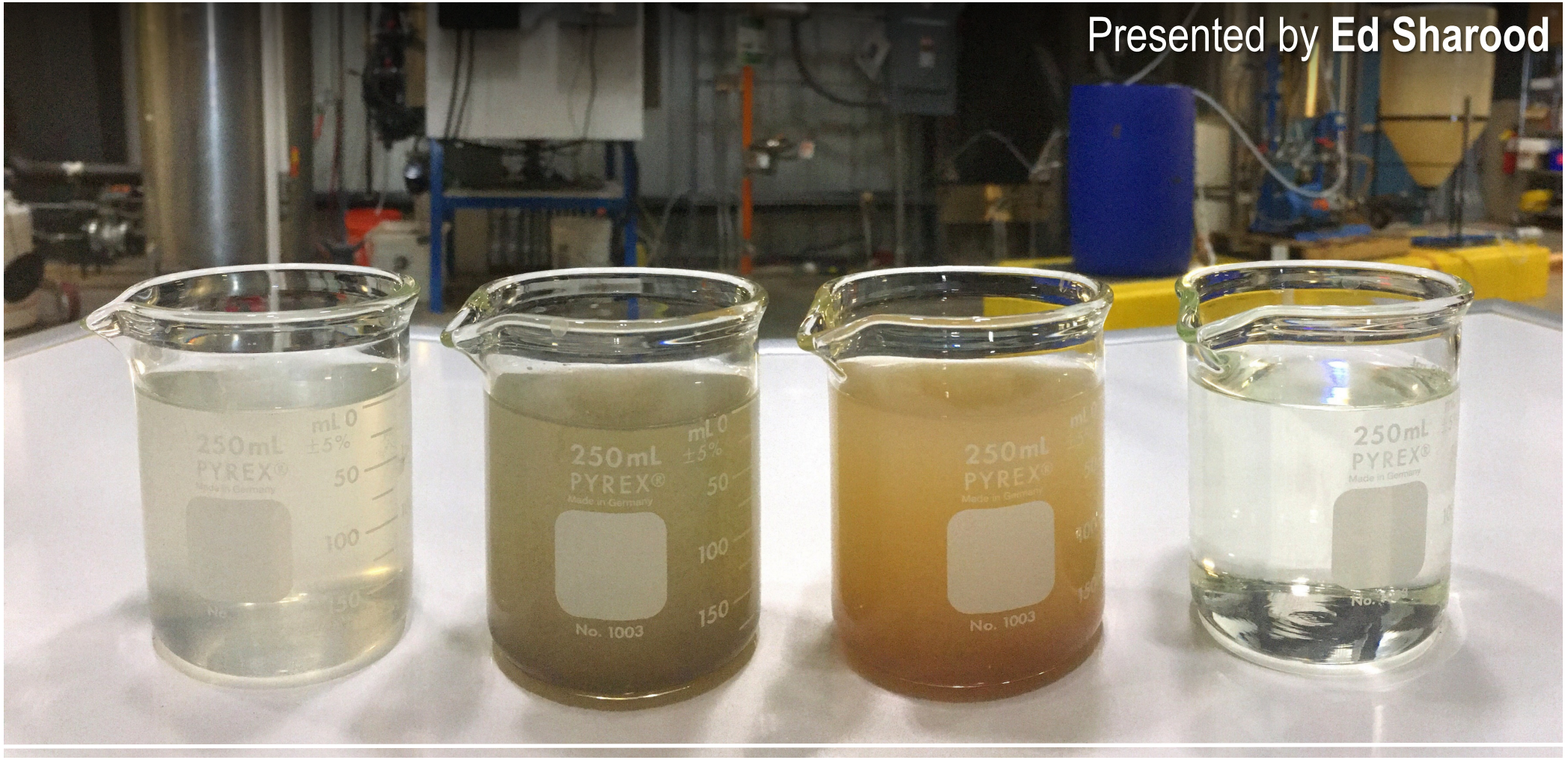
WOODARD &CURRAN

NEWEA
WORKING FOR WATER QUALITY

Regulations Playing Catch Up on Industrial Water Reuse

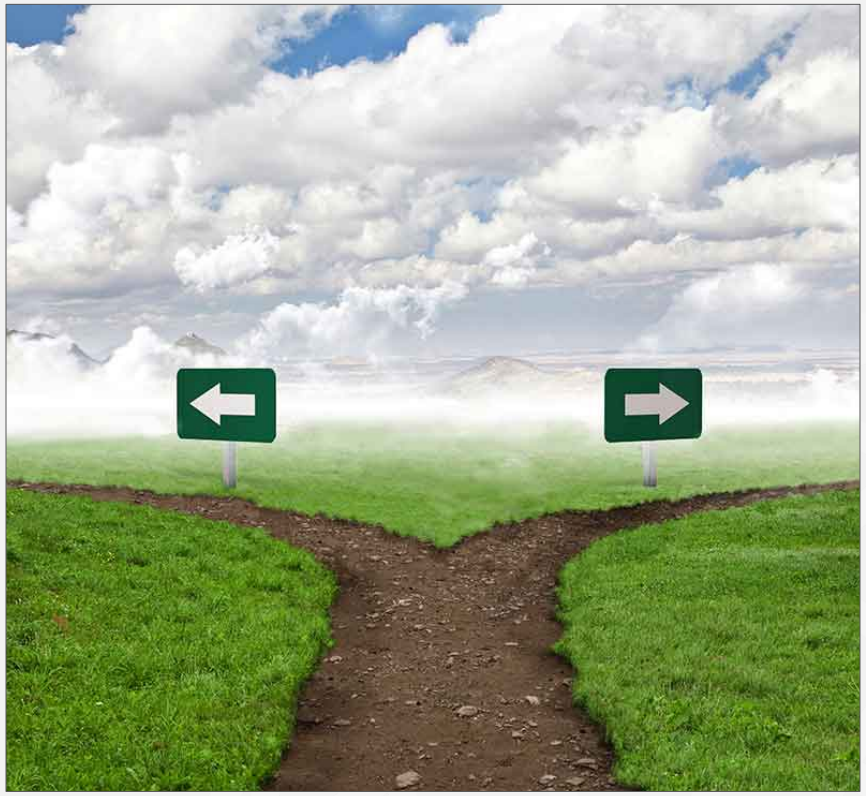


Presentation Overview

- Background
- Case for Industrial Water Reuse
- Challenge
- Wastewater Characteristics
- Technical solution
- Struggles of Water Reuse
- Resolution
- Questions

Background

- New Discharge Permit
- Options Evaluation
- Regulatory Challenges
- New Treatment Design



Industrial Water Reuse

Aligns with corporate sustainability goals

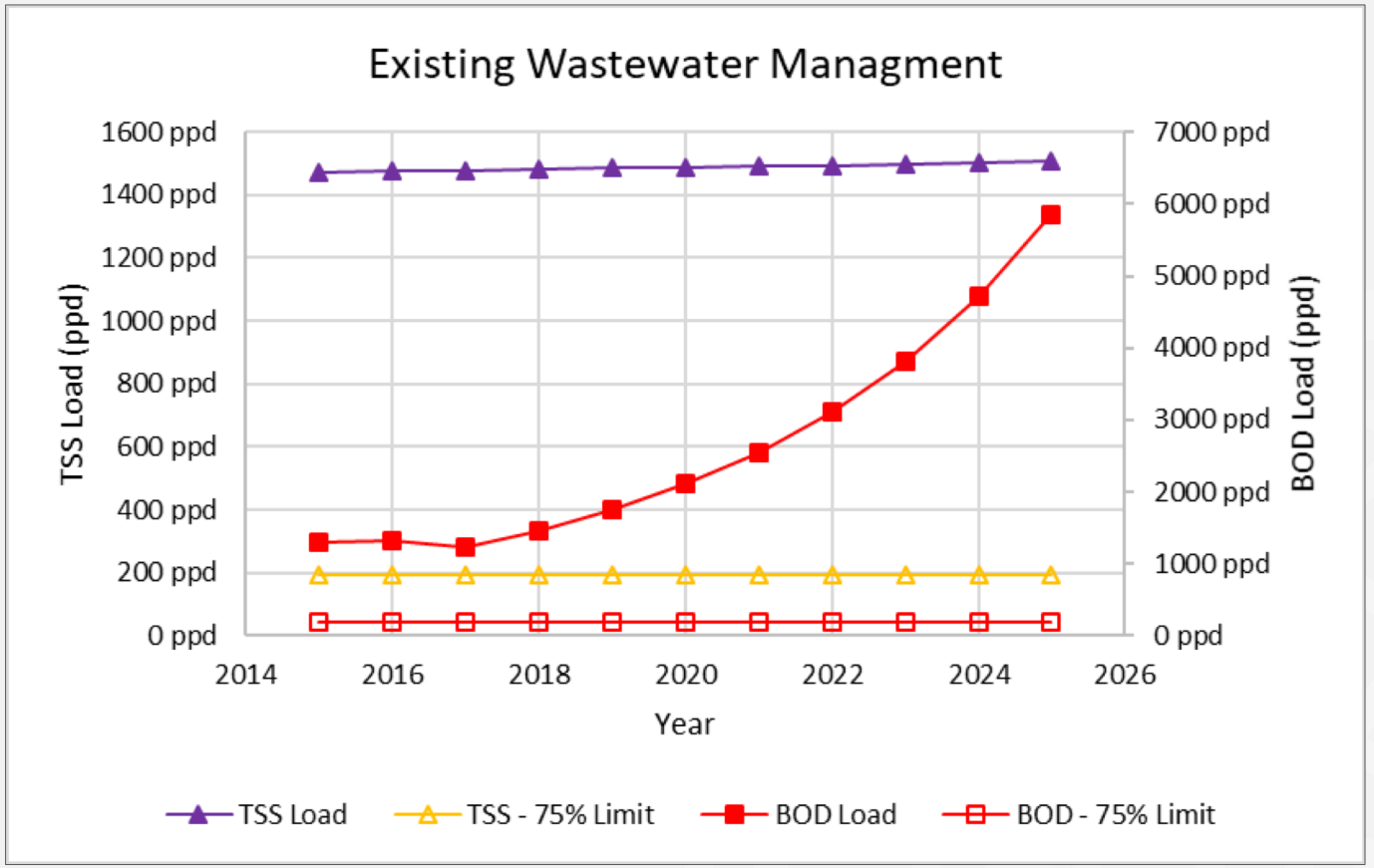
Increase Plant Resiliency

Uncertain Regulatory Environment

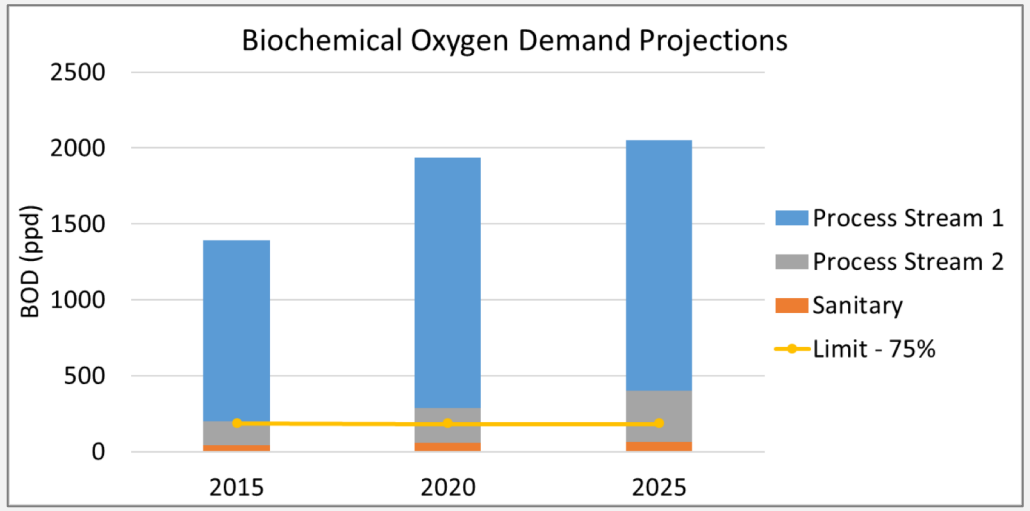
Sophisticated treatment already a necessity

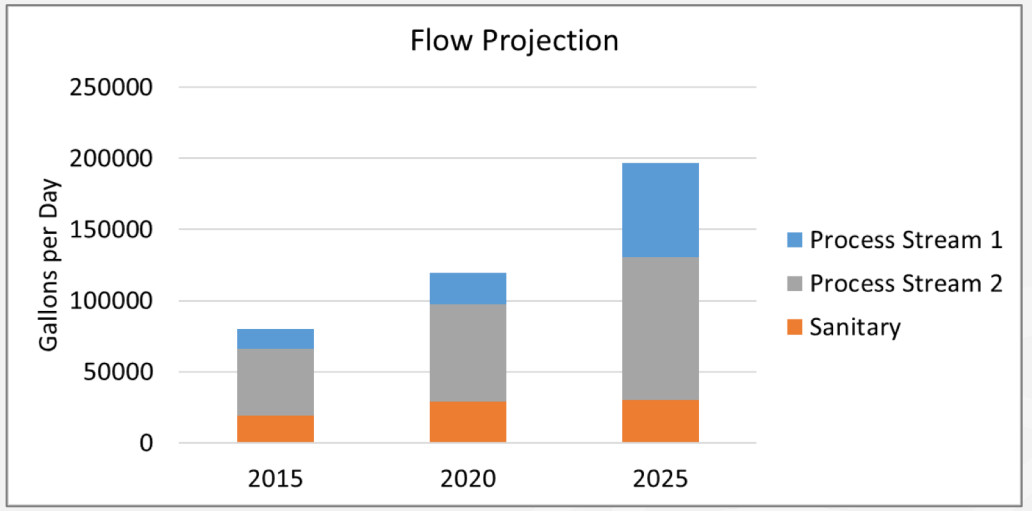
Challenge - Current system

- Woodard & Curran completed sampling and analysis plan
- Combined new data with existing records
- Worked with client to project growth
- Existing system was not suited for the client's needs



Wastewater Characteristics





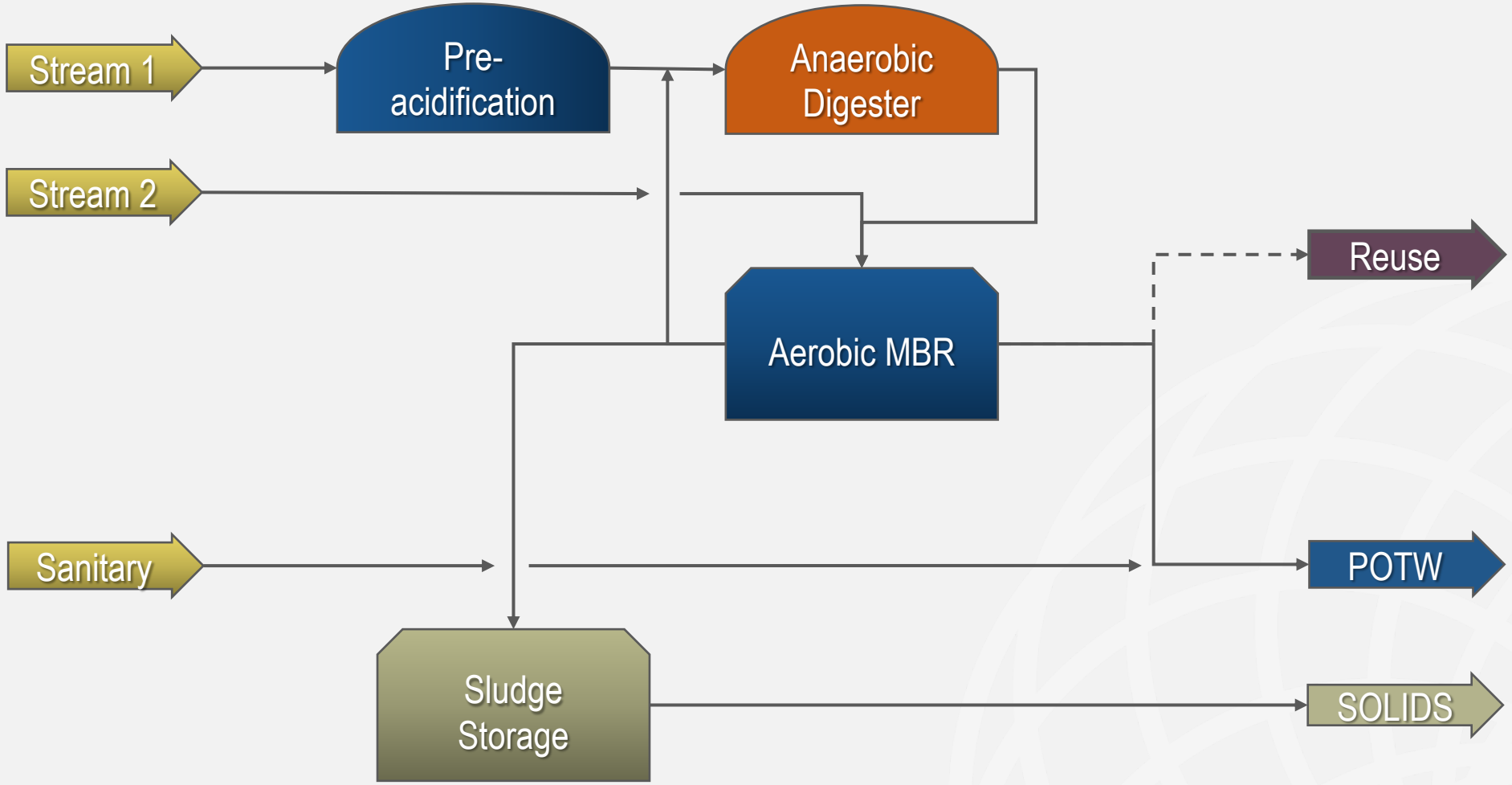
- Analysis showed three main wastewater streams
- Two process streams made up the majority of flows and loads

- Client already recycles nearly half of their water from production via RO treatment
- Very low metals concentration in process wastewater streams

Technical Solution: Options Evaluation

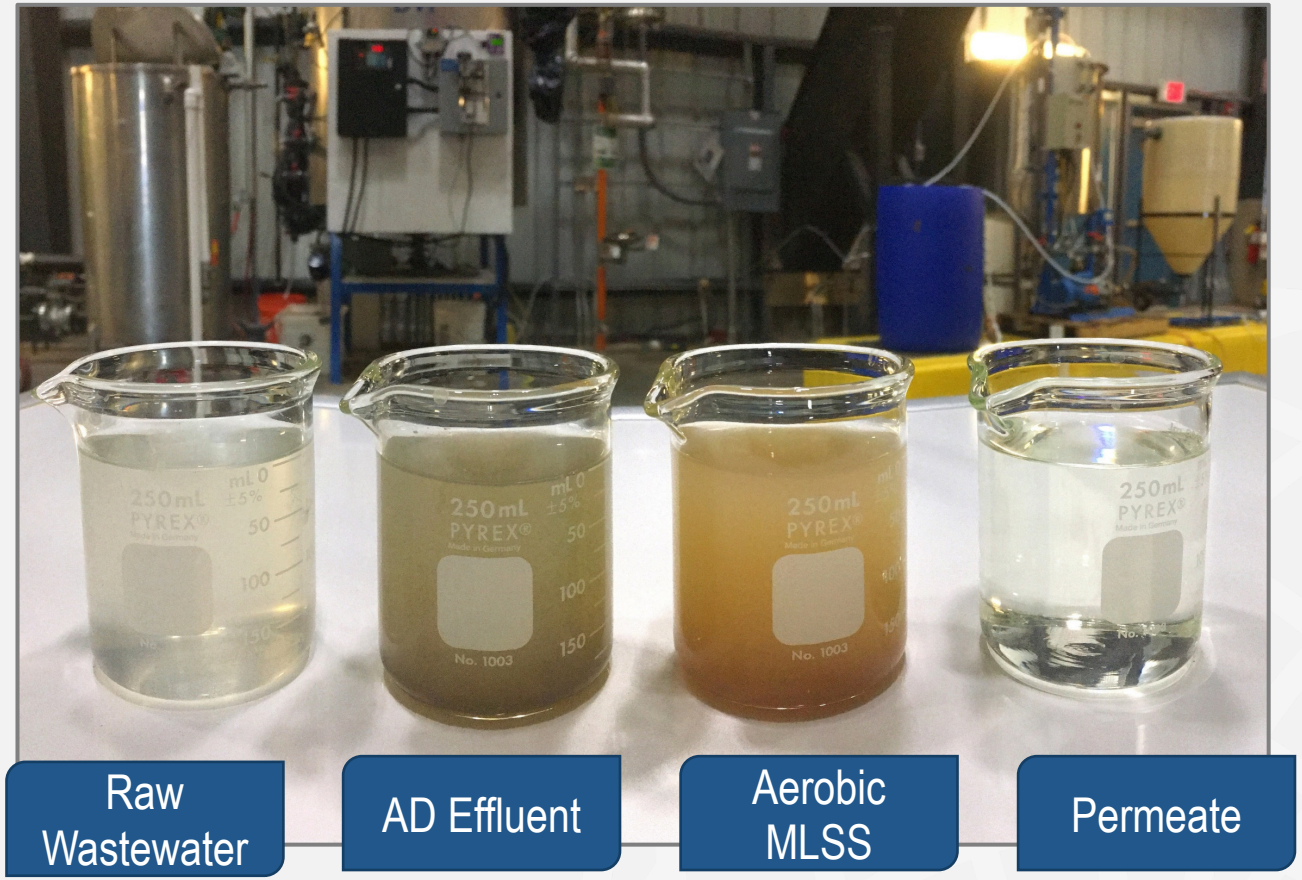
Anaerobic Digestion with Aerobic MBR

Technical Solution: Process Selection

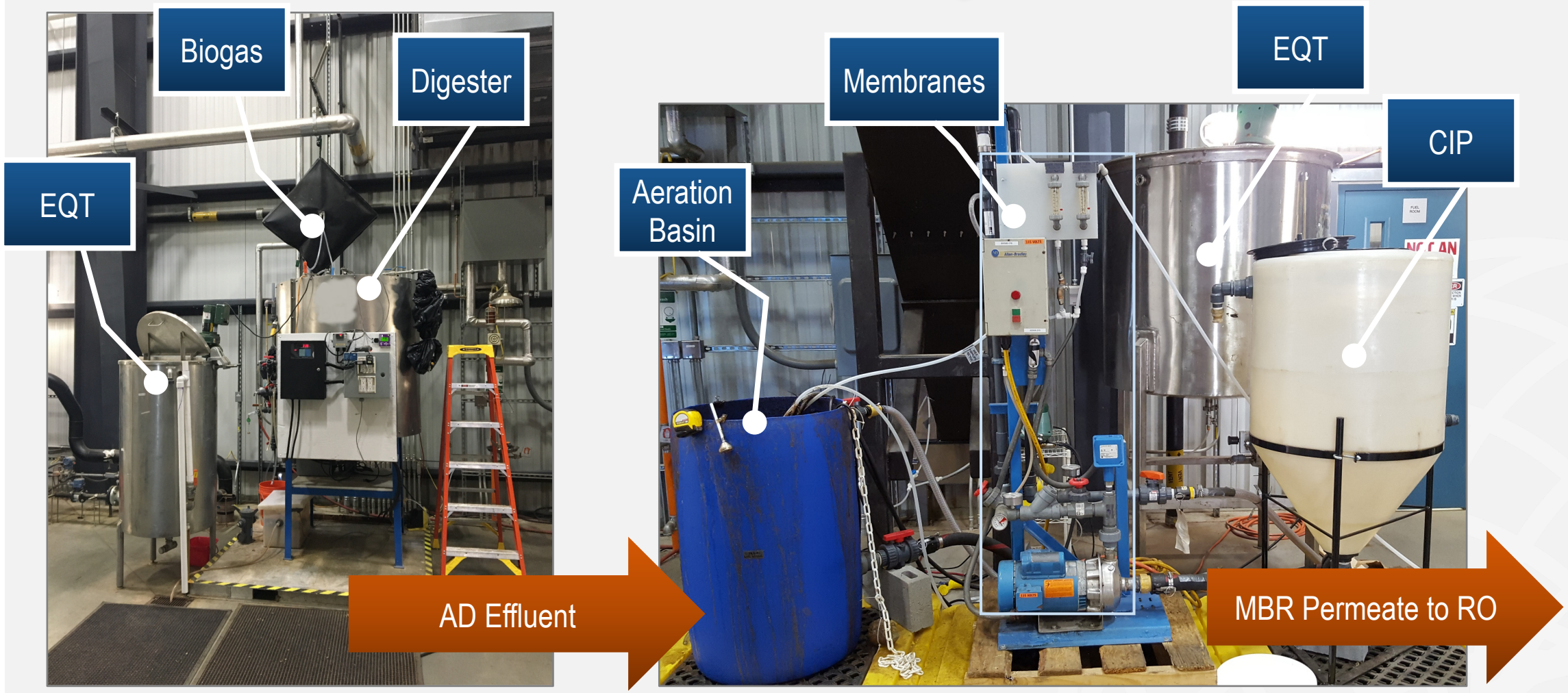


Technical Solution: Pilot Study

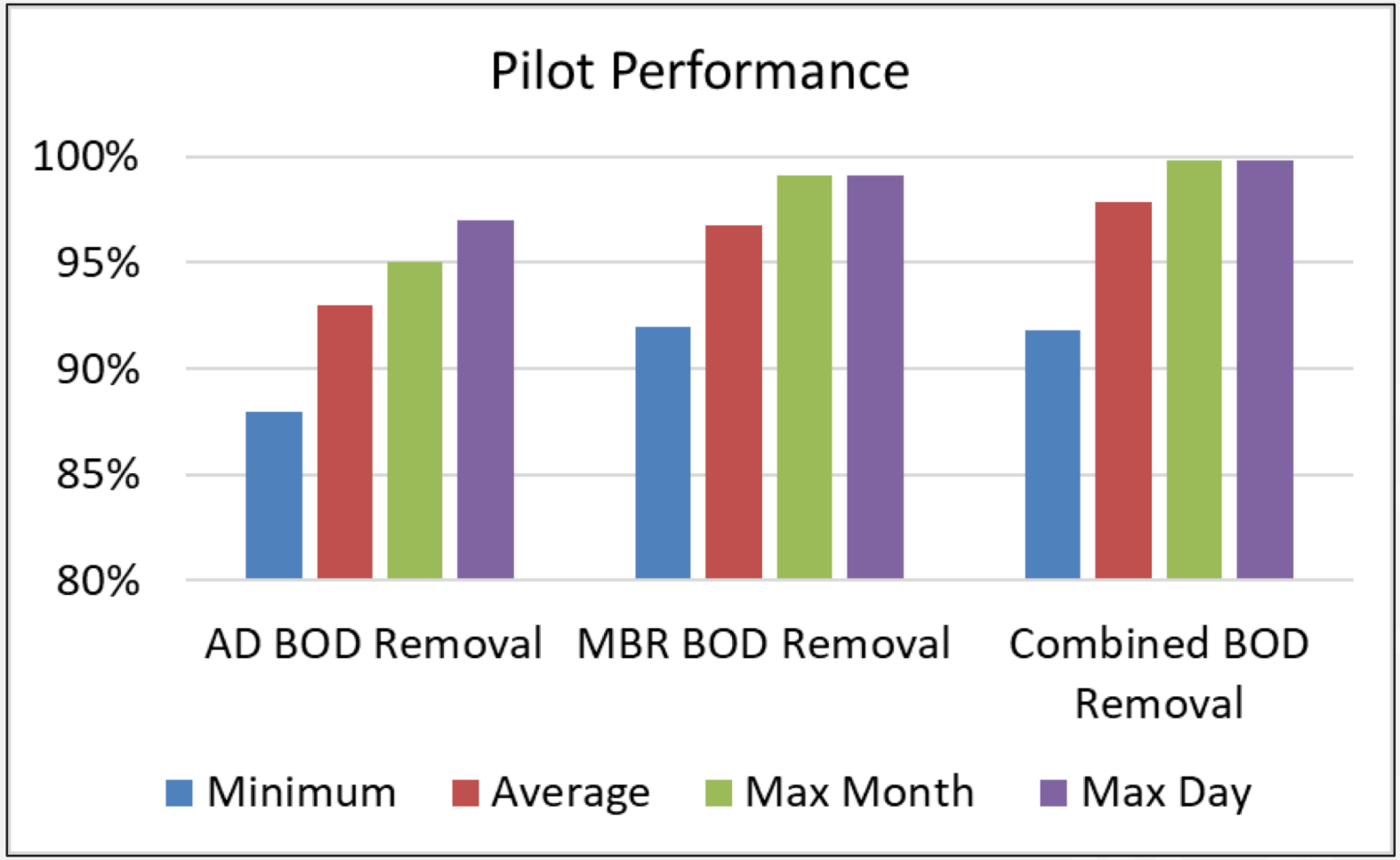
- Reasons for Pilot Study
  - Client not familiar with Anaerobic Digestion
  - Concerns about toxicity from sanitizing agents used in production
  - Need for better characterization of wastewater streams
  - Determine effectiveness of treatment method



Technical Solution: Pilot Study



Technical Solution: Pilot Study



Technical Solution: Pilot Study

Parameter	units	NDWS*	Permeate
Total Dissolved Solids	mg/L	500º	434
Total Organic Carbon	mg/L	N/A	5
Specific Conductance	µS/cm	N/A	838
UVT	%	N/A	85%
Total Phenols	mg/L	N/A	0.05
Chloride	mg/L	250º	29
Sulfate	mg/L	250º	7.6
Sulfide	mg/L	N/A	0.24
Bis (2-ethylhexyl) phthalate	mg/L	.006†	<5.000

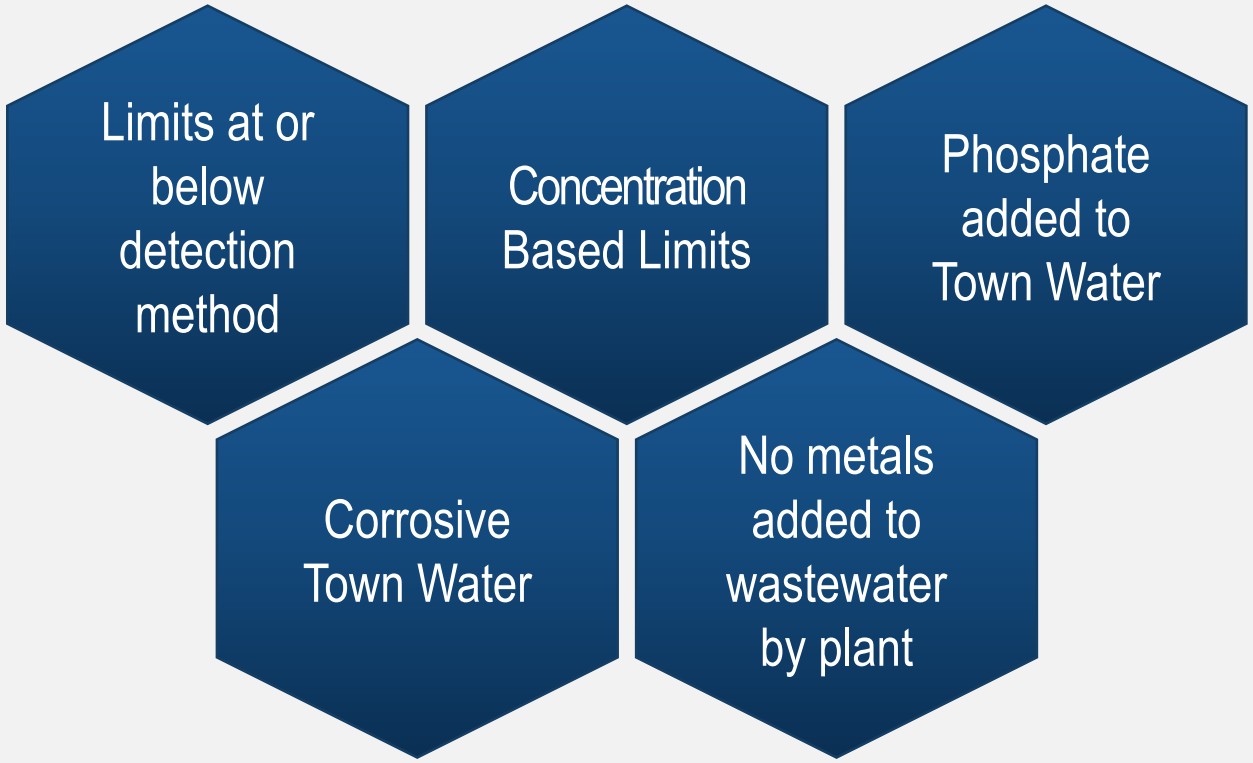
Parameter	units	Drinking Water Standard	Influent	Permeate
Aluminum	mg/L	0.05-0.2º	<0.050	<0.050
Arsenic	mg/L	0.01†	<0.0010	<0.001
Barium	mg/L	2.0†	0.0061	0.004
Cadmium	mg/L	0.005†	<0.001	<0.001
Chromium	mg/L	0.1†	0.0014	0.0013
Cobalt	mg/L	N/A	0.0064	0.005
Copper	mg/L	1.3†	0.079	0.15
Iron	mg/L	0.3º	0.278	0.21
Lead	mg/L	0.015†	0.001	0.001
Manganese	mg/L	0.05º	0.009	0.0073
Mercury	mg/L	0.002†	<0.0001	<0.0001
Molybdenum	mg/L	N/A	0.003	0.003
Nickel	mg/L	N/A	0.011	0.01
Potassium	mg/L		1.658	1.27
Selenium	mg/L	0.05†	0.0014	0.0013
Silica (calculated)	mg/L		9.6	9.4
Silver	mg/L	0.1	<0.0010	<0.001
Sodium	mg/L		202	197
Strontium	mg/L		0.031	0.028
Vanadium	mg/L		<0.0050	<0.005
Zinc	mg/L	5	0.042	0.025

* NDWS = National Drinking Water Standards

† Primary drinking water standards

º Secondary drinking water standards

Struggles of Water Reuse



	Effluent Concentration vs Permit			
Reuse %	**0%**	**10%**	**20%**	**40%**
TSS	Below	Below	Below	Below
BOD	Below	Below	Below	Below
Cyanide	Below	Below	Below	Below
Ammonia	Below	Below	Below	Below
TP	Below	Below	Exceeds	Exceeds
Al	Below	Below	Below	Below
As	Below	Below	Below	Below
Cd	Below	Below	Below	Below
Cr	Below	Below	Below	Exceeds
Cu	Below	Exceeds	Exceeds	Exceeds
Pb	Below	Below	Below	Below
Hg	Unknow	Unknow	Unknow	Unknow
Mo	Unknow	Unknow	Unknow	Unknow
Ni	Unknow	Unknow	Unknow	Unknow
Se	Below	Below	Below	Below
Ag	Unknow	Unknow	Unknow	Unknow
Zn	Below	Below	Below	Below
Cr(III)	Below	Below	Below	Below
Cr(VI)	Below	Below	Below	Below

Resolution

- Building the plant as designed, but no water reuse at this time
- Leaving design open for future installation of reuse equipment
- Working with Town to address permit issues

Questions?