goal
  - Ensure long-term safety, efficiency, and readiness for the future
- Key Deliverables
  - Assessment report
  - Preliminary design options
  - Cost estimates for next phases

STRANG

Image of logo from LinkedIn.com

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Questions?

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