July 2, 2025

Transmitted Electronically

Mr. Ron Ehrbar, Mayor
Village of Kelleys Island
121 Addison St.
Kelleys Island, Ohio 43438

Re: Village of Kelleys Island
Permit – Long Term
Acknowledgement
Surface Water PTI
Erie County
8CU00814

Honorable Mayor Ehrbar:

On June 2, 2025, a facility plan for a proposed wastewater treatment plant (WWTP) to serve the Village of Kelleys Island was submitted by Mr. Philip Lewis, K.E. McCartney & Associates, Inc., on behalf of the Village of Kelleys Island. Upon review of the facility plan and our follow-up meeting with representatives of the Village of Kelleys Island, K.E. McCartney & Associates, Inc., and additional Ohio EPA staff, we find the facility plan to be acceptable.

After our meeting on July 1, 2025, it has come to our attention that the proposed WWTP outfall located south of Lakeshore Drive, near Kelleys Landing, as discussed during the meeting may be within 500 yards of the Village of Kelleys Island water treatment plant (WTP) intake structure. Please be advised that if the proposed WWTP discharge is located within 500 yards of the WTP intake structure, we would need to evaluate discharge effluent limits for human health drinking water standards in addition to the best available demonstrated control technology limitations discussed during the meeting.

Additionally, we request that you please keep us informed of any additional public participation efforts (resident notices, public meetings, planned user charge system, etc.) and any necessary tree clearing needed along the right-of-ways for sewer installation. Please be advised that any project that will have a total (cumulative) earth disturbance of 1 acre or more would be required to obtain coverage under the stormwater construction general permit prior to commencing earth disturbance. Please keep us apprised of any ongoing federal parks coordination as well as any potential land acquisition from the Ohio Department of Natural Resources (ODNR). We also ask that you contact us if ODNR has any natural resource concerns for the area being cleared for construction.

If you have any questions or comments concerning the enclosed inspection report, please contact me at 419.373.3022 or email at justin.williams@epa.ohio.gov.

Sincerely,

Justin A. Williams

Justin A. Williams
Environmental Specialist II
Compliance and Enforcement
Ohio EPA Division of Surface Water
Northwest District Office

/cle

ec: Ron Ehrbar, Mayor
Andy Federle, Village Administrator
Philip Lewis, K.E. McCartney & Associates, Inc.
Craig Ward, Erie County Health Department
Kris Barnswell, Ohio EPA-DSW
Alex Smaili, Ohio EPA-DSW
Ryan Gierhart, Ohio EPA-DSW
Brittany Brockmann, Ohio EPA-DSW
Heather Allamon, Ohio EPA-DSW
Walter Ariss, Ohio EPA-DSW
Tony Nosko, Ohio EPA-DSW
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Village of Kelleys Island

Sanitary Facilities Plan

May 2025

Table of Contents

PREPARED BY: PHILIP A. LEWIS, P.E.

1.0 Introduction

1.1 Purpose

The Village of Kelleys Island hired K.E. McCartney & Associates (KEM) to complete a Sanitary Facilities Plan to investigate potential solutions to provide public sanitary service for this unsewered island community including businesses and residents. The Village of Kelleys Island is an island located in Erie County on Lake Erie approximately 4.5 miles directly north of Marblehead, Ohio. The village is home to many businesses, permanent residents, and seasonal residents. The village has many visitors during the year with summer being the peak season for visitors. While the village has a public water system that serves a large portion of the island, the sanitary is served by private septic systems and private wastewater treatment systems. The island has over 550 documented septic systems and 12 NPDES permitted treatment systems. In addition to the documented septic systems, there are also a number of undocumented systems throughout the island.

2.0 Existing Conditions

2.1 Service Area

KEM examined the potential service area and defined tributaries for wastewater conveyance sizing along with potential phasing. Figure 2.1 below shows the eight potential service areas included in the sanitary conveyance and treatment systems with the understanding that not all areas identified would be implemented immediately.

Figure 2.1 - Service Areas

The Village will be taking a staged approach with the initial phase serving the immediate downtown area along with additional reach to eliminate as many as nine (9) NPDES permits. The initial phase includes areas 1, 3, & 5 as shown in Figure 2.1. From a system analysis viewpoint, the Village would like to service the area shown in Figure 2.2.

Figure 2.2 – Initial Planning Service Area

2.2 Service Population

The Village population according to the 2020 census data is 289 year-round residents. The Village population fluctuates by season with peak population being in the summer months. According to Kelleys Island Chamber of Commerce, population can be as high as 5,000 during the summer months. Within the preliminary boundaries shown in Figure 2.2, the Village has 231 customers with 54 showing year-round water usage.

3.0 Future Conditions

In recent years, year-round residents have steadily decreased. However, planning of the collection system will be based on peak seasonal population with consideration for the expansion of the system to additional areas of 2, 4, 6, 7, & 8 illustrated on Figure 2.1.

3.1 Population Projections

As noted previously, the year-round residents have steadily decreased from 2000 – 2020 census from 367 to 289 (-21%). The population of year-round residents is not expected to increase. However, the influx of peak seasonal visitors and the corresponding population dynamics must be carefully taken into account.

4.0 Hydraulic Capacity

Seasonality of population and visitors creates hydraulic challenges that have to be considered. Any collection system components will need to be sized to handle peak seasons while any treatment system will need to be operational during minimum flow non-peak seasons and during high-flow peak seasons. Capacity at the WWTP will be based on average daily water flows during summer peak season per 10SS section 11.241.a.

Estimated flows for vacant land were based on municipality zoning code and allowable number of dwelling units per acre. KEM utilized 3.5 capita per dwelling unit and 100 gallons per day (gpd) per capita. For both commercial and industrial zoned areas, KEM utilized 1,000 gpd per acre for flow estimations with acreages. For existing residential acres, KEM utilized water usage data to estimate flows for these parcels. Based on these parameters, the following flow estimates were established:

	Residential - Other (AC)	One Family Dwelling (AC)	Two Family Dwelling (AC)	Three Family Dwelling (AC)	Mobile Homes (AC)	Vacant Residential (AC)	Commercial (AC)	Agricultural (AC)	State-Muni-Public Etc. (AC)	Tributary ADF (gpd)	Upstream Tributary ADF (gpm)	Total Tributary ADF (gpd)	Total Tributary ADF (gpm)	Total Tributary PHF (gpd)	Total Tributary PHF (gpm)
Initial Planning Area 1	8.7	52.9	1.1		0.0	23.9	33.2	10.7	23.5	93,832	77,937	171,769	119	549,661	382
Initial Planning Area 3	4.1	50.0	0.0		0.0	6.9	9.3	64.3	85.8	41,598			-	-	-
Initial Planning Area 5	0.8	47.9	0.8		0.0	14.9	2.5	8.7	136.3	48,878	133,320	182,198	127	583,033	405
Future Planning Area 2	1.7	33.2	0.7	15.2	0.0	30.1	25.8	46.7	0.0	77,629	175,199	252,827	176	809,047	562
Future Planning Area 4	19.4	109.5	4.3	0.4	1.0	158.3	0.0	0.0	102.1	175,199			-	-	-
Future Planning Area 6	11.3	49.9	0.0	0.0	0.0	34.8	27.3	0.0	0.0	77,937			-	-	-
Future Planning Area 7		54.0								52,931			-	-	-
Future Planning Area 8	20.9	11.9	0.0	0.0	0.0	39.7	0.0	0.0	104.4	38,790			-	-	-
										606,794	421	606,794	421	1,941,741	1,348

Table 4.1 – Flow Estimates by Area

The highlighted rows above are the initial planning area shown in Figure 2.1. Collection system sizing will be based on "Total Tributary PHF" to allow for future expansion of the system without requiring replacement of sewers. Wastewater Treatment sizing will be based on Average Daily Flows (ADF) with ability to treat Peak Hourly Flows (PHF). Due to seasonality, the selected wastewater treatment plant (WWTP) will be required to treat a large range of flows with the ability for expansion. The initial planning phase range of flows is based on average water usage, vacant land use, and current NPDES permitted flows. Taking this into account the WWTP flow range must be designed to effectively accommodate and provide treatment for the following conditions:

INITIAL PHASE CONDITIONS	ADF (GPD)	NOTES
Peak Summer	143,000	Summer water usage ADF + max day NPDES flows
Minimum Winter	26,000	Winter water usage ADF + min. ADF NPDES flows

Table 4.2 – Initial Planning Area WWTP Sizing

5.0 Organic Capacity

5.1 Design Average BOD_5, Maximum BOD_5, PHF BOD_5

The 5-Day Biochemical Oxygen Demand (BOD5) is defined as the amount of oxygen required to stabilize biodegradable organic matter under aerobic conditions within a five day period. The 10 State Standards (10SS) defines utilizing 0.17 lbs of BOD_5 per capita per day in section 11.253.a for new collection systems. However, section 11.253.e also allows for use of data from similar municipalities to be utilized for new systems as well. A very similar system for data comparison would be the neighboring island of Put-In-Bay to the west of Kelleys Island. Put-In-Bay has a WWTP and experiences the same seasonality and visitor influx on a larger scale. However, the landscape of the island is very similar with attractions, restaurants and bars attracting seasonal visitors. Put-In-Bay provided 3 previous years of influent data to KEM, this data was summarized and provided the following wastewater characteristics for design of the Kelleys Island WWTP:

Influent WW Characteristics	Summer	Winter	Peak
CBOD (mg/L)	230	80	350
TSS (mg/L)	120	60	190
NH3 (mg/L)	40	40	40

Table 5.1 – WWTP Influent Design Parameters

6.0 Sanitary Collection System

For the Village sanitary collection system two alternatives were considered, gravity and low-pressure force main system. Considering future operational and maintenance costs, gravity was the preferred alternative, provided that existing grades could accommodate this option. KEM conducted field survey via LiDAR Drone Scanning to efficiently determine the feasibility of gravity sanitary sewers based on elevations without requiring deep excavation of rock. Based on elevations along with homes not typically built with basements on the island due to shallow rock elevations, it was determined that the preference of shallow gravity sewers would be feasible.

6.1 Initial Planning Area

The sanitary collection system for the initial planning area will be sized for full development and system expansion. Sizing the collection system for all future use will allow for expansion without requiring replacement of sanitary sewers before the end of their useful life. Sanitary sewer sizing is based on "Total Tributary PHF" from Table 4.1 with additional capacity for any unforeseen future development as well. Figure 6.1 below illustrates the planned initial sanitary sewer diameters.

Figure 6.1 – Initial Planning Area Sanitary Sewers

Based on Figure 6.1, the following initial sanitary sewers are anticipated for the collection system:

Street	~Lengths (ft)	Diameter (in)	Capacity at Min. Slopes (gpm)
W. Lakeshore Rd.	3,900	10	603
E. Lakeshore Rd.	1,300	12	869
Division St.	4,700	10	603
Chappell St./Woodford Rd.	3,500	8	397

Table 6.1 – Initial Planning Area Sanitary Sewer Parameters

It is anticipated that the initial planning area will be constructed in phases to maximize affordability and potential funding opportunities. Therefore, the initial planning area will be constructed in three (3) phases and is based on maximizing users as illustrated in Figure 6.2 below.

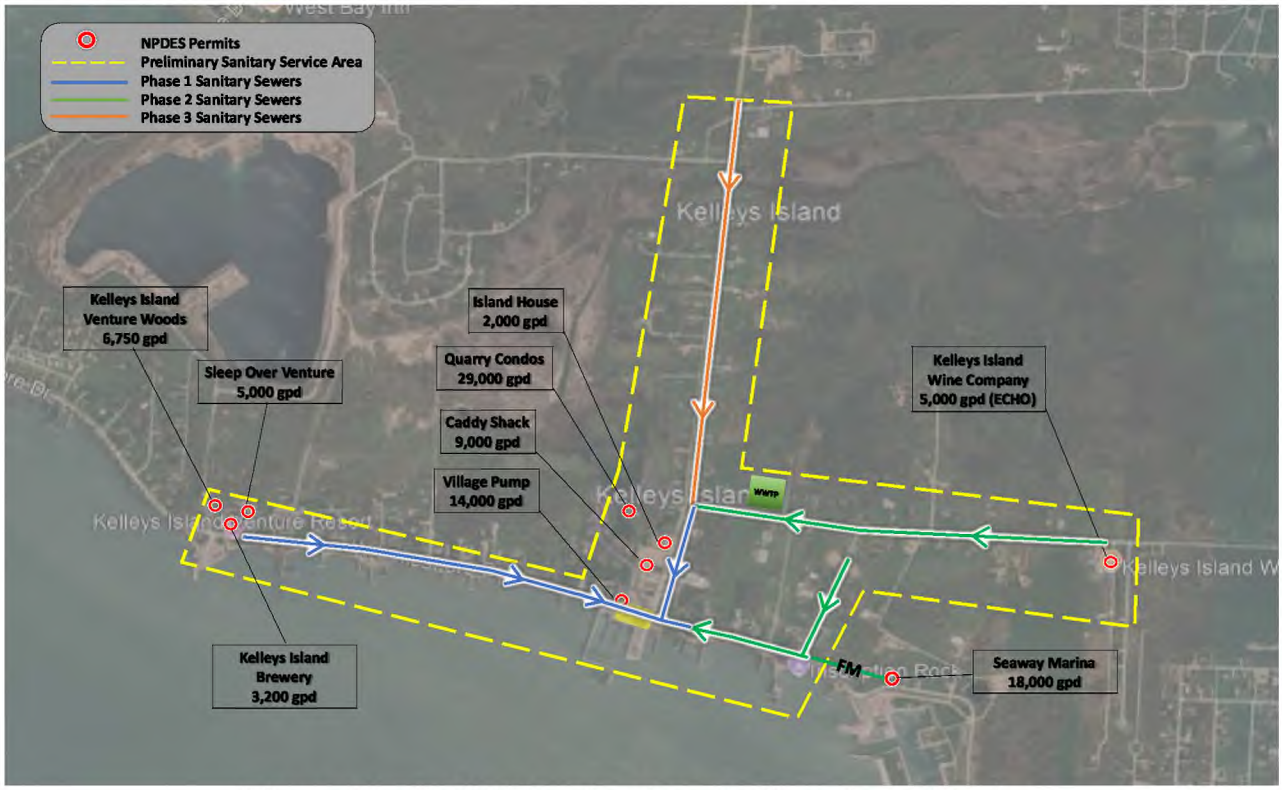


Figure 6.2 – Initial Planning Area Sanitary Sewer Phasing

In conjunction with new sanitary sewers, a new central pump station will be required to pump sanitary flows to the WWTP. A new central pumping station will be utilized to collect all sanitary flows and be designed with provisions for future expansion. The location of the new pumping station will be determined in preliminary design and will be designed with the following initial pumping parameters:

Parameter	Initial	Future
ADF Pumping Rate (gpm)	100	415
PHF Pumping Rate (gpm)	400	1350
Min. Number of Pumps	2	2
Drive Type	VFD	VFD
Diameter of Wet Well (ft)	6	6

Table 6.2 – Central Pumping Station Parameters

The location of the pump station discharge will be determined based on the evaluation of treatment options for the WWTP which are discussed in sections 7 – 9.

6.2 Future Planning Area

The Village would like to have the option of providing sanitary services to additional areas in the future. Future expansion will be dependent on funding availability. The future service areas are 2, 4, 6, 7, & 8 from Figure 2.1 and are shown below in Figure 6.2.

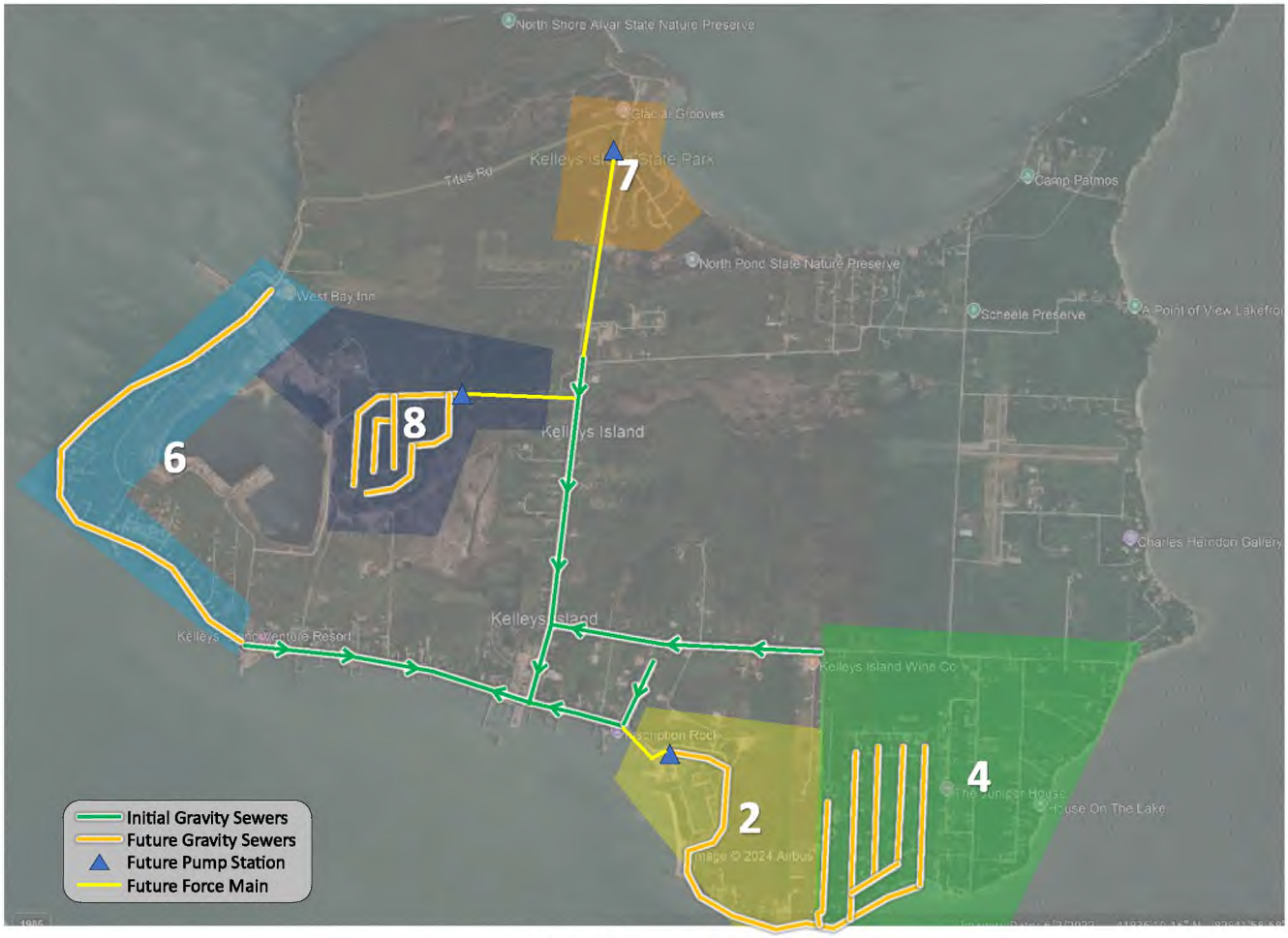


Figure 6.2 – Future Planning Area

7.0 Wastewater Treatment Alternative Development

Wastewater Treatment is the critical component of this project. Any alternative developed for wastewater treatment must have the ability to treat seasonal sanitary flows. In addition, all alternatives will most likely require meeting discharge permit limits for Best Available Demonstrated Control Technology (BADCT) treatment standards as provided by Ohio EPA:

Parameter	Monthly	Daily
CBOD5* (mg/L)	10	15
TSS* (mg/L)	12	18
Ammonia* Summer/Winter (mg/L)	1.0 / 3.0	1.5 / 4.5
Dissolved Oxygen (mg/L)	6.0	
PH	6.5 – 90	
Phosphorus* (mg/L)	None	
E. Coli*(#/100ml)	126	235
Chlorine Residual (max mg/L)	0.038	

*Note: Values listed are monthly limits

7.1 Alternative 1 - Existing Packaged WWTP Expansion

There is an existing sizeable WWTP not currently owned and operated by the Village. This WWTP could be obtained by the Village to expand and serve as their WWTP for this project.

7.1.1 Operational Description

The existing WWTP that the Village would consider rehabilitation and expansion of consists of two packaged plants totaling 29,000 gpd built in the 1980's and expanded in 1998 is currently owned by the Quarry Condos Association and is located within Area 1 shown in Figure 2.1. Drawings for the existing WWTP are not complete and there are no as-builts to reflect how the plant was truly constructed. However, upon site investigations it appears to have been constructed with the following between the two packaged plants:

- (6) Aeration Tanks
- (4) Positive Displacement Blowers (size unknown)
- (4) Final Clarifiers
- (2) Sludge Holding Tank
- (2) Dosing Pump Station for Sand Filters
- (2) Sand Filters approximately 24' x 24' each
- Chlorine Tablet Disinfection/Post Aeration Tank

This alternative would require modifications to the existing structures along with the replacement of all equipment in the existing plants. An expansion of this plant would require an additional 119,000 gpd extended aeration packaged WWTP to meet projected flows. This expansion would be a minimum of two train configurations to provide flexibility with the seasonal variability. This alternative would consist of the following components:

- Influent Pumping Station
- Mechanical Screening
- Extended Aeration (Existing tanks and new tanks)
- Sand Filters with Dosing Pump Station
- UV Disinfection
- Post Aeration
- Flow Metering
- Aerobic Sludge Holding

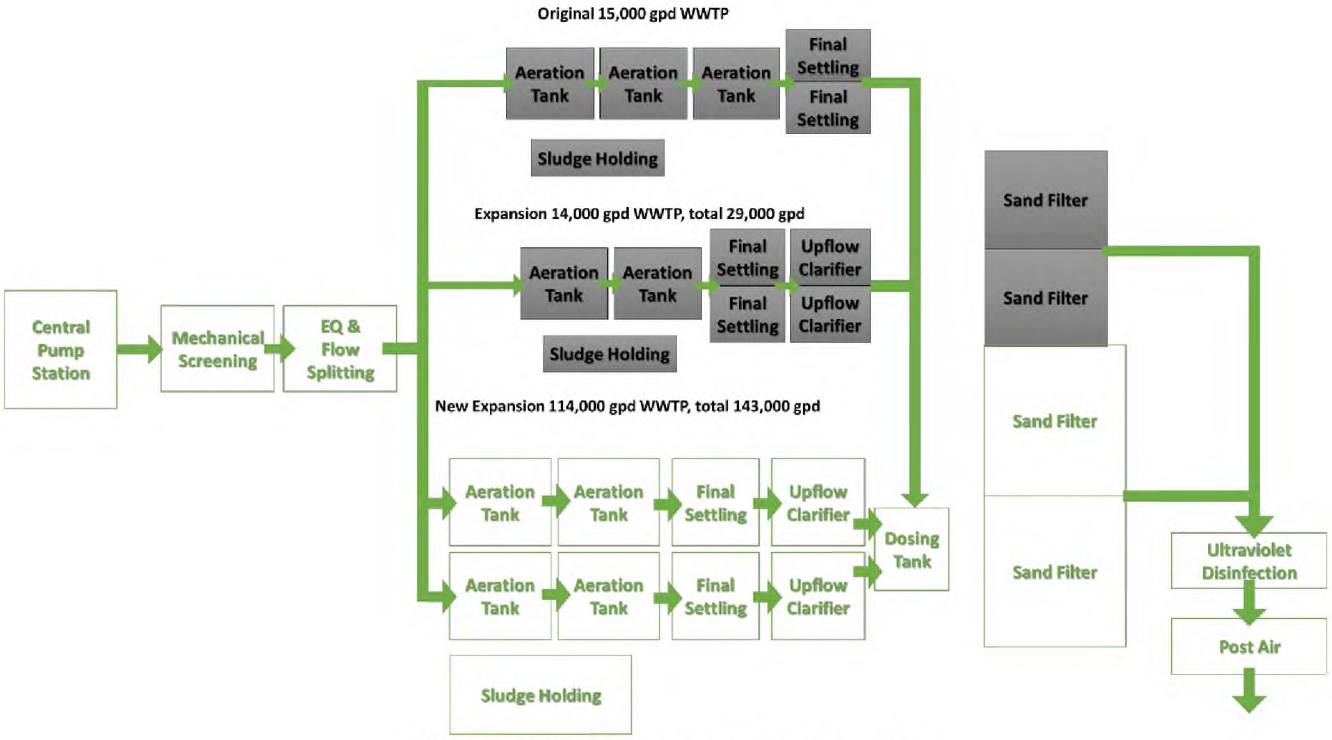


Figure 7.1 – Alternative 1 Schematic

7.1.2 Principal Advantages and Disadvantages

The principal advantage of this alternative is utilizing existing infrastructure. However, the principal disadvantage of this alternative is, with capacity required, the existing infrastructure will not reduce project cost substantially and could increase costs for any flow splitting modifications needed. In addition, the Village does not own this land or WWTP and would be required to acquire the land and system as well. This variation of existing treatment and new treatment may cause operational difficulties as well as flow imbalances which may prove to be difficult to control. The existing treatment system also has a limited remaining life expectancy left and will require replacement within 5-10 years.

7.1.3 Expandability

Expansion of this system would require additional extended aeration treatment trains. It can be easily expanded, but with operational intricacies considering variation in existing and new sizing and processes will prove difficult.

7.1.4 Flexibility

This alternative would include flow splitting to each treatment train, however it would prove to be difficult due to sizing differences of each treatment train.

7.1.5 Estimated Costs

The estimated capital costs for this alternative are approximately $5.96M with operation, maintenance, and replacement costs of approximately $159k annually. Replacement costs are higher for this option to save capital for replacement of the older existing system with the next 5-10 years. This option has a 20-year present worth value of approximately $8.1M. See Appendix B for detailed preliminary cost estimates.

7.2 Alternative 2 - New Sequence Batch Reactor WWTP

7.2.1 Operational Description

This alternative consists of the construction of a Sequence Batch Reactor (SBR) treatment system. The operation of the SBR process operates under the fill-and-draw principle by cycling through the fill, react, settle, draw, and idle phases under continuous influent which allows for treatment of flow up to six times the ADF and thus reduces the amount of any equalization required. This alternative would consist of the following components:

- Influent Pumping Station
- Mechanical Screening
- SBR System Tanks (includes equalization)
- UV Disinfection
- Post Aeration
- Flow Metering
- Aerobic Digesters

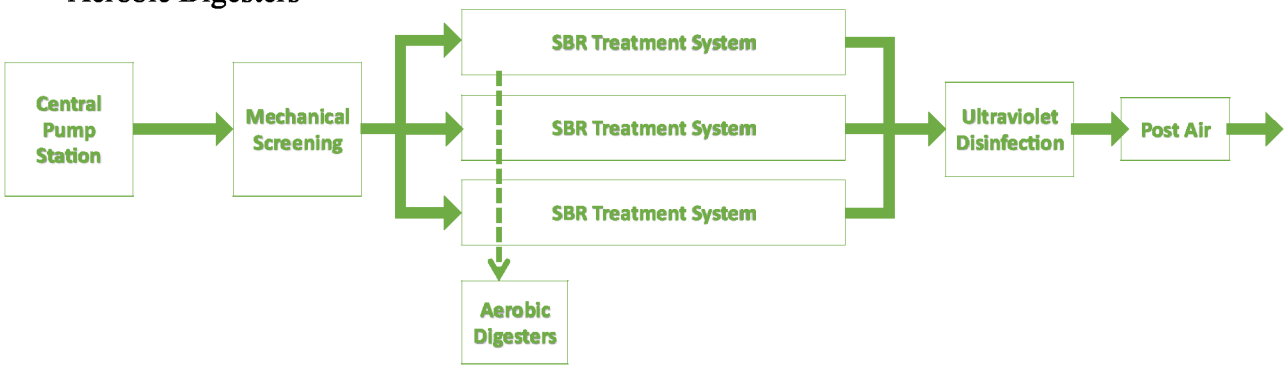


Figure 7.2 – Alternative 2 Schematic

7.2.2 Principal Advantages and Disadvantages

The principal advantage of this alternative is utilizing a single tank to provide equalization, primary clarification, biological treatment, and secondary clarification. This allows for a minimal footprint and potentially lower capital costs by eliminating the need for clarifiers. This system eliminates a variety of motor driven equipment and thus minimizes maintenance issues. The principal disadvantage of the SBR system is the higher level of automation and controls.

7.2.3 Expandability

Expansion of the SBR treatment plant alternative would be accomplished through the installation of additional SBR treatment trains.

7.2.4 Flexibility

This alternative would include flow splitting to each treatment train. With all trains being equal size, flow splitting will be less difficult. This will also allow for easier phasing and construction of each train during each planned phase of expansion.

7.2.5 Estimated Costs

The estimated capital costs for this alternative are approximately $5.41M with operation, maintenance, and replacement costs of approximately $57k annually. This option has a 20-year present worth value of approximately $5.98M. See Appendix B for detailed preliminary cost estimates.

7.3 Alternative 3 - New Packaged Extended Aeration WWTP

7.3.1 Operational Description

This alternative includes constructing a new packaged plant system. The Package Wastewater Treatment Plant would be an extended aeration process working on the principle of return activated sludge. The Package Treatment Plant consists of the following components:

- Trash Trap and/or Screening
- Flow Equalization Tanks
- Aeration Tank (Bio Reactor)
- Settling Tanks and Sludge Pumping
- Fixed Media Up-flow Clarifiers
- Dosing Tank
- Surface Sand Filters
- UV Light Disinfection
- Post Aeration
- Flow Metering
- Sludge Storage

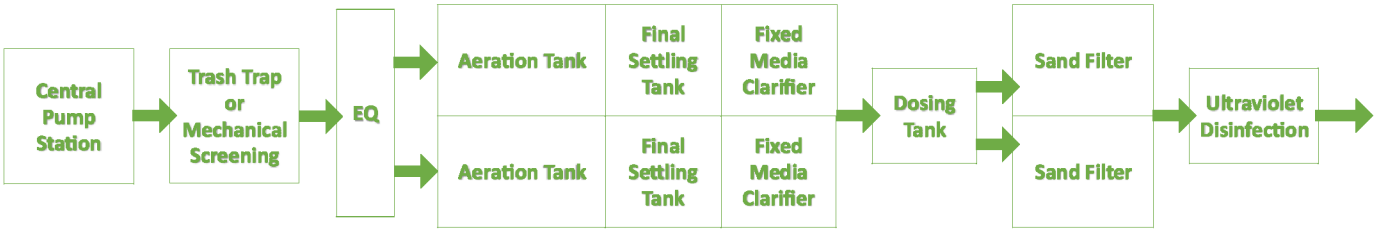


Figure 7.3 – Alternative 3 Schematic

The process tanks will be constructed of precast concrete. The plant manufacturer will provide blowers, pumps, controls panels, grating, and other miscellaneous items to complete the treatment system as part of the packaged treatment plant.

7.3.2 Principal Advantages and Disadvantages

The biggest advantage of the package treatment plant lies with the factory-made precast tanks and modular construction which can be done at a lower cost compared to field constructed tanks. The package plant also has a small footprint and will require minimal space. Additionally, package plants can easily be upgraded and expanded by providing parallel treatment trains. The disadvantages are the higher cost of operation and maintenance due to the large amount of motor-driven equipment along with the need for sand filters requiring additional space and maintenance.

7.3.3 Expandability

Expansion of the package treatment plant alternative would be accomplished through the addition of parallel treatment trains and connecting to and upgrading the UV Light Disinfection System.

7.3.4 Flexibility

This alternative would include flow splitting to each treatment train. With all trains being equal size, flow splitting will be less difficult. This will also allow for easier phasing and construction of each train during each planned phase of expansion.

7.3.5 Estimated Costs

The estimated capital costs for this alternative are approximately $5.47M with operation, maintenance, and replacement costs of approximately $85k annually. This option has a 20-year present worth value of approximately $6.6M. See Appendix B for detailed preliminary cost estimates.

8.0 Selected Alternative

8.1 Alternative Selection

The selected alternative for wastewater treatment is Alternative 2 – New Sequence Batch Reactor WWTP. This alternative has the least amount of potential operation, maintenance, & replacement costs along with the lowest 20-year present worth cost. With respect to flow variability, alternative 2 is easily adaptable to the seasonal flows and to the variability in flows from weekdays to weekends.

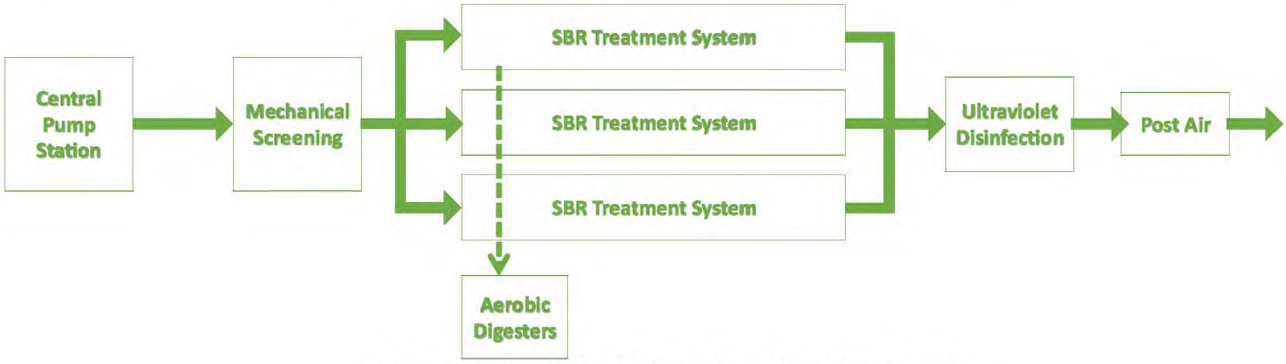


Figure 8.1 – Selected Alternative Schematic

8.2 Site Evaluation

KEM worked with Village on potential WWTP locations. The sites considered included village owned land, acquiring land adjacent to the existing Quarry Condo WWTP, and land exchange with ODNR northeast of downtown area on Chappell Rd. Considering varying factors of future expansion, direction of prevailing winds west/southwest, potential capital costs, and immediate availability of utilities, it was decided to move forward with pursuit of the land exchange with ODNR for a 3-acre parcel on Chappell Rd. This will also benefit the Village as a potential location for a new fire/EMS station, if necessary.

The WWTP effluent will be a direct discharge to Lake Erie.

Figure 8.2 – WWTP Site Location Map

8.3 Project Delivery Method

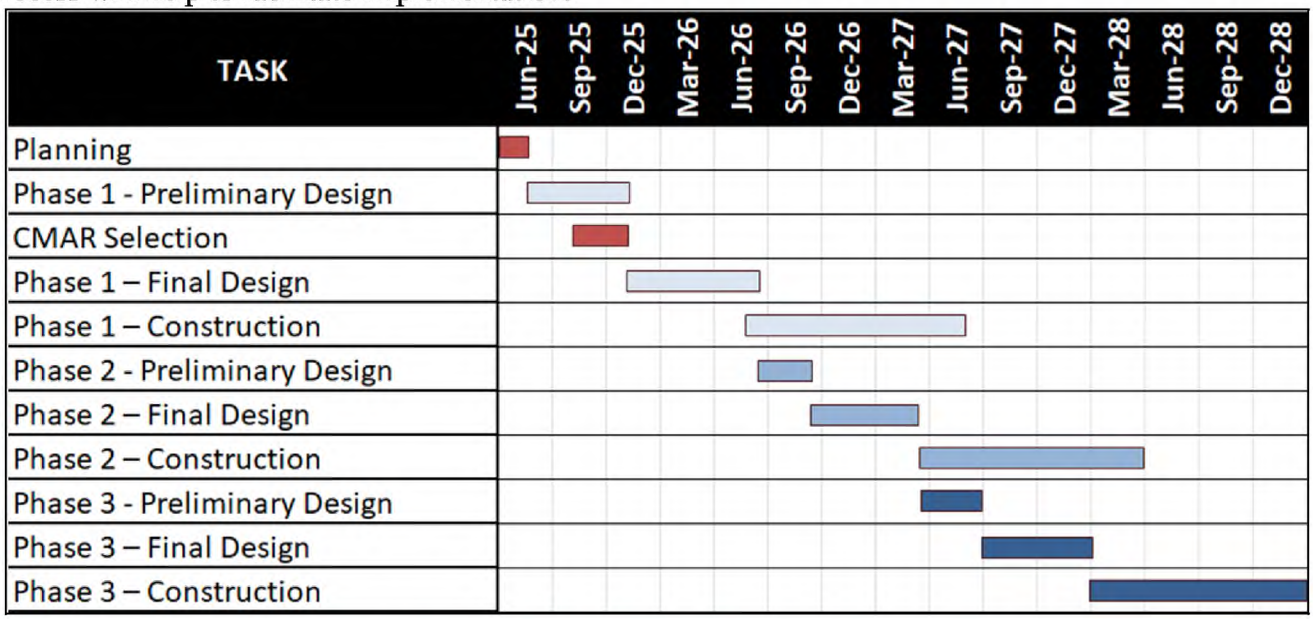
Project delivery methods were evaluated as well for this unique project because of its logistical construction constraints of being a remote island that is serviced via ferry or plane. KEM discussed with the Village three methods of delivery: Design/Bid/Build (traditional), Design/Build, and Construction Manager At-Risk (CMAR). Based on the size and complexity of a collection system, pump station, and WWTP, the design/build delivery was not a good fit due to the number of entities required to be involved along with unknown costs. In addition, due to the unpredictable nature of construction on a remote island, KEM discussed with the Village the disadvantages of design/bid/build delivery for this project. The big

disadvantages of the design/bid/build method would be cost estimating, mobilization, equipment deliveries, and contractor logistics. Therefore, KEM recommends the CMAR process for this project delivery. The CMAR project delivery offers the following advantages:

- Use of existing planning & design grant for CMAR preconstruction costs
- Collaboration with contractor from the start of final design to provide constructability reviews which will minimize construction costs
- CMAR provides a guaranteed maximum price (GMP) for construction. This would help mitigate risk for the owner.
- Open book bidding transparency

8.4 Project Implementation Schedule

The projected timeline for design through construction is from June 2025 through the end of Phase 3 construction projected in December 2028. This schedule is conservative as it is anticipated the CMAR process will help to facilitate implementation.



9.0 Wastewater Treatment Facility Design Capacity

The new WWTP will be designed for seasonality of the island and the entire initial planning area as shown in Figure 6.1. In Table 9.1 below, the ADF and PHF for each phase of construction is shown:

Season	ADF (GPD)	PHF (GPD)
Phase 1 - Peak	68,000	220,000
Phase 1 - Minimum	15,000	49,000
Phase 2 - Peak	97,000	311,000
Phase 2 - Minimum	19,000	61,000
Phase 3 - Peak	143,000	459,000
Phase 3 - Minimum	26,000	85,000

Table 9.1 – WWTP Design Capacity by Construction Phase

10.0 Public Participation

The Village has provided numerous opportunities for public participation throughout the planning process.

- KEM is providing the Village with quarterly update flyers to send to all current water users and to post to their website.
- Village Council meetings have been held for open discussion on these topics.
- KEM and the Village held a meeting with all the potential NPDES holders that have the potential to be included in this project. The intent of this meeting was to give them an overview of the project and gauge their interest before starting the planning process.

11.0 Environmental

Environmental aspects considered for this project include potential wetlands and depth of bedrock. As you can see from Figure 11.1 below, there are minimal concerns regarding wetlands and stream crossings for the collection system and the wastewater treatment plant.

Figure 11.1 – Ohio EPA Wetlands Map

Concerns with a new WWTP discharge are negligible due to removal of numerous existing discharges through regionalization. Therefore, no consideration is given to the effects of discharge loadings because any new discharge will be subject to tighter limits than existing systems.

12.0 Funding

The Village will need to implement sanitary billing as part of this project. KEM has used their water system users to identify Equivalent Residential Units (ERU) of 250 gpd. This would help the Village charge debt fees for larger users like the restaurants and other current NPDES holders by flow equivalents. KEM has calculated that this project will encompass approximately 330 ERU's once all three phases are completed. Without any grant funding, this project will be unaffordable at a projected debt service fee per ERU exceeding $100. Therefore, this project funding is expected to be secured through a strategic combination of the following options:

12.1 HB33 – ODOD

The Village received a $2M grant through House Bill 33 administered by Ohio Department of Development for the planning and design of their new sanitary system. This grant will be utilized for all initial planning, including this document, along with survey, soil borings, legal costs, Construction Manager At-Risk (CMAR) pre-construction fees, land acquisitions/easements (if applicable), and design through the CMAR process for this phased approach.

12.2 WPCLF Funding

The Village intends to nominate all phases of construction through the Ohio EPA WPCLF state revolving loan fund with regionalization discounts. The Village will also pursue principal forgiveness through this program as well with this project removing existing treatment plants that have E. Coli violations. The intention would be to apply for 30-40 year loan terms.

12.3 OPWC

The Village will also pursue the maximum $500k grant funding through District 5 Ohio Public Works Commission (OPWC). The intention would be to apply for the maximum grant available each year for all three phases of construction.

APPENDIX A – HEALTH DEPARTMENT LETTER OF SUPPORT

Erie County Health Department
An Accredited Public Health Department

Erie County Community Health Center
A Federally Qualified Health Center

Peter T. Schade, MPH, RS
Health Commissioner

November 18, 2024

Village of Kelleys Island
Attn: Mayor Ron Ehrbar

The Erie County Board of Health fully supports any project to develop a community sanitary wastewater collection and treatment system in the Village of Kelleys Island. The Village of Kelleys Island has numerous challenges related to the on-site treatment of wastewater on the island including:

- Aging household and commercial sewage treatment facilities.
- Overwhelmed systems are unable to treat the current demand of water consumption.
- Limiting environmental conditions such as limited soil depth to bedrock and an elevated seasonal water table prevent proper treatment of on-site systems.
- Small lot sizes inadequate of supporting on-site sewage treatment systems without the use of sizing reductions or off-lot discharging system options.

In conclusion, a community sanitary collection and treatment system on Kelleys Island would eliminate public health nuisances related to the current commercial and household sewage treatment systems. The elimination of these systems would ultimately prevent the pollution of Lake Erie, which is our largest draw to our area through tourism and recreation.

Sincerely,

Craig Ward, REHS
Chief Environmental Public Health Officer

420 Superior Street, Sandusky, Ohio 44870 • Phone (419) 626-5623 • Toll free (888) 399-6065
Fax (419) 626-8778 • www.eriecohealthohio.com

APPENDIX B – PRELIMINARY COST ESTIMATES & PRESENT WORTH VALUES

ESTIMATED COST FOR WASTEWATER TREATMENT PLANT IMPROVEMENTS
SANITARY COLLECTION SYSTEM - INITIAL AREA PHASE 1
KELLEYS ISLAND, OHIO

Item No.	Description	Quantity	Unit	Unit Cost	Cost
1	Mobilization	1	LS	$ 50,000.00	$ 50,000.00
2	By-Pass Pumping	1	LS	$ 10,000.00	$ 10,000.00
3	Packaged Pump Station (6 ft. Wet Well - No Bldg.)	1	LS	$ 250,000.00	$ 250,000.00
4	Wet Well Excavation & Hauling	19	CY	$ 1,000.00	$ 19,000.00
5	Pump Station Installation	1	LS	$ 62,500.00	$ 62,500.00
6	6" Force Main to WWTP	2000	LF	$ 60.00	$ 120,000.00
7	8" Sanitary Sewer		LF	$ 200.00	$ -
8	10" Sanitary Sewer	4900	LF	$ 250.00	$ 1,225,000.00
9	12" Sanitary Sewer	200	LF	$ 300.00	$ 60,000.00
10	6" Sanitary Sewer for Laterals	1460	LF	$ 150.00	$ 219,000.00
11	6" Wye	73	EA	$ 500.00	$ 36,500.00
12	48" Sanitary Manholes	13	EA	$ 10,000.00	$ 130,000.00
13	Type B Asphalt Pavement Replacement	545	SY	$ 100.00	$ 54,500.00
14	Rock Excavation	1700	CY	$ 250.00	$ 425,000.00
15	Drainage Tile - 4" & 6" Conduit Replacement	20	LF	$ 30.00	$ 600.00
16	Drainage Tile - 8" & 10" Conduit Replacement	20	LF	$ 40.00	$ 800.00
17	Drainage Tile - 12" & 15" Conduit Replacement	20	LF	$ 50.00	$ 1,000.00
18	Sidewalk Widening & Replacement	24720	SF	$ 14.00	$ 346,080.00
19	Electrical (12%)	12%	LS		$ 30,000.00
20	Controls (7%)	7%	LS		$ 18,000.00

Estimated Construction Cost Subtotal		$ 3,057,980.00
Construction Contingency	20%	$ 612,000.00
Total Estimated Construction Cost		**$ 3,669,980.00**
Final Design & Bidding	10%	
Construction Administration & Observation	10%	$ 367,000.00
Permits, Advertising, & Legal		$ 15,100.00
TOTAL ESTIMATED PROJECT COST		**$ 4,052,080.00**

Statements of Probable Construction Cost and Detailed Cost Estimates prepared by the Engineer represent his best judgment as a design professional familiar with the construction industry. It is ecognized, however, that the Engineer has no control over the cost of labor, materials, or equipment, over the contractors methods of determining bid prices, or over market conditions. Accordingly, the Engineer cannot and does not guarantee that bids will not vary from any Statement of Probable Construction Cost or other cost estimates prepared by him.

THE ESTIMATED USEFUL LIFE OF THE ABOVE PROJECT IS: 30 YEARS

ESTIMATED COST FOR WASTEWATER TREATMENT PLANT IMPROVEMENTS
SANITARY COLLECTION SYSTEM - INITIAL AREA PHASE 2
KELLEYS ISLAND, OHIO

Item No.	Description	Quantity	Unit	Unit Cost	Cost
1	Mobilization	0	LS	$ 10,000.00	$ -
2	By-Pass Pumping	0	LS	$ 10,000.00	$ -
3	Packaged Pump Station (6 ft. Wet Well - No Bldg.)	0	LS	$ 250,000.00	$ -
4	Wet Well Excavation & Hauling	0	CY	$ 100.00	$ -
5	Pump Station Installation	0	LS	$ 62,500.00	$ -
6	6" Force Main to WWTP	0	LF	$ 60.00	$ -
7	8" Sanitary Sewer	4400	LF	$ 200.00	$ 880,000.00
8	10" Sanitary Sewer		LF	$ 250.00	$ -
9	12" Sanitary Sewer	1200	LF	$ 300.00	$ 360,000.00
10	6" Sanitary Sewer for Laterals	520	LF	$ 150.00	$ 78,000.00
11	6" Wye	26	EA	$ 500.00	$ 13,000.00
12	48" Sanitary Manholes	14	EA	$ 10,000.00	$ 140,000.00
13	Type B Asphalt Pavement Replacement	1639	SY	$ 100.00	$ 163,900.00
14	Rock Excavation	1867	CY	$ 250.00	$ 466,750.00
15	Drainage Tile - 4" & 6" Conduit Replacement	30	LF	$ 30.00	$ 900.00
16	Drainage Tile - 8" & 10" Conduit Replacement	30	LF	$ 40.00	$ 1,200.00
17	Drainage Tile - 12" & 15" Conduit Replacement	30	LF	$ 50.00	$ 1,500.00
18	Sidewalk Widening & Replacement	15900	SF	$ 14.00	$ 222,600.00
19	Electrical (12%)	12%	LS		$ -
20	Controls (7%)	7%	LS		$ -

Estimated Construction Cost Subtotal		$ 2,327,850.00
Construction Contingency	20%	$ 466,000.00
Total Estimated Construction Cost		**$ 2,793,850.00**
Final Design & Bidding	0%	
Construction Administration & Observation	10%	$ 280,000.00
Permits, Advertising, & Legal		$ 15,100.00
TOTAL ESTIMATED PROJECT COST		**$ 3,088,950.00**

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THE ESTIMATED USEFUL LIFE OF THE ABOVE PROJECT IS: 30 YEARS

ESTIMATED COST FOR WASTEWATER TREATMENT PLANT IMPROVEMENTS
SANITARY COLLECTION SYSTEM - INITIAL AREA PHASE 3
KELLEYS ISLAND, OHIO

Item No.	Description	Quantity	Unit	Unit Cost	Cost
1	Mobilization		LS	$ 10,000.00	$ -
2	By-Pass Pumping		LS	$ 10,000.00	$ -
3	Packaged Pump Station (6 ft. Wet Well - No Bldg.)		LS	$ 250,000.00	$ -
4	Wet Well Excavation & Hauling		CY	$ 100.00	$ -
5	Pump Station Installation		LS	$ 62,500.00	$ -
6	6" Force Main to WWTP		LF	$ 60.00	$ -
7	8" Sanitary Sewer		LF	$ 200.00	$ -
8	10" Sanitary Sewer	3700	LF	$ 250.00	$ 925,000.00
9	12" Sanitary Sewer		LF	$ 300.00	$ -
10	6" Sanitary Sewer for Laterals	1620	LF	$ 150.00	$ 243,000.00
11	6" Wye	81	EA	$ 500.00	$ 40,500.00
12	48" Sanitary Manholes	10	EA	$ 10,000.00	$ 100,000.00
13	Type B Asphalt Pavement Replacement	0	SY	$ 100.00	$ -
14	Rock Excavation	1234	CY	$ 250.00	$ 308,500.00
15	Drainage Tile - 4" & 6" Conduit Replacement	20	LF	$ 30.00	$ 600.00
16	Drainage Tile - 8" & 10" Conduit Replacement	20	LF	$ 40.00	$ 800.00
17	Drainage Tile - 12" & 15" Conduit Replacement	20	LF	$ 50.00	$ 1,000.00
18	Sidewalk Widening & Replacement	22200	SF	$ 14.00	$ 310,800.00
19	Electrical (12%)	12%	LS		$ -
20	Controls (7%)	7%	LS		$ -

Estimated Construction Cost Subtotal		$ 1,930,200.00
Construction Contingency	20%	$ 387,000.00
Total Estimated Construction Cost		**$ 2,317,200.00**
Final Design & Bidding	0%	
Construction Administration & Observation	10%	$ 232,000.00
Permits, Advertising, & Legal		$ 15,100.00
TOTAL ESTIMATED PROJECT COST		**$ 2,564,300.00**

Statements of Probable Construction Cost and Detailed Cost Estimates prepared by the Engineer represent his best judgment as a design professional familiar with the construction industry. It is ecognized, however, that the Engineer has no control over the cost of labor, materials, or equipment, over the contractors methods of determining bid prices, or over market conditions. Accordingly, the Engineer cannot and does not guarantee that bids will not vary from any Statement of Probable Construction Cost or other cost estimates prepared by him.

THE ESTIMATED USEFUL LIFE OF THE ABOVE PROJECT IS: 30 YEARS

ESTIMATED COST FOR WASTEWATER TREATMENT PLANT IMPROVEMENTS

MINIMAL WWTP IMPROVEMENTS - ALTERNATIVE 1

KELLEYS ISLAND, OHIO

Item No.	Description	Quantity	Unit	Unit Cost	Cost
1	Mobilization	1	LS	$ 50,000.00	$ 50,000.00
2	By-Pass Pumping	1	LS	$ 10,000.00	$ 10,000.00
3	Temporary Sediment & Erosion Control	1	LS	$ 5,000.00	$ 5,000.00
	Existing Quarry Condos WWTP Rehab	1	LS	$ 375,000.00	$ 375,000.00
4	Screening Tanks Structure	9	CY	$ 800.00	$ 7,200.00
5	Screening Tanks (Grading & Hauling)	112	CY	$ 100.00	$ 11,200.00
6	Screening Equipment	1	LS	$ 170,000.00	$ 170,000.00
7	Packaged WWTP - Precast Tanks & Equipment	1	LS	$ 1,500,000.00	$ 1,500,000.00
8	Packaged WWTP Tanks - Excavation & Hauling	645	CY	$ 100.00	$ 64,500.00
9	Packaged WWTP Tank Ballasts	40	CY	$ 800.00	$ 32,000.00
10	Treatment Plant Platform & Handrail	264	LF	$ 400.00	$ 105,600.00
11	UV Disinfection Equipment	1	LS	$ 50,000.00	$ 50,000.00
12	Post Aeration Equipment	1	LS	$ 50,000.00	$ 50,000.00
13	UV/Post Aeration Structure	60	CY	$ 800.00	$ 48,000.00
14	WWTP Admin Building (Control Rm,Blowers, Lab, Electrical)	1250	SF	$ 400.00	$ 500,000.00
15	Generator & ATS	1	LS	$ 100,000.00	$ 100,000.00
16	12" Outlet Pipe	2000	LF	$ 300.00	$ 600,000.00
17	Installation	50%	LS		$ 323,000.00
18	Electrical	12%	LS		$ 315,000.00
19	Controls	7%	LS		$ 184,000.00

Estimated Construction Cost Subtotal		$ 4,500,500.00
Construction Contingency	20%	$ 901,000.00
Total Estimated Construction Cost		**$ 5,401,500.00**
Final Design & Bidding	0%	$ -
Construction Administration & Observation	10%	$ 541,000.00
Permits, Advertising, & Legal		$ 15,100.00
TOTAL ESTIMATED PROJECT COST		**$ 5,957,600.00**

Statements of Probable Construction Cost and Detailed Cost Estimates prepared by the Engineer represent his best judgment as a design professional familiar with the construction industry. It is ecognized, however, that the Enginee no control over the cost of labor, materials, or equipment, over the contractors methods of determining bid prices, or over market conditions. Accordingly, the Engineer cannot and does not guarantee that bids will not vary from any Statement of Probable Construction Cost or other cost estimates prepared by him.

THE ESTIMATED USEFUL LIFE OF THE ABOVE PROJECT IS: 20 YEARS

MINIMAL WWTP IMPROVEMENTS - ALTERNATIVE 1
Annual Operating Cost

$52,300.00	Electricity
$7,800.00	Plant Maintenance (1 maint x 10 hrs/wk)
$1,326.00	Plant Operator (1 operator x 3 days/wk @ min. 1.5hrs/wk)
$61,426.00	**Total Operating Cost**
$97,360.00	Total Replacement Costs
$158,786.00	Total OM&R

0.11 **Cost per kwh**

Electricity:

Equipment Description	Motor HP	Hours Working	Annual Cost
New Influent Pumps	20	9636	$15,815
Aeration Blowers (2 Blowers)	20	17520	$28,754
Flow EQ Blower (10% of time)	15	876	$1,078
Dosing Pumps	10	5840	$4,792
UV Disinfection (1 bank 100% of time, 2 banks 10% of time)		13500	$1,485
Fixed Media Pumps	5	876	$359
			$0
		TOTAL COST	**$52,300.00**

Maintenance - Equipment Replacement

Equipment Description	No. of Units	Unit Cost	Replacement Cost
New Influent Pumps	2	$25,000.00	$50,000.00
Aeration Blowers (2 Blowers)	2	$10,000.00	$20,000.00
Flow EQ Blower (10% of time)	2	$10,000.00	$20,000.00
Dosing Pumps	2	$20,000.00	$40,000.00
Fixed Media Pumps	2	$2,500.00	$5,000.00
UV Light Lamps	40	$30.00	$1,200.00
UV Light Ballast	3	$200.00	$600.00
TOTAL REPLACEMENT COST (PRESENT DOLLARS)			**$136,800.00**
TOTAL REPLACEMENT COST (10TH YEAR DOLLARS)			**$973,600.00**
TOTAL REPLACEMENT COST (20TH YEAR DOLLARS)			**$218,880.00**
**Replacement of existing tanks			

ESTIMATED COST FOR WASTEWATER TREATMENT PLANT IMPROVEMENTS

NEW SEQUENCE BATCH REACTOR SYSTEM - ALTERNATIVE 2

KELLEYS ISLAND, OHIO

Item No.	Description	Quantity	Unit	Unit Cost	Cost
1	Mobilization	1	LS	$ 50,000.00	$ 50,000.00
2	Temporary Sediment & Erosion Control	1	LS	$ 5,000.00	$ 5,000.00
3	Screening Tanks Structure	9	CY	$ 800.00	$ 7,200.00
4	Screening Tanks (Grading & Hauling)	112	CY	$ 100.00	$ 11,200.00
5	Screening Equipment	1	LS	$ 170,000.00	$ 170,000.00
6	New SBR Equipment	1	LS	$ 855,000.00	$ 855,000.00
7	New SBR Tanks Bottom & Top	354	CY	$ 800.00	$ 283,200.00
8	New SBR Tanks Structure - Precast Walls	1	LS	$ 412,500.00	$ 412,500.00
9	New SBR Tanks (Excavation & Hauling)	440	CY	$ 100.00	$ 44,000.00
10	Treatment Plant Platform & Handrail	264	LF	$ 400.00	$ 105,600.00
11	UV Disinfection Equipment	1	LS	$ 50,000.00	$ 50,000.00
12	Post Aeration Equipment	1	LS	$ 50,000.00	$ 50,000.00
13	UV/Post Aeration Structure	60	CY	$ 800.00	$ 48,000.00
14	WWTP Admin Building (Control Rm,Blowers, Lab, Electrical)	1250	SF	$ 400.00	$ 500,000.00
15	Generator & ATS	1	LS	$ 100,000.00	$ 100,000.00
16	12" Outlet Pipe	2000	LF	$ 300.00	$ 600,000.00
17	Installation	50%	LS		$ 588,000.00
18	Electrical	12%	LS		$ 129,000.00
19	Insrumentation & Controls	7%	LS		$ 76,000.00

Estimated Construction Cost Subtotal		$ 4,084,700.00
Construction Contingency	20%	$ 817,000.00
Total Estimated Construction Cost		**$ 4,901,700.00**
Final Design & Bidding	0%	$ -
Construction Administration & Observation	10%	$ 491,000.00
Permits, Advertising, & Legal		$ 15,100.00
TOTAL ESTIMATED PROJECT COST		**$ 5,407,800.00**

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THE ESTIMATED USEFUL LIFE OF THE ABOVE PROJECT IS: 20 YEARS

NEW SEQUENCE BATCH REACTOR SYSTEM - ALTERNATIVE 2
Annual Operating Cost

$28,300.00	Electricity
$13,000.00	Plant Maintenance (1 maint x 10 hrs/wk)
$1,950.00	Plant Class 1 Operator (1 operator x 3 days/wk @ min. 1.5hrs/wk)
$43,250.00	**Total Operating Cost**
$13,429.00	Total Replacement Costs
$56,679.00	Total OM&R

0.11 **Cost per kwh**

Electricity:

Equipment Description	Motor HP	Hours Working	Annual Cost
New Influent Pumps	20	4818	$7,907
UV Disinfection (1 bank 100% of time, 2 banks 10% of time)		13500	$1,485
WAS Pump	2.4	73	$14
Decanter Drive Unit	0.25	1825	$37
Jet Apirator (6 Total, 2 per tank)	90	2190	$16,174
Jet Mixer (3 total, 1 per tank)	2.7	2920	$647
Misc.			$2,000
		TOTAL COST	**$28,300.00**

Maintenance - Equipment Replacement

Equipment Description	No. of Units	Unit Cost	Replacement Cost
New Influent Pumps	2	$25,000.00	$50,000.00
WAS Pump	1	$2,000.00	$2,000.00
Decanter Drive Unit	3	$1,500.00	$4,500.00
Jet Apirator (6 Total, 2 per tank)	6	$5,000.00	$30,000.00
Jet Mixer (3 total, 1 per tank)	3	$5,000.00	$15,000.00
UV Light Lamps	40	$30.00	$1,200.00
UV Light Ballast	3	$200.00	$600.00
TOTAL REPLACEMENT COST (PRESENT DOLLARS)			**$103,300.00**
TOTAL REPLACEMENT COST (10TH YEAR DOLLARS)			**$134,290.00**
TOTAL REPLACEMENT COST (20TH YEAR DOLLARS)			**$165,280.00**

ESTIMATED COST FOR WASTEWATER TREATMENT PLANT IMPROVEMENTS

NEW PACKAGED PLANT - ALTERNATIVE 3

KELLEYS ISLAND, OHIO

Item No.	Description	Quantity	Unit	Unit Cost	Cost
1	Mobilization	1	LS	$ 50,000.00	$ 50,000.00
2	By-Pass Pumping	1	LS	$ 10,000.00	$ 10,000.00
3	Temporary Sediment & Erosion Control	1	LS	$ 5,000.00	$ 5,000.00
4	Screening Tanks Structure	9	CY	$ 800.00	$ 7,200.00
5	Screening Tanks (Grading & Hauling)	112	CY	$ 100.00	$ 11,200.00
6	Screening Equipment	1	LS	$ 170,000.00	$ 170,000.00
7	Packaged WWTP - Precast Tanks & Equipment	1	LS	$ 1,500,000.00	$ 1,500,000.00
8	Packaged WWTP Tanks - Excavation & Hauling	645	CY	$ 100.00	$ 64,500.00
9	Packaged WWTP Tank Ballasts	40	CY	$ 800.00	$ 32,000.00
10	Treatment Plant Platform & Handrail	264	LF	$ 400.00	$ 105,600.00
11	UV Disinfection Equipment	1	LS	$ 50,000.00	$ 50,000.00
12	Post Aeration Equipment	1	LS	$ 50,000.00	$ 50,000.00
13	UV/Post Aeration Structure	60	CY	$ 800.00	$ 48,000.00
14	WWTP Admin Building (Control Rm,Blowers, Lab, Electrical)	1250	SF	$ 400.00	$ 500,000.00
15	Generator & ATS	1	LS	$ 100,000.00	$ 100,000.00
16	12" Outlet Pipe	2000	LF	$ 300.00	$ 600,000.00
17	Installation	50%	LS		$ 329,000.00
18	Electrical	12%	LS		$ 315,000.00
19	Controls	7%	LS		$ 184,000.00

Estimated Construction Cost Subtotal		$ 4,131,500.00
Construction Contingency	20%	$ 827,000.00
Total Estimated Construction Cost		**$ 4,958,500.00**
Final Design & Bidding	0%	$ -
Construction Administration & Observation	10%	$ 496,000.00
Permits, Advertising, & Legal		$ 15,100.00
TOTAL ESTIMATED PROJECT COST		**$ 5,469,600.00**

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THE ESTIMATED USEFUL LIFE OF THE ABOVE PROJECT IS: 20 YEARS

NEW PACKAGED PLANT - ALTERNATIVE 3
Annual Operating Cost

$52,300.00	Electricity
$13,000.00	Plant Maintenance (1 maint x 10 hrs/wk)
$1,950.00	Plant Class 1 Operator (1 operator x 3 days/wk @ min. 1.5hrs/wk)
$67,250.00	**Total Operating Cost**
$17,784.00	Total Replacement Costs
$85,034.00	Total OM&R

0.11 **Cost per kwh**

Electricity:

Equipment Description	Motor HP	Hours Working	Annual Cost
New Influent Pumps	20	9636	$15,815
Aeration Blowers (2 Blowers)	20	17520	$28,754
Flow EQ Blower (10% of time)	15	876	$1,078
Dosing Pumps	10	5840	$4,792
UV Disinfection (1 bank 100% of time, 2 banks 10% of time)		13500	$1,485
Fixed Media Pumps	5	876	$359
		TOTAL COST	**$52,300.00**

Maintenance - Equipment Replacement

Equipment Description	No. of Units	Unit Cost	Replacement Cost
New Influent Pumps	2	$25,000.00	$50,000.00
Aeration Blowers (2 Blowers)	2	$10,000.00	$20,000.00
Flow EQ Blower (10% of time)	2	$10,000.00	$20,000.00
Dosing Pumps	2	$20,000.00	$40,000.00
Fixed Media Pumps	2	$2,500.00	$5,000.00
UV Light Lamps	40	$30.00	$1,200.00
UV Light Ballast	3	$200.00	$600.00
TOTAL REPLACEMENT COST (PRESENT DOLLARS)			**$136,800.00**
TOTAL REPLACEMENT COST (10TH YEAR DOLLARS)			**$177,840.00**
TOTAL REPLACEMENT COST (20TH YEAR DOLLARS)			**$218,880.00**

MINIMAL WWTP IMPROVEMENTS - ALTERNATIVE 1

Planning Period in Years: 20

Real Interest Rate on Treasury Notes & Bonds: 1.66%

SUMMARY OF ANNUAL OPERATING & MAINTENANACE COST

$61,426.00	**Total Annual O&M Cost**

SUMMARY OF REPLACEMENT AND SALVAGE COST

Work Item Description	Useful Life (Years)	Initial Cost Year 0	Replacement Cost Year 10	Replacement Cost Year 20	Salvage Value at Year 20
	20	$ 5,957,600	$ 973,600	$ 218,880	$ 144,460.8
TOTAL PROJECT COST		**$ 5,957,600**			
TOTAL REPLACEMENT COST			**$ 973,600**	**$ 218,880**	
TOTAL SALVAGE COST					**$ 144,461**

PRESENT WORTH CALCULATION

Factors

Present Worth of Annual O&M Cost	16.90
Present Worth of Annual O&M Cost Increase	151.32
Present Worth of Replacement Cost - 10 Years	0.85
Present Worth of Replacement Cost - 20 Years	0.72
Present Worth of Salvage Value	0.72

Calculation - Present Worth Values

Initial Cost	**$ 5,957,600**
Annual O&M Cost	**$ 1,038,153**
Annual O&M Cost Increase	**$ 278,855**
Replacement Cost Total	**$ 983,281**
Salvage Value (Minus)	$ (103,932)

TOTAL PRESENT WORTH	**$8,153,958**

NEW SEQUENCE BATCH REACTOR SYSTEM - ALTERNATIVE 2

Planning Period in Years: 20

Real Interest Rate on Treasury Notes & Bonds: 1.66%

SUMMARY OF ANNUAL OPERATING & MAINTENANACE COST

$43,250.00	**Total Annual O&M Cost**

SUMMARY OF REPLACEMENT AND SALVAGE COST

Work Item Description	Useful Life (Years)	Initial Cost Year 0	Replacement Cost Year 10	Replacement Cost Year 20	Salvage Value at Year 20
	20	$ 4,901,700	$ 134,290	$ 165,280	$ 109,084.8
TOTAL PROJECT COST		**$ 4,901,700**			
TOTAL REPLACEMENT COST			**$ 134,290**	**$ 165,280**	
TOTAL SALVAGE COST					**$ 109,085**

PRESENT WORTH CALCULATION

Factors

Present Worth of Annual O&M Cost	16.90
Present Worth of Annual O&M Cost Increase	151.32
Present Worth of Replacement Cost - 10 Years	0.85
Present Worth of Replacement Cost - 20 Years	0.72
Present Worth of Salvage Value	0.72

Calculation - Present Worth Values

Initial Cost	**$ 4,901,700**
Annual O&M Cost	**$ 730,963**
Annual O&M Cost Increase	**$ 196,342**
Replacement Cost Total	**$ 232,815**
Salvage Value (Minus)	$ (78,481)

TOTAL PRESENT WORTH	**$5,983,339**

NEW PACKAGED PLANT - ALTERNATIVE 3

Planning Period in Years: 20

Real Interest Rate on Treasury Notes & Bonds: 1.66%

SUMMARY OF ANNUAL OPERATING & MAINTENANACE COST

$67,250.00	**Total Annual O&M Cost**

SUMMARY OF REPLACEMENT AND SALVAGE COST

Work Item Description	Useful Life (Years)	Initial Cost Year 0	Replacement Cost Year 10	Replacement Cost Year 20	Salvage Value at Year 20
	20	$ 4,958,500	$ 177,840	$ 218,880	$ 144,460.8
TOTAL PROJECT COST		**$ 4,958,500**			
TOTAL REPLACEMENT COST			**$ 177,840**	**$ 218,880**	
TOTAL SALVAGE COST					**$ 144,461**

PRESENT WORTH CALCULATION

Factors

Present Worth of Annual O&M Cost	16.90
Present Worth of Annual O&M Cost Increase	151.32
Present Worth of Replacement Cost - 10 Years	0.85
Present Worth of Replacement Cost - 20 Years	0.72
Present Worth of Salvage Value	0.72

Calculation - Present Worth Values

Initial Cost	**$ 4,958,500**
Annual O&M Cost	**$ 1,136,584**
Annual O&M Cost Increase	**$ 305,294**
Replacement Cost Total	**$ 308,316**
Salvage Value (Minus)	$ (103,932)

TOTAL PRESENT WORTH	**$6,604,763**