

Study Session: District Research Program



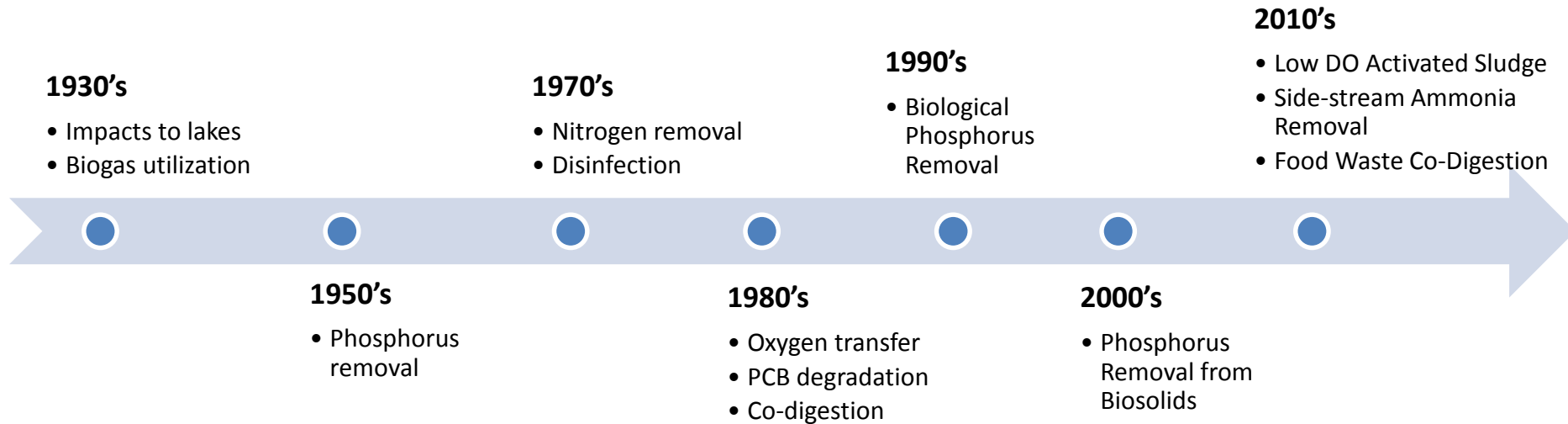
Madison Metropolitan Sewerage District

Brief History To 90 Years Of Innovation

Madison Metropolitan Sewerage District



Research Timeline & Milestones



- Investigations in most areas of District operations
- ~100 projects sponsored or supported

Why do all this research?



Madison Metropolitan Sewerage District met



Improved Decision Making

- Permit compliance
 - How effective, reliable, resilient is an option?
- Planning
 - Is a recommendation worth pursuing further?
- Operational challenges
 - What's causing us to have a problem?
- Knowledge gaps
 - What's going on over there?

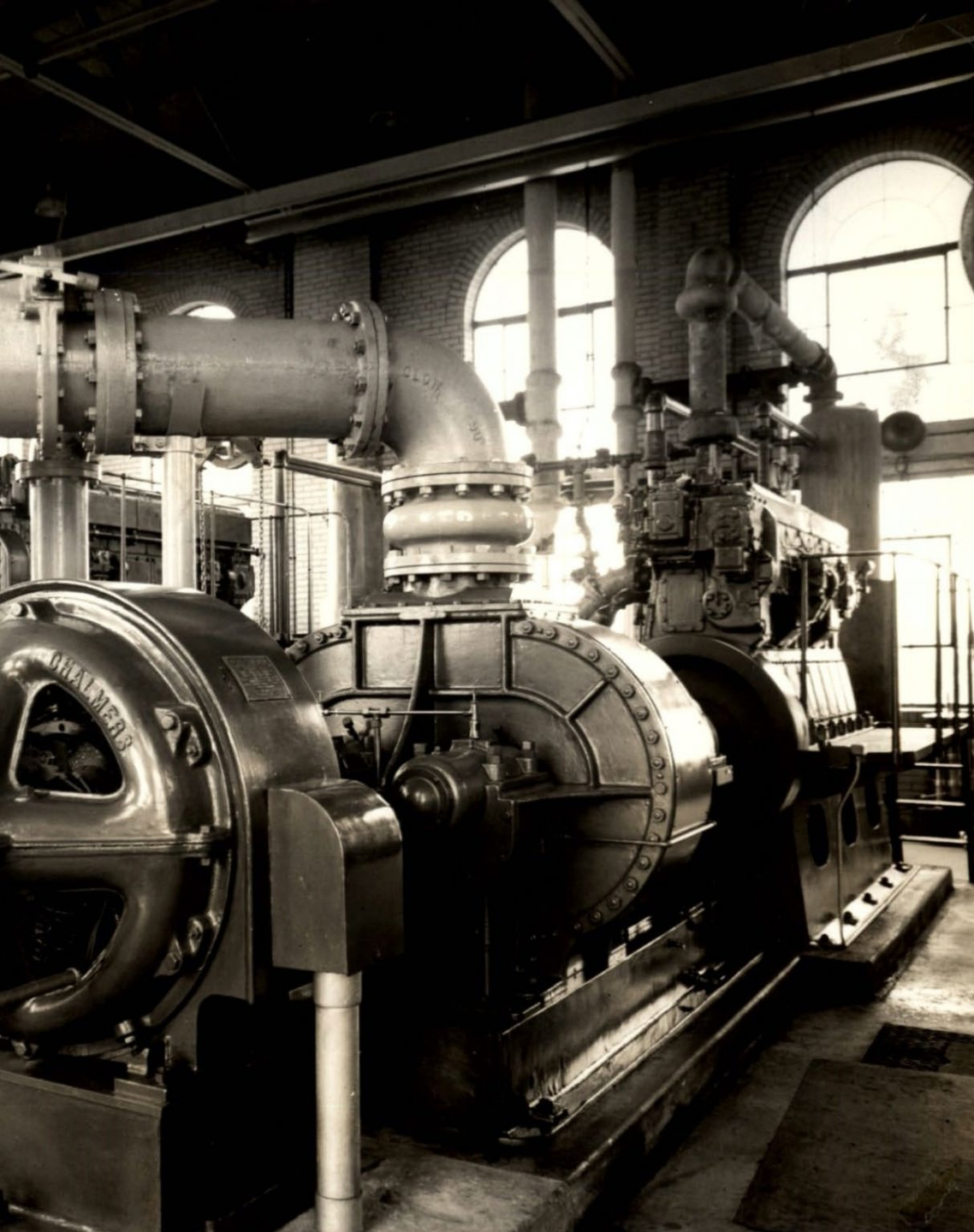


Commission Policies

- **O-1** Global Outcomes Policy
- **O-2A** Wastewater Collection and Treatment
 - Customers' wastewater is collected and treated in a manner that is consistently safe, reliable, efficient, environmentally responsible and forward thinking.
- **O-2B** Resource Conservation and Recovery
- **O-2C** Financial Sustainability
- **EL-2G** Infrastructure



Basic vs Applied Research



Research Purpose

District research is used to provide information specific to District concerns

- **Basic** (fundamental)
 - “What are bacteria”
- Applied
 - “How can we use bacteria X in our process?”



Applied Research Examples

- Oxygen transfer
 - Are fine bubble diffusers worth the investment?
- Biological phosphorus removal
 - Can we reliably remove P without chemicals?
- Disinfection
 - Is UV disinfection viable for the District?
- Operational challenges
 - How can nuisance organisms be controlled?



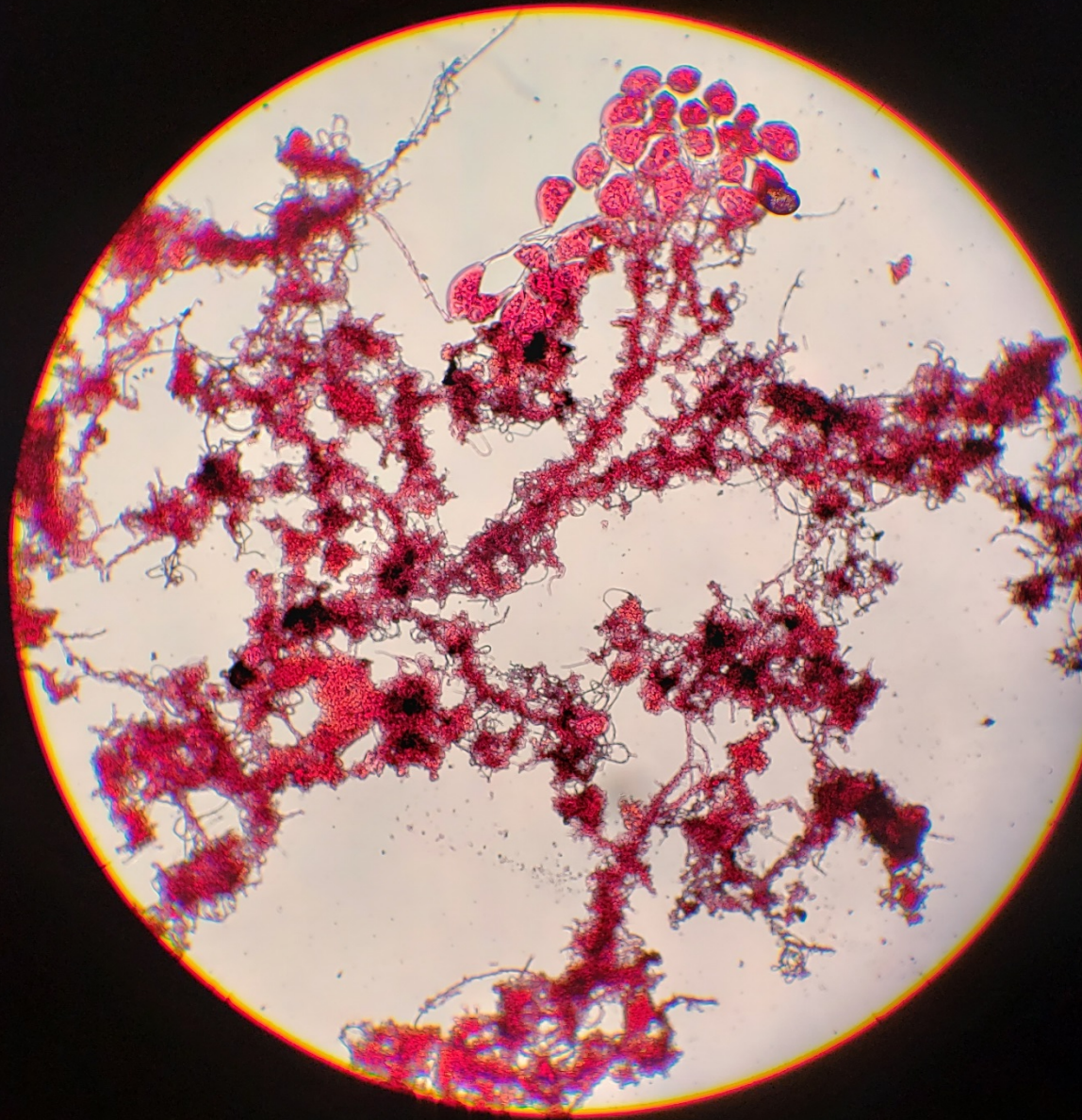
Update on recent sponsored research



Madison Metropolitan Sewerage District

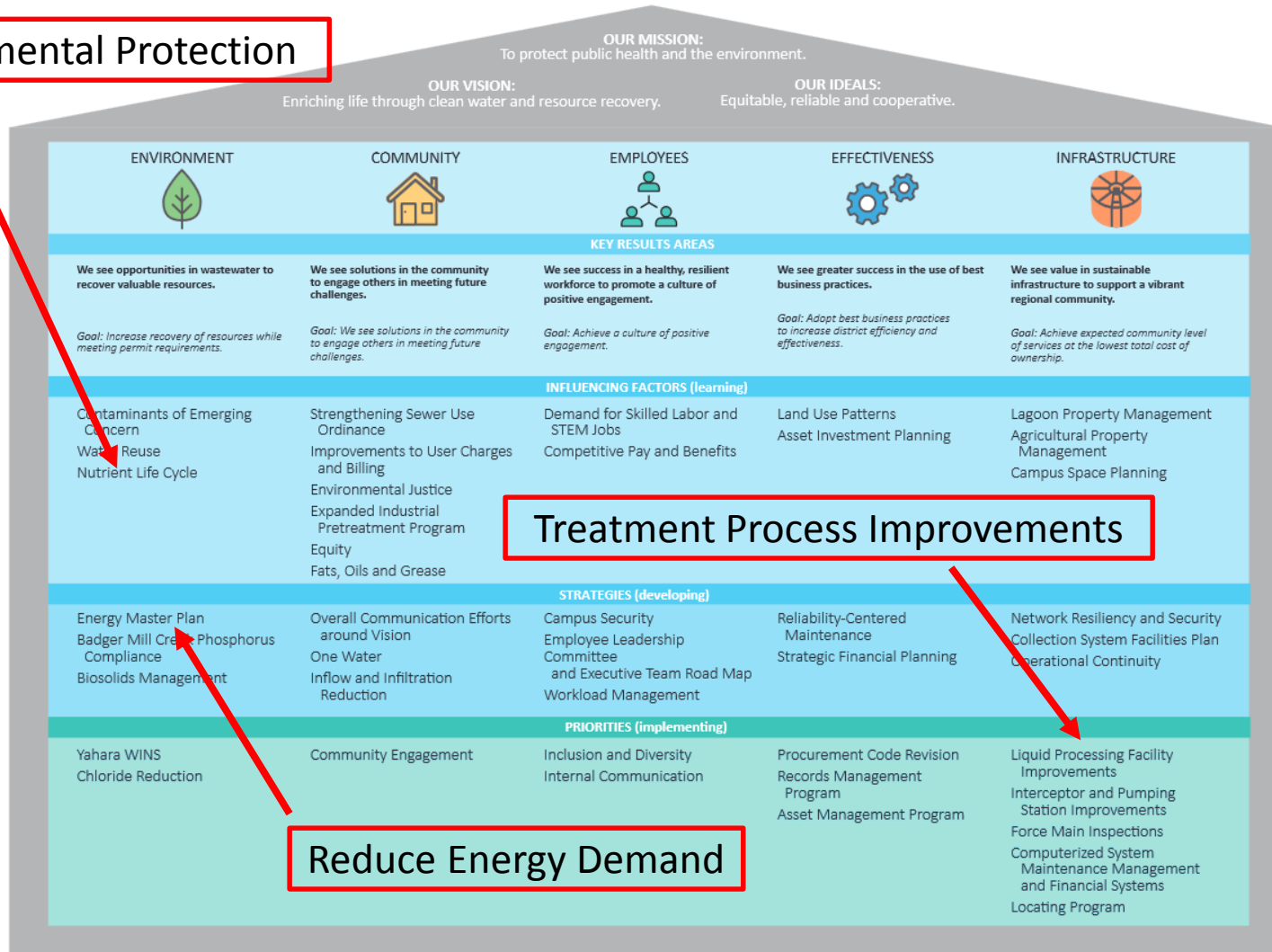


Low DO Activated Sludge



Strategy & Sponsored Research

Environmental Protection

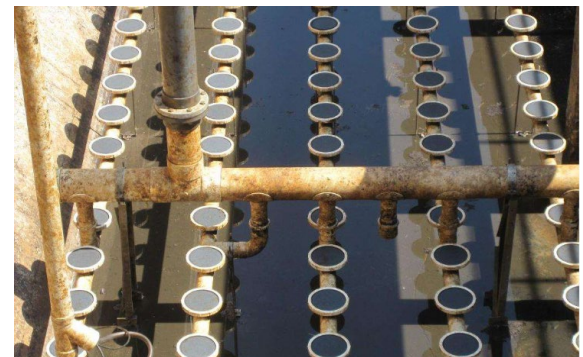


Treatment Process Improvements

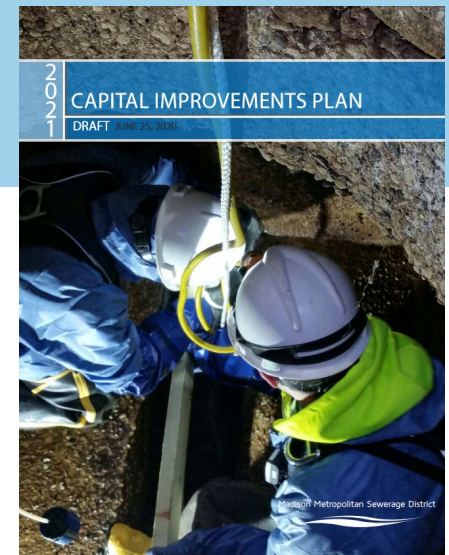
Reduce Energy Demand

What will this research be used for?

- Inform future decisions for things like:
 - Energy reduction potential
 - New blower sizing
 - New aeration system design
 - Process sensor technologies
 - Final clarifier requirements
 - Pumping and mixing needs
 - Nitrogen removal potential



Upcoming projects



CIP ID#

A01.2

Nitrite Shunt - Low DO Pilot (Full Scale Pilot)



START DATE:

2022

COMPLETION DATE:

2024

FINANCIAL ANALYSIS

2021 EXPENDITURE (\$2021)
\$0

TOTAL COST
\$2,791,000

CIP ID#

A01.1

Activated Sludge Projects



START DATE:

2022

COMPLETION DATE:

2027

FINANCIAL ANALYSIS

2021 EXPENDITURE (\$2021)
\$0

TOTAL COST
\$11,151,000

CIP ID#

A01.5

Plant Aeration System Projects (Nitrite Shunt/Low DO)



START DATE:

2025

COMPLETION DATE:

2027

FINANCIAL ANALYSIS

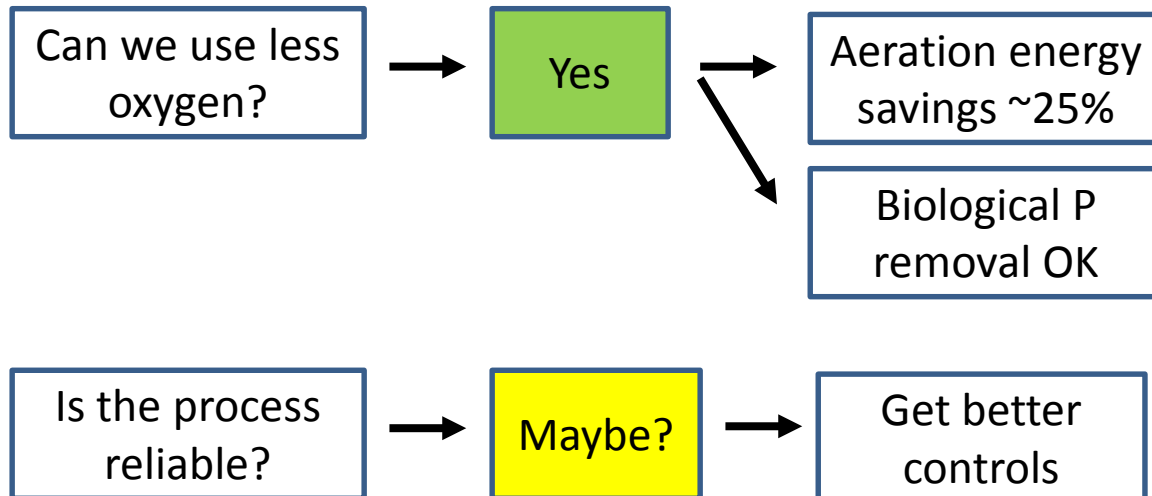
2020 EXPENDITURE (\$2021)
\$0

TOTAL COST
\$24,246,000

\$38 Million
(estimate)

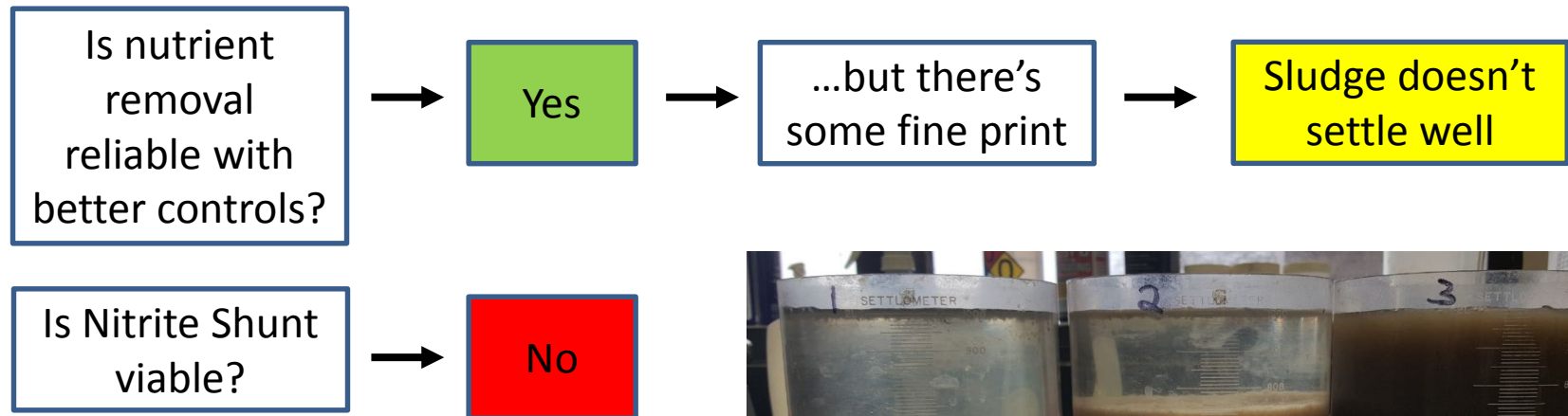
Early work

- What is practical limit for DO?
 - (to remove ammonia)
- Biological phosphorus removal impacted?
 - Do we see different “bugs” emerge?



Are novel approaches viable?

- 2016 Liquid Processing Facilities Plan
 - Nitrite Shunt recommended
- Ammonia-based aeration control



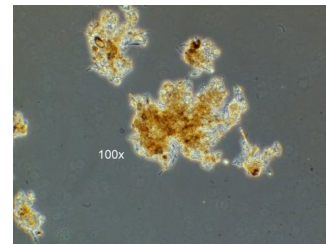
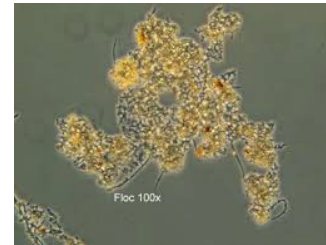
Full scale

Pilot A

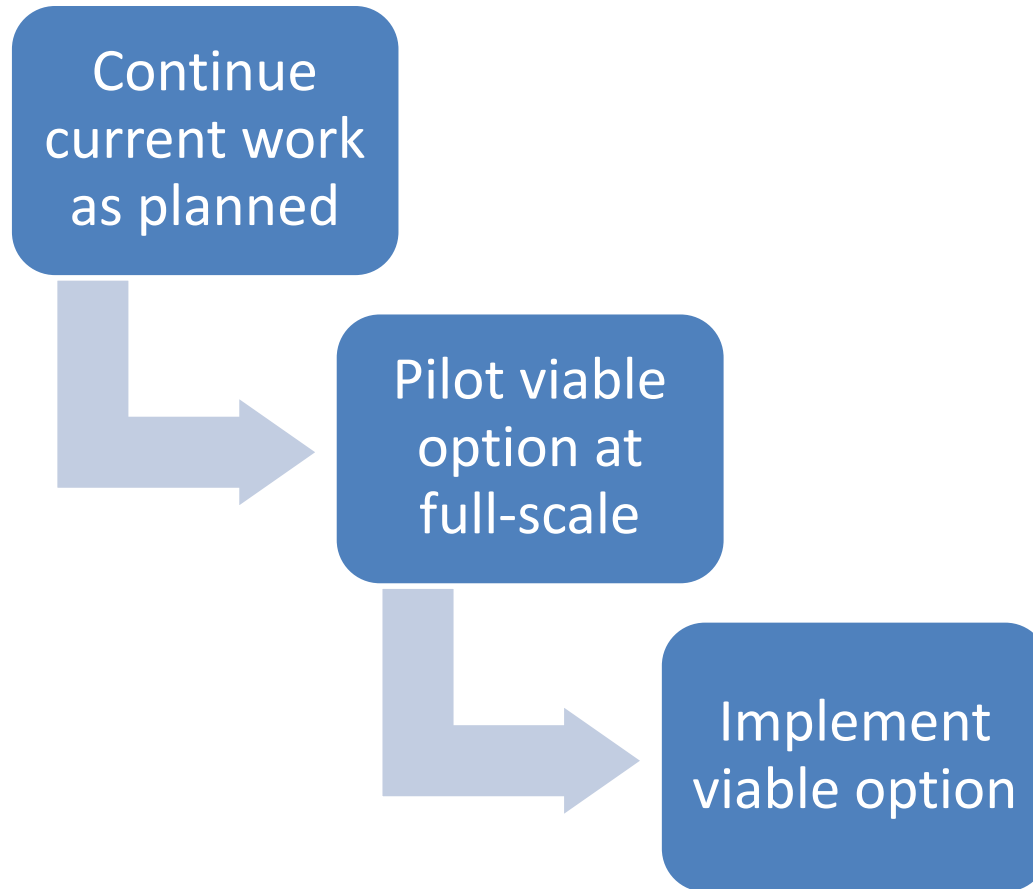
Pilot B

Current work

- Continue to evaluate process stability
- Characterize organic fractions over time
- Study biological floc size and composition
- Evaluate sludge densification process



Anticipated next steps



Future research priority areas

Energy
Management
Master Plan

Emerging
Contaminants

Biosolids
Management
Study

Resource
Recovery

Others?

Badger Mill
Creek
Phosphorus
Compliance





Question

Does the Commission have areas of interest that may be integrated into prioritized future research?



Thank you!