

Commonwealth of Kentucky Energy and Environment Cabinet

Division of Water

CONSTRUCTION PERMIT APPLICATION for WASTEWATER TREATMENT PLANT

See the Instructions for more information about selected portions of this application. Questions on completing this application? Contact the Water Infrastructure Branch at 502/564-3410 or visit our website at http://water.ky.gov for more information.

I. CONSTRUCTION PROJECT INFORMATION							
Project I	Name:						
Project (City/County:						
Name of	WWTP:						
KPDES I	Number of WWTP, if known (for modifications to an existing plant): KY						
Estimate	Estimated cost of WWTP improvements and sewer line extension: \$						
Project i	s: WWTP Only WWTP with sewer lines						
	Minor Modification to WWTP (Complete only Sections I, II, IV A, B, C, E3, H1, VII, VIII)						
II. APPL	ICANT INFORMATION						
Applican	(Entity paying for construction):E-mail:						
Street Ac	dress:						
City, Stat	e, Zip:						
Will own	ership be transferred? Yes. Name of new owner: No						
	ership be transferred? Yes. Name of new owner: No						
III. PRELI							
Has a Pr	MINARY SUBMITTAL						
Has a Pr	WINARY SUBMITTAL eliminary Submittal been made with all the information in this section? [See 401 KAR 5:005, Section 3]						
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IV. DESIGN CONSIDERATIONS

A. PLANS AND SPECIFICATIONS.

Design plans and specifications shall comply with 401 KAR 5:005 and "Recommended Standards for Wastewater Facilities" ("Ten States' Standards") 2014 edition. If engineering practices, other than those contained in "Ten States' Standards", were used in the design, indicate the source and the corresponding portion of the design. [See 401 KAR 5:005, Section 7]

Plans and specifications	submittals shall meet on of the following o	ptions:	
Submit at least one page	aper printed set of detailed plans (no larger t	han 24" x 36") and a PDF cop	y of the plans and specifications on
a data storage device	e such as a USB flash drive. Both copies sl	nall be dated with a stamp, si	ignature of a licensed professional
engineer in Kentucky	which complies with the requirements of 20	1 KAR 18:104. The digital pla	ans shall consist of a single pdf file
	ed "Engineering Plans" and the specification	- '	
Submit a PDF copy o	f the plans and specifications digitally via the	electronic form on the KY On	e Stop Business Portal website. The
	tted with stamp and signature of a licensed e		·
. ,	3. The plans shall be submitted as a single p	,	'
B. DESIGN ENGINEER, If	the WWTP design capacity is greater than	10,000 gpd or if the sewer li	nes associated with the WWTP wil
	ver system served by a regional facility. [Sec		
P.E.'s Name:		Firm:	
Street Address:			
City, State, Zip:			
	Fax:		
Street Address:			-
Phone:	Fax:	E-mail:	
	Provide the following design capacities, in mi	llion gallons per day or pound	s per day. [Section 3]
	MGD	Influent BOD:	•
	MGD	Influent SS:	
Peak Hourly Flow:	MGD	Influent NH ₃ -N:	lb/day
in the application or a	vide the following information (use additional on N/A if the item is not applicable to the proj	ect.	, , ,
	tic drawing of the facility layout and explanation		
	Reliability Category, Grade A, B, or C:		tailed description of the reliability
	that will be used for the WWTP. [Sections	3 and 13]	
3. A discussi	on of the design criteria used to size the unit	processes. [Section 3]	
. LABORATORY SERVICE	s. Give name of laboratory that will provide	services for self-monitoring ar	nd process control. [Section 3]
Firm Name:			
Street Address:			
City, State, Zip:			

G.	project.	ATION. Place a check (*) by the items that are incl	luded in this application	or an N/A if the item is not applicable to the
	1.	Include a plat or survey clearly indicating the sboundaries, and position of dwellings within 200 f	•	
	2.	If an open-top WWTP is closer than 200 feet to the used for noise and odor control. [Section 4]	ne closest dwelling, incl	ude what structure or other measures will be
	3.	For a WWTP with a spray irrigation system, if the d feet, include what protective measures will be use		
H.		NFORMATION TO BE SUBMITTED WITH APPLICATION. Place item is not applicable to the project.	e a check (✓) by the ite	ems that are included in this application or an
	1.	If modifying or replacing an existing WWTP of constructed without a by-pass to a stream and [Section 3]		,
	2.	A Sludge Management Plan for WWTPs, included disposed. [Section 3]	ling the sludge process	sing method and how sludge will be ultimately
	3.	If the discharge point does not coincide with a blu of ownership, or recorded right of easement for a		
	4. 5.	·	•	-
٧.	Sewer	LINES		
ch	eck (✓) by A. If th B. If th C. A de that D. A co	following items for projects that include sewer line is the items that are included in this application or N/A the project includes a pump station, the pump performs the project includes gravity sewer lines or force main demonstration that the sewer system has adequate can at the sewer system is not subject to excessive infiltred demonstration that the WWTP has adequate capacity bject to excessive infiltration or excessive inflow. [See Excessive infiltration or excessive inflow.	A if the item is not appliamence curve. [Sections, a plan view and profice apacity to treat the current ation or excessive inflowed to transport the anticipation.]	cable to the project. 1 8] le view for each. [Section 6] Int and the anticipated flow to the WWTP and v. [Section 8]
VI.	OTHER R	REQUIRED APPLICATIONS		
	C, c B. If th	the WWTP has a discharge, complete and file with the or Short Form C, as applicable. * SAME KPDES PER the WWTP does not have a discharge, complete opplication, Form ND."	RMIT WILL APPLY	
VII	l. FEES			
mu WV		<u> </u>		or the total amount. Fees do not apply for a \$ \$
			Total Amount:	\$

VIII. CERTIFICATION

I, the applicant, certify under penalty of law that this document and all attachments were prepared under my direction or supervision. The information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment or both for known violations. [Section 2]

Applicant's Name and Official Title (Type or Print)	Phone Number (Include area code)
Signature	Date





Package WWTP Replacement Cairo Elementary School 10694 U.S. Highway 41A Henderson, KY 42420

for

Henderson County Board of Education 5704 Airline Road Henderson, KY 42420

October, 2023

Project Description:

Henderson County Board of Education proposes to replace an existing Package Wastewater Treatment Plant (WWTP) at Cairo Elementary School with a new Package WWTP. The existing facility is permitted under KPDES Permit No. KY0076058. The existing Package WWTP uses extended aeration with chlorine disinfection. The new Package WWTP is proposed as extended aeration with peracetic acid disinfection. The new Package WWTP will be designed for the same average flow and the same design capacity as the existing facility, with the same treatment technology, and will tie into the same outfall pipe; therefore, will be under the same KPDES Permit.

Design Calculations:

Design Calculations presented below represent the minimum sizing for a new facility. The Package WWTP manufacturer and contractor shall review the requirements and specifications (attached), and provide a system to treat the wastewater flows to the effluent limitations given in the KPDES Permit. If sizing of the actual Package WWTP differs from the minimums given, the WWTP manufacturer/contractor shall provide calculations demonstrating that the facility will meet all design standards governing this project.

Wastewater Flow Estimates:

Existing wastewater flows for the existing facility as given in the KPDES Permit are as follows:

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Average Flow = 0.0012 MGD (1,200 GPD)
Design Capacity = 0.004 MGD (4,000 GPD)
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Typical wastewater flows for a facility of this type were evaluated for design conditions:

Design Average Flow:

Schools: 10 gpd per student x 308 students = 3,080 GPD

Typical Flows are within the range of actual flow and design capacity, therefore all design numbers shall be based on the permitted *Design Capacity Flow of 4,000 GPD (0.004 MGD)*.

Peak Hourly Flow:

Recommended Standards for Wastewater Facilities estimates the peak hourly flow to the average daily flow by the calculation of a peaking factor based on a relationship to the population equivalent (P.E.) by the equation: [18 + SQRT(P.E. in thousands)] / [4 + SQRT(P.E. in thousands)]. The population equivalent for 4,000 GPD wastewater flow is 40. The associated peaking factor was calculated as 4.33; therefore, the peak hourly flow is 17,333 GPD (12.04 GPM).

Loading:

Recommended Standards for Wastewater Facilities (Section 11.253) estimates the loading rates based on Population Equivalent (P.E.) as $BOD_5 = 0.17$ lb per P.E. per Day and Total Suspended Solids (TSS) = 0.2 lb per P.E. per Day. Anticipated loadings to the WWTP are as follows:

Average Flow Loading:

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1,200 \text{ GPD} = 12 \text{ P.E. } \times 0.17 \text{ lb BOD}_5 \text{ per P.E. per Day} = 2.0 \text{ lb BOD}_5 \text{ per Day} 1,200 \text{ GPD} = 12 \text{ P.E. } \times 0.20 \text{ lb TSS per P.E. per Day} = 2.4 \text{ lb TSS per Day}
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Design Capacity Flow Loading:

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4,000 \text{ GPD} = 40 \text{ P.E. } \times 0.17 \text{ lb } \text{BOD}_5 \text{ per P.E. per Day} = 6.8 \text{ lb } \text{BOD}_5 \text{ per Day}
4,000 \text{ GPD} = 40 \text{ P.E. } \times 0.20 \text{ lb TSS per P.E. per Day} = 8.0 \text{ lb TSS per Day}
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Aeration Tanks:

Recommended Standards for Wastewater Facilities (Section 92.31) lists a permissible aeration tank capacity per loading of 15 lb of BOD_5 per Day per 1,000 cubic feet of Tank. For a design capacity loading of 6.8 lb it would require 3,500 GAL of aeration tank capacity. Additional stipulations of providing multiple units capable of independent operation, freeboard, arrangement of tanks to prevent short-circuiting, air requirements and checking other permissible loadings must be taken into consideration when the WWTP manufacturer/contractor designs the specific system. Consequently, the final number, size, and arrangement of the tanks of the must be designed and provided by the WWTP manufacturer/contractor.

Air Requirements:

Recommended Standards for Wastewater Facilities (Section 92.332) states the air requirements of Diffused Air Systems. Normal air requirement for the extended aeration process is given at 2,050 cubic feet per pound of BOD₅. Air requirements for ammonia and nitrogen, sludge returns, skimmers, sludge holding and post aeration must be added to the normal requirement. Basic air requirements were calculated as follows:

BOD ₅ = 2,050 CF per pound of BOD ₅ \times 6.8 lb / 1,400 min/day = Ammonia & Nitro. = 2,050 CF per pound BOD ₅ \times 17 lb / 1,400 min/day = 2 sludge returns \times 7 CFM per sludge return = 1 skimmer \times 7 CFM per skimmer = sludge holding tank = 4 CFM per 1,000 GAL \times 2,000 GAL = post aeration = 4 CFM = TOTAL BASIC AIR REQUIREMENTS =	9.7 9.7 14.0 7.0 8.0 4.0	CFM CFM CFM CFM CFM
TOTAL BASIC AIR REQUIREMENTS =	52.4	CFM
SEPARATE SURGE TANK BLOWER:	20.0	CFM

Final Settling:

Recommended Standards for Wastewater Facilities (Section 72.232) states the minimum Final Settling Tank surface overflow rate at design peak hourly flow at 1,000 GPD per SQ FT for extended aeration with single stage nitrification. Additional capacity should be considered for uncertainties in operation and to adjust for various processes to minimize problems. If 600 GPD per SQ FT overflow rate at design peak hourly flow is used, a minimum 30 sq ft of settling is required. The final number, size, and arrangement of the clarifier tanks of the must be designed and provided by the WWTP manufacturer/contractor.

Peracetic Acid Contact Tank:

Contact time of the peracetic acid is based on the volume of the tank. A minimum 1,500 gallon contact tank is specified. Contact time is calculated for both average daily flow and peak hourly flow as follows:

Contact Time (min.) = Tank Volume (gal.) / Flow (gpm)

Average Daily Flow → Contact Time = 1,500 gal / 2.78 gpm = 540 minutes

Peak Hourly Flow → Contact Time = 1,500 gal / 12.04 gpm = 125 minutes



Other Equipment and Processes:

The Package WWTP shall also include other basic equipment and processes including trash trap for grease and other floatables, grit and other settleable wastes, surge tanks (flow equalization) with pumps, sludge holding/digester, and re-use of existing intermittent sand filter. See specifications. These particular units in part or whole shall be appropriately designed and sized by the WWTP manufacturer/contractor to meet effluent requirements and requirements of the *Recommended Standards for Wastewater Facilities*.

Closure Plan of the Existing Package WWTP (Section IV.H.1. of the KY Construction Permit Application):

The Existing WWTP will remain on-line during the construction of the new WWTP. The new WWTP will be tested and verified prior to taking the Existing WWTP off-line. The transition to the new Package WWTP system will be conducted while school is closed and wastewater flow can be temporarily halted. Once transitioned, the Existing WWTP will be demolished and removed from the site.

The following Sequence of Closure shall be followed:

- 1. Proposed package wastewater treatment plant will be brought on-line through manufacturer's startup direction.
- 2. Contractor shall flush existing lines to be removed to existing wastewater treatment plant while existing wastewater treatment plant is still operable.
- 3. Contractor shall properly remove sludge/sewage through existing wastewater treatment plant.
- 4. Contractor shall remove and salvage to owner all pumps, motors, electrical and mechanical items from the existing wastewater treatment plant.
- 5. Contractor shall excavate and dispose off-site all tanks of the existing wastewater treatment plant and fill with compacted soil.
- 6. All disturbed areas shall receive topsoil, fertilized, fine graded and seeded per specifications.

Sludge Management Plan (Section IV.H.2. of the KY Construction Permit Application):

The sewage treatment system shall be provided with a 2,000 gallon sludge holding tank. The sludge holding tank shall be separate from the main tankage and easily accessible for pumping. Pumping shall be by a licensed sanitary sewage disposal contractor.

Flow Measuring (Section IV.H.4. of the KY Construction Permit Application):

Flow from the sewage treatment system shall be measured with a weir plate at the outlet of the disinfection contact tank and a Pulsar OCF 6.1 ultrasonic level flow meter and transducer, or equivalent.

