MINUTES

Annual Business Meeting of the
Niagara Falls Water Board
March 23, 2026 at 5:00 p.m.

Water Treatment Plant Conference Room
5815 Buffalo Avenue, Niagara Falls New York 14304

Meeting could be attended in person or via videoconference. Minutes do not represent a complete summary of all matters discussed. Complete video recordings of meetings are posted online at: https://tinyurl.com/nfwbMedia**.**

1. **Preliminary Matters**

   a. **Call To Order**

Chairman Sirianni called the meeting to order at 5:00 p.m.

   b. **Pledge of Allegiance to the Flag of the United States of America**

   c. **Attendance:** **Cole** ***Present via Zoom,*** **Dean** ***Present,***
   Kimble ***Present via Zoom,*** **Sirianni** ***Present,*** **Weiss** ***Present.***

   d. **Public Comments**

   e. **Correspondence**

   f. **Prior Meeting Minutes**

      i. **Draft February 23, 2026 Business Meeting Minutes**

Motion by Board Member Dean and seconded by Chairman Sirianni to accept the February 23, 2026 business meeting minutes.

Cole __Y__ Dean __Y__ Kimble __Y__ Sirianni __Y__ Weiss __Y__

Motion carried, 5-0.

2. **Executive Director & General Counsel – Sean Costello**

    a. **Hazen and Sawyer Presentation on Recommended Treatment Technology for Wastewater Treatment Plant Upgrades**

Mr. Costello introduced Hazen and Sawyer engineers Mark Lenz, P.E., and Micah Blate, P.E. There followed a detailed presentation on the WWTP Preliminary Engineering Report, the slides from which are attached to these minutes.

3. **Finance – Deborah Ziolkowski**

    a. **Bank Account Balance Report**
    b. **Invested Funds Balance Report**
    c. **Wilmington Trust Account Report**

Ms. Ziolkowski discussed progress in building out and implementing Tyler Payments, which will allow customers to view and pay bills online.

The Board's auditors are scheduled to be on site the week of April 20, but that date is pending completion of certain pre-audit work. Ms. Ziolkowski currently is working to complete 2025 bank reconciliations.

Mr. Costello praised Ms. Ziolkowski's accomplishment in working with Paychex to improve the way payroll data is formatted, which has reduced the time to complete the journal entries for each payroll from most of the day down to about 30 minutes.

The Board discussed the 2026 shut off program, and the hours during which customers can pay versus the hours the meter shop is available to restore service. Shut off tags inform customers that service will not be restored until the next business day, but every effort is made to restore service as soon as possible.

4. **Administrative Services – Caleb Holman**

    a. **March 23, 2026 Personnel Actions**

Mr. Holman discussed monthly training activities and plans for a loss survey of the lift stations with the Board's Workers' Compensation carrier.

Motion by Board Member Dean and seconded by Board Member Weiss to approve Line Item 1 on the March 23, 2026 Personnel Actions, authorization to hire an Engineering Systems Technician.

Cole __Y__ Dean __Y__ Kimble __Y__ Weiss __Y__ Sirianni __Y__

Motion carried, 5-0.

Motion by Board Member Dean and seconded by Board Member Kimble to approve Line Item 2 on the March 23, 2026 Personnel Actions, authorization to hire an Accountant.

Cole __Y__ Dean __Y__ Kimble __Y__ Weiss __Y__ Sirianni __Y__

Motion carried, 5-0.

Motion by Board Member Dean and seconded by Board Member Weiss to approve Line Item 3 on the March 23, 2026 Personnel Actions, authorization to hire a WWTP Operator Trainee.

Cole __Y__ Dean __Y__ Kimble __Y__ Weiss __Y__ Sirianni __Y__

Motion carried, 5-0.

5. **Engineering – Douglas Williamson**

Mr. Williamson discussed three annual reports that are due at the end of March: (1) LaSalle Sanitary Sewer Overflow; (2) PCB Minimization Plan; and (3) MS4 Annual Report. While the PCB Minimization Plan report is an annual report required under the WWTP SPDES permit, the NFWB has not exceeded the permit's PCB limits since 2014.

Mr. Williamson further noted that after an evaluation by Encorus, it was determined that a 30" backwash pipe at the WWTP that showed signs of deterioration remains structurally sound and can be kept in service if re-coated and a pipe support is replaced. This saves a potentially costly replacement project.

The West Rivershore water main replacement project is scheduled to get underway next week, and a bid opening for a water main replacement project on Laughlin Drive, Witkop Avenue, and a portion of 85th Street is scheduled for early April with anticipated award at the April Board meeting.

Additionally, three bids for the rehabilitation of the Beech Avenue water tank are planned for April 17, one for the water tank recoating, one for the pump station, and one for the associated 20" water main.

6. **Outside Infrastructure Updates – Michael Eagler, Sr.**

7. **Information & Operational Technology (IT & OT) – Jonathan Joyce or Elton Mensah-Selby**

Mr. Joyce discussed plans to work on compliance with recently enacted cybersecurity regulations for water and wastewater facilities.

8. **February 2026 Operations and Maintenance Report**

    a. **2026-03-18 - E3communications Activity Report**

9. **Resolutions**

2026-03-001 – ELECTION OF OFFICERS AND COMMITTEE CHAIRPERSONS

Motion by Board Member Dean and seconded by Chairman Sirianni elect the following Board officers and committee chairpersons:

Board Chairperson:	***Richard Sirianni***
Board Vice-Chairperson:	***James S. Dean***
Board Treasurer:	***Renae Kimble***
Board Secretary:	***Sean W. Costello***
Governance Committee Chairperson:	***James S. Dean***
Finance and Audit Committee Chairperson:	***Renae Kimble***
Executive Staff Review Committee Chairperson:	***Daniel L. Weiss***
Wastewater Treatment Plant Upgrade (WWTP-UP) Committee Chairperson:	***Matthew Cole***

Cole __Y__ Dean __Y__ Kimble __Y__ Weiss __Y__ Sirianni __Y__

Motion carried, 5-0.

2026-03-002 – ACCEPTING PROPOSAL FOR WWTP HYDRAULIC STUDY

a. **2026-03-17 - Hazen and Sawyer Proposal for Hydraulic Study**

Motion by Board Member Dean and seconded by Board Member Weiss to approve.

Cole __Y__ Dean __Y__ Kimble __Y__ Weiss __Y__ Sirianni __Y__

Motion carried, 5-0.

2026-03-003 – ACCEPTING PROPOSAL FOR WWTP UNINTERRUPTIBLE POWER SUPPLY REPLACEMENTS

a. **2026-02-13 - Motion AI Proposal for UPS Replacement**

Motion by Board Member Kimble and seconded by Board Member Dean to approve.

Cole __Y__ Dean __Y__ Kimble __Y__ Weiss __Y__ Sirianni __Y__

Motion carried, 5-0.

10. Unfinished/Old Business

11. New Business & Additional Items for Discussion

12. Executive Session (if needed)

13. Adjournment of Meeting

Motion by Board Member Kimble and seconded by Board Member Dean to adjourn the meeting at 6:42 p.m.

Cole __Y__ Dean __Y__ Kimble __Y__ Weiss __Y__ Sirianni __Y__

Motion carried, 5-0.

1

Hazen Project Team Introductions

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Hazen Team Introductions

Mark Lenz, PE
Project Director

- 30 years experience
- Buffalo Office Manager
- Experienced with planning, design and construction of municipal water/wastewater projects (>$ 8 billion, across 30+ states)

Micah Blate, PE
Project Manager

- One of Hazen's corporate wastewater process leads
- PhD candidate
- Specialized in wastewater process, process optimization, process upset, biological process
- Has supported dozens of utilities across the US with major upgrades

Hazen

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Project Overview

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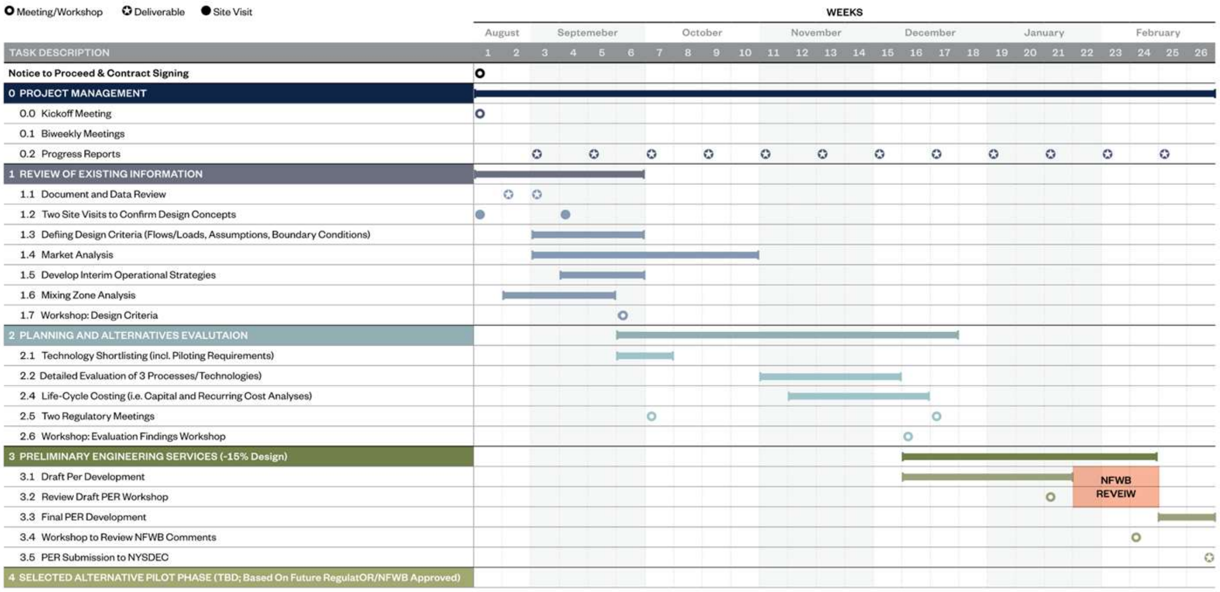
PER project kicked-off in August 2025



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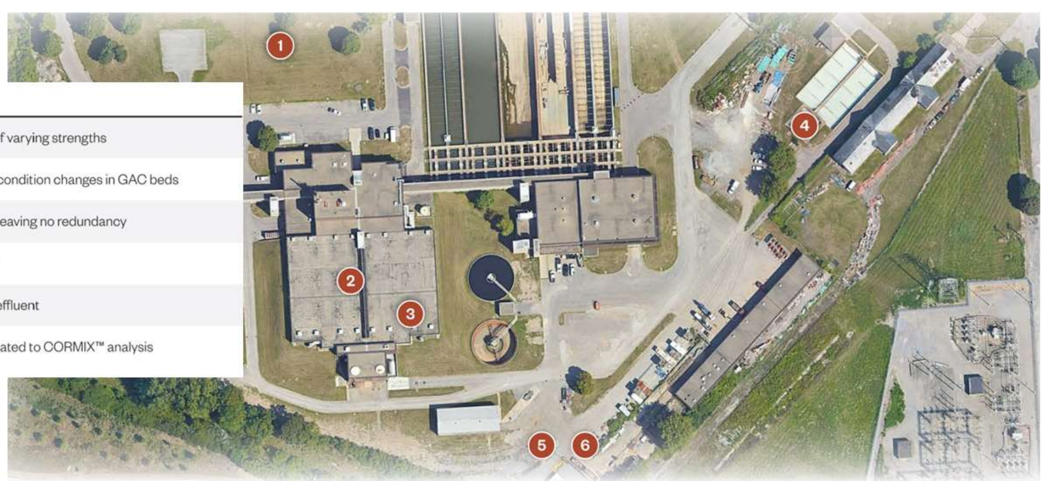
Historical WWTP Challenges

#	Item
1	Two influent sources of varying strengths
2	Sulfide cycling due to condition changes in GAC beds
3	Wet-weather peaking leaving no redundancy
4	Costly chlorine usage
5	Turbidity and color in effluent
6	Effluent regulations related to CORMIX™ analysis



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Major Changes Associated with Consent Order

New Effluent Limitations
- Biochemical Oxygen Demand (BOD_5)
- Settleable Solids and Total Suspended Solids (TSS)
- Total Sulfides
- Dieldrin
- Total Cyanide

New monitoring requirements for
- Emerging contaminants

Modified Effluent Limitations
- Total Phenolics
- Mercury

Other Changes
- Removed monitoring requirements for Enterococci
- New WET Testing action levels and limits
- Updated Compliance Level for Polychlorinated biphenyls (PCBs).
- Revised sampling frequencies for all parameters.

Hazen 7

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Preliminary Engineering Report Requirements from the Order

The report must follow the ***Environmental Facilities Corporation*** *report outline for the project to be eligible for SRF funding.*

- Definition of the problem and why the project is necessary
- Project and WWTP background and history
- Current conditions and operations at the WWTP
- ***Description of all applicable solutions and in-depth analysis of preferred alternatives***
- ***Scoring and comparison of preferred alternatives***
- Detailed overview of process and implementation of recommended alternative

Alternatives Analysis

Hazen 8

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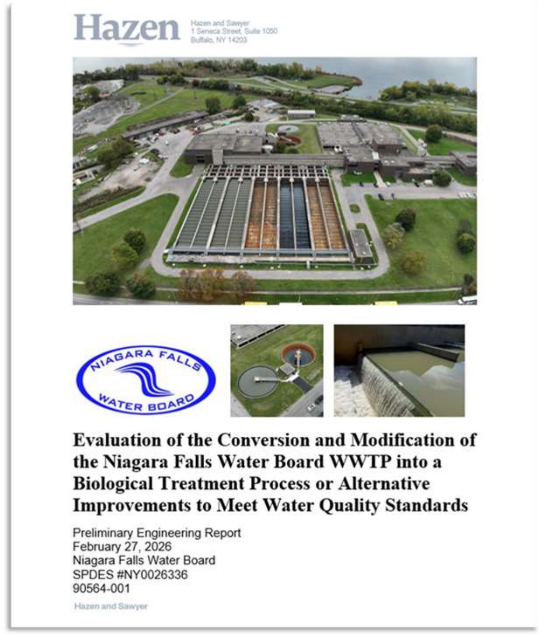
The report was submitted to the DEC on February 27th, 2026


Hazen
Hazen and Sawyer
1 Seneca Street, Suite 1050
Buffalo, NY 14203

Evaluation of the Conversion and Modification of the Niagara Falls Water Board WWTP into a Biological Treatment Process or Alternative Improvements to Meet Water Quality Standards

Preliminary Engineering Report
February 27, 2026
Niagara Falls Water Board
SPDES #NY0026336
90564-001
Hazen and Sawyer

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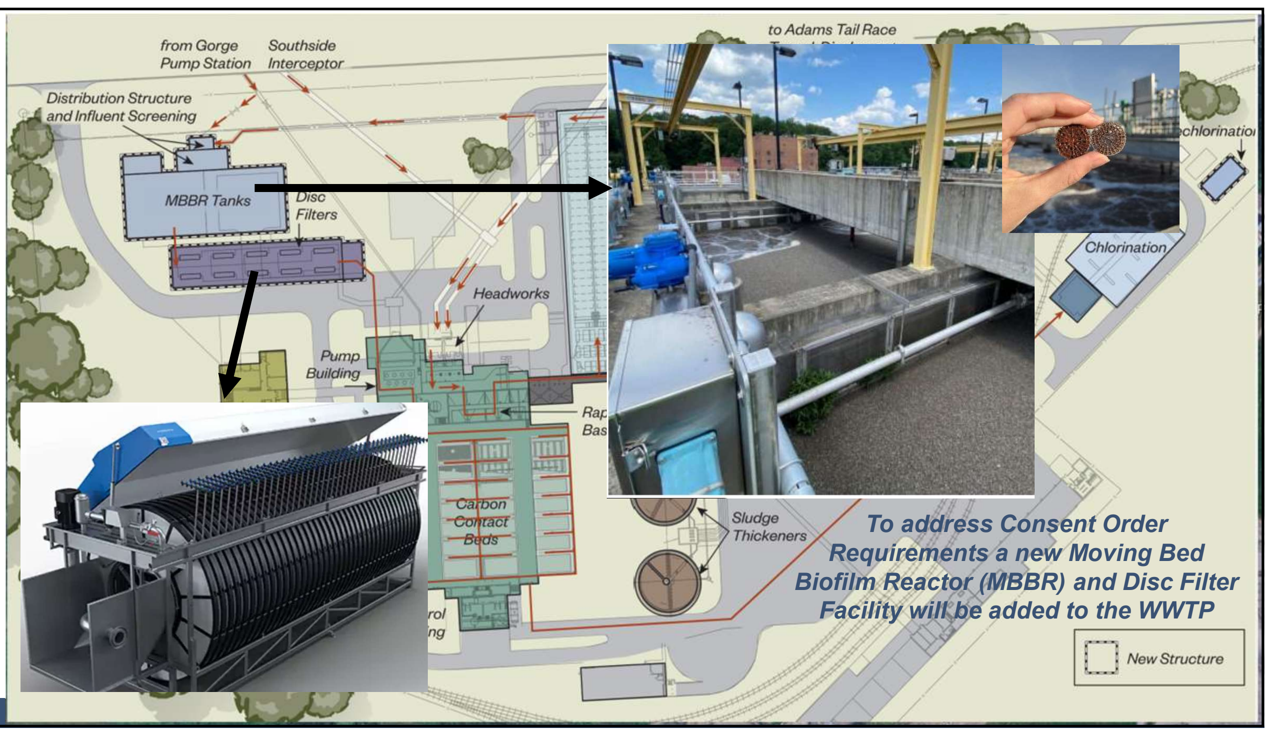

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Let’s explore the project details

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Our three step project approach provided a robust evaluation

1 Baseline Understanding

- Data Review
- Review of Historical Information
- Staff Interview
- Staff Interviews
- Condition Assessment
- Development of Design Flows and Loads
- CORMIX modeling

2 Evaluations

- Bench testing
- Review of “World of Options”
- Fatal Flaw Screening
- Evaluation of Shortlist of Technologies
- Solids Analysis

3 Recommendation & Preliminary Engineering Report

Hazen

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Building the foundational pieces of the project

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We built upon the significant amount of work that's already been completed

Title	Date and Firm
Strategic Master Plan for Wastewater Treatment	Black and Veatch, March 2005
WWTP Effluent Turbidity Engineering Report	URS Corporation, October 2015
Wastewater Treatment Plant and Gorge Pumping Station Rehabilitation	GHD, July 2018
Relocation of Outfalls 001 and 003 Alternatives Assessment	AECOM, September 2018
Evaluation of the Conversion and Modification of the Niagara Falls Water Board Wastewater Treatment Facility into a Biological Treatment Process	AECOM, December 2019; Addendum, June 2024
Evaluation of Adding Chlorine Dioxide to the Influent and Backwash Water of Carbon Filters at the Niagara Falls Water Board Wastewater Treatment Plant	AECOM, December 2021

Hazen

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Draft SPDES permit will require maintaining the GAC filters

Baseline Understanding

PARAMETER	EFFLUENT LIMITATION					MONITORING REQUIREMENTS				FN
	Type	Limit	Units	Limit	Units	Sample Frequency	Sample Type	Location Inf.	Location Eff.	
Flow	Monthly Average	48	MGD	-	-	Continuous	Recorder	-	X	-
pH	Range	6.0 – 9.0	SU	-	-	6/day	Grab	-	X	-
Total Organic Carbon, TOC	Monthly Average	-	mg/L	15,200	lbs/d	1/day	24-hr. Comp.	-	X	-
Total Organic Carbon, TOC	7-Day Average	-	mg/L	22,800	lbs/d	1/day	24-hr. Comp.	-	X	-
BOD_5	Monthly Average	30	mg/L	12,000	lbs/d	1/day	24-hr. Comp.	X	X	2
BOD_5	7-Day Average	45	mg/L	18,000	lbs/d	1/day	24-hr. Comp.	-	X	2
BOD_5, Percent Removal	Daily Minimum	85	Percent	-	-	1/day	Calculated	-	X	1,2
Total Suspended Solids (TSS)	Monthly Average	30	mg/L	12,000	lbs/d	1/day	24-hr. Comp.	X	X	-
Total Suspended Solids (TSS)	7-Day Average	45	mg/L	18,000	lbs/d	1/day	24-hr. Comp.	-	X	-
Total Suspended Solids (TSS), Percent Removal	Daily Minimum	85	Percent	-	-	1/day	Calculated	-	X	1
Settleable Solids	Daily Maximum	0.3	mL/L	-	-	6/day	Grab	-	X	-
Total Phosphorus (as P)	Monthly Average	1.0	mg/L	-	-	1/day	24-hr. Comp.	-	X	-
Total Sulfides	Daily Maximum	32	ug/L	13	lbs/d	1/month	24-hr. Comp.	-	X	2
Total Dissolved Solids	Daily Maximum	2,000	mg/L	-	-	1/month	24-hr. Comp.	-	X	-
Ammonia (as N) June 1st – Oct. 31st	Monthly Average	Monitor	mg/L	-	-	1/day	24-hr. Comp.	-	X	-
Ammonia (as N) Nov. 1st – May 31st	Monthly Average	Monitor	mg/L	-	-	1/day	24-hr. Comp.	-	X	-
Color (Apparent)	Daily Maximum	Monitor	PCU	-	-	1/month	Grab	-	X	-
Phenolics, Total	Daily Maximum	5.0	ug/L	4.0	lbs/d	2/month	24-hr. Comp.	-	X	3
Cyanide, Total	Daily Maximum	52	ug/L	-	-	1/month	24-hr. Comp.	-	X	-
α-BHC	Monthly Average	0.01	ug/L	Monitor	lbs/d	1/month	24-hr. Comp.	-	X	3
β-BHC	Monthly Average	0.02	ug/L	Monitor	lbs/d	1/month	24-hr. Comp.	-	X	3
γ-BHC	Monthly Average	0.02	ug/L	Monitor	lbs/d	1/month	24-hr. Comp.	-	X	3
δ-BHC	Monthly Average	0.04	ug/L	Monitor	lbs/d	1/month	24-hr. Comp.	-	X	3
Hexachlorobenzene	Monthly Average	0.20	ug/L	Monitor	lbs/d	1/month	24-hr. Comp.	-	X	3
Mercury	Daily Maximum	50	ng/L	-	-	Monthly	Grab	-	X	-
Mercury	12 MRA	16	ng/L	-	-	Monthly	Calculated	-	X	-
Mirex	Daily Maximum	0.4	ug/L	Monitor	lbs/d	1/month	24-hr. Comp.	-	X	3

The existing wastewater treatment plant is a physical-chemical treatment facility:

- Unable to treat for biochemical oxygen demand (BOD)
- A number of constituents on the permit require maintaining the GAC

PARAMETER	EFFLUENT LIMITATION					MONITORING REQUIREMENTS				FN
	Type	Limit	Units	Limit	Units	Sample Frequency	Sample Type	Location Inf.	Location Eff.	
PCB-1248	Daily Maximum	0.095	ug/L	Monitor	lbs/d	1/month	24-hr. Comp.	-	X	3
4,4'-DDD	Monthly Average	0.04	ug/L	Monitor	lbs/d	1/month	24-hr. Comp.	-	X	3
4,4'-DDE	Monthly Average	0.02	ug/L	Monitor	lbs/d	1/month	24-hr. Comp.	-	X	3
4,4'-DDT	Monthly Average	0.05	ug/L	Monitor	lbs/d	1/month	24-hr. Comp.	-	X	3
Dieldrin	Monthly Average	0.002	ug/L	-	-	1/month	24-hr. Comp.	-	X	3
Biennial Pollutant Scan	Daily Maximum	Monitor	ug/L	-	-	1/Two Years	24-hr. Comp.	X	X	4
EFFLUENT DISINFECTION Required All Year		Limit	Units	Limit	Units	Sample Frequency	Sample Type	Inf.	Eff.	FN
Coliform, Fecal	30-Day Geometric Mean	200	No./ 100 mL	-	-	1/day	Grab	-	X	-
Coliform, Fecal	7-Day Geometric Mean	400	No./ 100 mL	-	-	1/day	Grab	-	X	-
Chlorine, Total Residual	Daily Maximum	0.05	mg/L	-	-	6/day	Grab	-	X	2,5
WHOLE EFFLUENT TOXICITY (WET) TESTING		Limit	Units	Action Level	Units	Sample Frequency	Sample Type	Inf.	Eff.	FN
WET - Acute Invertebrate	See footnote	2.4	TUa	-	-	Quarterly	See footnote	-	X	6
WET - Acute Vertebrate	See footnote	2.4	TUa	-	-	Quarterly	See footnote	-	X	6
WET - Chronic Invertebrate	See footnote	-	-	10	TUc	Quarterly	See footnote	-	X	6
WET - Chronic Vertebrate	See footnote	-	-	10	TUc	Quarterly	See footnote	-	X	6

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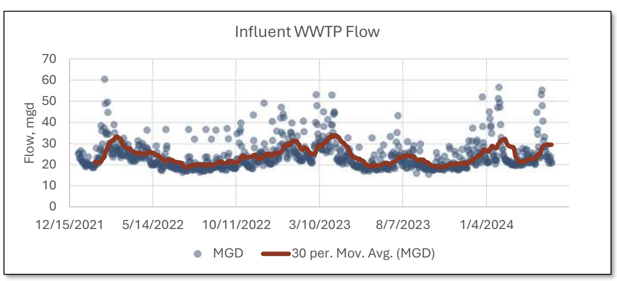
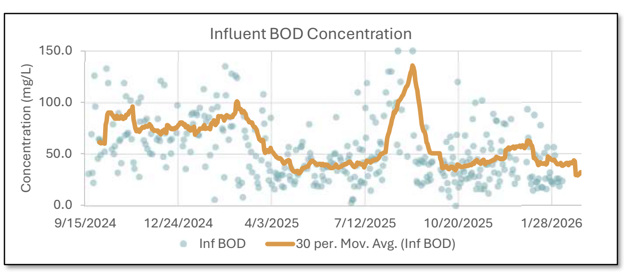
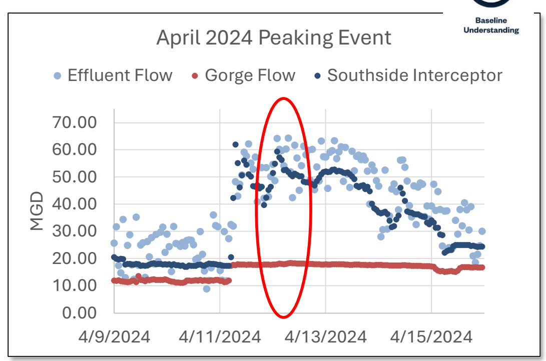
Historical data (flows and loads) were reviewed to understand current plant conditions

Baseline Understanding





Nearly two-year average influent BOD concentration (Biochemical Oxygen Demand), an indicator of organic pollutants



Example high flow event from April 2024

Parameter	Southside Interceptor	Gorge Pump Station	Combined Influent
April 2024 Maximum Flow	62.0	18.5	80.5
2024 Average Flow	11.5	11.9	23.4
Maximum Hour **Peaking Factor**	5.4	1.6	3.4

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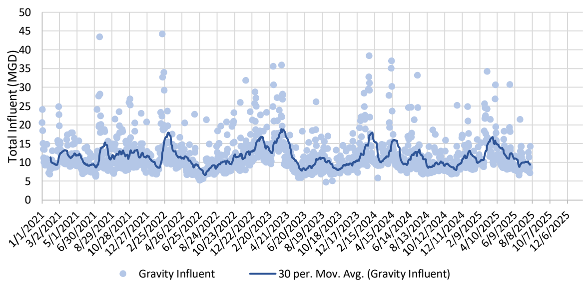
The influent sources vary significantly in flow and pollutant loadings

Baseline Understanding

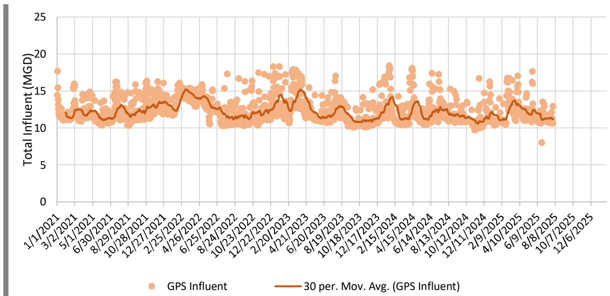
Gravity Influent Sewer



Parameter	Value
Chemical Oxygen Demand	150 mg/L
Ammonia	6 mg/L
Phosphorus	2.2 mg/L

Prone to wet-weather peaks and significantly stronger than the Gorge Forcemain

Gorge Forcemain



Parameter	Value
Chemical Oxygen Demand	40 mg/L
Ammonia	2 mg/L
Phosphorus	0.8 mg/L

Less prone to wet-weather peaks and very dilute. Recommend diverting past primary treatment for upgrade.

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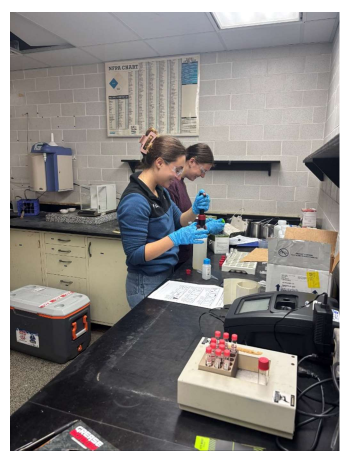
We performed short-term sampling to understand pollutant behavior through the WWTP, subsequently used for process design

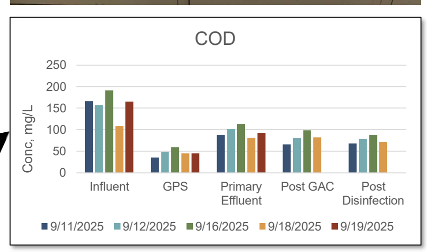
Baseline Understanding

Short-Term Sampling

2-week long sampling event to analyze eight types of pollutant concentrations at five key locations throughout the train of treatment to identify where the visible contrast begins

COD findings (Chemical Oxygen Demand)—an indicator of organic pollutants and a precursor to visible contrast of effluent





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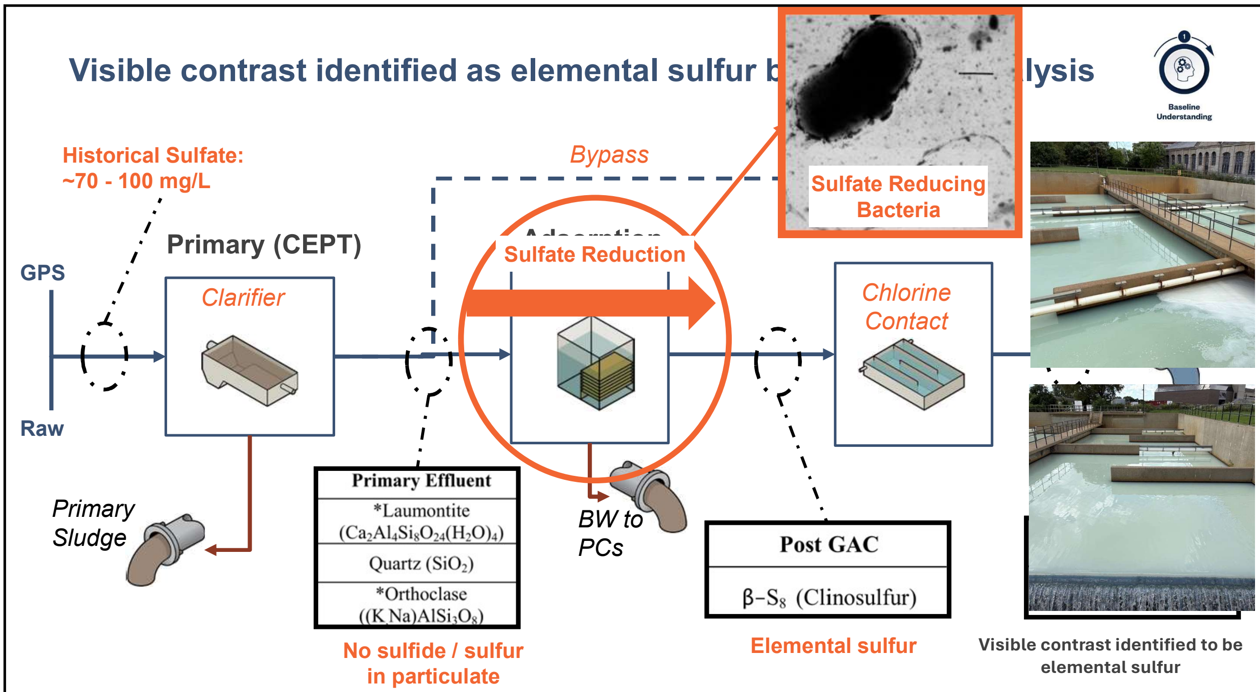
Visible contrast identified as elemental sulfur b… lysis



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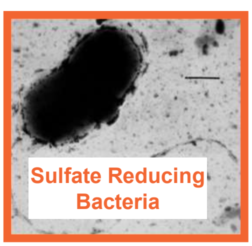
Minimizing reduced sulfur compounds in effluent requires multi-prong approach

Baseline Understanding



Environment	Carbon availability	Sulfate
• No oxygen	• Inherently available in wastewater	• In influent wastewater
⇩	⇩	⇩
Maintain aerated environment in feed to GAC	Treat/ reduce carbon entering GAC	Reduce influent sulfate (potential through industrial pretreatment program)

Hazen 20

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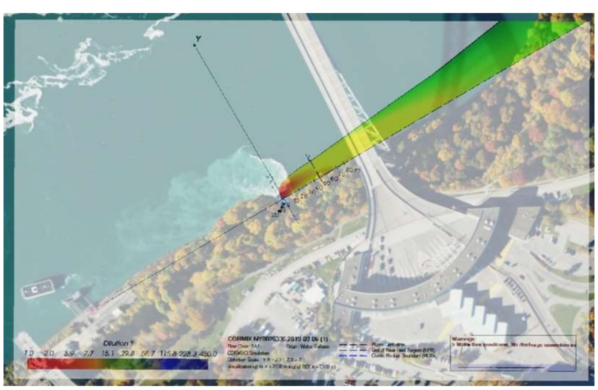
A condition assessment identified a number of deficiencies requiring improvements to provide the long-term viability of the WWTP in addition to the major upgrade

Baseline Understanding

Recommended Improvements	
Process	Description
Primary Treatment	• Replace the eight rapid mix diversion slide gates • Replace Ferric Chloride Tank Nos. 1 and 2
Intermediate Pumping and Carbon Treatment	• Hydraulic evaluation and replacement of intermediate pumps to address operational challenges • Full replacement of the carbon media in all 28 carbon beds • Replace Carbon Backwash Pump Nos. 1A and 2A • Allowance for pipe replacement • Replace all ten backflow preventers (potable water supply)
HVAC and Electrical	• Mechanical evaluation and recommendation of upgrades for HVAC system in Power Center 1 • Structural evaluation of the carbon building skylights' framing and supports and replacing of roof • Restore all explosion-proof fixtures along the main channel • Replace feeders to Power Centers 4, 5, and 6

DEC uses CORMIX for mixing analysis and determination of effluent limits

Baseline Understanding



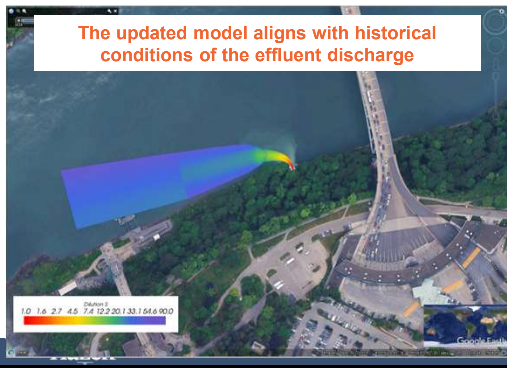
Effluent plume used for CORMIX modeling by DEC

<u>Findings from our review of the DEC CORMIX Model:</u>

- Current model predicts narrow plume that is attached to the shore down stream
- With little/no site specific data the DEC CORMIX model is based on many assumptions
- River dimensions and flow area – assumed rectangular
- Depth profile is unknown – impacts flow area and velocity
- Assume velocity is velocity of the river but the aerial image of the plume shows that the plume is moving upstream
- Flow volumes and direction are all assumed as no in-stream velocity data is available
- Does not account for fact that mixing continues to occur beyond 120 m away from the outfall

We updated the CORMIX model to be more representative of actual, historical conditions

Baseline Understanding



Parameter	Current Permit	Draft Permit	***Recommended Limit from this Analysis***
Total Residual Chlorine (TRC)	3.0 mg/L	0.05 mg/L	***1.0 mg/L***
WET – Acute Invertebrate	15.3 TUa	2.4 TUa	***7.2 TUa***
WET – Acute Vertebrate	15.3 TUa	2.4 TUa	***7.2 TUa***
WET – Chronic Invertebrate	101 TUa	10 TUc	***34 TUc***
WET – Chronic Vertebrate	101 TUa	10 TUc	***34 TUc***

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Primary findings from this phase of work

Baseline Understanding

- The two influent sources have very different characteristics (pollutant loading and flows)
- The CORMIX model was updated and recommended alternate SPDES permit limits
- It will be necessary to maintain the GAC filters for some SPDES constituents
- Elemental sulfur is responsible for visible contrast in the effluent

Hazen 24

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Evaluation of alternatives

Evaluations

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The December 2019 project proposed a Membrane Bioreactor (MBR)

In today's dollars the project would cost: $283M

Project Goal:
Identify feasibility of performing biological treatment of influent wastewater

Project Recommendations:
- Remove granular activated carbon
- Install activated sludge (AS) in GAC beds
- Install new membrane tanks adjacent to GAC facility

Major challenges with this plan:
- Difficult to construct, while maintaining treatment at the facility
- Costly to operate and install
- MBR provide level of AS treatment not required (over design)
- More complex operation than conventional AS
- **Will not meet permit limits on its own (need to keep GAC)**

Hazen 26

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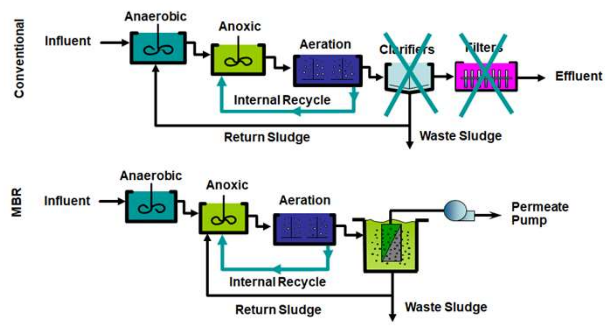
What is an MBR?

- Membrane bioreactors (MBRs) replace secondary clarifiers and some types of filtration
- Smaller footprint than conventional activated sludge clarifiers
- Operate at higher MLSS concentrations
  - 8,000 mg/L
  - Reduced basin footprint
- Provides a positive barrier to TSS removal
  - Effluent TSS typically ≤ 1 mg/L
  - Reduces particulate N and P
  - Reuse quality effluent
- Considerations
  - Additional Pre-treatment required (1-2 mm fine screens)



Hazen

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A robust, defensible alternative evaluation was performed to select the best treatment strategy to address the consent order and new effluent limits

Evaluations

Step 1: World of Options
- Identify **all** applicable wastewater treatment technologies or other potential solutions

Step 2: Identify Feasible Alternatives
- Shortlist potential alternatives based on existing WWTP conditions, cost feasibility, and technology reputation

Step 3: Test Feasible Alternatives
- Perform treatability studies on WWTP samples to confirm the alternative can meet the necessary criteria

Step 4: Compare Preferred Alternatives
- Create a scoring matrix using qualitative and quantitative criteria to assign a final score to each alternative

Hazen 28

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We reviewed the technology/ process "world of options"

Potential solutions and technology alternatives categorized into three groups

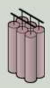
Evaluations

Physical/Chemical Treatment

Maintain the existing strategy with the addition of a strong chemical (oxidant) or additional filter

Biological Treatment

Add a biological treatment stage to the WWTP



Hybrid

Add to or modify the existing treatment process to include both above types of treatment

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World of Options List

Resulting list of potential solutions

Evaluations

Physical/Chemical Treatment	Biological Treatment	Hybrid Treatment
• **Chemical Oxidant** • **Membrane** • **Ion Exchange**	• **Biologically Aerated Filter (BAF)** • **Suspended Growth (activated sludge)** • **Moving Bed Biofilm Reactor (MBBR)** • **Enhanced Primary**	• **Membrane and reflect water treatment**

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Short-Listing of World of Options

Physical/Chemical Treatment	Biological Treatment	Hybrid Treatment
• Chemical Oxidant • ~~Membrane~~ • ~~Ion Exchange~~	• BAF • ~~Suspended Growth~~ • MBBR • ~~Enhanced Primary~~	• Membrane and reject water treatment
Produces reject stream requiring treatment	Footprint requirements. No US installations.	
↓	↓	↓
Alt 1: Chemical Oxidant	Alt 2a: BAF Alt 2b: MBBR	Alt 3: Nanofiltration with Reject Treatment

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Bench-top treatability testing identified most suitable processes for further evaluation

~~Physical/Chemical Treatment~~	Biological Treatment	~~Hybrid Treatment~~
• ~~Chemical Oxidant~~	• BAF • MBBR	• ~~Nanofiltration with reject treatment~~
Testing determined ozone unable to provide sufficient pollutant removal	Testing confirmed that either process will provide level of treatment required	Testing determined nanofiltration does not provide sufficient pollutant removal and also requires reject water treatment

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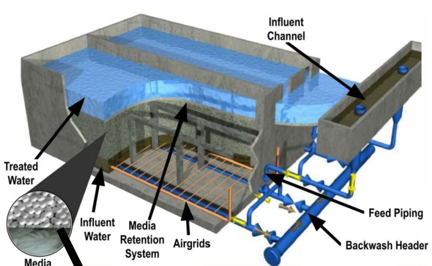
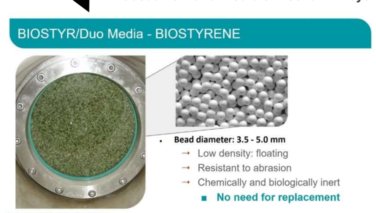
Evaluation of alternatives

What is a BAF?



Process flow and media of Veolia BAF system



Top view of typical Veolia BAF cell

Biological Aerated Filters

What?

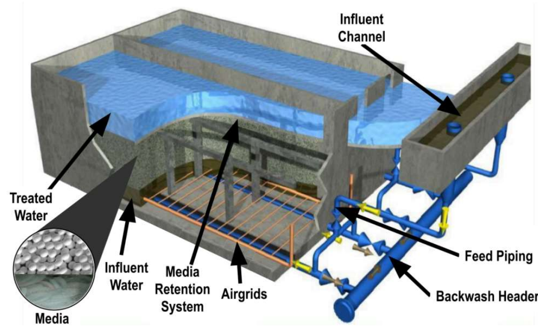
- Upflow submerged fixed film processes that remove COD and solids in a single step

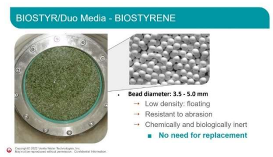
Why?

- Reduce organic load to carbon contactors by growing biofilm on filter media

Where?

- Patapsco WWTP, MD
- Tahoe Truckee Sanitation Agency, CA





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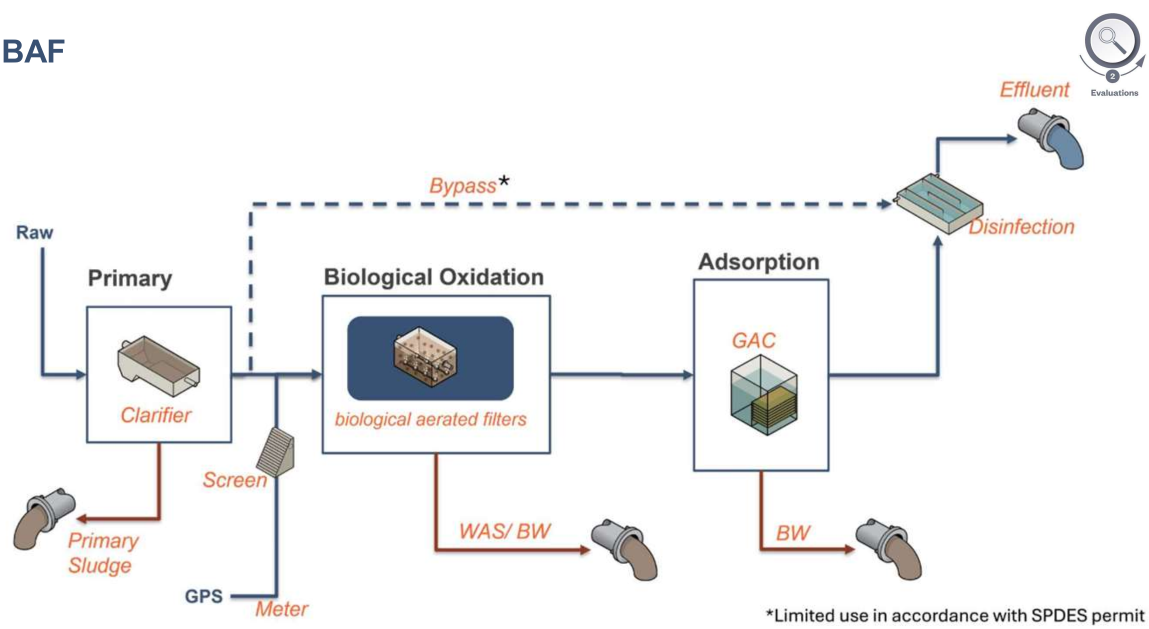
BAF



*Limited use in accordance with SPDES permit

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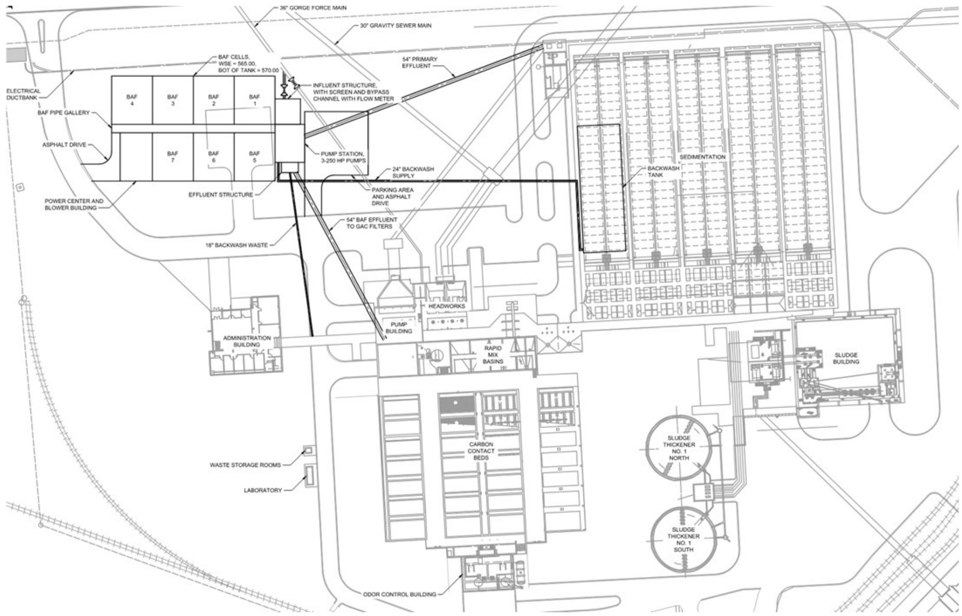
Summary of Biological Aerated Filter (BAF)

- Preliminary BAF site layout includes:
  - 7 BAF reactors
  - Influent structure with bypass available
  - New intermediate pump station
  - Modifications to Sedimentation Basin No. 1 for system use



Evaluations

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Summary of Biological Aerated Filter (BAF)

Evaluations

Parameter	Value
Total Energy Use per Year	3,580,000 kWh/yr
Total Labor Hours per Year	4,696.5 hours/yr
Total Operations and Maintenance Cost	**$1.3M/yr**

Parameter	Value
Direct Construction Costs 2026	$116.5M
Total Estimated Project Cost	**$407.0M**
Low End (-30%)	$285M
High End (+50%)	$611M

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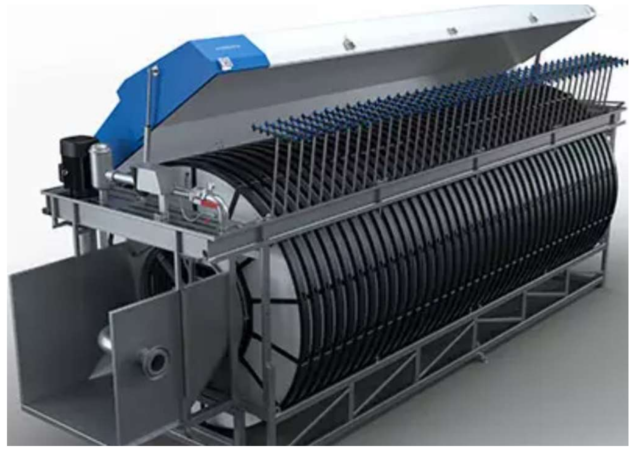
What is an MBBR?

Top view of exposed Veolia MBBR system

MBBR Media



Disc Filter

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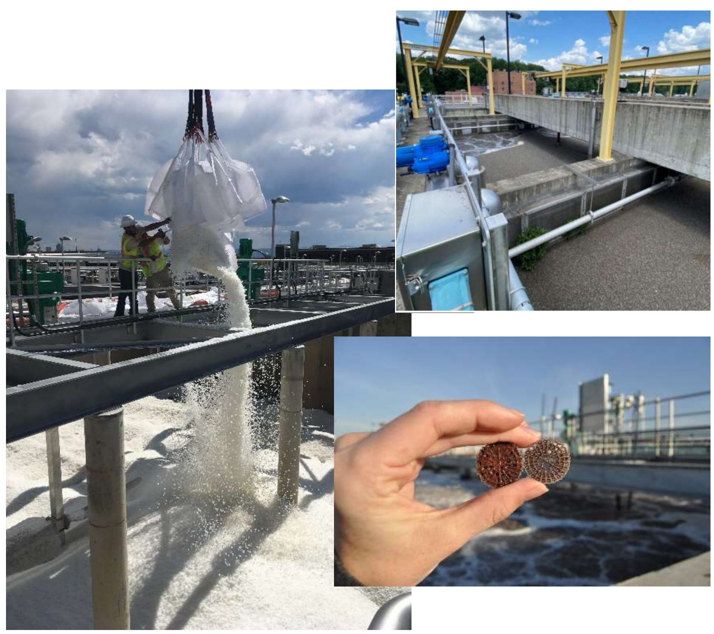
Moving Bed Bioreactor (MBBR)

What?
- Mixture of fixed growth biomass in compact footprint

Why?
- Reduce organic load to carbon contactors
- Minimize sludge production

Where?
- Noman Cole WRF, VA
- Chesterfield WWTP, VA



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Disc Filter

What?

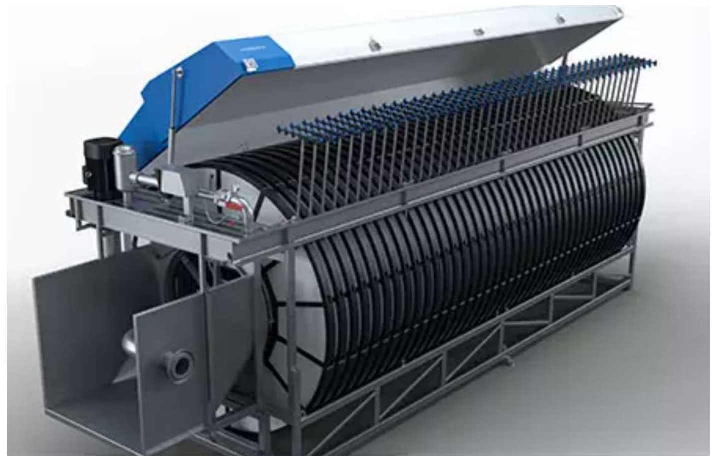
- Wooven cloth filters mounted on discs to allow for separation of suspended solids

Why?

- Reduce suspended solids generated in MBBR

Where?

- Sjöunda, Malmö, Sweden



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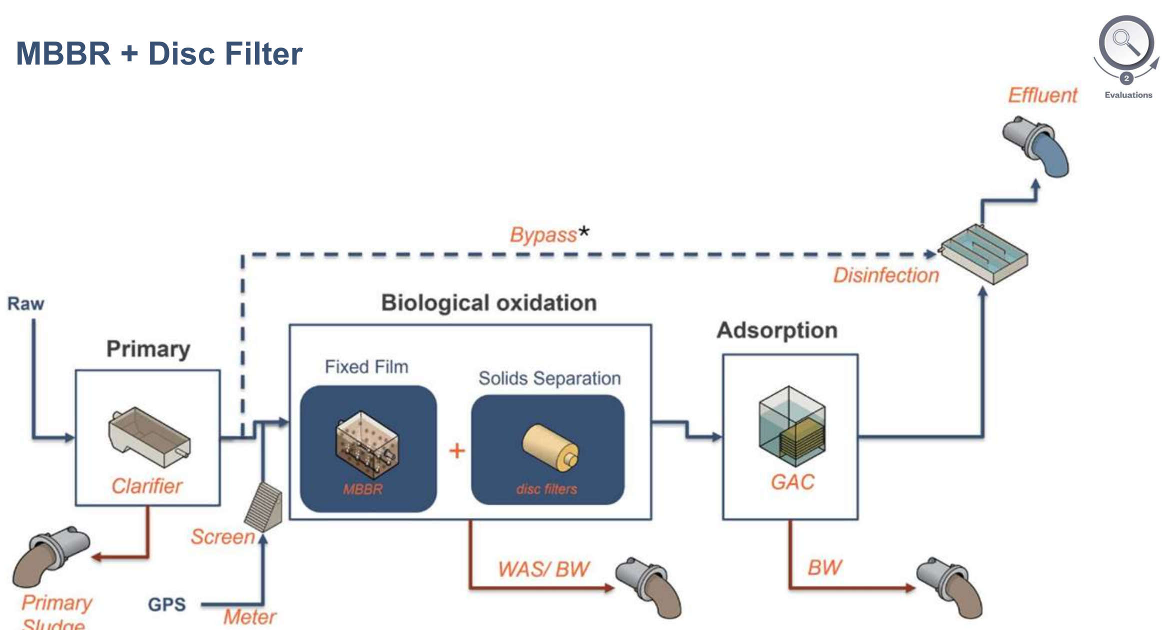
MBBR + Disc Filter



*Limited use in accordance with SPDES permit

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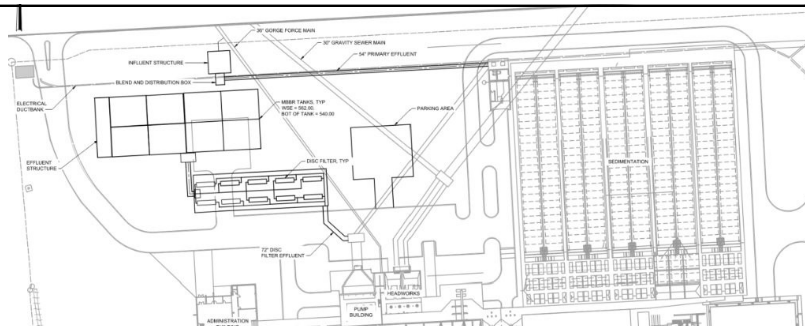
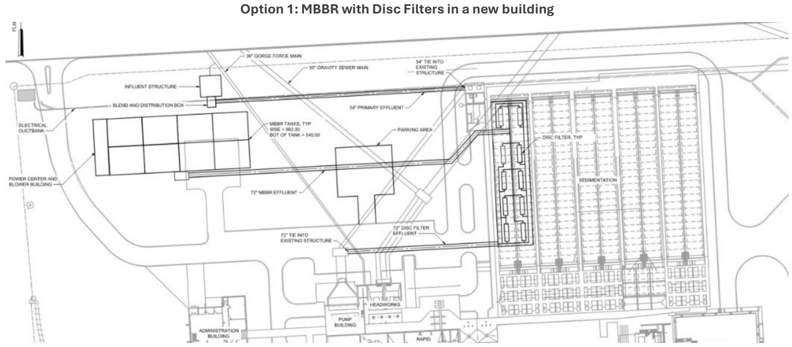
Summary of Moving Bed Biofilm Reactor (MBBR)

- Preliminary MBBR site layout includes:
  - 8 MBBR reactors
  - 10 Disc Filter units
  - New Disc Filter Building OR Modifications to Sedimentation Basin No. 1
  - New polymer dosing system



Option 1: MBBR with Disc Filters in a new building



Option 2: MBBR with Disc Filters in Sed. Basin No. 1

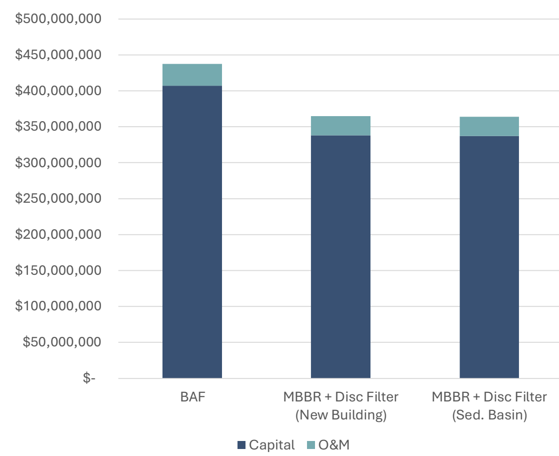
Summary of Moving Bed Biofilm Reactor (MBBR)

Parameter	Value
Total Energy Use per Year	3,100,000 kWh/yr
Total Labor Hours per Year	2,700 hours/yr
Total Operations and Maintenance Cost	**$1.1M/yr**

Parameter	Option 1 (New Disc Filter Building)	Option 2 (Repurpose Sed. Basin No. 1)
	Value	
Direct Construction Costs 2026	$96.1M	$95.7M
Total Estimated Project Cost	**$338.2M**	**$336.7M**
Low End (-30%)	$237M	$236M
High End (+50%)	$507M	$505M

Life-Cycle Cost Comparison

	BAF	MBBR + Disc Filter (Sed. Basin)	MBBR + Disc Filter (New Building)
Capital	$407M ($285M - $611M)	$337M ($236M - $505M)	$338M ($237M - $507M)
O&M	$1.1M	$1.0M	$1.0M
25-Year NPV	$437M	$364M	$365M
Additional FTE	2.	2	
Energy Usage/ year	3,580,000	3,100,000	



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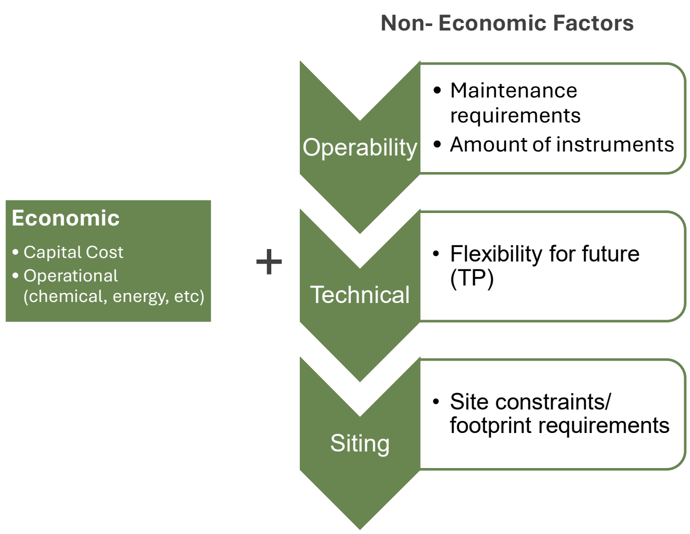
Economic and Non-Economic Comparison

Qualitative and Quantitative Criteria



Factor		Weight
Economic	Capital	50%
	O&M	20%
Operability	# of instruments	10%
	# of basins	5%
Technical	Flexibility for future	10%
Siting	sq.ft.	5%
Total		100%

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MBBR results in highest score and lower cost

Factor		Weight	BAF	MBBR
			Score	Score
Economic	Capital	50%	29.7	**33.1**
	O&M	20%	13.9	**14.6**
Operability	# of instruments	10%	3.1	**7.2**
	# of basins	5%	1.5	**1.0**
Technical	Flexibility for future	10%	10.0	**10.0**
Siting	sq.ft.	5%	3.1	**4.2**
Total		**100%**	**61.3**	**70.1**

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Final Report Recommendations

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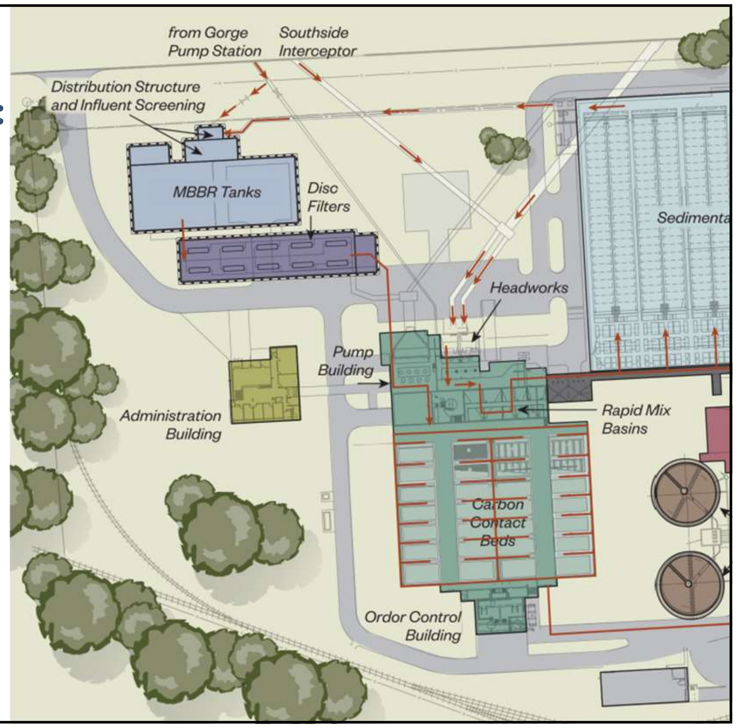
Recommended Alternative: MBBR + Disc Filters

Highest score, lowest cost

In addition:

- Widely established technology in the wastewater sector
- Multiple manufacturers promoting competitive bidding (lowest cost, best value for NFWB)
- Treatment capacity can easily be upgraded, as needed in the future



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Recommendation – Effluent Modifications

Parameter	Current Permit	Draft Permit	Recommended Limit from this Analysis
Biochemical Oxygen Demand (BOD_5)	N/A	30 mg/L monthly avg.	***N/A***
		45 mg/L 7-day avg.	***N/A***
		85% removal daily minimum	***30-day avg.***
Total Suspended Solids (TSS)	30 mg/L monthly avg.	30 mg/L monthly avg.	***N/A***
	45 mg/L 7-day avg.	45 mg/L 7-day avg.	***N/A***
	N/A	85% removal daily minimum	***30-day avg.***
Total Sulfides	N/A	32 ug/L	***Monitor only***
Total Residual Chlorine (TRC)	3.0 mg/L	0.05 mg/L	***1.0 mg/L***
WET – Acute Invertebrate	15.3 TUa	2.4 TUa	***7.2 TUa***
WET – Acute Vertebrate	15.3 TUa	2.4 TUa	***7.2 TUa***
WET – Chronic Invertebrate	101 TUa	10 TUc	***34 TUc***
WET – Chronic Vertebrate	101 TUa	10 TUc	***34 TUc***

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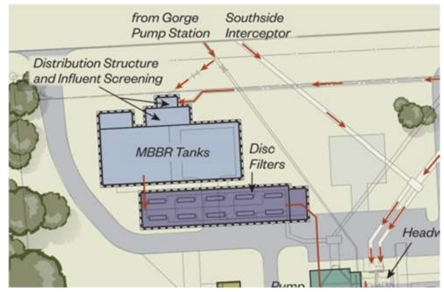
Cost Comparison of MBR to Proposed Alternative

2019 Recommendation: MBR

Parameter	Value
SOGR Improvements	$40M
MBR (2026 Dollars)	$283M
Mid-point of Construction	$398M

- × Does not maintain GAC
- × Challenging construction
- × MBR provides unnecessary level of treatment

2026 PER Recommendation: MBBR + Disc Filter



Parameter	Value
SOGR Improvements	$40M
MBBR + DF (2026 Dollars)	$232M
Mid-point of Construction	$336M

- ✓ Maintains GAC (more robust treatment)
- ✓ Lowest cost, highest score
- ✓ Less complex MOPO
- ✓ Less complex operations

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Next steps

Hydraulic Study

- Recommended improvements will alter plant operations and the nature of flow through. This study will confirm existing hydraulics and refine hydraulic analysis from the PER

Derating Study

- Current flows are significantly less than rated plant capacity. Reducing the rating of the facility will reduce new infrastructure and save costs.

Update the Industrial Pretreatment Program

Perform a Rate Structure Study

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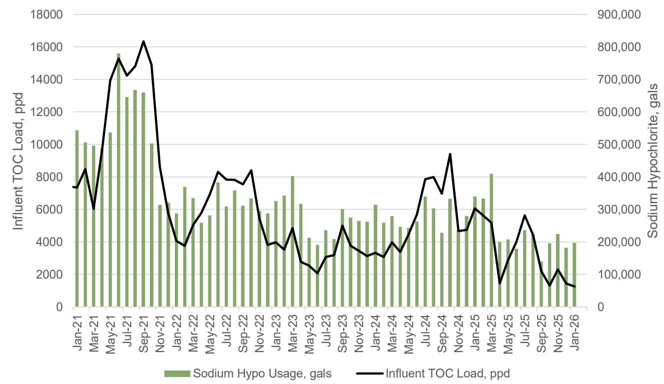
Other Interesting Findings From the PER



The 'typical' visible contrast has significantly improved and chlorine usage is at historical lows

The improvements to contrast and reduced chlorine usage correlates to the closure of a Significant Industrial User (SIU)

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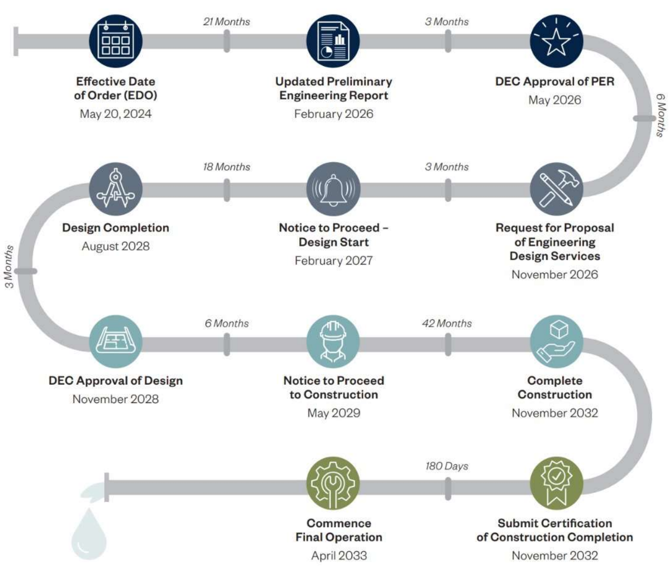
Next Steps on Consent Order

- PER Submitted February 2026
- NYS DEC review and approve PER
- Procure engineering design services – 6 months post PER approval
- Design NTP - 9 months post PER approval
- Design completion – 18 months post NTP
- Construction complete – 48 months post DEC design approval
- Final operation startup – 180 days construction complete



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Bullpen

AACE Cost Estimate Classifications

- **Class 4** cost estimate is typically for Preliminary Engineering Report (PER/PDR)
  - Project Definition: 10% - 30%
  - ANSI Classification: Order of Magnitude
  - Development Methodology: factored major equipment costs or parametric models
  - Recommended Design Contingency: 20% to 40%
  - Expected Accuracy Range: (low end) -30% to -15%, (high end) +20% to +50%
- **Class 3** cost estimate is typically done during Design Development
  - Project Definition: 50% - 60%
  - ANSI Classification: Budgetary
  - Development Methodology: Semi-detailed unit costs w. multiple line items per process area/category
  - Recommended Design Contingency: 15% to 25%
  - Expected Accuracy Range: (low end) -20% to -10%, (high end) +10% to +30%

Hazen recommends a Class 4 classification in report to align with Project Definition, Recommended Design Contingency and Expected Accuracy Range, and EFC recommended design contingencies. However, the development methodology does align to Class 3 expectations.

American Association of Cost Engineers – Capital Cost Class Estimates

AACE Class	ANSI Classification	Typical Use	Project Definition	Expected Range of Accuracy: Low Expected Actual Cost	Expected Range of Accuracy: High Expected Actual Cost	Other Terms
Class 5	Order-of-Magnitude	Strategic Planning; Concept Screening	0% to 2%	-50% to -20%	+30% to +100%	ROM; Ballpark; Blue Sky; Ratio
Class 4	Order-of-Magnitude	Feasibility Study	1% to 15%	-30% to -15%	+20% to +50%	Feasibility; Top-down; Screening; Pre-design
Class 3	Budgetary	Budgeting	10% to 40%	-20% to -10%	+10% to +30%	Budget; Basic Engineering Phase; Semi-detailed
Class 2	Definitive	Bidding; Project Controls; Change Management	30% to 75%	-15% to -5%	+5% to +20%	Engineering; Bid; Detailed Control; Forced Detail
Class 1	Definitive	Bidding; Project Controls; Change Management	65% to 100%	-10% to -3%	+3% to +15%	Bottoms Up; Full Detail; Firm Price

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Cost Assumptions

Capital Cost Assumptions

Parameter	Value
General Conditions	20%
Special Conditions (Tie-ins, small tools, overtime)	2%
Permits	1.0%
Contractor's Risk/Tariffs	10%
Insurance (Builders Risk, Gen. Liability, etc.)	3%
Bonds	3.0%
Contractor's O & P	20%
Design Contingency	40%
Escalation Adder (5%/yr, w/ NTP 06/2029 @ 24-months = 23.54%)	23.5%
Project Contingency (Management Reserves)	10%
Engineering and Implementation Fees	15%

Operations and Maintenance Assumptions

Parameter	Value
Electricity	$0.17/kwh
Annual Maintenance	2.5% on mechanical equipment
Loaded Labor Rate	$75/hr

Life-Cycle Cost Assumptions

Parameter	Value
Interest Rate	4%
Inflation/ Escalation Rate	3%
Life-Cycle Term	25 years
Life-Cycle Assumed Flow	Annual Average (23 mgd)

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Labor Estimates

- Provides estimate of staffing requirements
- Based on plant size and unit process