

City of Grand Ledge

Wastewater Treatment Plant – Alternatives Analysis

December 13, 2021



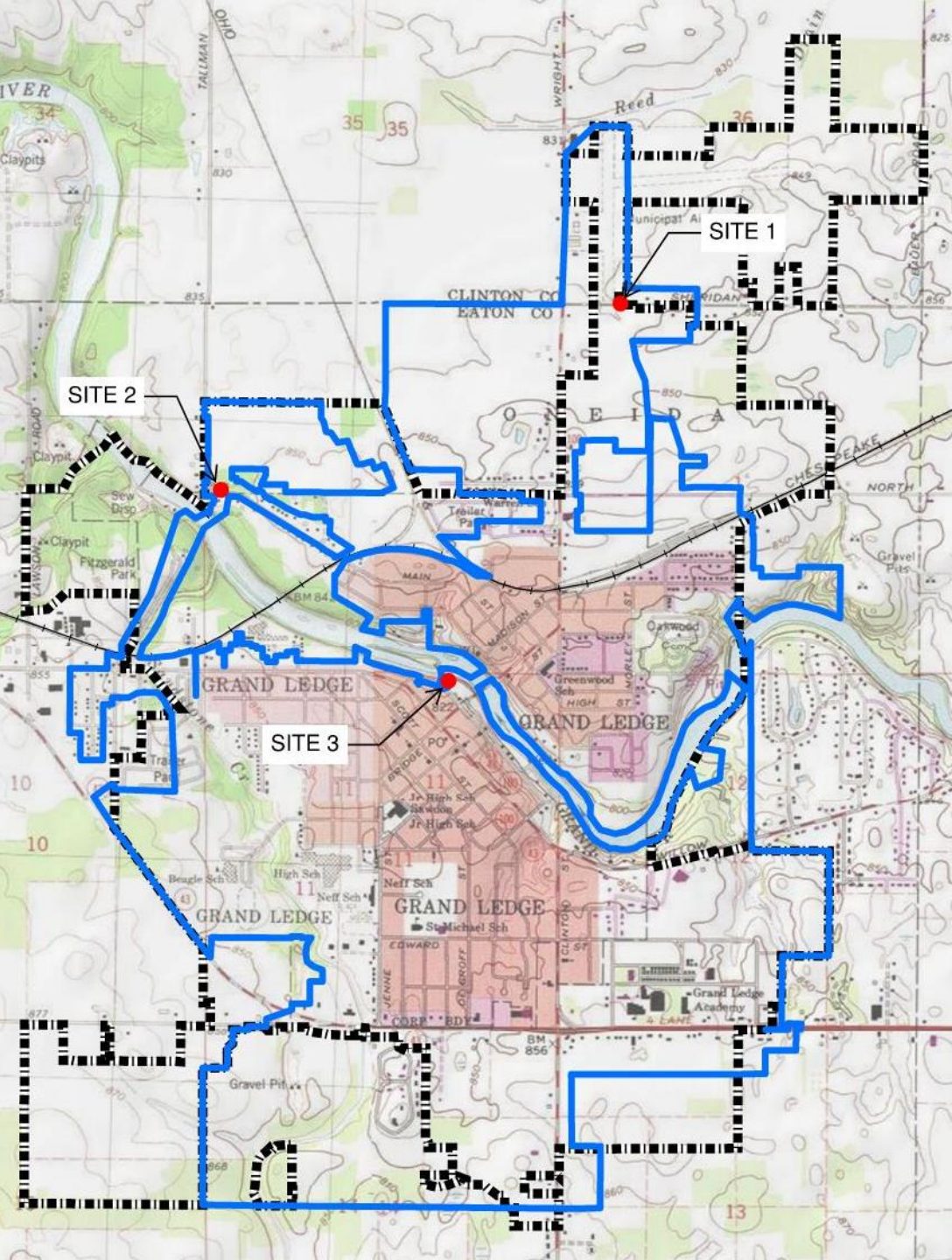
Purpose

- Recap Basis of Design
- Confirm the wastewater treatment plant (WWTP) influent loading
- Identify potential treatment alternatives
- Identify the preferred treatment alternative

Basis of Design

Projected Annual Average Flows and Loads

Flow Source	Flow (MGD)	CBOD ₅ (mg/L)	CBOD ₅ (lbs/day)	TSS (mg/L)	TSS (lbs/day)	NH ₃ -N (mg/L)	NH ₃ -N (lbs/day)	Total-P (mg/L)	Total-P (lbs/day)
Existing Average	1.06	291	2,395	228	2,258	25	221	4.9	39
Additional Residential & Commercial Average	1.40	190	2,211	210	2,453	25	292	4.9	57
Additional Industrial Average	1.20	183	1,834	234	2,282	36	351	5	49
WTP Average	0.28	0	0	144	340	0	0	0	0
Total Projected Average	3.9	198	6,449	225	7,332	26	864	4.4	145



Collection System Sampling Locations

- Site 1 – Eaton Highway Pump Station: Potential higher strength waste
- Site 2 – West Main Gravity Sewer: Domestic background waste
- Site 3 – West River Street Pump Station: Replicate composite influent waste

Collection System Sampling

Site	Date	BOD ₅ (mg/L)	TSS (mg/L)	Total-P (mg/L)	Ammonia (mg/L)
Eaton Highway Pump Station	8/18/2021	616	168	5.1	9.6
	8/20/2021	550	212	5.8	10
West Main Gravity Sewer	8/18/2021	193	164	4.3	27.7
	8/20/2021	238	236	4.8	28.5
West River Street Pump Station	8/18/2021	240	258	64.0	23.4
	8/20/2021	308	250	5.2	23.8

Phased Flow Projections

Parameter	Units	Current Design	Actual	Phase 1a	Phase 1b	Phase 2
Average Day	MGD	1.5	1.06	2.2	2.8	3.9
Maximum Day	MGD	3.0	4.66	5.4	5.6	7.9
Peak Hour Flow	MGD	-	10*	13.1	13.7	14.3
Equalized Peak Hour	MGD	-	10*	5.4	5.6	7.9

**Estimated based on overflow events*

Treatment Alternatives for Improvement

- Alternative 1 – No Action
- Alternative 2 – Regional Alternative
- Alternative 3 – Expansion of Conventional Activated Sludge
- Alternative 4 – Conversion to Extended Aeration
- Alternative 5 – Conversion to Membrane Bioreactors (MBRs)
- Alternative 6 – Maintain Existing Facility and Construct a Remote Facility

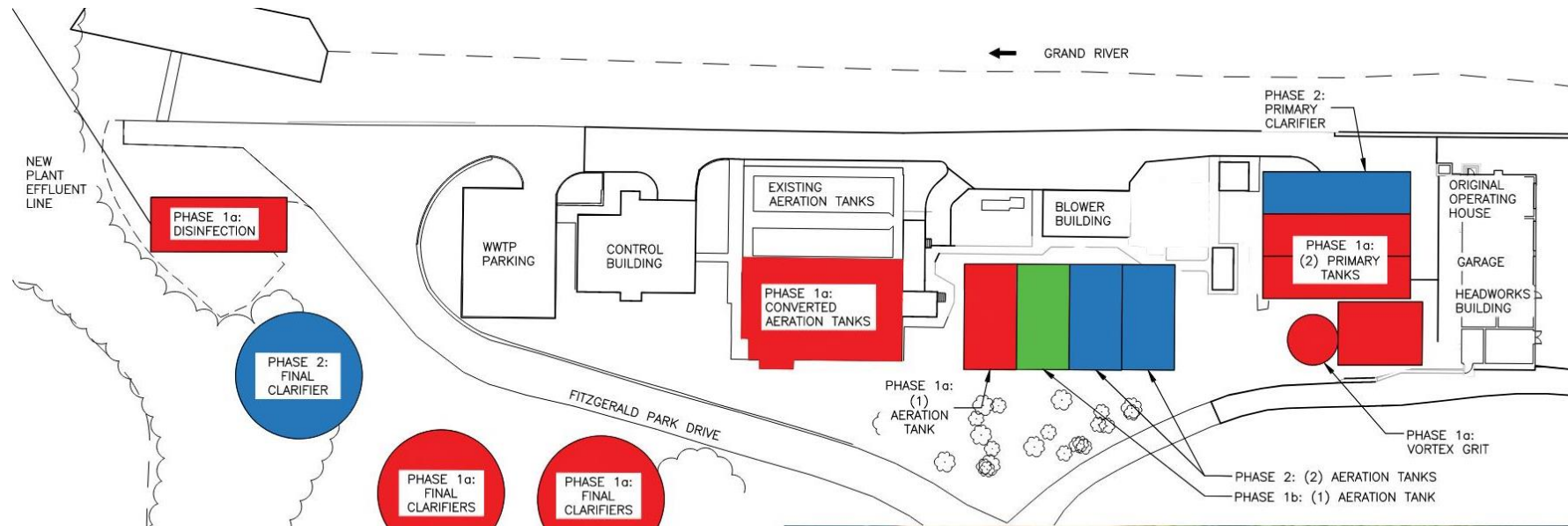
Alternative 1 – No Action

- Continue with current operations
- WWTP capacity limitation
- A consent order is likely to be issued by EGLE in the near future
- Not a viable option

Alternative 2 – Regional Alternative

- **Potential Options**
 - Southern Clinton County Municipal Utility Authority (SCCUMA) WWTP
 - Delta Township WWTP
- **Distance**
 - SCUMMA WWTP: 12.4-mile forcemain for connection
 - Delta Township WWTP: 3.3-mile forcemain for connection
- **Capacity Limitations**
 - SCUMMA WWTP: Rated for 5.0 MGD
 - Delta Township WWTP: Rated for 8.0 MGD, Annual Average 4.9 MGD
- **Cost of Treatment**
- **Expansion of Service Area**
- **Not a principal alternative, not evaluated further**

Alternative 3 – Conventional Activated Sludge

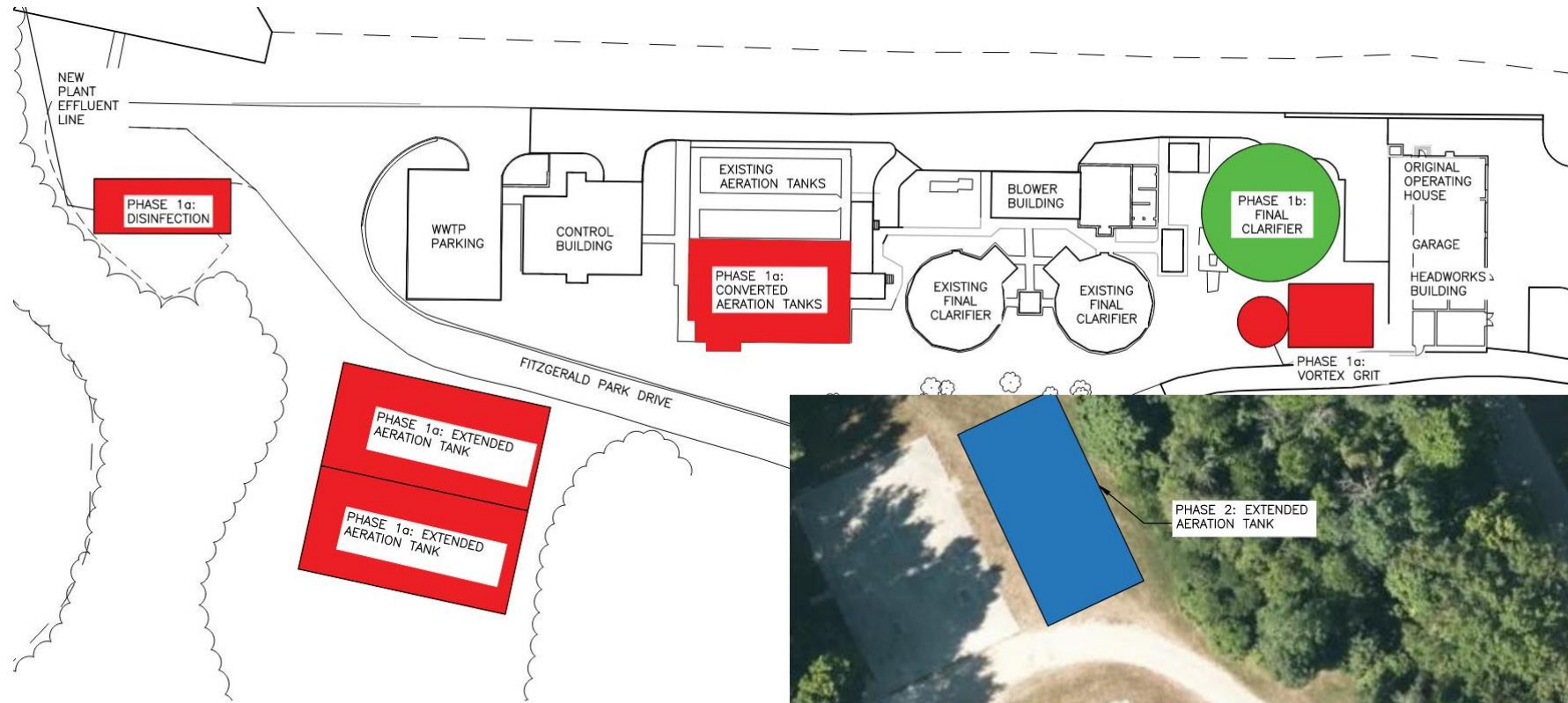


ALTERNATIVE 3 SITE MAP
 SCALE: 1" = 50'

LEGEND					
	EDGE OF WATER		LIGHT		GRAVEL SURFACE
	SHRUBS		GUY ANCHOR		PAVED SURFACE
	DECIDUOUS TREE		UTILITY POLE		CURB & GUTTER
	HEDGE EDGE OF WOODS		SIGN		FENCE

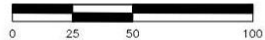


Alternative 4 – Extended Aeration



ALTERNATIVE 4 SITE MAP

SCALE: 1" = 50'

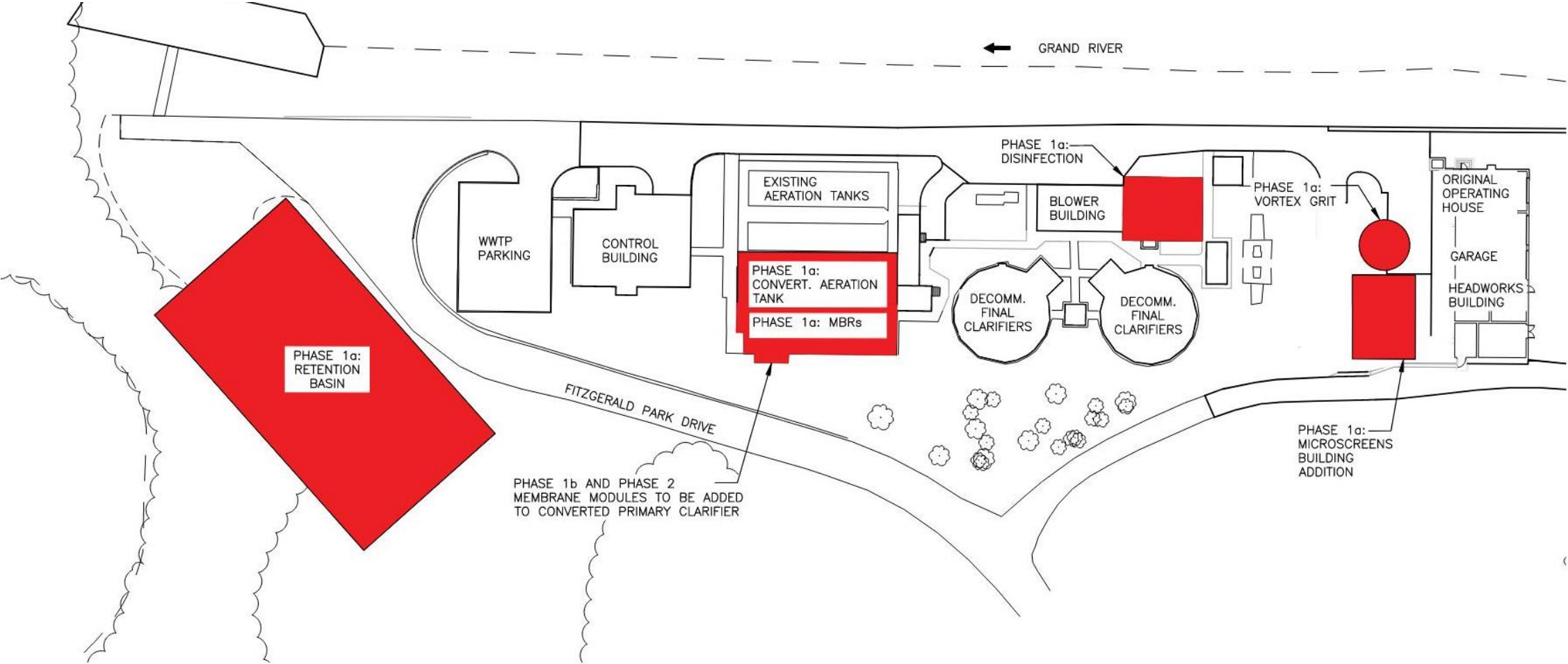


LEGEND

	EDGE OF WATER		LIGHT		GRAVEL SURFACE
	SHRUBS		GUY ANCHOR		PAVED SURFACE
	DECIDUOUS TREE		UTILITY POLE		CURB & GUTTER
	HEDGE EDGE OF WOODS		SIGN		FENCE



Alternative 5 – MBRs



ALTERNATIVE 5 SITE MAP

SCALE: 1" = 50'



Alternative 6 – Maintain Existing Facility and Construct a Remote Facility

- Collection system modifications to redirect flow
- Operational difficulties
- Restrictive effluent limits discharging to Whitney Drain
- Additional NPDES permit
- Not a principal alternative, not evaluated further

Net Present Worth Analysis

Items	Alternate 3: Conventional Activated Sludge Expansion	Alternate 4: Extended Aeration	Alternate 5: MBRs
Total Estimated Project Cost	\$34,096,000	\$37,001,000	\$28,017,000
Present Worth of 20 Years of OM&R Costs	\$17,042,000	\$19,406,000	\$21,210,000
Present Worth of Salvage Value	\$5,579,000	\$6,349,000	\$4,228,000
Total Net Present Worth	\$45,559,000	\$50,058,000	\$44,999,000

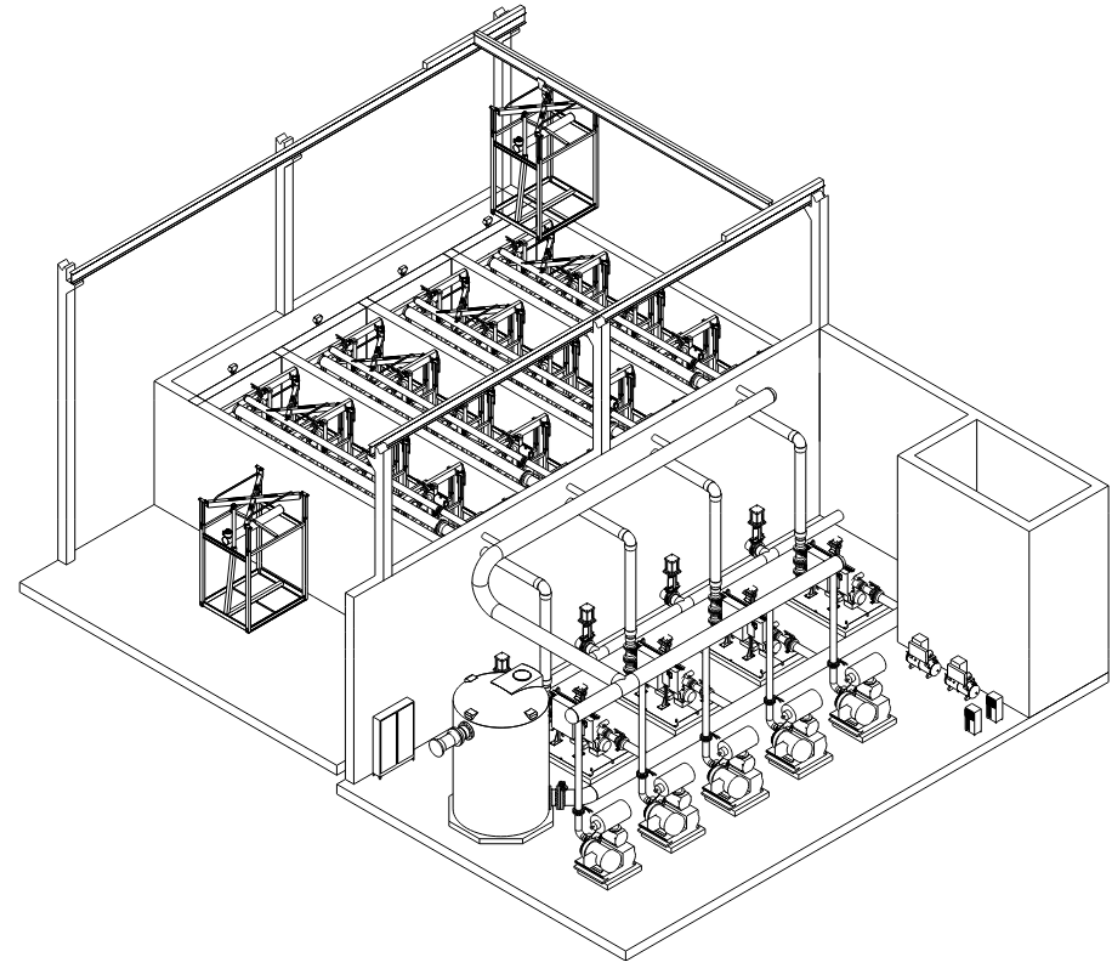
Futures Expansion

Items	Alternate 3: Conventional Activated Sludge Expansion	Alternate 4: Extended Aeration	Alternate 5: MBRs
Phase 1b	\$3,447,000	\$4,329,000	\$1,896,400
Phase 2	\$9,211,000	\$5,805,000	\$3,238,600

	Alternate 3: Conventional Activated Sludge Expansion	Alternate 4: Extended Aeration	Alternate 5: MBRs
Total Estimated Project Cost – Expand to Phase 2 Capacity in a Single Construction Project	\$42,961,000	\$45,039,000	\$32,052,000

Conclusion and Recommendations

- Collection system sampling used to validate projected flows and loads
- Alternatives 3, 4 and 5 capable of meeting treatment requirements
- Alternative 5 has lowest capital cost, lowest net present worth, ease of expansion, highest quality effluent
- Alternative 5 is the recommended alternative



Example MBR Setup

Next Steps

- Solicit proposals and select an engineering firm
- Confirm funding source
- Develop and submit funding report

Task	Timeline
Preliminary Design & Funding Report	January 2022 – June 2022
Final Design	July 2022 – December 2022
Permitting	December 2022 – February 2023
Bidding	March 2023 – April 2023
Construction	May 2023 – January 2026

Thank You

