Executive Summary | Pump Station 2 Rack & Grit Improvements

- WRRF PS 2 Rack and Grit was constructed in 1990 and last updated 2015 and its capacity is 900 MGD.
- It removes a combined ~15 tons of screenings and grit from the influent to the WRRF each day.
- The existing screen and grit processes operates at 15% and 32% efficiency, respectively. This means that ~64 tons of inorganic material goes to the downstream process areas each day.
- The proposed improvements will remove ~35 tons of screenings and grit per day, more than doubling the current removal of solids.

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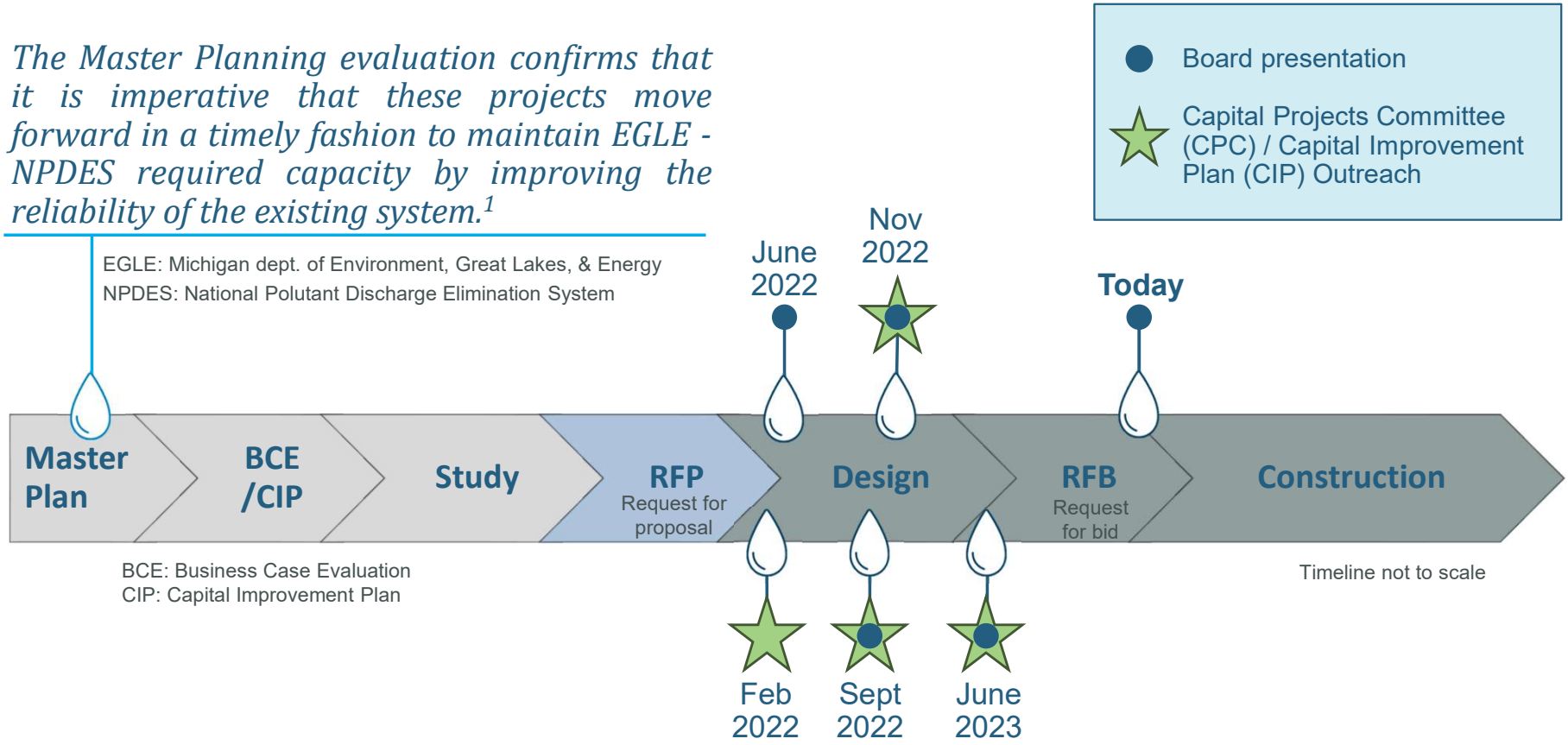
Capital Improvement Project (CIP) 211007 Timeline

WRRF Pump Station 2 Bar Rack Replacement and Grit System Improvements

Project type: Design - Bid – Build

The Master Planning evaluation confirms that it is imperative that these projects move forward in a timely fashion to maintain EGLE - NPDES required capacity by improving the reliability of the existing system.[1]



1. GLWA 2020 Master Plan, 7.4.5.1: PS2 and Preliminary Treatment Improvements

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Rack and Grit is sewage pre-processing to PROTECT the WRRF

Screenings of floating debris = Clogs for pipes

Grit = Sandpaper for pumps and valves, blocks for aeration

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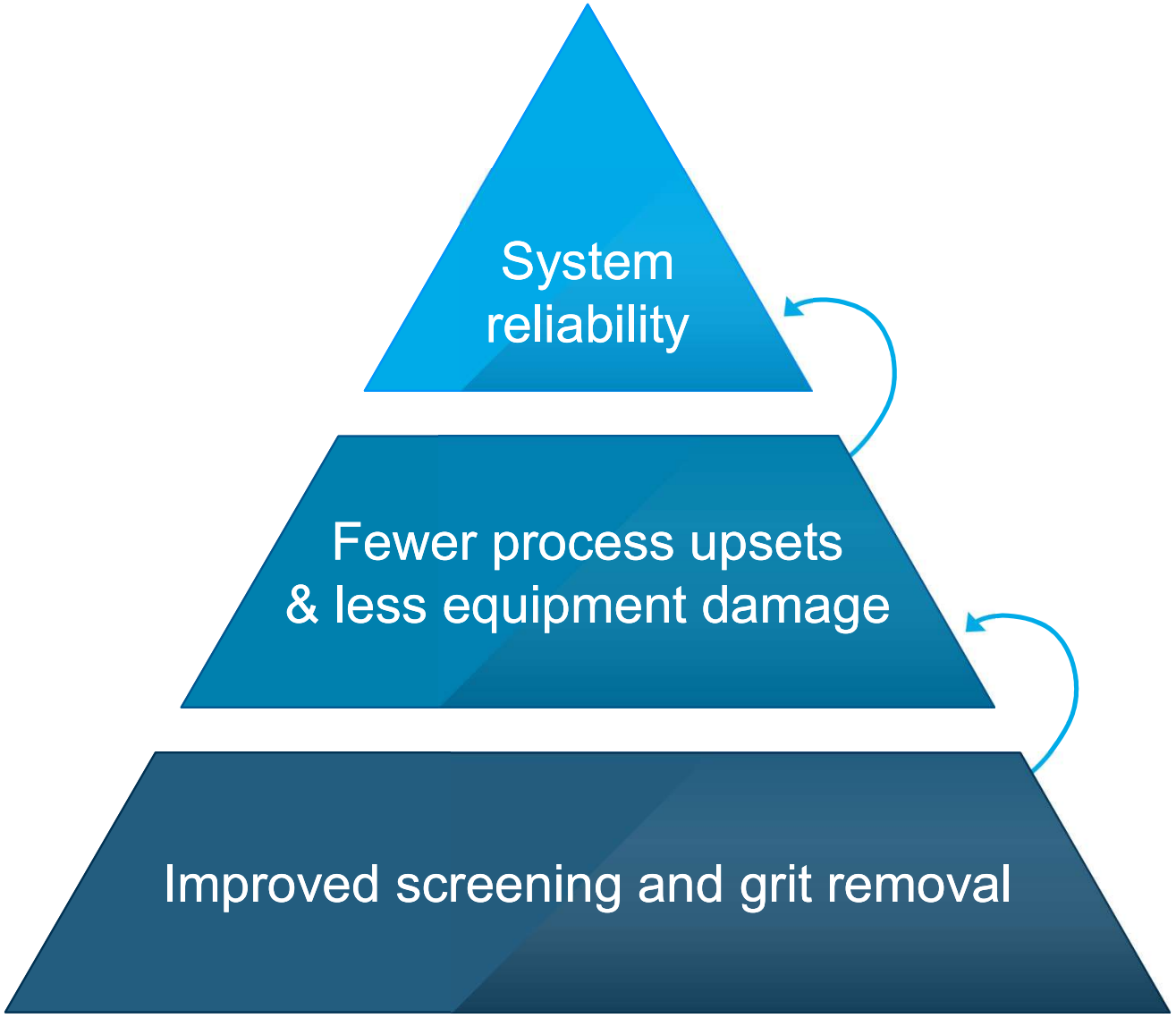
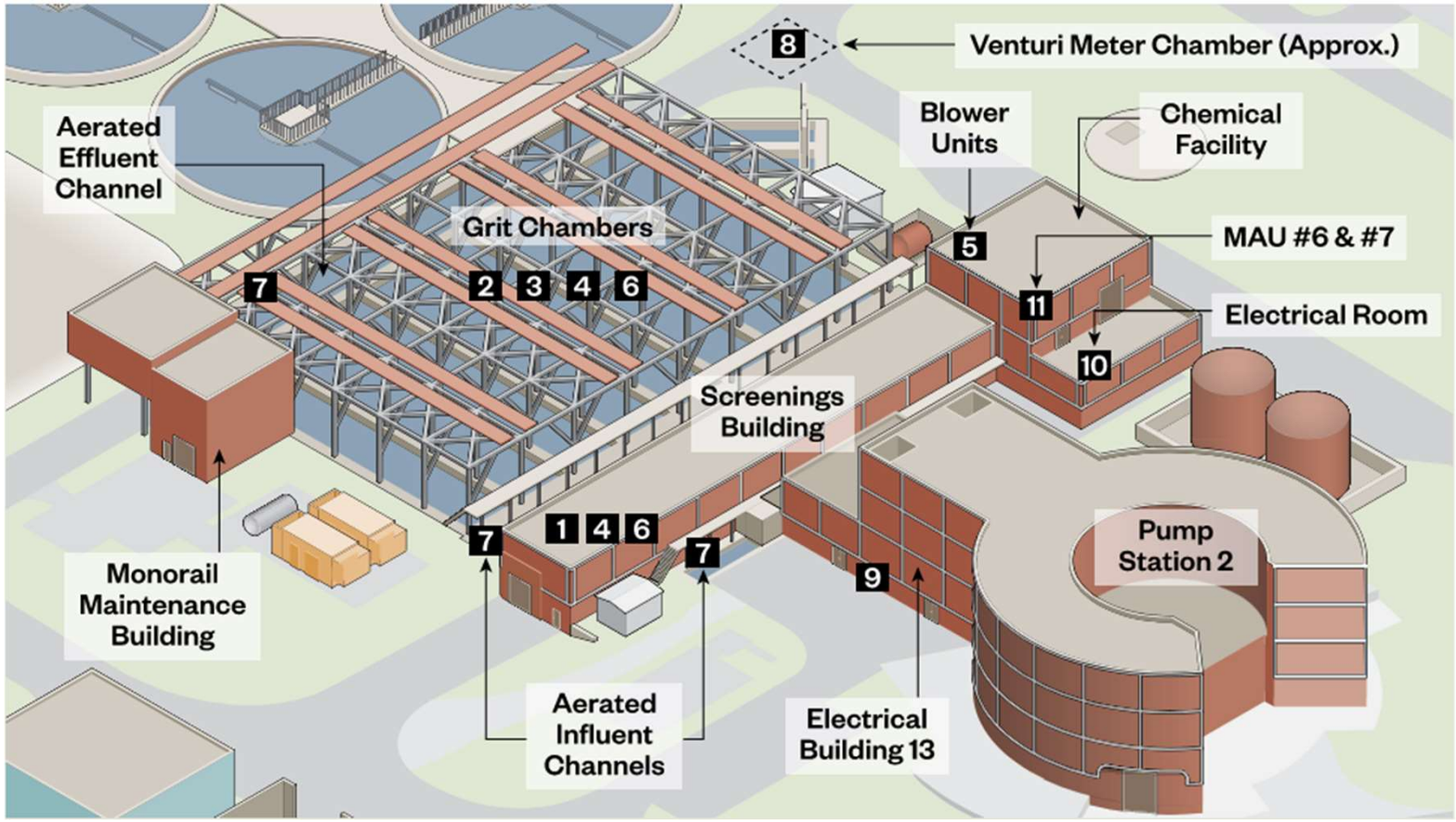
Project Purpose



Existing Facilities | At discharge side of Pump Station 2



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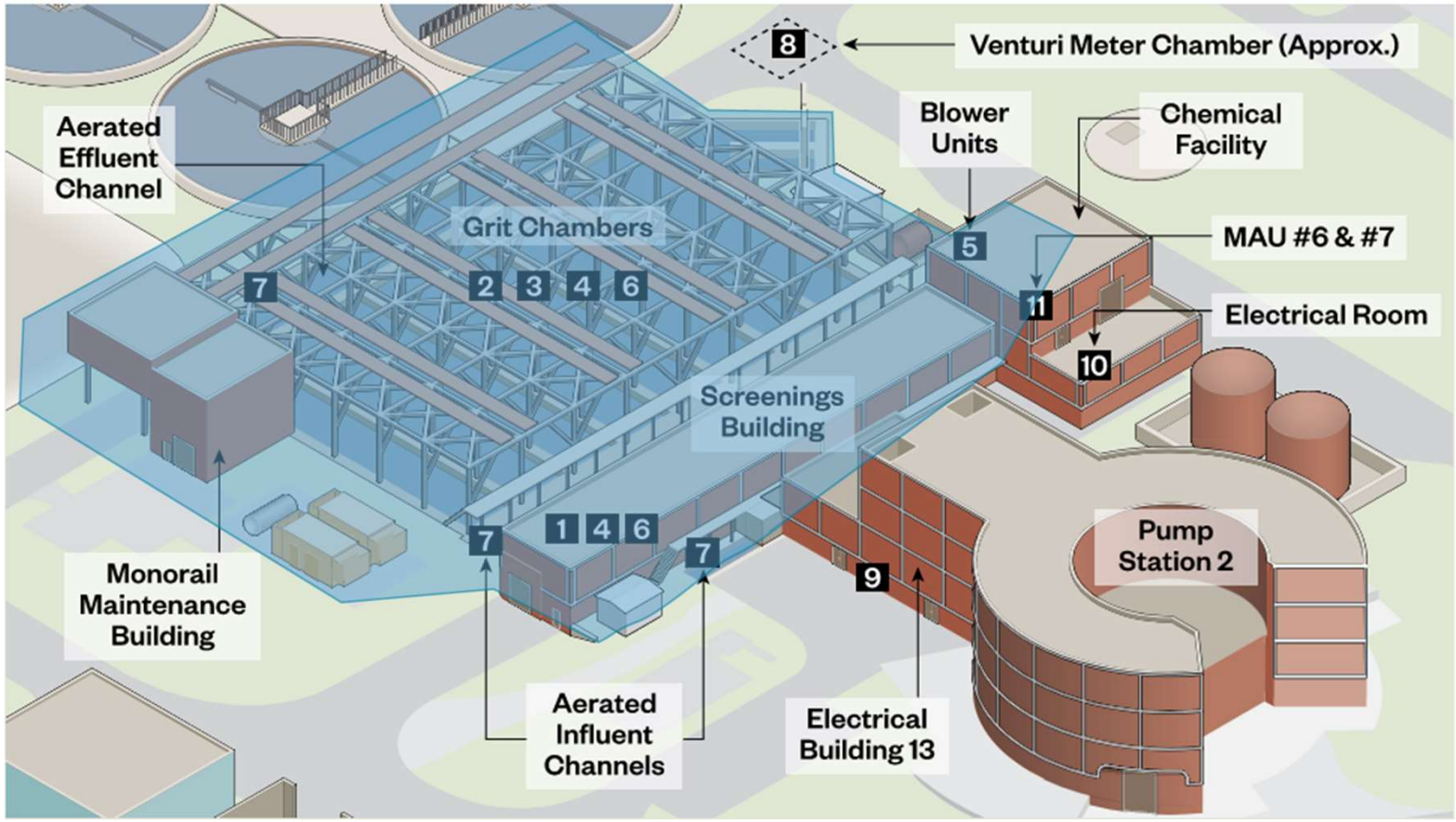
Existing Facilities | At discharge side of Pump Station 2



Current State | The equipment is approaching end of life

Equipment to upgrade

- Eight ¾” gap bar screens
- Screening conveyor
- Aerated grit channels
- Clamshell Bucket
- Building and auxiliary systems

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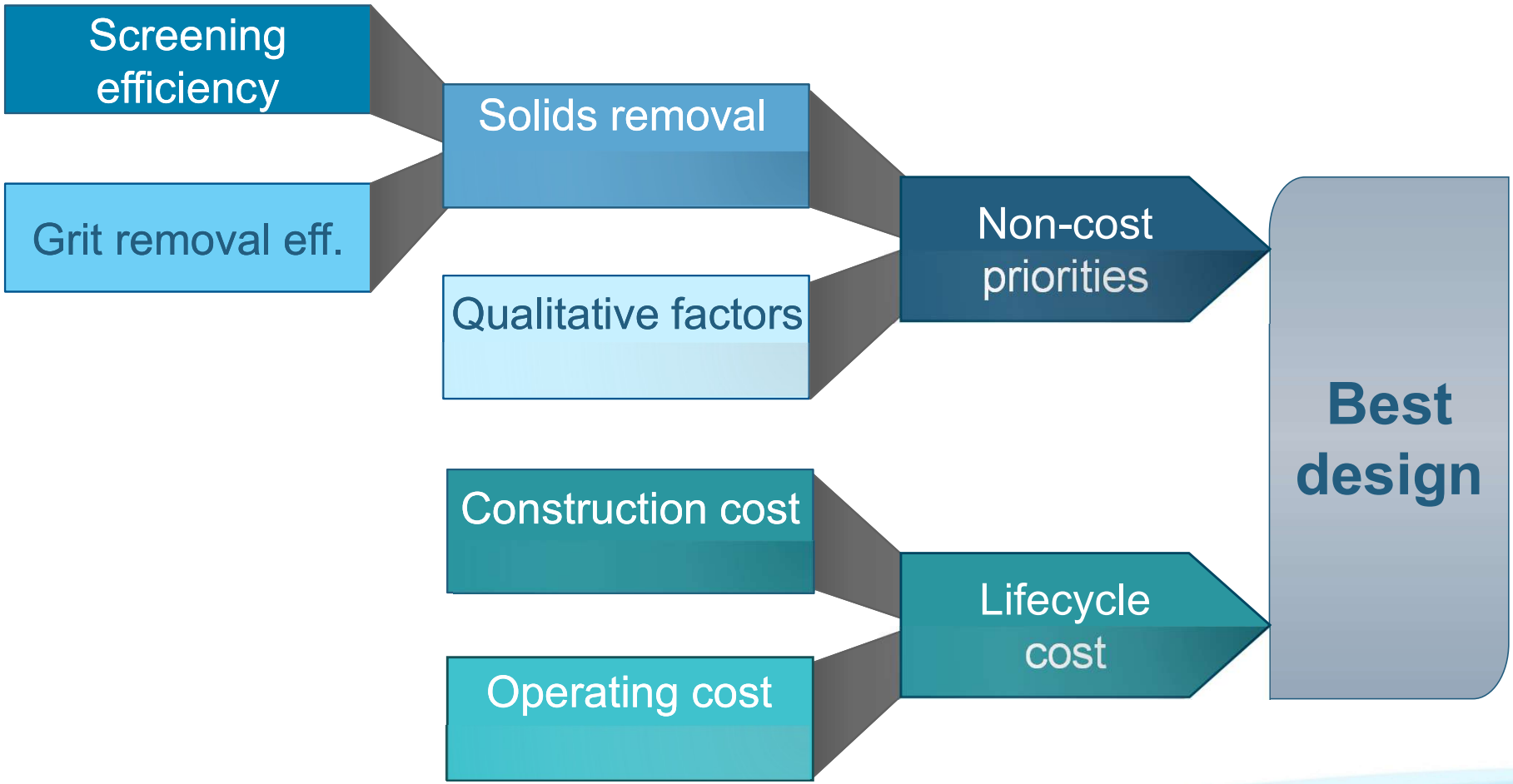
The alternatives evaluation balanced cost vs. design priorities



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Alternatives evaluation compared combos of screen & grit systems

	A1. Tank rehab + screw conveyors	**A2.** Tank rehab + grit pump	**A3.** Tank rehab + chain & flight	**B.** Stacked tray	**C.** Stirred vortex	**D.** Dry weather system
A. Narrow bars in existing racks						
A1. Narrow bars + 2 new racks						
B. Coarse and fine screens in existing building						
C. Coarse and fine screens in two locations						
D. A + fine screens @ grit tank inlet						
E. A + fine screens @ grit tank inlet						

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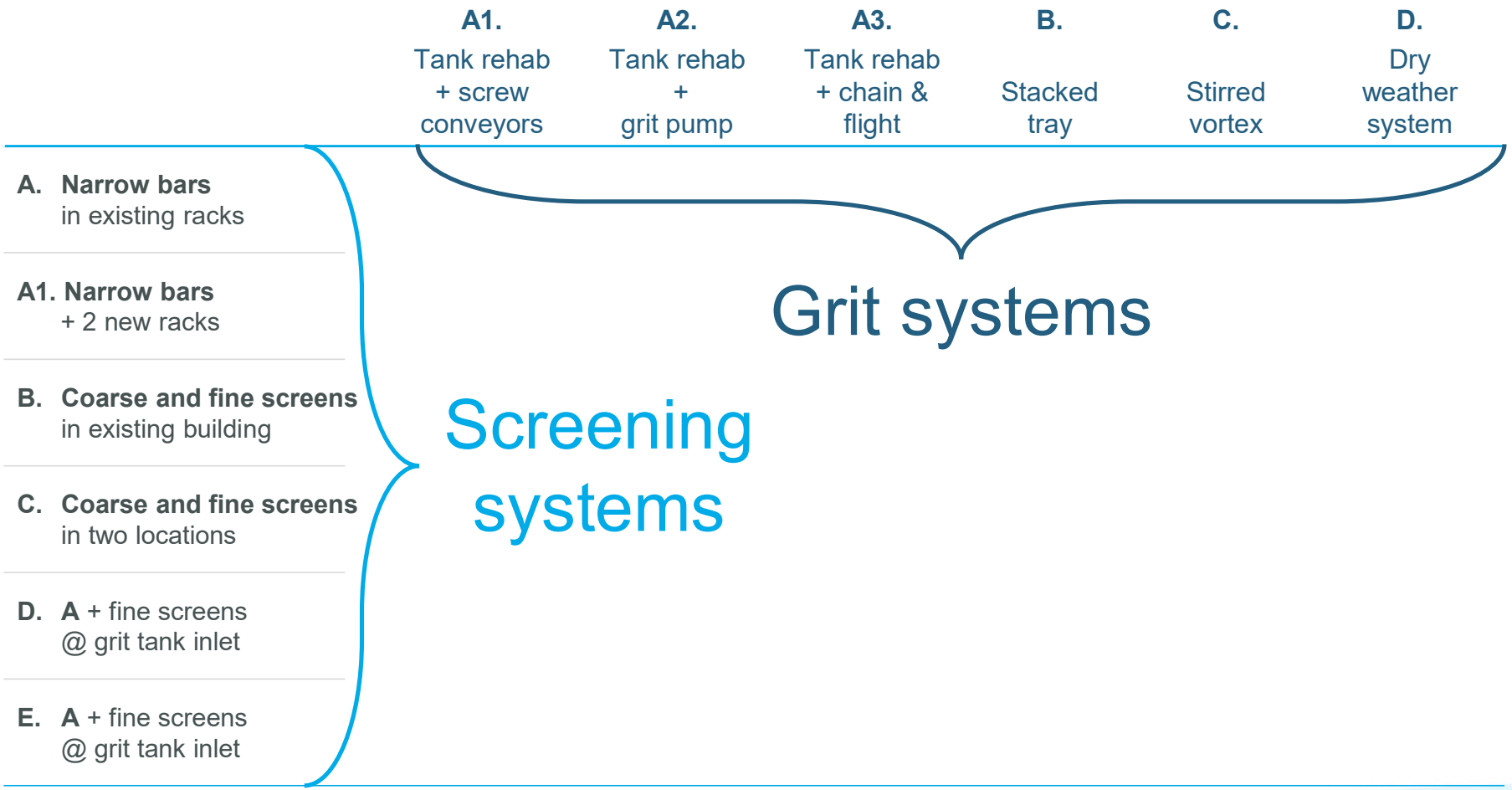
Alternatives evaluation compared combos of screen & grit systems



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Alternatives evaluated | Feasibility check eliminated two systems

	A1. Tank rehab + screw conveyors	A2. Tank rehab + grit pump	A3. Tank rehab + chain & flight	B. Stacked tray	C. Stirred vortex	D. Dry weather system
A. Narrow bars in existing racks						
A1. Narrow bars + 2 new racks						
B. Coarse and fine screens in existing building	Eliminated Blocked emergency egress and maintenance access					
C. Coarse and fine screens in two locations	Eliminated Not feasible with hydraulic limitations					
D. A + fine screens @ grit tank inlet						
E. A + fine screens @ grit tank inlet						

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Alternatives evaluated | Two more options eliminated in early scoring

	A1. Tank rehab + screw conveyors	A2. Tank rehab + grit pump	A3. Tank rehab + chain & flight	B. Stacked tray	C. Stirred vortex	D. Dry weather system
A. Narrow bars in existing racks						
A1. Narrow bars + 2 new racks						
B. Coarse and fine screens in existing building			Eliminated Operations & maintenance concerns			Eliminated High cost
C. Coarse and fine screens in two locations						
D. A + fine screens @ grit tank inlet						
E. A + fine screens @ grit tank inlet						

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Alternatives evaluated | Two more options eliminated in early scoring

	A1. Tank rehab + screw conveyors	A2. Tank rehab + grit pump	A3. Tank rehab + chain & flight	B. Stacked tray	C. Stirred vortex	D. Dry weather system
A. Narrow bars in existing racks						
A1. Narrow bars + 2 new racks					Selected	
B. Coarse and fine screens in existing building			Eliminated			Eliminated
C. Coarse and fine screens in two locations			Operations & maintenance concerns			High cost
D. A + fine screens @ grit tank inlet						
E. A + fine screens @ grit tank inlet						

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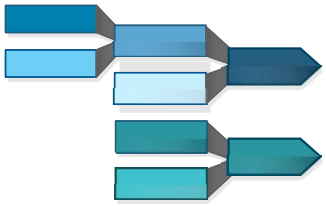
Viable system alternatives were scored on cost and priority criteria



Design Combinations (comparison)

Screening \ Grit	A1. Tank rehab + conveyors	A2. Tank rehab + grit pump	B. Stacked tray	C. Stirred vortex
A. Narrow bars in existing racks				
A1. Narrow bars + 2 new racks				Selected
D. A + fine screens @ grit tank inlet				
E. A + fine screens @ grit tank inlet				

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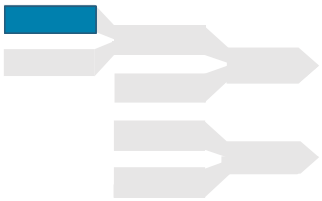
Scoring | Screening capture ratio



75% & above
50%-74%
25%-49%
Below 25%

Design Combinations
(% of screenings removed)

Screening \ Grit	A1. Tank rehab + conveyors	A2. Tank rehab + grit pump	B. Stacked tray	C. Stirred vortex
A. Narrow bars in existing racks	15%			
A1. Narrow bars + 2 new racks	35%			Selected
D. A + fine screens @ grit tank inlet	80%			
E. A + fine screens @ grit tank inlet				

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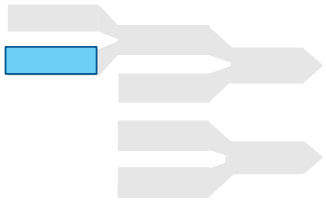
Scoring | Grit removal efficiency



75% & above
50% - 74%
25% - 49%
Below 25%

Design Combinations
(% of grit removed)

Screening \ Grit	A1. Tank rehab + conveyors	A2. Tank rehab + grit pump	B. Stacked tray	C. Stirred vortex
A. Narrow bars in existing racks	25%		68% Selected	
A1. Narrow bars + 2 new racks				
D. A + fine screens @ grit tank inlet	13%			
E. A + fine screens @ grit tank inlet				

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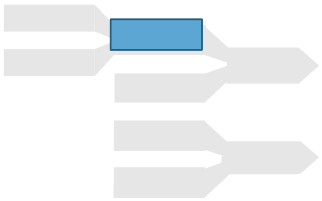
Scoring | Total solids removal



75 & above
50-74
25-49
Below 25

Design Combinations
(tons of solids per day)

Screening \ Grit	A1. Tank rehab + conveyors	A2. Tank rehab + grit pump	B. Stacked tray	C. Stirred vortex
A. Narrow bars in existing racks	19		37	
A1. Narrow bars + 2 new racks	31		49	
D. A + fine screens @ grit tank inlet	52		75	
E. A + fine screens @ grit tank inlet				

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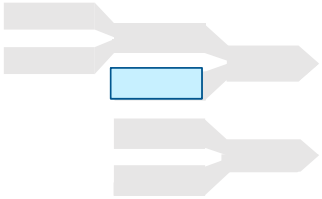
Scoring | Qualitative factors



Performance

History of performance in similar wastewater treatment facilities

GLWA experience

Resistance to damage / failure

Regulatory

Flexibility to meet NPDES requirements during construction

Adaptability to future flows

Operations and Maintenance

Maintainability

Ease of operation

Constructability and Maintenance of Ongoing Plant Operations (MOPO)

Health and Safety (H&S)

Plant traffic impact

Changes to existing H&S exposure

Public Benefit

Nuisance potential: odor / traffic / noise

Efficiency and Innovation

Energy savings

Reduces future costs

Sustainability

Facility footprint

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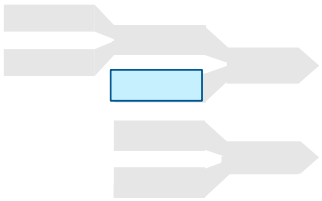
Scoring | Qualitative factors



55 and above
50-54
45-49
Below 45

Design Combinations
(out of 100 possible points)

Screening \ Grit	A1. Tank rehab + conveyors	A2. Tank rehab + grit pump	B. Stacked tray	C. Stirred vortex
A. Narrow bars in existing racks	53		43	49
A1. Narrow bars + 2 new racks	57		52	61
D. A + fine screens @ grit tank inlet	44		40	51
E. A + fine screens @ grit tank inlet	47			56

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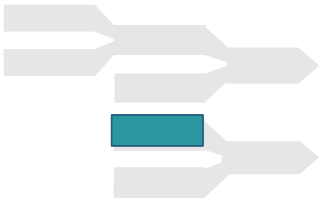
Scoring | Est. Construction cost



Below 60
60-69
70-79
80 and above

Design Combinations
(scaled cost, max cost = 100)

Screening \ Grit	A1. Tank rehab + conveyors	A2. Tank rehab + grit pump	B. Stacked tray	C. Stirred vortex
A. Narrow bars in existing racks	52	65	74	57
A1. Narrow bars + 2 new racks	61	74	83	66
D. A + fine screens @ grit tank inlet	78	90	100	85
E. A + fine screens @ grit tank inlet				

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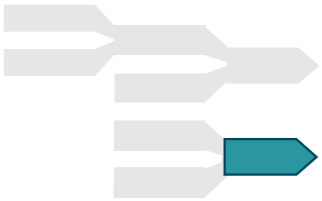
Scoring | Est. Lifecycle cost



Design Combinations
(scaled cost, max cost = 100)

- Below 60
- 60-69
- 70-79
- 80 and above

Screening \ Grit	A1. Tank rehab + conveyors	A2. Tank rehab + grit pump	B. Stacked tray	C. Stirred vortex
A. Narrow bars in existing racks	54	67	75	58
A1. Narrow bars + 2 new racks	62	76	83	67
D. A + fine screens @ grit tank inlet	79	92	100	86
E. A + fine screens @ grit tank inlet				85

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Performance Improvement | Better screening and grit removal

	Current	Proposed
Screening	 • ¾” and larger	 • ¼” and larger 
Grit removal	• 95% removal of grit >200 microns • 23% - 40% of total	• 95% removal of grit >105 microns • ~80% of total
Operations	• One week to empty each grit tank into dumpsters	• Grit automatically pumped to dumpsters

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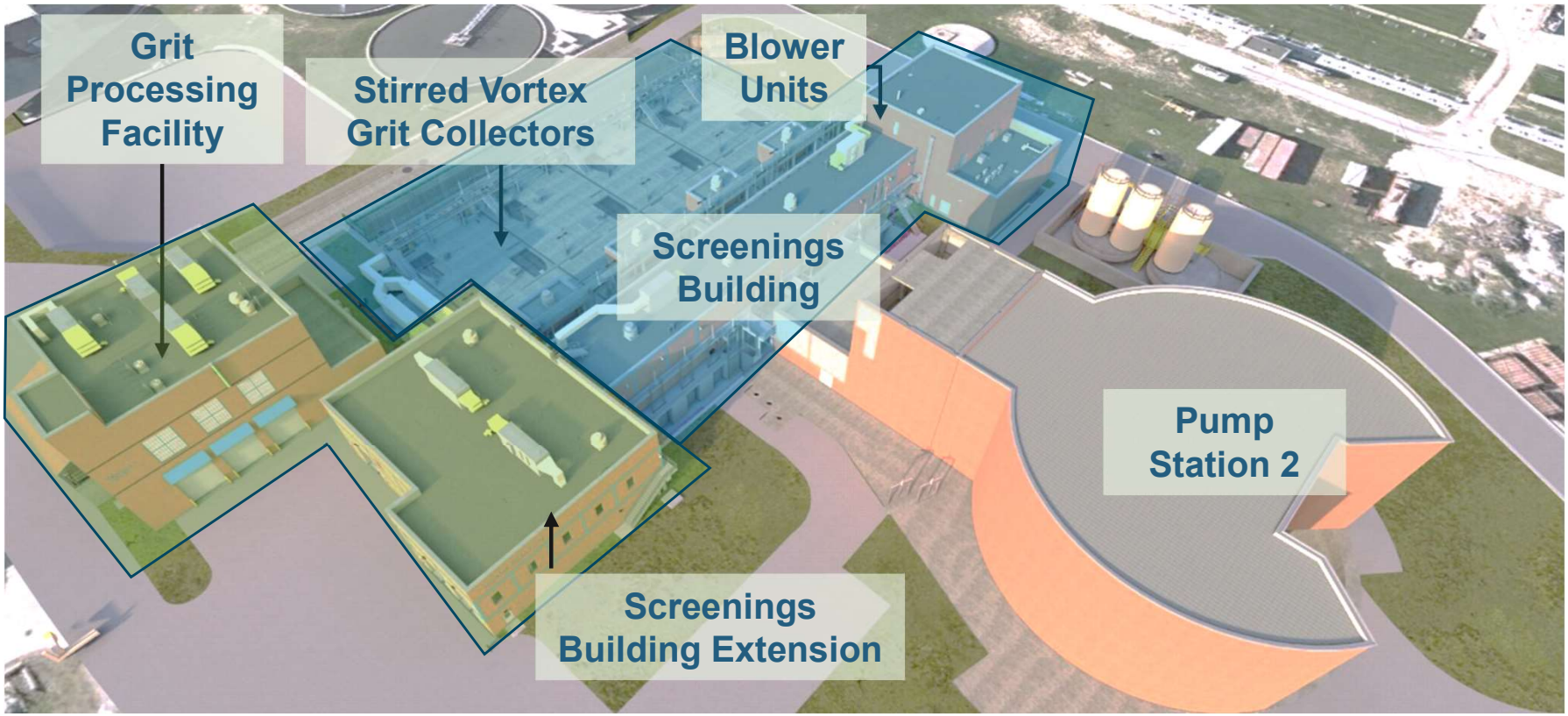
Proposed PS2 screening and grit removal facilities



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Screening Upgrades I/II | Replace bar screens with finer screens

Existing Bar Screens

¾” Bar screens (8 total)

Proposed

¼” Bar screens (10 total)

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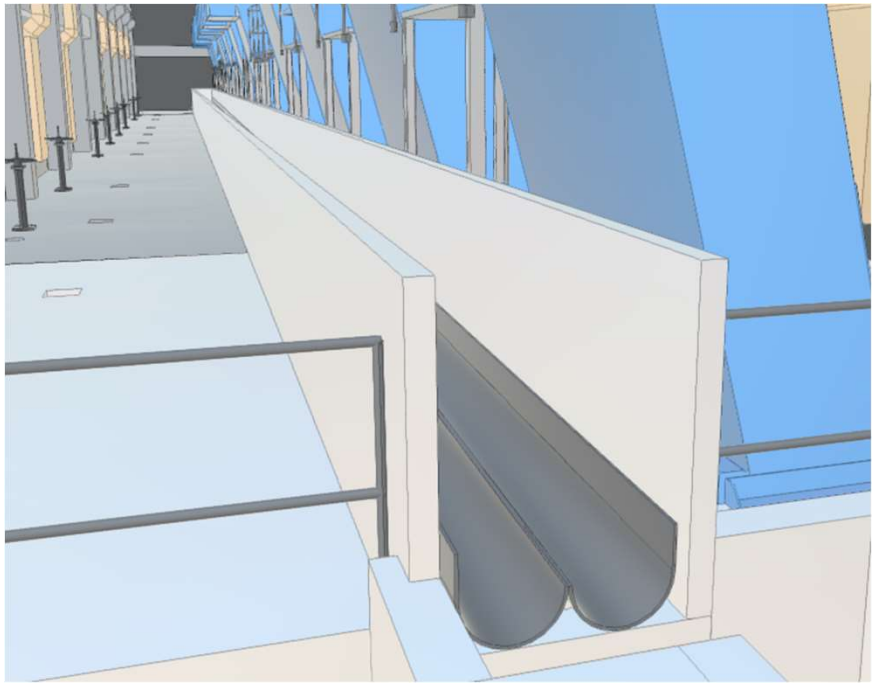
Screening Upgrades II/II | Replace conveyor with sluice trough

Existing conveyor to dumpster

Belt rolling to dumpster

Proposed



Trough flowing to washers & compactors

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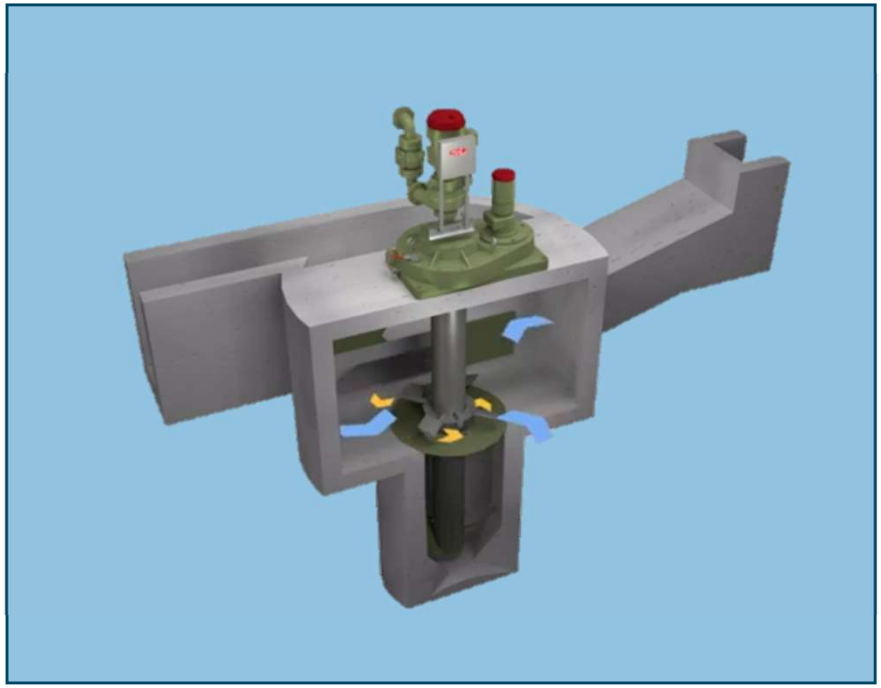
Grit Upgrades I/II | Install stirred vortex grit collectors

Existing Grit Chambers

Aerated channels with weirs (8 total)

Proposed



Stirred vortex grit collectors (8 total)

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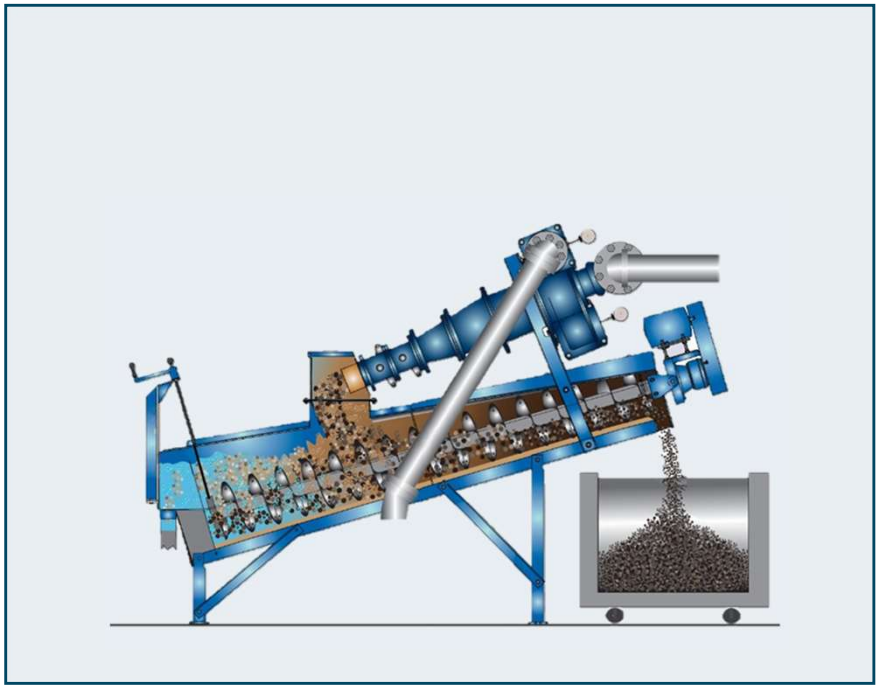
Grit Upgrades II/II | Replace bucket with grit classifiers

Existing Grit Removal

Clamshell bucket

Proposed



Cyclone classifiers (6 total)

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Construction Summary
Timeline and Costs

Construction duration	58 months (April 2030 assuming Oct. 2024 NTP)
Designer	Hazen and Sawyer
Builder	Commercial Construction Company
Design cost	$11.8M
Amendment	$5.4M (construction phase support)
Construction cost	$225M
Total	**$242M**

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Summary | Pump Station 2 Rack & Grit is a strategic capital project

Goals

- Remove a higher percentage of solids
- Replace equipment nearing end-of-life
- Simplify operations and reduce maintenance costs

Other benefits

- Reduce wear on primary sludge pumps and other processing equipment
- Improve quality of biosolids products
- Inform upcoming Pump Station 1 Screening and Grit project

Recommendation

- Replace the 8 existing bar screens with **10 finer bar screens** for debris removal
- Install **stirred vortex units** and **cyclone classifiers** for grit removal
- Building, mechanical, electrical, and other **misc. improvements**

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