

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES
MISSOURI CLEAN WATER COMMISSION



CONSTRUCTION PERMIT

The Missouri Department of Natural Resources hereby issues a permit to:

Lake Forest Estates Clean Water District
Mark Basler, Chairman
Wastewater System Improvements
Lake Forest Estates Clean Water District Wastewater Treatment Facility
13100 Lakewood Dr.
Ste. Genevieve, MO 63670

for the construction of (described facilities):

See attached.

Permit Conditions:

See attached.

Construction of such proposed facilities shall be in accordance with the provisions of the Missouri Clean Water Law, Chapter 644, RSMo, and regulation promulgated thereunder, or this permit may be revoked by the Department of Natural Resources (department).

As the department does not examine structural features of design or the efficiency of mechanical equipment, the issuance of this permit does not include approval of these features.

A representative of the department may inspect the work covered by this permit during construction. Issuance of a permit to operate by the department will be contingent on the work substantially adhering to the approved plans and specifications.

This permit applies only to the construction of water pollution control components; it does not apply to other environmentally regulated areas.

August 3, 2026
Effective Date

August 2, 2028
Expiration Date

Heather Peters, Director, Water Protection Program

CONSTRUCTION PERMIT

I. CONSTRUCTION DESCRIPTION

Conversion of existing earthen basins to flow equalization basins, a sludge digestion and storage basin, and a concrete-lined dual sequencing batch reactor. Construction of a fine screen, effluent lift station, and UV disinfection. The outfall is being relocated to Establishment Creek. The design average flow will remain 118,300 gallons per day (gpd).

A closure plan will need to be submitted to the Southeast Regional Office for review and approval prior to any closure activities (i.e., the second cell of the existing flow equalization basin).

This project will also include general site work appropriate to the scope and purpose of the project and all necessary appurtenances to make a complete and usable wastewater treatment facility.

II. COST ANALYSIS FOR COMPLIANCE

Pursuant to Section 644.145, RSMo, when issuing permits under this chapter that incorporate a new requirement for discharges from publicly owned combined or separate sanitary or storm sewer systems or publicly owned treatment works, or when enforcing provisions of this chapter or the Federal Water Pollution Control Act, 33 U.S.C. 1251 et seq., pertaining to any portion of a publicly owned combined or separate sanitary or storm sewer system or [publicly owned] treatment works, the Department of Natural Resources shall make a “finding of affordability” on the costs to be incurred and the impact of any rate changes on ratepayers upon which to base such permits and decisions, to the extent allowable under this chapter and the Federal Water Pollution Control Act. This process is completed through a cost analysis for compliance. Permits that do not include new requirements may be deemed affordable.

The department is required to determine “findings of affordability” because the permit applies to a combined or separate sanitary sewer system for a publicly-owned treatment works.

Cost Analysis for Compliance - The department has made a reasonable search for empirical data indicating the permit is affordable. The search consisted of a review of department records that might contain economic data on the community, a review of information provided by the applicant as part of the application, and public comments received in response to public notices of this draft permit. If the empirical cost data was used by the permit writer, this data may consist of median household income, any other ongoing projects that the department has knowledge, and other demographic financial information that the community provided as contemplated by Section 644. 145.3. See **APPENDIX – COST ANALYSIS FOR COMPLIANCE**.

III. **CONSTRUCTION PERMIT CONDITIONS**

The permittee is authorized to construct subject to the following conditions:

1. This construction permit does not authorize discharge.
2. All construction shall be consistent with plans and specifications signed and sealed by Richard Cochran, Jr., P.E., with Waters Engineering, Inc., and as described in this permit.
3. The department must be contacted in writing prior to making any changes to the plans and specifications that would directly or indirectly have an impact on the capacity, flow, system layout, or reliability of the proposed wastewater treatment facilities or any design parameter that is addressed by 10 CSR 20-8, in accordance with 10 CSR 20-8.110(11).
4. State and federal law does not permit bypassing of raw wastewater; therefore, steps must be taken to ensure that raw wastewater does not discharge during construction. If a sanitary sewer overflow or bypass occurs, report the appropriate information to the department's Southeast Regional Office per 10 CSR 20-7.015(9)(G).
5. In addition to the requirements for a construction permit, 10 CSR 20-6.200 requires land disturbance activities of 1 acre or more to obtain a Missouri state operating permit to discharge stormwater. The permit requires best management practices sufficient to control runoff and sedimentation to protect waters of the state. Land disturbance permits will only be obtained by means of the department's ePermitting system available online at <https://dnr.mo.gov/data-e-services/missouri-gateway-environmental-management-mogem>. See <https://dnr.mo.gov/data-e-services/water/electronic-permitting-epermitting> for more information.
6. All construction must adhere to applicable 10 CSR 20-8 (Chapter 8) requirements listed below.
 - Flood protection shall apply to new construction and to existing facilities undergoing major modification. The wastewater facility structures, electrical equipment, and mechanical equipment shall be protected from physical damage by not less than the one hundred (100)-year flood elevation. 10 CSR 20-8.140(2)(B)
 - Unless another distance is determined by the Missouri Geological Survey or by the department's Public Drinking Water Branch, the minimum distance between wastewater treatment facilities and all potable water sources shall be at least three hundred feet (300'). 10 CSR 20-8.140(2)(C)1.
 - Facilities shall be readily accessible by authorized personnel from a public right-of-way at all times. 10 CSR 20-8.140(2)(D)
 - The outfall shall be so constructed and protected against the effects of flood water, ice, or other hazards as to reasonably ensure its structural stability and freedom from stoppage. 10 CSR 20-8.140(6)(A)

- All sampling points shall be designed so that a representative and discrete twenty-four (24) hour automatic composite sample or grab sample of the effluent discharge can be obtained at a point after the final treatment process and before discharge to or mixing with the receiving waters. 10 CSR 20-8.140(6)(B)
- All outfalls shall be posted with a permanent sign indicating the outfall number (i.e., Outfall #001). 10 CSR 20-8.140(6)(C)
- All wastewater treatment facilities shall be provided with an alternate source of electric power or pumping capability to allow continuity of operation during power failures. 10 CSR 20-8.140(7)(A)1.
- Disinfection and dechlorination, when used, shall be provided during all power outages. 10 CSR 20-8.140(7)(A)2.
- Electrical systems and components in raw wastewater or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors that are normally present, shall comply with the NFPA 70 *National Electric Code (NEC)* (2017 Edition), as approved and published August 24, 2016, requirements for Class I, Division 1, Group D locations. 10 CSR 20-8.140(7)(B)
- An audiovisual alarm or a more advanced alert system, with a self-contained power supply, capable of monitoring the condition of equipment whose failure could result in a violation of the operating permit, shall be provided for all wastewater treatment facilities. 10 CSR 20-8.140(7)(C)
- No piping or other connections shall exist in any part of the wastewater treatment facility that might cause the contamination of a potable water supply. 10 CSR 20-8.140(7)(D)1.
- Where a potable water supply is to be used for any purpose in a wastewater treatment facility other than direct connections, a break tank, pressure pump, and pressure tank or a reduced pressure backflow preventer consistent with the department's Public Drinking Water Branch shall be provided. 10 CSR 20-8.140(7)(D)3.A.
- For indirect connections, a sign shall be permanently posted at every hose bib, faucet, hydrant, or sill cock located on the water system beyond the break tank or backflow preventer to indicate that the water is not safe for drinking. 10 CSR 20-8.140(7)(D)3.B.
- Where a separate non-potable water supply is to be provided, a break tank will not be necessary, but all system outlets shall be posted with a permanent sign indicating the water is not safe for drinking. 10 CSR 20-8.140(7)(D)4.
- A means of flow measurement shall be provided at all wastewater treatment facilities. 10 CSR 20-8.140(7)(E)

- Effluent twenty-four (24) hour composite automatic sampling equipment shall be provided at all mechanical wastewater treatment facilities and at other facilities where necessary under provisions of the operating permit. 10 CSR 20-8.140(7)(F)
- Isolate all wastewater treatment components installed in a building where other equipment or offices are located from the rest of the building by an air-tight partition, provide separate outside entrances, and provide separate and independent fresh air supply. 10 CSR 20-8.140(7)(G)
- Adequate provisions shall be made to effectively protect facility personnel and visitors from hazards. The following shall be provided to fulfill the particular needs of each wastewater treatment facility:
 - Fencing. Enclose the facility site with a fence designed to discourage the entrance of unauthorized persons and animals; 10 CSR 20-8.140 (8) (A)
 - Gratings over appropriate areas of treatment units where access for maintenance is necessary; 10 CSR 20-8.140(8)(B)
 - First aid equipment; 10 CSR 20-8.140(8)(C)
 - Posted “No Smoking” signs in hazardous areas; 10 CSR 20-8.140(8)(D)
 - Appropriate personal protective equipment (PPE); 10 CSR 20-8.140(8)(E)
 - Portable blower and hose sufficient to ventilate accessed confined spaces; 10 CSR 20-8.140(8)(F)
 - 10 CSR 20-8.140(8)(G) Portable lighting equipment complying with NEC requirements. See subsection (7)(B) of this rule;
 - 10 CSR 20-8.140(8)(H) Gas detectors listed and labeled for use in NEC Class I, Division 1, Group D locations. See subsection (7)(B) of this rule;
 - Appropriately-placed warning signs for slippery areas, non-potable water fixtures (see subparagraph (7)(D)3.B. of this rule), low head clearance areas, open service manholes, hazardous chemical storage areas, flammable fuel storage areas, high noise areas, etc.; 10 CSR 20-8.140(8)(I)
 - Ventilation shall include the following:
 - Isolate all pumping stations and wastewater treatment components installed in a building where other equipment or offices are located from the rest of the building by an air-tight partition, provide separate outside entrances, and provide separate and independent fresh air supply; 10 CSR 20-8.140(8)(J)1.
 - Force fresh air into enclosed screening device areas or open pits more than four feet (4') deep. 10 CSR 20-8.140(8)(J)2.
 - Dampers are not to be used on exhaust or fresh air ducts. Avoid the use of fine screens or other obstructions on exhaust or fresh air ducts to prevent clogging; 10 CSR 20-8.140(8)(J)3.
 - Where continuous ventilation is needed (e.g., housed facilities), provide at least twelve (12) complete air changes per hour. Where continuous ventilation would cause excessive heat loss, provide intermittent ventilation of at least thirty (30) complete air changes per hour when facility personnel enter the area. Base air change demands on one hundred percent (100%) fresh air; 10 CSR 20-8.140(8)(J)4.

- Electrical controls. Mark and conveniently locate switches for operation of ventilation equipment outside of the wet well or building. Interconnect all intermittently operated ventilation equipment with the respective wet well, dry well, or building lighting system. The manual lighting/ventilation switch is expected to override the automatic controls. For a two (2) speed ventilation system with automatic switch over where gas detection equipment is installed, increase the ventilation rate automatically in response to the detection of hazardous concentrations of gases or vapors; 10 CSR 20-8.140(8)(J)5.
- Fabricate the fan wheel from non-sparking material. Provide automatic heating and dehumidification equipment in all dry wells and buildings. 10 CSR 20-8.140(8)(J)6.
- Explosion-proof electrical equipment, non-sparking tools, gas detectors, and similar devices, in work areas where hazardous conditions may exist, such as digester vaults and other locations where potentially explosive atmospheres of flammable gas or vapor with air may accumulate. 10 CSR 20-8.140(8)(K)
- Provisions for local lockout/tagout on stop motor controls and other devices; 10 CSR 20-8.140(8)(L)
- Provisions for an arc flash hazard analysis and determination of the flash protection boundary distance and type of PPE to reduce exposure to major electrical hazards shall be in accordance with NFPA 70E *Standard for Electrical Safety in the Workplace* (2018 Edition), as approved and published August 21, 2017. 10 CSR 20-8.140(8)(M)
- All wastewater treatment facilities must have a screening device, comminutor, or septic tank for the purpose of removing debris and nuisance materials from the influent wastewater. 10 CSR 20-8.150(2)
- All screening devices and screening storage areas shall be protected from freezing. 10 CSR 20-8.150(4)(A)1.
- Provisions shall be made for isolating or removing screening devices from their location for servicing. 10 CSR 20-8.150(4)(A)2.
- Manually cleaned screen channels shall be protected by guard railings and deck gratings with adequate provisions for removal or opening to facilitate raking. 10 CSR 20-8.150(4)(A)3.A.(I)
- Mechanically cleaned screen channels shall be protected by guard railings and deck gratings. 10 CSR 20-8.150(4)(A)3.A.(II)
- Mechanical screening equipment shall have adequate removal enclosures to protect facility personnel against accidental contact with moving parts and to prevent dripping in multi-level installations. 10 CSR 20-8.150(4)(A)3.B.(I)
- A positive means of locking out each mechanical screening device shall be provided. 10 CSR 20-8.150(4)(A)3.B.(II)

- An emergency stop button with an automatic reverse function shall be located in close proximity to the mechanical screening device. 10 CSR 20-8.150(4)(A)3.B.(III)
- Electrical systems and components in raw wastewater or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors that are normally present, shall comply with the NFPA 70 *National Electric Code (NEC)* (2017 Edition), as approved and published August 24, 2016, requirements for Class I, Division 1, Group D locations. 10 CSR 20-8.140(7)(B)
- Where two (2) or more mechanically cleaned bar screens are used, the design shall provide for taking the largest unit out-of-service without sacrificing the capability to handle the average design flow. Where only one mechanically cleaned screen is used, it shall be sized to handle the design peak instantaneous flow. 10 CSR 20-8.150(4)(B)
- The minimum total Sequencing Batch Reactor (SBR) basin volume shall be equal to the design daily influent flow volume and either upstream in-line or off-line storage is necessary to minimize influent flow during settling and decanting. 10 CSR 20-8.180(6)(A)
- A minimum of two (2) Sequencing Batch Reactor (SBR) basins shall be installed. 10 CSR 20-8.180(6)(B)
- Emergency Power. Disinfection and dechlorination processes, when used, shall be provided during all power outages. 10 CSR 20-8.190(2)(A)
- Effluent twenty-four (24) hour composite automatic sampling equipment shall be provided at all mechanical wastewater treatment facilities and at other facilities where necessary under provisions of the operating permit. 10 CSR 20-8.190(3)(D)
- The UV dosage shall be based on the design peak hourly flow, maximum rate of pumpage, or peak batch flow. 10 CSR 20-8.190(5)(A)1.
- The UV system shall deliver the target dosage based on equipment derating factors and, if needed, have the UV equipment manufacturer verify that the scale up or scale down factor utilized in the design is appropriate for the specific application under consideration. 10 CSR 20-8.190(5)(A)3.
- The UV system shall deliver a minimum UV dosage of thirty thousand microwatt seconds per centimeters squared ($30,000 \mu\text{W} \cdot \text{s}/\text{cm}^2$). 10 CSR 20-8.190(5)(A)4.
- Closed vessel UV systems. The combination of the total number of closed vessels shall be capable of treating the design peak hourly flow, maximum rate of pumpage, or peak batch flow. 10 CSR 20-8.190(5)(B)2.
- Closed vessel UV systems utilizing medium-pressure lamps shall be provided with an automatic cleaning system in order to prevent algae growth. 10 CSR 20-8.190(5)(B)3.

- The UV system must continuously monitor and display at the UV system control panel the following minimum conditions:
 - The relative intensity of each bank or closed vessel system;
10 CSR 20-8.190(5)(C)1.A.
 - The operational status and condition of each bank or closed vessel system;
10 CSR 20-8.190(5)(C)1.B.
 - The ON/OFF status of each lamp in the system; 10 CSR 20-8.190(5)(C)1.C. and
 - The total number of operating hours of each bank or each closed vessel system.
10 CSR 20-8.190(5)(C)1.D.
- The UV system shall include an alarm system. Alarm systems shall comply with 10 CSR 20-8.140(7)(C). 10 CSR 20-8.190(5)(C)2.

7. Upon completion of construction:

- A. The Lake Forest Estates Clean Water District will become the responsible authority for operation and maintenance of these facilities;
- B. Submit an electronic copy of the as-built plans if the project was not constructed in accordance with previously submitted plans and specifications;
- C. Submit the Statement of Work Completed form to the department in accordance with 10 CSR 20-6.010(5)(N) (<https://dnr.mo.gov/document-search/wastewater-construction-statement-work-completed-mo-780-2155>) and request the operating permit modification public noticed from June 18 to July 20, 2026, be issued.

IV. **REVIEW SUMMARY**

1. **CONSTRUCTION PURPOSE**

The Lake Forest Estates Clean Water District WWTF currently discharges to Big Bottom Creek. Due to an EPA-approved Total Maximum Daily Load (TMDL) for Big Bottom Creek, the facility was facing lower final effluent limits that could not be met with the existing facility.

2. **FACILITY DESCRIPTION**

The existing facility (pre-construction) is a three-cell lagoon, with the first earthen basin baffled into two cells and aerated. The former (original) three-cell lagoon is still being used for flow equalization prior to the current facility. Sludge is being retained in the lagoon system. The community has 277 residential connections. The existing collection system is approximately 6.3 miles.

For the proposed construction, the first and last cells of the current equalization-basin system (~1.63-acre plus 0.28-acre surface area, ~1,114,000 gallons, 1.89-ft operating depth) will continue to be used for equalization of peak flows. The second equalization basin will be closed. The final earthen basin of the current treatment lagoon (the current settling cell) will be converted to a concrete-lined sequencing batch reactor (SBR) (a total surface area of ~0.28 acres, 8-ft total water depth), with a

concrete wall splitting the basin into two cells. The first earthen basin of the current treatment lagoon (the current aerated basin) will be converted to a sludge digestion and storage basin (~1.2-acre surface area, ~3,328,000 gallons, 9.7-ft total water depth) with overflow decant back to the SBR.

A fine screen will be added prior to entering the SBR. An effluent lift station will be added after the SBR. A UV disinfection system will be added after the effluent lift station. The outfall will be relocated from Big Bottom Creek to Establishment Creek.

The Lake Forest Estates Clean Water District WWTF is located within Landgrant 2046, northeast of the unincorporated community of Grayhawk, just north of Lake Anne at its discharge to Big Bottom Creek, in Ste. Genevieve County, Missouri. The outfall will be relocated to discharge approximately 0.6 miles to the north-northwest of the existing discharge.

The facility's design average flow will remain 118,300 gpd and serves a hydraulic population equivalent of approximately 1,183 people (based on 100 gpd per person).

3. COMPLIANCE PARAMETERS

Outfall 001 is being physically removed and therefore will be deleted from the operating permit. Outfall 002 will be constructed and added to the operating permit. The proposed project will be required to meet final effluent limits as established in the Antidegradation review dated April 1, 2026.

The limits following the completion of construction that will be applicable to the facility are as follows:

Parameter	Units	Monthly average limit
Biochemical Oxygen Demand ₅	mg/L	30
Total Suspended Solids	mg/L	30
Ammonia as N-January	mg/L	3.8
Ammonia as N-February	mg/L	3.1
Ammonia as N-March	mg/L	2.7
Ammonia as N-April	mg/L	2.1
Ammonia as N-May	mg/L	1.7
Ammonia as N-June	mg/L	1.3
Ammonia as N-July	mg/L	1.1
Ammonia as N-August	mg/L	1.0
Ammonia as N-September	mg/L	1.4
Ammonia as N-October	mg/L	2.0
Ammonia as N-November	mg/L	2.6
Ammonia as N-December	mg/L	3.3
pH	SU	6.0-9.0
<i>E. coli</i>	#/100mL	206
BOD ₅ Percent Removal	%	85
TSS Percent Removal	%	85
Parameter	Units	Monthly Average Minimum
Dissolved Oxygen (DO)	mg/L	5.0

4. ANTIDegradation

The department has reviewed the antidegradation report for this facility and issued the Water Quality and Antidegradation Review dated April 1, 2026, due to relocation of the outfall to Establishment Creek. See **APPENDIX – ANTIDegradation**.

5. REVIEW of MAJOR TREATMENT DESIGN CRITERIA

Existing major components that will remain in use include the following:

- For the proposed construction, the first and last cells of the current equalization-basin system will continue to be used for equalization of peak flows. The second equalization basin will be closed.
- The final earthen basin of the existing treatment lagoon (the current settling cell) will be converted to a concrete-lined SBR, with a concrete wall splitting the basin into two cells. The first baffled earthen basin of the existing treatment lagoon system (the aerated cell) will be converted to an aerated sludge holding basin with overflow decant back to the SBR. Sludge will be land applied as needed.

Construction will cover the following items:

- Influent Flow Splitter – An adjustable slide gate will be installed into the existing flow splitter box to restrict flow to the SBR and divert excess flows to the flow equalization basins. The maximum flow to the SBR would be 0.5 million gallons per day (MGD), with an additional 0.14 MGD flowing to the equalization basins.
- Flow Measurement – Installation of accurate flow measurement devices will give the treatment facility a means of improved data analysis.
 - Electromagnetic Meter – An effluent electromagnetic 8-inch flow meter shall measure the secondary treated and disinfected wastewater prior to discharge at Outfall No. 002.
- Screening – Installation of screening devices removes nuisance inorganic materials from raw wastewater.
 - Mechanical Fine Screen – one in-channel, mechanically-cleaned, spiral-screw fine screen with a maximum 6-mm perforated plate spacing and screen enclosure for outdoor protection. The screening devices shall be capable of treating a design peak flow of 0.50 MGD. The screen will include compaction and dewatering system. The addition of a coarse bar screen with one-inch (1”) bar spacing prior to the mechanically-cleaned fine screen provides protection of the fine screen. The addition of a washer/compactor and screenings conveyor will mitigate the increased volume of screenings captured by washing, dewatering, and compacting the screenings prior to disposal. The screening structure is followed by the SBR system.
 - Trash Rack – A coarse manual trash rack (perforated screen style) with ½-inch clear openings staggered at 11/16-inch with an open area of 47% will be located at the decanter discharge location within the effluent lift station wet well.

- **Wet Weather Flow Equalization** – Wet weather flow equalization is utilized during wet weather events where the peak flow is greater than the design peak capacity of the treatment facility. Once the wet weather event subsides, the flow should be returned to the head of the treatment facility for full secondary treatment. The two *existing* equalization basins have a combined design volume estimated to be more than 1.11 million gallons (MG). The equalization basins have surface areas of ~1.63 acres and ~0.28 acres with a 1.89-ft variable operating depth. The basins are *not* being modified, but the flow splitting structure is being modified with a slide gate to restrict the design peak hourly flow through the SBR system to 20,833 gph (or 0.500 MGD). The stored wastewater can be held back by a valved discharge pipe until flows recede. Flow automatically returns to the main system via gravity.
- **Sequencing Batch Reactor (SBR)** – Dual concrete-lined sequencing batch reactors in the adapted final cell (total surface area of ~0.28 acres) with a hydraulic retention time of 2.46 days (59 hours) from basin bottom to the eight foot water level and 9.71 hours of hydraulic retention time between the seven-ft and eight-ft design operating levels. The average design flow of the two basins is 0.1183 MGD with a maximum design flow of 0.5 MGD. The basins are designed with a sludge depth of 3.7 ft, 5.1 ft of freeboard (13.1 ft), with an emergency wall opening at 8.6 ft from bottom. The basins will typically operate on four cycles per day per basin, with each cycle duration being six hours. Aeration is provided by four 7.5-horsepower surface aerators (two per basin) providing up to 3.0 lbs of oxygen per hp per hour. The actual oxygen requirements are 298.55 lbs/day for the entire system. Four five-horsepower (5-hp) submersible, raw-sewage mixers (two per basin) with VFDs will be included. The decant system will have a typical flow rate at maximum design flow of 1,483 gpm but is capable of 2,084 gpm. The decant duration is 15 minutes with eight decants per day (four decants per basin per day) in normal mode and 24 decants per day (12 per basin) in storm mode.
- **Effluent Pump Station** – A duplex effluent pump station is utilized to route effluent to the relocated outfall. The post-SBR concrete wet well will be one rectangular basin with a minimum water depth of two feet and maximum water depth of 12 ft to provide a maximum operating volume of 16,830 gallons. Each pump will be capable of pumping 350 gpm (0.5 MGD) at 145.8 ft TDH. The 15-minute decant will move 21,570 gallons in a typical cycle. In normal mode, the wet well will have 345 minutes of idle time until the next decant. In storm mode, the wet well will have 105 minutes of idle time until the next decant. The effluent pump station will pump the flow through the closed UV disinfection system.
- **Disinfection** – Disinfection is the process of removal, deactivation, or killing of pathogenic microorganisms.
 - **Closed Vessel Ultraviolet (UV)** – A closed vessel, gravity flow, low pressure high intensity UV disinfection system capable of treating a peak flow of at least 0.5 MGD while delivering a minimum UV intensity of 30 mJ/cm² with an expected ultraviolet transmissivity of 65% or greater. The closed vessel UV

system consists of 24 lamps per reactor. Two closed vessel UV reactors are arranged in parallel. The disinfected effluent will flow through the effluent force main through flow measurement equipment and to Outfall No. 002.

- Relocated Outfall – Construction of ~ 3,921 ft of 8-inch SDR-26 PVC force main to the new outfall. The new outfall location is approximately 0.7 miles northwest from the current outfall location and would discharge to Establishment Creek. The outfall consists of a discharge pipe and concrete structure for flood protection. Effluent samples are to be taken after complete treatment; a spigot tap is provided.
- Emergency Power – A 150 kW standby diesel generator and non-automatic (manual) transfer switch will be provided to operate the treatment facility in event of power failure. The equalization basins will provide backup storage as needed.
- Sludge Digestion and Storage Basin – The *existing* aerated lagoon basin (baffled into cells 1 and 2) will be converted into a non-baffled aerated sludge storage basin with diffused aeration system rehabilitated to provide aeration and mixing of the sludge to prevent anaerobic conditions. The two *existing* positive displacement blowers are each capable of providing 160 scfm. The existing basin will decant by gravity through a pipe that is 10.1 ft above the basin floor. The top of berm is 2.3 ft above the operating water level. The basin is aerated, has a surface area of ~ 1.2 acres, and a volume of ~ 3,328,000 gallons. At the daily sludge production of only 1,510 gallons (0.85% solids), the basin has ample storage of more than one year. The sludge will be received from the SBR system.
- Sludge Wasting Pumps – Each SBR basin will contain one sludge wasting pump and associated valves. The submersible sludge wasting pumps will be capable of pumping 35 gpm at five feet of TDH with a 1.8-HP motor. The pumps are utilized to pump waste sludge from the SBR basin sumps to the aerated sludge holding basin. The design basis of the sludge wasting to the digester is 3,028 gpd at 0.85%.

6. OPERATING PERMIT

Operating permit MO-0035742 will require a modification to reflect the construction activities. The modified MO-0035742 for the Lake Forest Estates Clean Water District WWTF was successfully public noticed from June 18, 2026, to July 20, 2026, with no comments received. Submit the Statement of Work Completed to the department in accordance with 10 CSR 20-6.010(5)(N) and request the operating permit modification be issued.

With your CP application, an operating permit modification was submitted for public notice to reflect the change in your operating permit. Your operating permit is set to expire on February 28, 2027, and an application for renewal was received on April 28, 2026. Note that if construction is not complete prior to expiration of the current operating permit, the operating permit renewal will incorporate the modification elements.

This facility does not meet the requirements of the MOGDS issued on July 1, 2024, for the following reason: design flow, publicly owned, more-stringent antidegradation limits.

V. NOTICE OF RIGHT TO APPEAL

If you were adversely affected by this decision, you may be entitled to an appeal before the Administrative Hearing Commission (AHC) pursuant to Section 621.250 RSMo. To appeal, you must file a petition with the AHC within 30 days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed; if it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the AHC. Any appeal should be directed to:

Administrative Hearing Commission
U.S. Post Office Building, Third Floor
131 West High Street, P.O. Box 1557
Jefferson City, MO 65102-1557
Phone: 573-751-2422
Fax: 573-751-5018
Website: <https://ahc.mo.gov>

Scott Adams, P.E.
Engineering Section

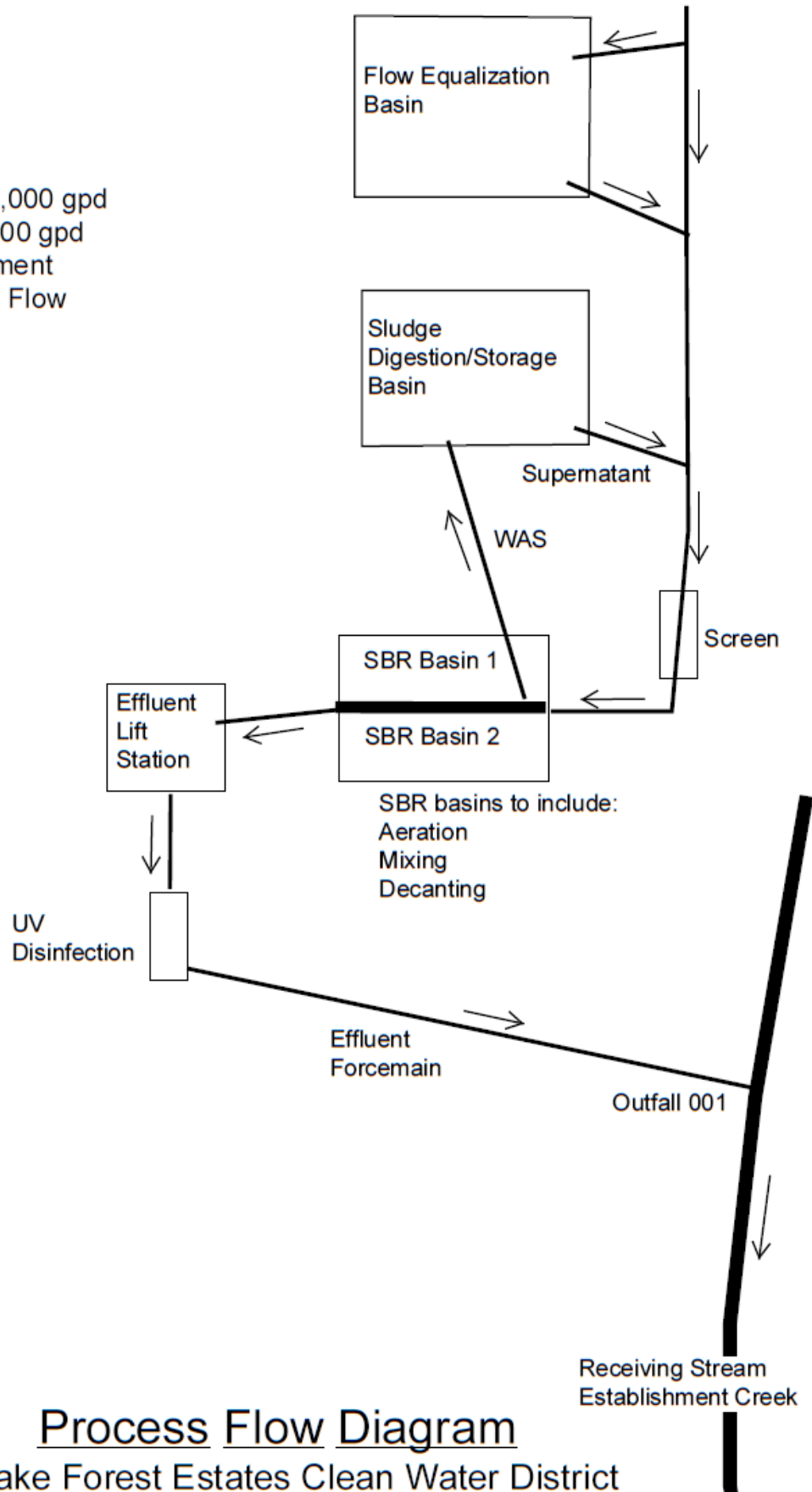
scott.adams@dnr.mo.gov

VI. APPENDICES

- [Process Flow Diagram](#)
- [2026 Cost Analysis for Compliance \(CAFCOM\)](#)
- [Antidegradation](#)

1. Appendix 1 - Process Flow Diagram

Design Flow - 118,000 gpd
Peak Flow - 500,000 gpd
All process Equipment
designed for Peak Flow
Conditions



2. Appendix 2a – 2026 Cost Analysis for Compliance:

**Missouri Department of Natural Resources
Water Protection Program
Cost Analysis for Compliance
(In accordance with RSMo 644.145)**

**Lake Forest Estates Clean Water District WWTF, Permit Modification due to proposed construction
LAKE FOREST ESTATES CLEAN WATER DISTRICT
Missouri State Operating Permit #MO-0035742**

Section 644.145 RSMo requires the Department of Natural Resources (department) to make a “finding of affordability” when “issuing permits under” or “enforcing provisions of” state or federal clean water laws “pertaining to any portion of a combined or separate sanitary sewer system for publicly-owned treatment works.” This cost analysis does not dictate how the permittee will comply with new permit requirements.

New Permit Requirements

Based on relocation of the outfall to Establishment Creek, outfall 001 is being removed and replaced with outfall 002. In addition, monthly monitoring for total phosphorus and total nitrogen (including total Kjeldahl nitrogen, nitrate, and nitrite) are being reduced from monthly to quarterly; influent total phosphorus and total nitrogen (including total Kjeldahl nitrogen, nitrate, and nitrite) are being added on a quarterly basis, and influent ammonia is being added monthly. [10 CSR 20-7.015(9)(D)8.] The reduction in some costs and the addition of other costs for sampling are the only additions in this operating permit.

Connections

The number of connections for this facility was taken from the department’s fee tracking system, as a financial questionnaire was not provided.

Connection Type	Number
Residential	290
Commercial	0
Industrial	0
Total	290

Data Collection for this Analysis

This cost analysis is based on data available to the department as provided by the permittee and data obtained from readily available sources. For the most accurate analysis, it is essential that the permittee provides the department with current information about the district’s financial and socioeconomic situation. The financial questionnaire available to permittees on the department’s website (<https://dnr.mo.gov/document-search/financial-questionnaire-mo-780-2511>) is a required attachment to the permit renewal application. If the financial questionnaire is not submitted with the renewal application, the department sends a request to complete the form with the welcome correspondence. If certain data was not provided by the permittee to the department and the data is not obtainable through readily available sources, this analysis will state that the information is “unknown”.

Eight Criteria of 644.145 RSMo

The department must consider the eight (8) criteria presented in subsection 644.145 RSMo to evaluate the cost associated with new permit requirements.

(1) A community's financial capability and ability to raise or secure necessary funding;

Criterion 1 Table. Current Financial Information for the LAKE FOREST ESTATES CLEAN WATER DISTRICT

Financial Criterion	Result
Current Monthly User Rates per 5,000 gallons*	\$82.00 ‡
Median Household Income (MHI) ¹	\$63,735 (county)
Current Annual Operating Costs (excludes depreciation)	\$62,406 (2024/2025 budget)

* User Rates listed are proposed January 2025 user rate required to repay upcoming USDA loan.

‡ The Financial Questionnaire stated that the required rate per the district's USDA loan (obligation signed March 17, 2022) is **\$82.00** per home per month, which was to go into effect January 2025.

(2) Affordability of pollution control options for the individuals or households at or below the median household income level of the community;

The following tables outline the estimated costs of the new permit requirements:

Criterion 2A Table. Estimated Cost Breakdown of New Permit Requirements

New Requirement	Frequency	Estimated Cost	Estimated Annual Cost
Ammonia - Influent	Monthly	\$47	+ \$564
Total Kjeldahl Nitrogen - Influent	Quarterly added (+4)	\$45	+ \$180
Nitrate + Nitrite - Influent	Quarterly added (+4)	\$47	+ \$188
Total Phosphorus - Influent	Quarterly added (+4)	\$27.50	+ \$110
Total Kjeldahl Nitrogen - Effluent	Monthly to Quarterly (-8)	\$45	- \$360
Nitrate + Nitrite - Effluent	Monthly to Quarterly (-8)	\$47	- \$376
Total Phosphorus - Effluent	Monthly to Quarterly (-8)	\$27.50	- \$220

Total Estimated Annual Cost of New Permit Requirements = + \$86 (total)

Criterion 2B Table. Estimated Costs for New Permit Requirements

Financial Criterion	Result
(1) Estimated Annual Cost	\$86
(2) Estimated Monthly User Cost for New Requirements ²	\$7.17 total \$0.02 per month per user
• Estimated Monthly User Cost for New Requirements as a Percent of MHI ³	0.0005 %
(3) Total Monthly User Cost*	\$82.02
• Total Monthly User Cost as a Percent of MHI ⁴	1.559 %

* Current User Rate + Estimated Monthly Costs of New Sampling Requirements

Due to the minimal cost associated with new permit requirements, the department anticipates an extremely low (or no) rate increase will be necessary, which could impact individuals or households of this community.

(3) An evaluation of the overall costs and environmental benefits of the control technologies;

This analysis is being conducted based on new requirements in the permit, which will not require the addition of new control technologies at the facility. However, the new sampling requirements are being established in order to provide data regarding the health of the receiving stream's aquatic life and to ensure that the existing permit limits are providing adequate protection of aquatic life. Improved wastewater provides benefits such as avoided health costs due to water-related illness, enhanced environmental ecosystem quality, and improved natural resources. The preservation of natural resources has been proven to increase the economic value and sustainability of the surrounding communities. Maintaining Missouri's water quality standards fulfills the goal of restoring and maintaining the chemical, physical, and biological integrity of the receiving stream; and, where attainable, it achieves a level of water quality that provides for the protection and propagation of fish, shellfish, wildlife, and recreation in and on the water.

Nutrient Monitoring

Nutrients are mineral compounds that are required for organisms to grow and thrive. Of the six (6) elemental macronutrients, nitrogen and phosphorus are generally not readily available and limit growth of organisms. Excess nitrogen and phosphorus will cause a shift in the ecosystem's food web. Once excess nitrogen and phosphorus are introduced into a waterbody, some species' populations will dramatically increase, while other populations will not be able to sustain life. Competition and productivity are two factors in which nutrients can alter aquatic ecosystems and the designated uses of a waterbody. For example, designated uses, such as drinking water sources and recreational uses, become impaired when algal blooms take over a waterbody. These blooms can cause foul tastes and odors in the drinking water, unsightly appearance, and fish mortality in the waterbody. Some algae also produce toxins that may cause serious adverse health conditions such as liver damage, tumor promotion, paralysis, and kidney damage. The monitoring requirements for nitrogen and phosphorus have been added to the permit to provide data regarding the health of the receiving stream's aquatic life. A healthy ecosystem is beneficial as it provides reduced impacts on human and aquatic health as well as recreational opportunities.

(4) Inclusion of ongoing costs of operating and maintaining the existing wastewater collection and treatment system, including payments on outstanding debts for wastewater collection and treatment systems when calculating projected rates:

The community has reported that they have no outstanding debt for the current wastewater collection and treatment systems. However, the district is working to get a USDA loan for the proposed construction upgrades. The community reported that each user currently pays \$63.83 monthly, which will be raised to \$82.00 monthly in January 2025. According to a USDA Area Specialist, \$50.52 (61.8%) will be used toward payments on the outstanding debt.

As shown in Criterion 2, the user rate plus the amount for the additional sampling requirements is \$82.02.

(5) An inclusion of ways to reduce economic impacts on distressed populations in the community, including but not limited to low and fixed income populations. This requirement includes but is not limited to:

- (a) Allowing adequate time in implementation schedules to mitigate potential adverse impacts on distressed populations resulting from the costs of the improvements and taking into consideration local community economic considerations.
- (b) Allowing for reasonable accommodations for regulated entities when inflexible standards and fines would impose a disproportionate financial hardship in light of the environmental benefits to be gained.

The following table characterizes the current overall socioeconomic condition of the community as compared to the overall socioeconomic condition of Missouri. The following information was compiled using the latest U.S. Census data.

Criterion 5 Table. Socioeconomic Data ^{1, 5-9} for the County of Ste Genevieve

	Administrative Unit	Ste. Genevieve County	Missouri State	United States
1	Population (2023)	18,551	6,168,181	332,387,540
2	Percent Change in Population (2000-2023)	4.0%	10.2%	18.1%
3	2023 Median Household Income (in 2024 Dollars)	\$63,118	\$70,567	\$80,011
4	Percent Change in Median Household Income (2000-2023)	-11.1%	-1.1%	1.9%
5	Median Age (2023)	43.2	38.9	38.7
6	Change in Median Age in Years (2000-2023)	6.3	2.7	3.5
7	Unemployment Rate (2023)	4.6%	4.1%	5.2%
8	Percent of Population Below Poverty Level (2023)	7.9%	12.6%	12.4%
9	Percent of Household Received Food Stamps (2023)	6.3%	9.9%	11.8%

(6) An assessment of other community investments and operating costs relating to environmental improvements and public health protection;

The community did not report any other investments relating to environmental improvements.

(7) An assessment of factors set forth in the United States Environmental Protection Agency's guidance, including but not limited to the "Combined Sewer Overflow Guidance for Financial Capability Assessment and Schedule Development" that may ease the cost burdens of implementing wet weather control plans, including but not limited to small system considerations, the attainability of water quality standards, and the development of wet-weather standards;

The new requirements associated with this permit will not impose a financial burden on the community, nor will they require the LAKE FOREST ESTATES CLEAN WATER DISTRICT to seek funding from an outside source.

(8) An assessment of any other relevant local community economic conditions.

See bullet 4 above. The district is obtaining a USDA loan for proposed upgrades and relocation of the outfall. The community did not report any other relevant local economic conditions.

Conclusion and Finding

As a result of new regulations, the department is proposing modifications to the current operating permit that may require the permittee to increase monitoring. The department has considered the eight (8) criteria presented in subsection 644.145 RSMo to evaluate the cost associated with the new permit requirements.

This analysis examined whether the new sampling requirements affect the ability of an individual customer or household to pay a utility bill without undue hardship or unreasonable sacrifice in the essential lifestyle or spending patterns of the individual or household. After reviewing the above criteria, the department finds that the new sampling requirements may result in a low burden with regard to the community's overall financial

capability and a low financial impact for most individual customers/households; therefore, the new permit requirements are affordable.

References

1. (A) 2023 MHI in 2024 Dollar: United States Census Bureau. 2018-2022 American Community Survey 5-Year Estimates, Table B19013: Median Household Income in the Past 12 Months (in 2022 Inflation-Adjusted Dollars). <https://data.census.gov/cedsci/table?q=B19013&tid=ACSDT5Y2022.B19013>.
(B) 2000 MHI in 1999 Dollar: (1) For United States, United States Census Bureau (2003) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-2-1 Part 1. United States Summary, Table 5. Work Status and Income in 1999: 2000, Washington, DC. <https://www.census.gov/content/dam/Census/library/publications/2003/dec/phc-2-1-pt1.pdf>.
(2) For Missouri State, United States Census Bureau (2003) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-2-27, Missouri, Table 10. Work Status and Income in 1999: 2000, Washington, DC. <https://www.census.gov/content/dam/Census/library/publications/2003/dec/phc-2-1-pt1.pdf>.
(C) 2023 CPI and 1999 CPI: U.S. Department of Labor Bureau of Labor Statistics (2023) Consumer Price Index - All Urban Consumers, U.S. City Average. All Items. 1982-84=100 (unadjusted) - CUUR0000SAO. <https://data.bls.gov/cgi-bin/surveymost?bls>.
(D) 2023 MHI in 2024 Dollar = 2022 MHI in 2022 Dollar x 2023 CPI / 2022 CPI; 2000 MHI in 2023 Dollar = 2000 MHI in 1999 Dollar x 2023 CPI / 1999 CPI.
(E) Percent Change in Median Household Income (2000-2022) = (2022 MHI in 2023 Dollar - 2000 MHI in 2023 Dollar) / (2000 MHI in 2023 Dollar).
2. $(\$86/290)/12 = \0.02 (Estimated Monthly User Cost for New Requirements)
3. $(\$0.02/(\$63,118/12))100\% = 0.0005\%$ (New Sampling Only)
4. $(\$82.02/(\$63,118/12))100\% = 1.559\%$ (Total User Cost)
5. (A) Total Population in 2023: United States Census Bureau. 2018-2022 American Community Survey 5-Year Estimates, Table B01003: Total Population - Universe: Total Population. <https://data.census.gov/cedsci/table?q=B01003&tid=ACSDT5Y2022.B01003>.
(B) For United States, United States Census Bureau (2002) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-1-1 Part 1. United States Summary, Table 1. Age and Sex: 2000, Washington, DC. <https://www.census.gov/content/dam/Census/library/publications/2003/dec/phc-2-1-pt1.pdf>.
(2) For Missouri State, United States Census Bureau (2002) 2000 Census of Population and Housing, Summary Population and Housing Characteristics, PHC-1-27, Missouri, Table 2. Age and Sex: 2000, Washington, DC. <https://www2.census.gov/library/publications/2003/dec/phc-2-1-pt2.pdf>.
(C) Percent Change in Population (2000-2022) = (Total Population in 2022 - Total Population in 2000) / (Total Population in 2000).
6. Median Age in 2023: United States Census Bureau. 2018-2022 American Community Survey 5-Year Estimates, Table B01002: Median Age by Sex - Universe: Total population. <https://data.census.gov/cedsci/table?q=B01002&tid=ACSDT5Y2022.B01002>.
(B) For United States, United States Census Bureau (2002) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-1-1 Part 1. United States Summary, Table 1. Age and Sex: 2000, Washington, DC., Page 2. <https://www.census.gov/content/dam/Census/library/publications/2003/dec/phc-2-1-pt1.pdf>.
(2) For Missouri State, United States Census Bureau (2002) 2000 Census of Population and Housing, Summary Population and Housing Characteristics, PHC-1-27, Missouri, Table 2. Age and Sex: 2000, Washington, DC., Pages 64-92. <https://www2.census.gov/library/publications/2003/dec/phc-2-1-pt2.pdf>.
(C) Change in Median Age in Years (2000-2023) = (Median Age in 2023 - Median Age in 2000).
7. United States Census Bureau. 2019-2023 American Community Survey 5-Year Estimates, S2301: Employment Status for the Population 16 Years and Over - Universe: Population 16 years and Over. <https://data.census.gov/cedsci/table?q=unemployment&tid=ACSST5Y2022.S2301>.
8. United States Census Bureau. 2019-2023 American Community Survey 5-Year Estimates, Table S1701: Poverty Status in the Past 12 Months. <https://data.census.gov/cedsci/table?q=S1701&tid=ACSST5Y2022.S1701>.
9. United States Census Bureau. 2019-2023 American Community Survey 5-Year Estimates, Table S2201: Food Stamps/Supplemental Nutrition Assistance Program (SNAP) - Universe: Households. <https://data.census.gov/cedsci/table?q=S2201&tid=ACSST5Y2022.S2201>.

3. Appendix 2b – 2022 Cost Analysis for Compliance:

**Missouri Department of Natural Resources
Water Protection Program
Cost Analysis for Compliance
(In accordance with RSMo 644.145)**

**Lake Forest Estates Clean Water District WWTF, Permit Renewal
LAKE FOREST ESTATES CLEAN WATER DISTRICT
Missouri State Operating Permit #MO-0035742**

Section 644.145 RSMo requires the Department of Natural Resources (Department) to make a “finding of affordability” when “issuing permits under” or “enforcing provisions of” state or federal clean water laws “pertaining to any portion of a combined or separate sanitary sewer system for publicly-owned treatment works.” This cost analysis does not dictate that the permittee will upgrade their facility, or how the permittee will comply with new permit requirements. The results of this analysis are used to determine an adequate compliance schedule for the permit that may mitigate the financial burden of new permit requirements.

New Permit Requirements

The permit requires compliance with effluent limitations for BOD, TSS, Ammonia, Dissolved Oxygen, Total Phosphorus, Total Nitrogen, and *E. coli*, which may require the design, construction, and operation of a different treatment technology. For this analysis, the Department used the mechanical treatment technology selected by the facility that is the most practical solution to meet the new requirements for the community.

The permit also requires compliance with new monthly sampling requirements for influent BOD and TSS.

Flow and Connections

The size of the facility evaluated for upgrades was chosen based on the permitted design flow. If significant population growth is expected in the community, or if a significant portion of the flow is due to inflow and infiltration, then the flows and resulting estimated costs used in a facility plan prepared by a consulting engineer may differ. The number of connections was reported by the permittee on the updated engineering cost spreadsheet.

Flow Evaluated: 118,300 gallons per day

Connection Type	Number
Residential	290
Commercial	0
Industrial	0
Total	290

Data Collection for this Analysis

This cost analysis is based on data available to the department as provided by the permittee and data obtained from readily available sources. For the most accurate analysis, it is essential that the permittee provides the Department with current information about the district’s financial and socioeconomic situation. The financial questionnaire available to permittees on the department’s website (<http://dnr.mo.gov/forms/780-2511-f.pdf>) is a

required attachment to the permit renewal application. If the financial questionnaire is not submitted with the renewal application, the Department sends a request to complete the form with the welcome correspondence. Though the Department has made attempts to gather financial information from the LAKE FOREST ESTATES CLEAN WATER DISTRICT; no information has been provided. The Department has relied heavily on readily available data to complete this analysis. If certain data was not provided by the permittee to the Department and the data is not obtainable through readily available sources, this analysis will state that the information is “unknown”.

The estimated costs were obtained from the facility on the 2020 Waters Engineering, Inc. Preliminary Engineering Report and June 2021 cost update.

Eight Criteria of 644.145 RSMo

The Department must consider the eight (8) criteria presented in subsection 644.145 RSMo to evaluate the cost associated with new permit requirements.

(4) A community’s financial capability and ability to raise or secure necessary funding;

Criterion 1 Table. Current Financial Information for:

Financial Criterion	Result
Current Monthly User Rates per 5,000 gallons*	\$40.56
Municipal Bond Rating (if applicable)	unknown
Bonding Capacity	unknown
Median Household Income (MHI) ²	\$60,871
Current Annual Operating Costs (excludes depreciation)	\$141,163
Current Outstanding Debt for the Facility	\$76,006
Amount within the Current User Rate Used toward Payments on Outstanding Debt Related to the Current Wastewater Infrastructure	\$21.85

* User Rates were reported by the permittee on the Financial Questionnaire.

(5) Affordability of pollution control options for the individuals or households at or below the median household income level of the community;

The following tables outline the estimated costs of the new permit sampling requirements:

Criterion 2A Table. Estimated Cost Breakdown of New Permit Sampling Requirements

New Requirement	Frequency	Estimated Cost	Estimated Annual Cost
BOD – Influent	Monthly	\$41	\$492
TSS - Influent	Monthly	\$16	\$192
Total Phosphorus	Monthly Σ	\$24 x 8	\$192
Total Nitrogen	Monthly Σ	\$73 x 8	\$584

Total Estimated Annual Cost of New Permit Sampling Requirements = \$1,460

Σ - previous permit required quarterly samples

The following cost estimates are for the construction of a brand new treatment facility or system that is the most practical to facilitate compliance with new permit requirements.

Cost Estimate Assumptions:

- Total Present Worth includes a 2.375% interest rate to construct and perform annual operation and maintenance of the new treatment plant over the term of the USDA loan, which is 35 years.
- Capital Cost includes design, construction, inspection, and contingency costs from the 2020 Waters Engineering, Inc. Preliminary Engineering Report and June 2021 cost update.
- Operation and maintenance (O&M) includes operations, maintenance, replacement accounts, sludge disposal, billing, equipment, chemical, electrical, and miscellaneous expense costs for the facility on an annual basis. It includes items that are expected to be replaced during operations. These estimates are from the 2020 Waters Engineering, Inc. Preliminary Engineering Report and June 2021 cost update.
- Estimated user costs were calculated using equations that account for debt retirement, no grant funding factored, and reserve fund factored costs over the life of the loan. Estimated user costs are from the 2020 Waters Engineering, Inc. Preliminary Engineering Report and June 2021 cost update.

Treatment Plant and I&I Control Option Cost Estimates:

For the mechanical plant option, the facility estimated costs for a lagoon-based sequencing batch reactor with filtration and UV disinfection. New sampling costs are included in the following cost estimations. Costs are based on USDA Grant and Loan combination.

Criterion 2A Table. Estimated Costs for Treatment Plant and I&I Control Option

Cost Criterion	Cost
(1) Estimated Total Present Worth	\$6,448,951
• Estimated Capital Cost	\$6,343,651
• Estimated Annual Cost of Operation and Maintenance	\$105,300
• Estimated Annual Cost of New Sampling Requirements	\$1,460
• Estimated Monthly User Cost	\$67.27
(2) Current Monthly Debt Retirement Amount Per User	\$21.85
(3) Total Monthly User Cost	\$89.12
• Total Monthly User Cost as a Percent of Median Household Income ³	1.8%

(6) An evaluation of the overall costs and environmental benefits of the control technologies;

An investment in wastewater treatment will provide several social, environmental, and economic benefits. Improved wastewater provides benefits such as avoided health costs due to water-related illness, enhanced environmental ecosystem quality, and improved natural resources. The preservation of natural resources has been proven to increase the economic value and sustainability of the surrounding communities. Maintaining Missouri's water quality standards fulfills the goal of restoring and maintaining the chemical, physical, and biological integrity of the receiving stream; and, where attainable, it achieves a level of water quality that provides for the protection and propagation of fish, shellfish, wildlife, and recreation in and on the water.

- **Nutrient**

Nutrients are mineral compounds that are required for organisms to grow and thrive. Of the six (6) elemental macronutrients, nitrogen and phosphorus are generally not readily available and limit growth of organisms. Excess nitrogen and phosphorus will cause a shift in the ecosystem's food web. Once excess nitrogen and phosphorus are introduced into a waterbody, some species' populations will dramatically increase, while other populations will not be able to sustain life. Competition and productivity are two factors in which nutrients can alter aquatic ecosystems and the designated uses of a waterbody. For example, designated uses, such as drinking water sources and recreational uses, become impaired when algal blooms take over a waterbody. These blooms can cause foul tastes and odors in the drinking water, unsightly appearance, and fish mortality in the waterbody. Some algae also produce toxins that may cause serious adverse health conditions such as liver damage, tumor promotion, paralysis, and kidney damage. A healthy ecosystem is beneficial as it provides reduced impacts on human and aquatic health as well as recreational opportunities.

- **Total Ammonia Nitrogen Treatment**

Ammonia can be toxic to aquatic life. Fish may suffer a loss of equilibrium, hyperexcitability, increased respiratory activity and oxygen uptake, and increased heart rate. At extreme ammonia levels, fish may experience convulsions, coma, and death. Native fish and other native aquatic life are extremely important to Missouri's ecosystem. They contribute essential nutrients to the streams, rivers, lakes, pond other waters in which they inhabit. Freshwater ecosystems are important for human survival, in that it provides a majority of people's drinking water. Also, a pristine freshwater ecosystem with an abundance of aquatic life can increase the community's overall income of revenue. Revenue to businesses and sales tax revenue is increased as the natural amenity will attract fisherman and tourism to the area. Fish and other aquatic life also provide a source of low cost sustenance for the people within the surrounding communities. Final water quality-based effluent limits for total ammonia nitrogen is a requirement of this permit. A schedule of compliance is given with the final limits so that the permittee has time to secure funding and update their treatment plant, if necessary. Further information can be found in the Water Protection Program fact sheet titled "Changes to the Water Quality Standard for Ammonia" at <http://dnr.mo.gov/pubs/pub2481.htm>.

- **Disinfection**

E. coli is a species of bacteria that normally live in the intestines of humans and warm-blooded animals. While some strains of *E. coli* are harmless, there are several strains that can cause severe diarrhea, abdominal cramps, and severe kidney failure. The people most susceptible to these consequences are young children, the elderly, and those with weakened immune systems. The receiving stream that this facility discharges to contains the WBC-B designated use to protect human health in accordance with Water Quality Standards (10 CSR 20-7.031) and the Clean Water Act. The disinfection of wastewater effluent benefits human health by reducing exposure to disease-causing bacteria, such as *E. coli*, and viruses and reducing health care costs to those infected by contaminated water. The construction and installation of a disinfection system at the treatment facility will protect human health as well as meet water quality standards.

- **Evaluation of Inflow and Infiltration**

Inflow and Infiltration (I&I) refers to surface water and groundwater that enters the sanitary sewer collection system. A certain amount of I&I is unavoidable and is accounted for in the initial sewer design capacity. Due to the age and deterioration of some collection systems, it is not uncommon for wet-weather peak flows to be an

order of magnitude larger than the average daily flows. When the I&I exceeds the designed allowances, sewer capacity is met and usually results in sewer system overflows, increased conveyance costs, and the reduction of future population service capacity.

Minimizing I&I is an economical incentive for your community as it reduces; the operational costs of wastewater conveyance, treatment and disposal costs and capital costs to upgrade to a new treatment plant.

The evaluation of I&I within your collection system is the first step to minimizing liability from public health risks and water pollution. Once the district has determined where significant sources of I&I contribute to the collection system, efforts can be made to eliminate these sources of I&I and minimize the potential for sanitary sewer overflows.

(9) Inclusion of ongoing costs of operating and maintaining the existing wastewater collection and treatment system, including payments on outstanding debts for wastewater collection and treatment systems when calculating projected rates:

The community reported that their outstanding debt for their current wastewater collection and treatment systems is \$76,006. The community reported that each user pays \$40.56 monthly, of which, \$21.85 is used toward payments on the current outstanding debt.

(10) An inclusion of ways to reduce economic impacts on distressed populations in the community, including but not limited to low and fixed income populations. This requirement includes but is not limited to:

- (a) Allowing adequate time in implementation schedules to mitigate potential adverse impacts on distressed populations resulting from the costs of the improvements and taking into consideration local community economic considerations.
- A schedule of compliance will be provided based on the results of this cost analysis. The schedule of compliance is provided to ensure that the entity has time to reasonably plan for compliance with the new permit requirements. The time provided ensures the entity has time to hire an engineer, develop facility plans, hold community meetings, seek an appropriate funding source, and construct the facility. This analysis has determined the community may endure a medium financial burden. The previous permit contained a schedule of compliance that was established to allow for the permittee to adequately plan toward compliance. If it is determined by the permittee that a longer schedule of compliance is necessary due to financial reasons, please contact the Department and request modification of the compliance schedule.
 - An integrated plan may be an appropriate option if the community needs to meet other environmental obligations as well as the new requirements within this permit. The integrated plan needs to be well thought out with specific timeframes built into the management plan in which the municipality can reasonably commit. The plan should be designed to allow the municipality to meet Clean Water Act obligations by maximizing infrastructure improvement dollars through the appropriate sequencing of work. For further information on how to develop an integrated plan, please see the Department publication, "Missouri Integrated Planning Framework," at <https://dnr.mo.gov/document-search/missouri-integrated-planning-framework-pub2684/pub2684>.
 - If the permittee can demonstrate that the proposed pollution controls result in substantial and widespread economic and social impact, they may use Factor 6 of the Use Attainability Analysis (UAA) 40 CFR 131.10(g)(6) in the form of a variance. This process is completed by determining the treatment type with the highest attainable effluent quality that would not result in a socio-economic hardship. For more information on variance requests, please visit the Department's water quality standards webpage at <https://dnr.mo.gov/water/what-were-doing/water-planning/quality-standards-impaired-waters-total-maximum-daily-loads/standards/variances>.

(b) Allowing for reasonable accommodations for regulated entities when inflexible standards and fines would impose a disproportionate financial hardship in light of the environmental benefits to be gained.

- An opportunity may exist for the relocation of the point of discharge to a receiving stream capable of a greater mixing zone. The 2020 Waters Engineering, Inc. Preliminary Engineering Report appears to have investigated the option of outfall relocation.
- The district may apply for State Revolving Fund (SRF) financial support in order to help fund a capital improvements plan. Other loans and grants also exist for which the facility may be eligible. More information can be found on the Department's FAC website at <https://dnr.mo.gov/water/business-industry-other-entities/financial-opportunities/financial-assistance-center/wastewater>. The 2020 Waters Engineering, Inc. Preliminary Engineering Report indicates SRF financing was investigated and between discussions with the Department, it was determined financing through USDA would be the best option for this project.

The following table characterizes the current overall socioeconomic condition of the community as compared to the overall socioeconomic condition of Missouri. The following information was compiled using the latest U.S. Census data.

Criterion 5 Table. Socioeconomic Data ^{2, 4-8} for the St. Genevieve County

No.	Administrative Unit	Ste. Genevieve County	Missouri State
1	Population (2019)	17,848	6,104,910
2	Percent Change in Population (2000-2019)	0.0%	9.1%
3	2019 Median Household Income (in 2020 Dollars)	\$60,871	\$56,145
4	Percent Change in Median Household Income (2000-2019)	0.0%	-4.7%
5	Median Age (2019)	43.3	38.6
6	Change in Median Age in Years (2000-2019)	5.6	2.5
7	Unemployment Rate (2019)	3.5%	4.6%
8	Percent of Population Below Poverty Level (2019)	11.5%	13.7%
9	Percent of Household Received Food Stamps (2019)	8.4%	11.1%

(11) An assessment of other community investments and operating costs relating to environmental improvements and public health protection;

The 2020 Waters Engineering, Inc. Preliminary Engineering Report evaluates upgrades/improvements to the district's aging collection system infrastructure. Evaluation of the collection system indicate leaks contributing I&I into collection system are likely coming from the collection lines around and under the community's lakes. Although not required by this permit, the district is investing in upgrades/improvements to the collection system infrastructure to prevent future issues with excessive I&I, including catastrophic failure of the collection lines located under and around the community's lakes. These additional upgrades/improvements, though not required in the permit, relate to environmental improvements and have been factored into the overall project cost totals in the 2020 Waters Engineering, Inc. Preliminary Engineering Report.

(12) An assessment of factors set forth in the United States Environmental Protection Agency's guidance, including but not limited to the "Combined Sewer Overflow Guidance for Financial Capability Assessment and Schedule Development" that may ease the cost burdens of implementing wet weather control plans, including but not limited to small system considerations, the attainability of water quality standards, and the development of wet weather standards;

The following table characterizes the community's overall financial capability to raise the necessary funds to meet the new permit requirements.

Criterion 7A Table. Financial Capability Indicator

Indicators	Strong (3 points)	Mid-Range (2 points)	Weak (1 point)	Score
Bond Rating Indicator	Above BBB or Baa	BBB or Baa	Below BBB or Baa	NA
Overall Net Debt as a % of Full Market Property Value	Below 2%	2% - 5%	Above 5%	3
Unemployment Rate (2019)	Beyond 1% below Missouri average of 4.6%	± 1% of Missouri average of 4.6%	Beyond 1% above Missouri average of 4.6%	3
2019 Median Household Income (in 2020 Dollars)	Beyond 25% above Missouri MHI (\$56,145)	± 25% of Missouri MHI (\$56,145)	Beyond 25% below Missouri MHI (\$56,145)	2
Percent of Population Below Poverty Level (2019)	Beyond 10% below Missouri average of 13.7%	± 10% of Missouri average of 13.7%	Beyond 10% above Missouri average of 13.7%	2
Percent of Household Received Food Stamps (2019)	Beyond 5% below Missouri average of 11.1%	± 5% of Missouri average of 11.1%	Beyond 5% above Missouri average of 11.1%	2
Property Tax Revenues as a % of Full Market Property Value	Below 2%	2% - 4%	Above 4%	NA
Property Tax Collection Rate	Above 98%	94% - 98%	Below 94%	NA
Total Average Score (Financial Capability Indicator)	--	--	--	2.4

The **Financial Capability Indicator** and the **Residential Indicator** are considered jointly in the Financial Capability Matrix to determine the financial burden that could occur from compliance with the new requirements of the permit.

- Financial Capability Indicator (from Criterion 7): 2.4
- Treatment Plant and I&I Control Option Residential Indicator (from Criterion 2): 1.8%

Criterion 7B Table. Financial Capability Matrix - Residential Indicator (User Rate as a % of MHI)

Financial Capability Indicator	Low (Below 1%)	Mid-Range (1.0% to 2.0%)	High (Above 2.0%)
Weak (Below 1.5)	Medium Burden	High Burden	High Burden
Mid-Range (1.5 – 2.5)	Low Burden	Medium Burden	High Burden
Strong (Above 2.5)	Low Burden	Medium Burden	High Burden

- Resulting Financial Burden for Treatment Plant and I&I Control Option: Medium Burden

(13) An assessment of any other relevant local community economic conditions.

The community did not report any other relevant local economic conditions. Due to a lack of data readily available for the district, Ste. Genevieve County data are used to factor the district's socioeconomic status. Ste. Genevieve County's socioeconomic status and population are thought to be stable.

Conclusion and Finding

As a result of new regulations, the Department is proposing modifications to the current operating permit that may require the permittee to upgrade the facility and construct new control technologies and to increase monitoring. The Department has considered the eight (8) criteria presented in subsection 644.145 RSMo to evaluate the cost associated with the new permit requirements.

The permittee has determined that the lagoon-based sequencing batch reactor with filtration and UV disinfection is the most practical and affordable option. The construction and operation of a lagoon-based sequencing batch reactor with filtration and UV disinfection will ensure that the individuals within the community will not be required to make unreasonable sacrifices in their essential lifestyle or spending patterns or undergo hardships in order to make the projected monthly payments for sewer connections.

In accordance with 40 CFR 122.47(a)(1) and 10 CSR 20-7.031(11), compliance must occur as soon as possible. The previous permit contained a seven (7) and thirteen (13) year schedules of compliance for the design and construction of a mechanical treatment plant. The previous schedules have been found to be adequate based on this analysis. The Department is committed to review all requests for additional time in the schedule of compliance where adequate justification is provided.

The Department is committed to reassessing the cost analysis for compliance at renewal to determine if the initial schedule of compliance will accommodate the socioeconomic data and financial capability of the community at that time. Because each community is unique, the Department wants to make sure that each community has the opportunity to consider all options and tailor solutions to best meet their needs. The Department understands the economic challenges associated with achieving compliance, and is committed to using all available tools to make an accurate and practical finding of affordability for Missouri communities. If the community is interested in the funding options available to them, please contact the Financial Assistance Center for more information. <https://dnr.mo.gov/water/business-industry-other-entities/financial-opportunities/financial-assistance-center/wastewater>.

References

1. <http://www.hydomantis.com/>
2. 2019 MHI in 2019 Dollar: United States Census Bureau. 2015-2019 American Community Survey 5-Year Estimates, Table B19013: Median Household Income in the Past 12 Months (in 2019 Inflation-Adjusted Dollars).
<https://data.census.gov/cedsci/table?q=B19013&g=0400000US29.160000&tid=ACSDT5Y2019.B19013&hidePreview=false>.
(B) 2000 MHI in 1999 Dollar: (1) For United States, United States Census Bureau (2003) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-2-1 Part 1. United States Summary, Table 5. Work Status and Income in 1999: 2000, Washington, DC. <https://www.census.gov/prod/cen2000/phc-2-1-pt1.pdf>.
(2) For Missouri State, United States Census Bureau (2003) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-2-27, Missouri, Table 10. Work Status and Income in 1999: 2000, Washington, DC.
<https://www.census.gov/prod/cen2000/phc-2-27-pt1.pdf>.
(C) 2020 CPI, 2019 CPI and 1999 CPI: U.S. Department of Labor Bureau of Labor Statistics (2020) Consumer Price Index - All Urban Consumers, U.S. City Average. All Items. 1982-84=100. <https://data.bls.gov/pdq/SurveyOutputServlet>.
(D) 2019 MHI in 2020 Dollar = 2019 MHI in 2019 Dollar x 2020 CPI / 2019 CPI; 2000 MHI in 2020 Dollar = 2000 MHI in 1999 Dollar x 2020 CPI / 1999 CPI.
(E) Percent Change in Median Household Income (2000-2019) = (2019 MHI in 2020 Dollar - 2000 MHI in 2020 Dollar) / (2000 MHI in 2020 Dollar).
3. $(\$89.12/(\$60,871/12))100\% = 1.8\%$ (Treatment Plant and I&I Control Option + sampling)
4. Total Population in 2019: United States Census Bureau. 2015-2019 American Community Survey 5-Year Estimates, Table B01003: Total Population - Universe: Total Population.
<https://data.census.gov/cedsci/table?q=B01003&g=0400000US29.160000&tid=ACSDT5Y2019.B01003&hidePreview=false>.
(B) Total Population in 2000: (1) For United States, United States Census Bureau (2002) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-1-1 Part 1. United States Summary, Table 1. Age and Sex: 2000, Washington, DC.
<https://www.census.gov/prod/cen2000/phc-1-1-pt1.pdf>.
(2) For Missouri State, United States Census Bureau (2002) 2000 Census of Population and Housing, Summary Population and Housing Characteristics, PHC-1-27, Missouri, Table 2. Place of Birth, Residence in 1995, and Language: 2000, Washington, DC.
<http://www.census.gov/prod/cen2000/phc-2-27-pt1.pdf>.
(C) Percent Change in Population (2000-2019) = (Total Population in 2019 - Total Population in 2000) / (Total Population in 2000).
5. Median Age in 2019: United States Census Bureau. 2015-2019 American Community Survey 5-Year Estimates, Table B01002: Median Age by Sex - Universe: Total population.
<https://data.census.gov/cedsci/table?q=B01002&g=0400000US29.160000&tid=ACSDT5Y2019.B01002&hidePreview=false>.
(B) Median Age in 2000: (1) For United States, United States Census Bureau (2002) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-1-1 Part 1. United States Summary, Table 1. Age and Sex: 2000, Washington, DC., Page 2.
<https://www.census.gov/prod/cen2000/phc-1-1-pt1.pdf>.
(2) For Missouri State, United States Census Bureau (2002) 2000 Census of Population and Housing, Summary Population and Housing Characteristics, PHC-1-27, Missouri, Table 2. Place of Birth, Residence in 1995, and Language: 2000, Washington, DC.
<http://www.census.gov/prod/cen2000/phc-2-27-pt1.pdf>.
(C) Change in Median Age in Years (2000-2019) = (Median Age in 2019 - Median Age in 2000).
6. United States Census Bureau. 2015-2019 American Community Survey 5-Year Estimates, B23025: Employment Status for the Population 16 Years and Over - Universe: Population 16 years and Over.
<https://data.census.gov/cedsci/table?q=B23025&g=0400000US29.160000&tid=ACSDT5Y2019.B23025&hidePreview=false>.
7. United States Census Bureau. 2015-2019 American Community Survey 5-Year Estimates, Table S1701: Poverty Status in the Past 12 Months.
<https://data.census.gov/cedsci/table?q=S1701&g=0400000US29.160000&tid=ACSST5Y2019.S1701&hidePreview=false>.
8. United States Census Bureau. 2015-2019 American Community Survey 5-Year Estimates, Table B2201: Food Stamps/Supplemental Nutrition Assistance Program (SNAP) - Universe: Households.
<https://data.census.gov/cedsci/table?q=Receipt%20of%20Food%20Stamps&g=0400000US29.050000,29.160000&tid=ACSST5Y2019.S2201&hidePreview=true>.

4. **Appendix 3 – Antidegradation Analysis (and StreamStats Report):**

Water Quality and Antidegradation Review

For the Protection of Water Quality
and Determination of Antidegradation Effluent Limits for

Establishment Creek

Requested by
Cody Luebbering, Principal Scientist
Geosyntec Consultants, Inc.

For

Lake Forest Estates Clean Water District Wastewater Treatment Plant Upgrade and Outfall Relocation

March 2026

Table of Contents

1.	Purpose of Antidegradation Review Report	35
2.	Antidegradation Limits and Monitoring Information	36
3.	Facility Information	37
A.	Facility Performance History:.....	38
B.	Natural Heritage Review.....	38
C.	Geohydrologic Evaluation	38
4.	Receiving Waterbody Information	39
A.	Receiving Waterbody.....	39
B.	Mixing Considerations and Low Flow Values	39
i.	Mixing Considerations.....	40
C.	Existing Water Quality	40
D.	Receiving Water Monitoring Requirements	40
5.	Antidegradation Review Information	40
A.	Tier Determination.....	40
B.	Necessity of Degradation.....	42
i.	ALTERNATIVE #1: REGIONALIZATION.....	42
ii.	ALTERNATIVE #2: SURFACE IRRIGATION (NO DISCHARGE EVALUATION)..	42
iii.	Alternatives to No Discharge.....	42
J.	Social and Economic Importance (SEI).....	45
6.	Derivation and Discussion of Parameters and Limits.....	45
7.	General Assumptions of the Water Quality and Antidegradation Review	51
8.	Antidegradation Review Preliminary Determination	52
	Appendix A: Map of Discharge Location.....	53
	Appendix B: Geohydrologic Evaluation Report 2025.....	55
	Appendix C: Geohydrologic Evaluation Report 2024.....	58
	Appendix D: Natural Heritage Review	61
	Appendix E: Antidegradation Review Summary Attachments	66
	Appendix F: StreamStats Report	73
	Appendix G: DO modeling.....	1

- **Purpose of Antidegradation Review Report**

An Antidegradation Review Request was submitted by Cody Luebbering, Principal Scientist with Geosyntec Consultants, Inc. on behalf of Lake Forest Estates Clean Water District (LFECWD) for the LFECWD's existing conventional aerated lagoon to upgrade their wastewater treatment facility and relocate the existing outfall from Big Bottom Creek to the larger, nearby Establishment Creek to enable the facility to meet effluent limitations for ammonia. The facility is currently not reliably meeting the final effluent limitations outlined in Missouri State Operating Permit MO-0035742. The *Antidegradation Review Report for Lake Forest Estates Clean Water District Wastewater Treatment Plant Upgrade and Outfall Relocation* outlines five different alternatives, and the preferred alternative is the construction of a new effluent line to relocate the outfall from the Big River Creek to the Establishment Creek. Establishment Creek is classified as P stream, gaining, and with year-round flow. This outfall relocation would allow for mixing considerations in the determination of final effluent limits. The project will involve a change to the treatment components however there will be no change to the design average flow, which will remain at 118,300 gallons per day (gpd).

In accordance with Missouri's Water Quality Standards [10 CSR 20-7.031(3)] and federal antidegradation policy at Title 40 Code of Federal Regulation (CFR) Section 131.12 (a), the department developed a statewide antidegradation policy and corresponding procedures to implement the policy. A proposed discharge to a water body will be required to undergo a level of Antidegradation Review that documents that the use of a water body's available assimilative capacity is justified. Effective August 30, 2008, and revised July 13, 2016, a facility is required to use Missouri's Antidegradation Implementation Procedure (AIP) for new and expanded wastewater discharges.

The AIP specifies that when the proposed activity results in a reduction by 10 percent or more of the:

- facility assimilative capacity for any pollutant as a result of any single discharge;
- segment assimilative capacity for any pollutant as a result of all discharges combined after existing water quality (EWQ) is determined; or
- any new or expanded discharge that the department determines will likely result in the increased accumulation of pollutants or their degradation products in sediment or fish tissue,

then a demonstration of necessity (i.e., alternatives analysis) and a determination of social and economic importance are required.

The applicant elected to assume that all pollutants of concern (POC) result in a reduction by 10 percent or more of the assimilative capacity of the receiving stream in the absence of existing water quality. An alternatives analysis was conducted to fulfill the requirements of the Antidegradation Implementation Procedure (AIP).

The preferred treatment technology is lagoon SBR conversion with outfall relocation. The receiving waterbody is Establishment Creek. The proposed design flow is 118,300 gpd.

The following is a review of the *Antidegradation Review Report* dated January 2026.

- **Antidegradation Limits and Monitoring Information**

The parameters in Table 2-1 below are expected effluent limits and monitoring requirements developed in accordance with the National Pollutant Discharge Elimination System (NPDES) program, state level 10 CSR 20-7 Water Quality requirements, and limits and monitoring requirements developed as part of this antidegradation review in accordance with the AIP. Antidegradation review limits and monitoring requirements are implemented through the operating permit, and these requirements are subject to change prior to permit implementation. Significant changes may require additional antidegradation review.

Table 2-1: Antidegradation Limits

PARAMETER	Unit	Basis	Daily Maximum	Average Weekly	Monthly Average
Flow	MGD	FSR			*
BOD ₅	mg/L	PBEL		35	30
TSS	mg/L	PBEL		35	30
<i>Escherichia coli</i> **	#/100mL	FSR	1,030		206**
Ammonia as N (January)	mg/L	PBEL	12.7		3.8
(February)			10.6		3.1
(March)			10.5		2.7
(April)			7.7		2.1
(May)			5.9		1.7
(June)			4.2		1.3
(July)			3.4		1.1
(August)			2.9		1.0
(September)			4.4		1.4
(October)			6.9		2.0
(November)			9.7		2.6
(December)			12.7		3.3
Total Phosphorus	mg/L	FSR			*
Total Nitrogen	mg/L	FSR			*
Total Kjeldahl Nitrogen	mg/L	FSR			*
Nitrite + Nitrate	mg/L	FSR			*
PARAMETER	Unit	Basis for Limits			Minimum/Maximum
pH	SU	FSR			6.0 - 9.0
PARAMETER	Unit	Basis for Limits			Monthly Avg. Min
Dissolved Oxygen (DO)	mg/L	FSR			5.0
BOD ₅ Percent Removal	%	FSR			85
TSS Percent Removal	%	FSR			85

* - Monitoring requirement only

** - #/100mL; the Monthly Average for *E. coli* is a geometric mean.

Basis for Limitations Codes:

MDEL – Minimally Degrading Effluent Limit, TBEL – Technology-Based Effluent Limit, NDEL – Non-Degrading Effluent Limit, WQBEL – Water Quality-Based Effluent Limit, PBEL – Performance Based Effluent Limit, FSR – Federal or State Regulation, BPJ – Best Professional Judgment

• **Facility Information**

The current LFECWD WWTF includes a conventional aerated three cell lagoon with baffles and aerated primary and secondary cells and third cell settling basin along with floating laterals and diffusers. The WWTF discharges to Big Bottom Creek which has a Total Maximum Daily Load (TMDL) for low dissolved oxygen, ammonia, and organic sediment. The current operating permit has schedules of compliance to meet final effluent limits for: biochemical oxygen demand-5, total suspended solids, *E. coli*, and ammonia by April 1, 2023, and biochemical oxygen demand-5, total nitrogen, total phosphorus, and dissolved oxygen by February 1, 2029. LFECWD WWTF is struggling to consistently meet the effluent limits, which became effective on April 1, 2023, with the existing conventional aerated lagoon technology. Therefore, LFECWD is proposing to upgrade their WWTF and relocate the existing outfall from Big Bottom Creek to the larger, nearby Establishment Creek. The facility has submitted a construction permit application which is under review (CP0002430) for modification of existing aerated lagoon into sequencing batch reactor with disk filtration and UV disinfection including upgrades and rehabilitation of collection system. The facility's current permitted design flow in the operating permit MO-0035742, issued March 1, 2022, and expiring February 28, 2027, is 118,300 gallons per day and this will remain unchanged with this project of relocation of the outfall.

Facility Name:	Lake Forest Estates Clean Water District WWTF
Address:	0.6 miles northeast of Hwy O and Lakewood Dr. intersection, Ste. Genevieve, MO 63670
Permit #:	MO-0035742
County:	Ste. Genevieve County
Facility Type:	POTW
Owner:	LAKE FOREST ESTATES CLEAN WATER DISTRICT
Continuing Authority:	LAKE FOREST ESTATES CLEAN WATER DISTRICT
Sec. of State Charter No:	D001296688
UTM Coordinates:	X=744787, Y=4205530
Legal Description:	Landgrant 2046, Ste. Genevieve County
12 digit watershed:	071401010908
Ecoregion:	Ozark Highlands

○ **Facility Performance History:**

A review of the discharge monitoring report data from the past five years shows multiple exceedances in the following parameters: 28 exceedances for BOD₅, 26 exceedances for TSS, 18 exceedances for *E. coli* and 29 exceedances for ammonia as N throughout all the five years.

○ **Natural Heritage Review**

A Missouri Department of Conservation Natural Heritage Review was obtained by the applicant (see Appendix D). Two species of bats, Indiana and Northern Long-Eared, may be present in the project area. The following recommendations were made for construction activities:

- Manage construction to minimize sedimentation and run-off to nearby streams.
- If any trees need to be removed for the project, contact the U.S. Fish and Wildlife Service for coordination under the Endangered Species Act.
- Revegetate disturbed areas to minimize erosion, ideally with native plant species compatible with the local landscape.
- Retain forest vegetation along the stream and where possible, leave snags standing and preserve mature forest canopy. Do not enter caves known to harbor bats, especially from September to April.
- Check your project site for any karst features and make every effort to protect groundwater in the area.
- Remove any mud, soil, trash, animals, plants, or plant material from equipment before leaving any water body or work area.
- Drain water from machinery that has operated in water, checking any potential water reservoirs such as tracks and buckets.
- When possible, wash and rinse equipment thoroughly with hard spray or hot water and dry in the hot sun before using again.

○ **Geohydrologic Evaluation**

Geohydrologic Evaluations dated December 19, 2025, and May 10, 2024, were submitted with the request and the receiving stream is gaining for discharge purposes (see Appendix B and C). The 2024 Geohydrologic evaluation classified a portion of Establishment Creek as losing, therefore on December 11, 2025, scientists from Geosyntec performed stream gauging on Establishment Creek as a QA/QC measure. The resulting data was given to Missouri Geological Survey to reevaluate, after the review it was determined that this reach where the proposed discharge point for new outfall is located in the Establishment Creek is classified as gaining and therefore the overall geohydrologic limitations rating has been changed from severe to moderate in the December 19, 2025 Geohydrologic Evaluation report.

- **Receiving Waterbody Information**

- **Receiving Waterbody**

Table a-2: Outfalls Table

OUTFALL	DESIGN FLOW (CFS)	DESIGN FLOW (MGD)	TREATMENT LEVEL	EFFLUENT TYPE
001	0.183	0.1183	Secondary	Domestic

Table a-3: Receiving Stream(s)

WATER-BODY NAME	CLASS	WBI D	DESIGNATED USES*	12-DIGIT HUC	DISTANCE TO CLASSIFIED SEGMENT (MI)
Establishment Creek	P	1739	AHP-WWH, WBC- B, SCR, HHP, IRR, LWP	071401010908	0

* **AHP** = Aquatic Habitat Protection - To ensure the protection and propagation of fish, shellfish, and wildlife. AHP is further subcategorized as: **WWH** = Warm Water Habitat, **HHP** = Human Health Protection as it relates to the consumption of fish; **IND** = Industrial water supply; **IRR** = Irrigation - Application of water to cropland or directly to cultivated plants that may be used for human or livestock consumption; **LWP** = Livestock and wildlife protection - Maintenance of conditions in waters to support health in livestock and wildlife; **WBC** = Whole Body Contact recreation where the entire body is capable of being submerged. WBC is further subcategorized as: **WBC-A** = Whole body contact recreation that supports swimming uses and has public access; **WBC-B** = Whole body contact recreation that supports swimming; **SCR** = Secondary Contact Recreation (like fishing, wading, and boating).

Table a4: Receiving Stream Segments - Receiving Water Body Segment Outfall #1:

Segment	UTM coordinates	Location
Upper end segment*	X = 744787 ; Y = 4205530	outfall
Lower end segment*	X = 745967 ; Y = 4206750	downstream confluence

*Segment is the portion of the stream where discharge occurs. Segment is used to track changes in assimilative capacity and is bound at a minimum by existing sources and confluences with other significant water bodies.

- **Mixing Considerations and Low Flow Values**

The proposed receiving waterbody is Establishment Creek, which is a class P stream. The applicant elected to use USGS StreamStats to establish low flow values. See Appendix F for StreamStats summary.

Table b-5: Receiving Stream(s) Low-Flow Values (CFS)

RECEIVING STREAM	1Q10	7Q10	30Q10
Establishment Creek	0.317	0.413	0.556

○ **Mixing Considerations**

For Class P Stream

Table c-6: Mixing Considerations

MIXING ZONE (CFS) [10 CSR 20-7.031(5)(A)4.B.(II)(a)]			ZONE OF INITIAL DILUTION (CFS) [10 CSR 20-7.031(5)(A)4.B.(II)(b)]		
1Q10	7Q10	30Q10	1Q10	7Q10	30Q10
0.079	0.103	0.139	0.008	0.01	0.013

○ **Existing Water Quality**

The facility will relocate outfall to Establishment Creek. No existing water quality data was submitted.

○ **Receiving Water Monitoring Requirements**

No receiving water monitoring requirements recommended at this time.

• **Antidegradation Review Information**

○ **TIER DETERMINATION**

Waterbodies are assigned Tier 1, 2, or 3 protection levels.

Tier 1 protection is applied to a waterbody on a pollutant-by-pollutant basis for pollutants which may cause or contribute to the impairment of a beneficial use or violation of Water Quality Criteria (WQC); and prohibit further degradation of Existing Water Quality (EWQ) where additional pollutants of concern (POCs) would result in the water being included on the 303(d) List. According to the AIP, the waters may receive the POCs that are causing impairments if 1) the discharge would not cause or contribute to a violation of the WQS, 2) all other conditions of the state permitting requirements are met (i.e., no discharge options are explored and technology based requirements (including ELGs) are met); and 3) the permit is issued with the highest statutory and regulatory requirements.

- As this proposed discharge is to Establishment Creek, the receiving waterbody is not 303(d) list, and as such Tier 1 is not applicable.

Tier 2 level protection is assigned to the waterbody on a pollutant-by-pollutant basis that prohibits the degradation of water quality of a surface water unless a review of reasonable

alternatives and social and economic considerations justifies the degradation in accordance with the methods presented in the AIP.

- Tier 2 Pollutants for this review include: biochemical oxygen demand (BOD), total suspended solids (TSS), ammonia, Dissolved Oxygen (DO), *Escherichia coli* (*E. Coli*), Total Phosphorus, Total Nitrogen, and pH.

Tier 3 protection prohibits any degradation of water quality of Outstanding National Resource Waters and Outstanding State Resource Waters as identified in Tables D and E of the Water Quality Standards (WQS). Temporary degradation of water receiving Tier 3 protection may be allowed by the department on a case-by-case basis as explained in Section VI of the AIP.

- As this proposed discharge is to Establishment Creek, the receiving waterbody is not an Outstanding National Resource Water or an Outstanding State Resource Water, and as such Tier 3 is not applicable.

Below is a list of POCs reasonably expected and identified by the permittee in their application to be in the discharge. Pollutants of concern are defined as those pollutants “proposed for discharge that affect beneficial use(s) in waters of the state.” They include pollutants that “create conditions unfavorable to beneficial uses in the water body receiving the discharge or proposed to receive the discharge” (AIP, Page 6).

All the POCs discharged to Establishment Creek are considered Tier 2, significant degradation.

Table 5-7: Pollutants of Concern and Tier Determinations

Pollutants of Concern	Tier	Review Type	Comment
Biological Oxygen Demand (BOD ₅)	2*	Alternatives Analysis/ Significant	-
Total Suspended Solids (TSS)	**	Alternatives Analysis/ Significant	-
Ammonia as N	2*	Alternatives Analysis/ Significant	-
<i>Escherichia coli</i> (<i>E. coli</i>)	2*	-	Disinfection required, UV proposed
Phosphorus, Total	2*	Alternatives Analysis/ Significant	Monitoring required per 10 CSR 20-7.015(9)(D)8
Nitrogen, Total	2*	Alternatives Analysis/ Significant	Monitoring required per 10 CSR 20-7.015(9)(D)8
Total Kjeldahl Nitrogen	2*	-	Monitoring required per 10 CSR 20-7.015(9)(D)8
Nitrite + Nitrate	2*	-	Monitoring required per 10 CSR 20-7.015(9)(D)8
pH	***	-	10 CSR 20-7.015(8)(A)2. applied
Dissolved Oxygen (DO)	2*	Alternatives Analysis	

* Tier assumed.

** Tier determination not possible: No in-stream standards for these parameters.

*** Standards for these parameters are ranges.

- **Necessity of Degradation**

The AIP specifies that if the proposed activity does result in a reduction by 10 percent or more of the assimilative capacity then a demonstration of necessity (i.e., alternatives analysis) and a determination of social and economic importance are required. Part of that analysis as shown below is the evaluation of non-degrading alternatives, such as regionalization or no discharge systems.

The applicant has the option of assuming discharge will result in a reduction by 10 percent or more of the assimilative capacity and proceeding directly to the alternatives analysis, thereby avoiding the determination of the assimilative capacity of the receiving water. The applicant has elected this option.

I. ALTERNATIVE #1: REGIONALIZATION

Regionalization consists of conveying wastewater to the nearest regional publicly owned treatment works with capacity. The nearest community with a regional treatment works to feasibly pump wastewater to is the City of Bloomsdale WWTF. The City of Bloomsdale WWTF is approximately 7.0 miles away from the LFECWD WWTF. Due to conveyance distance with crossing highways and streams, and the lack of available capacity at the City of Bloomsdale WWTF regionalization is not a practical alternative.

II. ALTERNATIVE #2: SURFACE IRRIGATION (NO DISCHARGE EVALUATION)

The LFECWD WWTF contacted nearby property owners to secure land for application. However, the only available lands for application were on steeper slopes higher in the watershed. A geohydrologic evaluation was performed on these nearby lands in 2024 and demonstrated these lands to be mostly glades with very thin to non-existent soils and bedrock (Appendix C). Based on the lack of appropriate land for the application of wastewater, this is not a practical alternative.

III. ALTERNATIVES TO NO DISCHARGE

1. ALTERNATIVE #3: BASE CASE – UPGRADES TO THE EXISTING LAGOON AND OUTFALL RELOCATION TO ESTABLISHMENT CREEK

The base case technology is an aerated lagoon with a fixed film reactor. The base case would be upgraded with new blowers installed in a blower building to provide a longer design life for the system. The blower building would undergo renovations including new paint, roof, and miscellaneous exterior work. A new fixed film media reactor would be constructed with a settling clarifier and recirculation line to treat ammonia and return any sloughing to the primary cell. Prior to discharge, the effluent would be treated with an upgraded ultraviolet (UV) disinfection system to meet the disinfection requirements, and a triplex pump station would be installed to discharge effluent to Establishment Creek. The base case employs some of the same technology currently being used at the WWTF. Aerated lagoons with fixed film reactors are fairly simple to operate, do not require a highly classified operator, and are used in many nearby communities. The existing treatment plant can be updated with new aeration equipment and upgraded with a fixed film reactor with a heater,

solids settling tank, effluent pumping station, and a UV disinfection system. The fixed film reactor, return sludge pumps, UV, and new effluent pump station would all require additional operation and maintenance. The new system will require additional training and a higher-level operator than the current system; but they are relatively easy to operate, and nearby treatment facilities have already incorporated this technology so assistance would be easy to find.

2. **ALTERNATIVE #4: DISCHARGE TO BIG BOTTOM CREEK ADJACENT WATERSHED**

Big Bottom Creek has an approved TMDL with future, stringent effluent limitations for BOD5, TSS, and ammonia. Continuing to discharge to Big Bottom Creek will require extensive upgrades to the WWTF to meet the effluent limits. Upgrades would include conversion of the existing lagoon to an SBR with the construction of a concrete wall within the settling basin. This would separate the basin into two aeration basins. An effluent equalization basin would be constructed adjacent to them to reduce the loading to the UV and tertiary treatment facilities. New aeration and mixing equipment would be installed in the aeration basins along with floating decanters. Chemical feed equipment would be installed to provide a coagulant for the phosphorus removal in the aeration basins. Additionally, controls would be provided to cycle the aeration, mixers, and decanters in a staged manner as well as turn on the chemical feed equipment for efficient use of the coagulant. Waste activated sludge would be pumped to the existing aerated partial mix cell for further treatment and storage. This sludge could later be dredged/removed under contract and land applied. Prior to discharge, the water would be pumped from the equalization basin to a tertiary cloth disc filter and then disinfected by a UV disinfection system. The effluent would then flow over stepped aeration to Big Bottom Creek. This alternative would require significant WWTF upgrades to meet effluent limits and therefore is not a preferred alternative because of being practically unfeasible.

3. **ALTERNATIVE #5: CONVERSION OF THE EXISTING LAGOON TO SBR WITH OUTFALL RELOCATION TO ESTABLISHMENT CREEK**

WWTF upgrades would include conversion of the existing lagoon to an earthen based SBR with the construction of a concrete wall within the settling basin. This would separate the basin into two aeration basins. New aeration and mixing equipment would be installed along with floating decanters. Controls would be provided to cycle the aeration, mixing, and decanting in a staged manner. A Triplex pumping station with limited equalization capacity would pump the effluent through a pressurized UV disinfection system prior to discharge. Unlike the previous alternative, no tertiary treatment would be provided. Waste activated sludge from the SBR basins would be pumped to the existing aerated partial mix cell for further treatment and storage. This sludge could later be dredged/removed under contract and land applied. This is the preferred alternative because of being economically efficient and practically feasible.

4. ALTERNATIVE #6: CONVERSION OF THE EXISTING LAGOON TO AN SBR WITH TERTIARY TREATMENT AND OUTFALL RELOCATION TO ESTABLISHMENT CREEK

The upgraded WWTF would include conversion of the existing lagoon to an earthen based SBR with the construction of a concrete wall within the settling basin. This would separate the basin into two aeration basins. Additionally, an effluent equalization basin would be constructed adjacent to the aeration basins to reduce the loading to the tertiary treatment facilities. New aeration and mixing equipment would be installed in the aeration basins along with floating decanters. Chemical feed equipment would be installed to provide a coagulant for the phosphorus removal in the aeration basin. Controls would be provided to cycle the aeration, mixing, and decanting in a staged manner as well as turn on the chemical feed equipment for efficient use of the coagulant. Waste activated sludge from the SBR basins would be pumped to the existing aerated partial mix cell for further treatment and storage. This sludge could later be dredged/removed under contract and then land applied. Prior to discharge, the water would be pumped from the equalization basin to a tertiary cloth disc filter. A triplex pumping station would then pump the effluent through a pressurized UV disinfection system prior to discharge in Establishment Creek. Even though this alternative is practically feasible it is not economically efficient.

Table 5-8: Alternatives Analysis Comparison

Pollutant	Alternative 3 (Base Case) Upgrade Existing Lagoon with New Fixed Film Media Reactor with Outfall Relocation to Establishment Creek	Alternative 4 Discharge to Big Bottom Creek Adjacent watershed	Alternative 5 (Preferred Alternative) Upgrade Existing Lagoon with SBR along with Outfall Relocation to Establishment Creek	Alternative 6 Upgrade Existing Lagoon to an SBR with Tertiary Treatment and Outfall Relocation to Establishment Creek
BOD ₅	≤ 30 mg/L	≤ 5 mg/L	≤ 30 mg/L	≤ 10 mg/L
TSS	≤ 30 mg/L	≤ 10 mg/L	≤ 30 mg/L	≤ 10 mg/L
Ammonia as N	≤ 1.1 mg/L	≤ 0.9 mg/L	≤ 1.0 mg/L	≤ 0.6 mg/L
Escherichia coli (<i>E. coli</i>)	≤ 206 CFU/100mL	≤ 206 CFU/100mL	≤ 206 CFU/100mL	≤ 206 CFU/100mL
pH	6.0/9.0 SU	6.0/9.0 SU	6.0/9.0 SU	6.0/9.0 SU
Phosphorus, Total	-	≤ 0.5 mg/L	-	≤ 0.5 mg/L
Nitrogen, Total	-	≤ 5 mg/L	-	≤ 5 mg/L
Dissolved Oxygen (DO)	≤ 5 mg/L	≤ 6.0 mg/L	≤ 5 mg/L	≤ 5 mg/L
Life Cycle Cost**	\$5,307,500	-	\$5,901,000	\$ 7,543,950
Ratio	100%	-	111%	142%
Practicable	Yes	No	Yes	Yes

* monitoring requirement

**Life cycle cost at 20-year design life and 2.5% interest

- **Social and Economic Importance(SEI)**

The affected nearby communities consist of the citizens of Ste. Genevieve County, Missouri. According to the United States Census Bureau, social and economic factors relevant to the affected community are:

- Median household income in Ste. Genevieve County is approximately \$61,310 compared to the State of Missouri median household income of \$68,920;
- The percent persons in poverty in Ste. Genevieve County is approximately 9.6% compared to the state average of 12.3%;
- The percent of persons over the age of 25 with a bachelor's degree or higher is approximately 18.4% compared to the state average of 31.9%;
- An important SEI benefit of the proposed LFECWD WWTF SBR upgrade and outfall relocation project is that it is anticipated to resolve the low dissolved oxygen water quality issue in Big Bottom Creek, for which a TMDL has been developed and approved.

- **Derivation and Discussion of Parameters and Limits**

Wasteload allocations and limits were calculated using two methods:

A. **Water quality-based** – Using water quality criteria or water quality model results and the dilution equation below:

$$C = \frac{(C_s \times Q_s) + (C_e \times Q_e)}{(Q_e + Q_s)} \quad (\text{EPA/505/2-90-001, Section 4.5.5})$$

$$C_e = \frac{(Q_e + Q_s)C - (C_s \times Q_s)}{Q_e}$$

Where C = downstream concentration (mg/L)
 C_s = upstream concentration (mg/L)
 Q_s = upstream flow (cfs)
 C_e = effluent concentration (mg/L)
 Q_e = effluent flow (cfs)

Chronic wasteload allocations were determined using applicable chronic water quality criteria (CCC: criteria continuous concentration) and stream volume of flow at the edge of the mixing zone (MZ). Acute wasteload allocations were determined using applicable water quality criteria (CMC: criteria maximum concentration) and stream volume of flow at the edge of the zone of initial dilution (ZID).

Water quality-based maximum daily and average monthly effluent limitations were calculated using methods and procedures outlined in USEPA's "Technical Support Document For Water Quality-based Toxics Control" (EPA/505/2-90-001).

B. Alternative Analysis-based – Using the preferred alternative’s treatment capacity for conventional pollutants such as BOD₅ and TSS that are provided by the consultant as the WLA, the performance based effluent average monthly and average weekly limits are determined by applying the WLA as the average monthly (AML) and multiplying the AML by 1.5 to derive the average weekly limit (AWL).

Note: Alternatives analysis-based effluent limits have been based on the authority included in Section I.A. of the AIP. Also under 40 CFR 133.105, permitting authorities shall require more stringent limitations than equivalent to secondary treatment limitations for 1) existing facilities if the permitting authority determines that the 30-day average and 7-day average BOD₅ and TSS effluent values could be achievable through proper operation and maintenance of the treatment works, and 2) new facilities if the permitting authority determines that the 30-day average and 7-day average BOD₅ and TSS effluent values could be achievable through proper operation and maintenance of the treatment works, considering the design capability of the treatment process.

Outfall #001 – Main Facility Outfall

- **Flow.** Though not limited itself, the volume of effluent discharged from each outfall is needed to assure compliance with permitted effluent limitations [40 CFR Part 122.44(i)(1)(ii)]. If the permittee is unable to obtain effluent flow, then it is the responsibility of the permittee to inform the department, which may require the submittal of an operating permit modification. Influent monitoring has been and will be required for this facility in its Missouri State Operating Permit.
- **Biochemical Oxygen Demand (BOD₅)**. Effluent limits of 30 mg/L average monthly and 35 mg/L average weekly were established as a result of a discharging technology alternatives analysis conducted by the applicant. These limits are at least as stringent as the minimum effluent regulations established in 10 CSR 20-7.015(8)(A)1.
- **Dissolved Oxygen Modeling:**
To protect beneficial uses within the waterbody, dissolved oxygen modeling (Appendix G) analysis was submitted for review. The applicant utilized a Streeter-Phelps analysis, and staff believes that the results of the model are protective of the water quality standards for dissolved oxygen. The Streeter Phelps modeling simulated using the current design flow indicated a 2.95 mg/L dissolved oxygen deficit below the calculated dissolved oxygen saturation value. The modeled lowest dissolved oxygen or critical dissolved oxygen sag was 5.0 mg/L. This value is at or above the water quality standard of 5 mg/L for protection of warmwater aquatic habitats.
- **Total Suspended Solids (TSS)**. Effluent limits of 30 mg/L average monthly and 35 mg/L average weekly were established as a result of a discharging technology alternatives analysis conducted by the applicant. These limits are at least as stringent as the minimum effluent regulations established in 10 CSR 20-7.015(8)(A)1.

- **Biochemical Oxygen Demand (BOD₅) Percent Removal.** In accordance with 40 CFR Part 133, removal efficiency is a method by which the Federal Regulations define Secondary Treatment and Equivalent to Secondary Treatment, which applies to BOD₅ for Publicly Owned Treatment Works (POTWs)/municipals. This facility is required to meet 85% removal efficiency for BOD₅.
- **Total Suspended Solids (TSS) Percent Removal.** In accordance with 40 CFR Part 133, removal efficiency is a method by which the Federal Regulations define Secondary Treatment and Equivalent to Secondary Treatment, which applies to TSS for Publicly Owned Treatment Works (POTWs)/municipals. This facility is required to meet 85% removal efficiency for TSS.
- **Escherichia coli (E. coli).** Effluent limits of 206 CFU per 100 mL monthly average and 1,030 CFU per 100 mL as a daily max of geometric mean during the recreation season (April 1 – October 31) were established as a result of a discharging technology alternatives analysis conducted by the applicant. The Lake Forest Estates Clean Water District WWTF upgrade and outfall relocation project will utilize UV irradiation for disinfection and therefore will not contribute to impairment of the WBC-A designated use of the receiving stream, as per 10 CSR 20-7.031(5)(C).
- **Total Ammonia Nitrogen.** For water quality-based limits, the EPA 1999 Update of *Ambient Water Quality Criteria for Ammonia* is currently effective in Missouri, but the proposed limits were maintained to be at least as stringent as limits developed from the EPA *Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater 2013* criteria. To verify that the proposed alternative analysis effluent limits provided by the facility are protective of the water quality-based effluent limits, below is the following calculation of water quality-based effluent limits. It demonstrates that the proposed alternative analysis effluent limits proposed by the applicant are more protective.

Early Life Stages Present Total Ammonia Nitrogen criteria apply [10 CSR 20-7.031(5)(B)7.C. & Table B3]. Background total ammonia nitrogen = 0.01 mg/L

Table 6-9: EPA 1999 Ammonia Criteria as of March 2026

Month	Temp (°C)*	pH (SU)*	Total Ammonia Nitrogen CCC (mg N/L)	Total Ammonia Nitrogen CMC (mg N/L)
January	8.1	7.8	3.1	12.1
February	9.3	7.9	2.7	10.1
March	13.0	7.8	3.1	12.1
April	16.7	7.8	2.7	12.1
May	20.0	7.8	2.2	12.1
June	24.0	7.8	1.7	12.1
July	26.6	7.8	1.5	12.1
August	26.5	7.9	1.3	10.1
September	23.5	7.8	1.8	12.1
October	18.0	7.8	2.5	12.1
November	14.0	7.8	3.1	12.1
December	10.0	7.8	3.1	12.1

* Ecoregion Data (Ozark Highlands)

WBQEL equation $C_e = (((Q_e + Q_s) * C) - (Q_s * C_s)) / Q_e$

January

Chronic WLA: $C_e = ((0.183 + 0.139)3.1 - (0.139 * 0.01)) / 0.183 = 5.5$
 Acute WLA: $C_e = ((0.183 + 0.008)12.1 - (0.008 * 0.01)) / 0.183 = 12.7$
 AML = WLA_c = 5.5 mg/L
 MDL = WLA_a = 12.7 mg/L

February

Chronic WLA: $C_e = ((0.183 + 0.139)2.7 - (0.139 * 0.01)) / 0.183 = 4.8$
 Acute WLA: $C_e = ((0.183 + 0.008)10.1 - (0.008 * 0.01)) / 0.183 = 10.6$
 AML = WLA_c = 4.8 mg/L
 MDL = WLA_a = 10.6 mg/L

March

Chronic WLA: $C_e = ((0.183 + 0.139)3.1 - (0.139 * 0.01)) / 0.183 = 5.5$
 Acute WLA: $C_e = ((0.183 + 0.008)12.1 - (0.008 * 0.01)) / 0.183 = 12.7$
 AML = WLA_c = 5.5 mg/L
 MDL = WLA_a = 12.7 mg/L

April

Chronic WLA: $C_e = ((0.183 + 0.139)2.7 - (0.139 * 0.01)) / 0.183 = 4.8$
 Acute WLA: $C_e = ((0.183 + 0.008)12.1 - (0.008 * 0.01)) / 0.183 = 12.7$
 AML = WLA_c = 4.8 mg/L
 MDL = WLA_a = 12.7 mg/L

May

Chronic WLA: $C_e = ((0.183 + 0.139)2.2 - (0.139 * 0.01)) / 0.183 = 3.9$
 Acute WLA: $C_e = ((0.183 + 0.008)12.1 - (0.008 * 0.01)) / 0.183 = 12.7$
 AML = WLA_c = 3.9 mg/L
 MDL = WLA_a = 12.7 mg/L

June

Chronic WLA: $C_e = ((0.183 + 0.139)1.7 - (0.139 * 0.01)) / 0.183 = 3.0$
 Acute WLA: $C_e = ((0.183 + 0.008)12.1 - (0.008 * 0.01)) / 0.183 = 12.7$
 AML = WLA_c = 3 mg/L
 MDL = WLA_a = 12.7 mg/L

July

Chronic WLA: $C_e = ((0.183 + 0.139)1.5 - (0.139 * 0.01)) / 0.183 = 2.5$
 Acute WLA: $C_e = ((0.183 + 0.008)12.1 - (0.008 * 0.01)) / 0.183 = 12.7$
 AML = WLA_c = 2.5 mg/L
 MDL = WLA_a = 12.7 mg/L

August

Chronic WLA: $C_e = ((0.183 + 0.139)1.3 - (0.139 * 0.01)) / 0.183 = 2.2$
 Acute WLA: $C_e = ((0.183 + 0.008)10.1 - (0.008 * 0.01)) / 0.183 = 10.6$
 AML = WLA_c = 2.2 mg/L
 MDL = WLA_a = 10.6 mg/L

September

Chronic WLA: $C_e = ((0.183 + 0.139)1.8 - (0.139 * 0.01)) / 0.183 = 3.1$
 Acute WLA: $C_e = ((0.183 + 0.008)12.1 - (0.008 * 0.01)) / 0.183 = 12.7$
 AML = WLA_c = 3.1 mg/L
 MDL = WLA_a = 12.7 mg/L

October

Chronic WLA: $C_e = ((0.183 + 0.139)2.5 - (0.139 * 0.01)) / 0.183 = 4.4$
 Acute WLA: $C_e = ((0.183 + 0.008)12.1 - (0.008 * 0.01)) / 0.183 = 12.7$
 AML = WLA_c = 4.4 mg/L
 MDL = WLA_a = 12.7 mg/L

November

Chronic WLA: $C_e = ((0.183 + 0.139)3.1 - (0.139 * 0.01)) / 0.183 = 5.5$
 Acute WLA: $C_e = ((0.183 + 0.008)12.1 - (0.008 * 0.01)) / 0.183 = 12.7$
 AML = WLA_c = 5.5 mg/L
 MDL = WLA_a = 12.7 mg/L

December

Chronic WLA: $C_e = ((0.183 + 0.139)3.1 - (0.139 * 0.01)) / 0.183 = 5.5$
 Acute WLA: $C_e = ((0.183 + 0.008)12.1 - (0.008 * 0.01)) / 0.183 = 12.7$
 AML = WLA_c = 5.5 mg/L
 MDL = WLA_a = 12.7 mg/L

Table 6-10: EPA 2013 Ammonia Criteria as of March 2026

Month	Temp (°C)*	pH (SU)*	Total Ammonia Nitrogen CCC (mg N/L)	Total Ammonia Nitrogen CMC (mg N/L)
January	8.1	7.8	2.2	12.7
February	9.3	7.9	1.8	10.6
March	13.0	7.8	1.6	10.1
April	16.7	7.8	1.3	7.4
May	20.0	7.8	1.0	5.6
June	24.0	7.8	0.8	4.0
July	26.6	7.8	0.7	3.3
August	26.5	7.9	0.6	2.7
September	23.5	7.8	0.8	4.2
October	18.0	7.8	1.2	6.7
November	14.0	7.8	1.5	9.3
December	10.0	7.8	1.9	12.7

* Ecoregion Data (Ozark Highlands)

WBQEL equation $C_e = (((Q_e + Q_s) * C) - (Q_s * C_s)) / Q_e$

January

Chronic WLA: $C_e = AML = ((0.183 \text{ cfs} + 0.139 \text{ cfs}) * 2.2 \text{ mg/L} - (0.139 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 3.8 \text{ mg/L}$

Acute WLA: $C_e = MDL = ((0.183 \text{ cfs} + 0.008 \text{ cfs}) * 12.7 \text{ mg/L} - (0.008 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 13.2 \text{ mg/L}$

February

Chronic WLA: $C_e = AML = ((0.183 \text{ cfs} + 0.139 \text{ cfs}) * 1.8 \text{ mg/L} - (0.139 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 3.1 \text{ mg/L}$

Acute WLA: $C_e = MDL = ((0.183 \text{ cfs} + 0.008 \text{ cfs}) * 10.6 \text{ mg/L} - (0.008 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 11.0 \text{ mg/L}$

March

Chronic WLA: $C_e = AML = ((0.183 \text{ cfs} + 0.139 \text{ cfs}) * 1.6 \text{ mg/L} - (0.139 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 2.8 \text{ mg/L}$

Acute WLA: $C_e = MDL = ((0.183 \text{ cfs} + 0.008 \text{ cfs}) * 10.1 \text{ mg/L} - (0.008 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 10.5 \text{ mg/L}$

April

Chronic WLA: $C_e = AML = ((0.183 \text{ cfs} + 0.139 \text{ cfs}) * 1.3 \text{ mg/L} - (0.139 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 2.2 \text{ mg/L}$

Acute WLA: $C_e = MDL = ((0.183 \text{ cfs} + 0.008 \text{ cfs}) * 7.4 \text{ mg/L} - (0.008 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 7.7 \text{ mg/L}$

May

Chronic WLA: $C_e = AML = ((0.183 \text{ cfs} + 0.139 \text{ cfs}) * 1 \text{ mg/L} - (0.139 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 1.8 \text{ mg/L}$

Acute WLA: $C_e = MDL = ((0.183 \text{ cfs} + 0.008 \text{ cfs}) * 5.6 \text{ mg/L} - (0.008 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 5.9 \text{ mg/L}$

June

Chronic WLA: $C_e = AML = ((0.183 \text{ cfs} + 0.139 \text{ cfs}) * 0.8 \text{ mg/L} - (0.139 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 1.4 \text{ mg/L}$

Acute WLA: $C_e = MDL = ((0.183 \text{ cfs} + 0.008 \text{ cfs}) * 4 \text{ mg/L} - (0.008 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 4.2 \text{ mg/L}$

July

Chronic WLA: $C_e = AML = ((0.183 \text{ cfs} + 0.139 \text{ cfs}) * 0.7 \text{ mg/L} - (0.139 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 1.2 \text{ mg/L}$

Acute WLA: $C_e = MDL = ((0.183 \text{ cfs} + 0.008 \text{ cfs}) * 3.3 \text{ mg/L} - (0.008 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 3.4 \text{ mg/L}$

August

Chronic WLA: $C_e = AML = ((0.183 \text{ cfs} + 0.139 \text{ cfs}) * 0.6 \text{ mg/L} - (0.139 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 1.0 \text{ mg/L}$

Acute WLA: $C_e = MDL = ((0.183 \text{ cfs} + 0.008 \text{ cfs}) * 2.7 \text{ mg/L} - (0.008 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 2.8 \text{ mg/L}$

September

Chronic WLA: $C_e = AML = ((0.183 \text{ cfs} + 0.139 \text{ cfs}) * 0.8 \text{ mg/L} - (0.139 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 1.4 \text{ mg/L}$

Acute WLA: $C_e = MDL = ((0.183 \text{ cfs} + 0.008 \text{ cfs}) * 4.2 \text{ mg/L} - (0.008 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 4.4 \text{ mg/L}$

October

Chronic WLA: $C_e = AML = ((0.183 \text{ cfs} + 0.139 \text{ cfs}) * 1.2 \text{ mg/L} - (0.139 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 2.0 \text{ mg/L}$

Acute WLA: $C_e = MDL = ((0.183 \text{ cfs} + 0.008 \text{ cfs}) * 6.7 \text{ mg/L} - (0.008 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 6.9 \text{ mg/L}$

November

Chronic WLA: $C_e = AML = ((0.183 \text{ cfs} + 0.139 \text{ cfs}) * 1.5 \text{ mg/L} - (0.139 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 2.6 \text{ mg/L}$

Acute WLA: $C_e = MDL = ((0.183 \text{ cfs} + 0.008 \text{ cfs}) * 9.3 \text{ mg/L} - (0.008 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 9.7 \text{ mg/L}$

December

Chronic WLA: $C_e = AML = ((0.183 \text{ cfs} + 0.139 \text{ cfs}) * 1.9 \text{ mg/L} - (0.139 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 3.3 \text{ mg/L}$

Acute WLA: $C_e = MDL = ((0.183 \text{ cfs} + 0.008 \text{ cfs}) * 12.7 \text{ mg/L} - (0.008 \text{ cfs} * 0.01 \text{ mg/L})) / 0.183 \text{ cfs} = 13.2 \text{ mg/L}$

Table 6-3: Comparison of QBEL and Performance Based Levels

MONTH	QBEL Based on 1999 EPA Criteria (mg/L) MDL	QBEL Based on 1999 EPA Criteria (mg/L) AML	QBEL Based on 2013 EPA Criteria (mg/L) MDL	QBEL Based on 2013 EPA Criteria (mg/L) AML	Proposed Limits (mg/L) MDL	Proposed Limits (mg/L) AML
January	12.7	5.5	13.2	3.8	12.7	3.8
February	10.6	4.8	11.0	3.1	10.6	3.1
March	12.7	5.5	10.5	2.8	10.5	2.8
April	12.7	4.8	7.7	2.2	7.7	2.2
May	12.7	3.9	5.9	1.8	5.9	1.8
June	12.7	3.0	4.2	1.4	4.2	1.4
July	12.7	2.5	3.4	1.2	3.4	1.2
August	10.6	2.2	2.9	1.0	2.9	1.0
September	12.7	3.1	4.4	1.4	4.4	1.4
October	12.7	4.4	6.9	2.0	6.9	2.0
November	12.7	5.5	9.7	2.6	9.7	2.6
December	12.7	5.5	13.2	3.4	12.7	3.3

- **Ammonia as N, Influent Monitoring.** As the proposed facility design flow is greater than 0.1 MGD, influent monitoring will be required per 10 CSR 20-7.015(9)(D)8.
- **Total Phosphorus.** Monitoring required for facilities greater than 100,000 gpd design flow per 10 CSR 20- 7.015(9)(D)8
- **Total Nitrogen.** Monitoring required for facilities greater than 100,000 gpd design flow per 10 CSR 20- 7.015(9)(D)8
- **pH.** Technology based limits, 6.0/9.0 SU [10 CSR 20-7.015] are protective of the water quality standard [10 CSR 20-7.031(5)(E)], due to the buffering capacity of the mixing zone.
- **General Assumptions of the Water Quality and Antidegradation Review**
 - A. A Water Quality and Antidegradation Review (WQAR) assumes that [10 CSR 20-6.010(2) Continuing Authorities and 10 CSR 20-6.010(4)(A)5.B., consideration for no discharge] has been or will be addressed in a Missouri State Operating Permit or Construction Permit Application.
 - B. A WQAR does not indicate approval or disapproval of alternative analysis as per [10 CSR 20-7.015(4) Losing Streams], and/or any section of the effluent regulations.
 - C. Changes to Federal and State Regulations (FSR) made after the drafting of this WQAR may alter Water Quality Based Effluent Limits (QBEL).
 - D. Effluent limitations derived from FSR may be QBEL or Effluent Limit Guidelines (ELG).

- E. WQBEL supersede ELG only when they are more stringent. Mass limits derived from technology based limits are still appropriate.
- F. A WQAR does not allow discharges to waters of the State, and shall not be construed as a National Pollution Discharge Elimination System (NPDES) or Missouri State Operating Permit to discharge or a permit to construct, modify, or upgrade.
- G. Limitations and other requirements in a WQAR may change as Water Quality Standards (WQS), Methodology, and Implementation procedures change.
- H. Nothing in this WQAR removes any obligations to comply with county or other local ordinances or restrictions.
- I. If the proposed treatment technology is not covered in 10 CSR 20-8 Design Guides, the treatment process may be considered a new technology. As a new technology, the permittee would need to work with the review engineer to ensure equipment is sized properly. The operating permit may contain additional requirements to evaluate the effectiveness of the technology once the facility is in operation. This Antidegradation Review is based on the information provided by the facility and is not a comprehensive review of the proposed treatment technology. If the review engineer determines the proposed technology will not consistently meet proposed effluent limits, the permittee will be required to revise their Antidegradation Report.

- **Antidegradation Review Preliminary Determination**

The proposed new facility discharge location will result in a reduction by 10 percent or more of the pollutant assimilative capacity of the Establishment Creek. Due to the existing infrastructure in place, the Big Bottom Creek TMDL, the practicability of alternatives, and economic efficiencies of treatment alternatives, the recommended alternative is the lagoon SBR upgrade and outfall relocation alternative. Regionalization and conversion to a non-discharging system were also deemed impracticable.

Per the requirements of the AIP, the effluent limits in this review were developed to be protective of beneficial uses and to attain the highest statutory and regulatory requirements. The department has determined that the submitted review is sufficient and meets the requirements of the AIP. No further analysis is needed for this discharge.

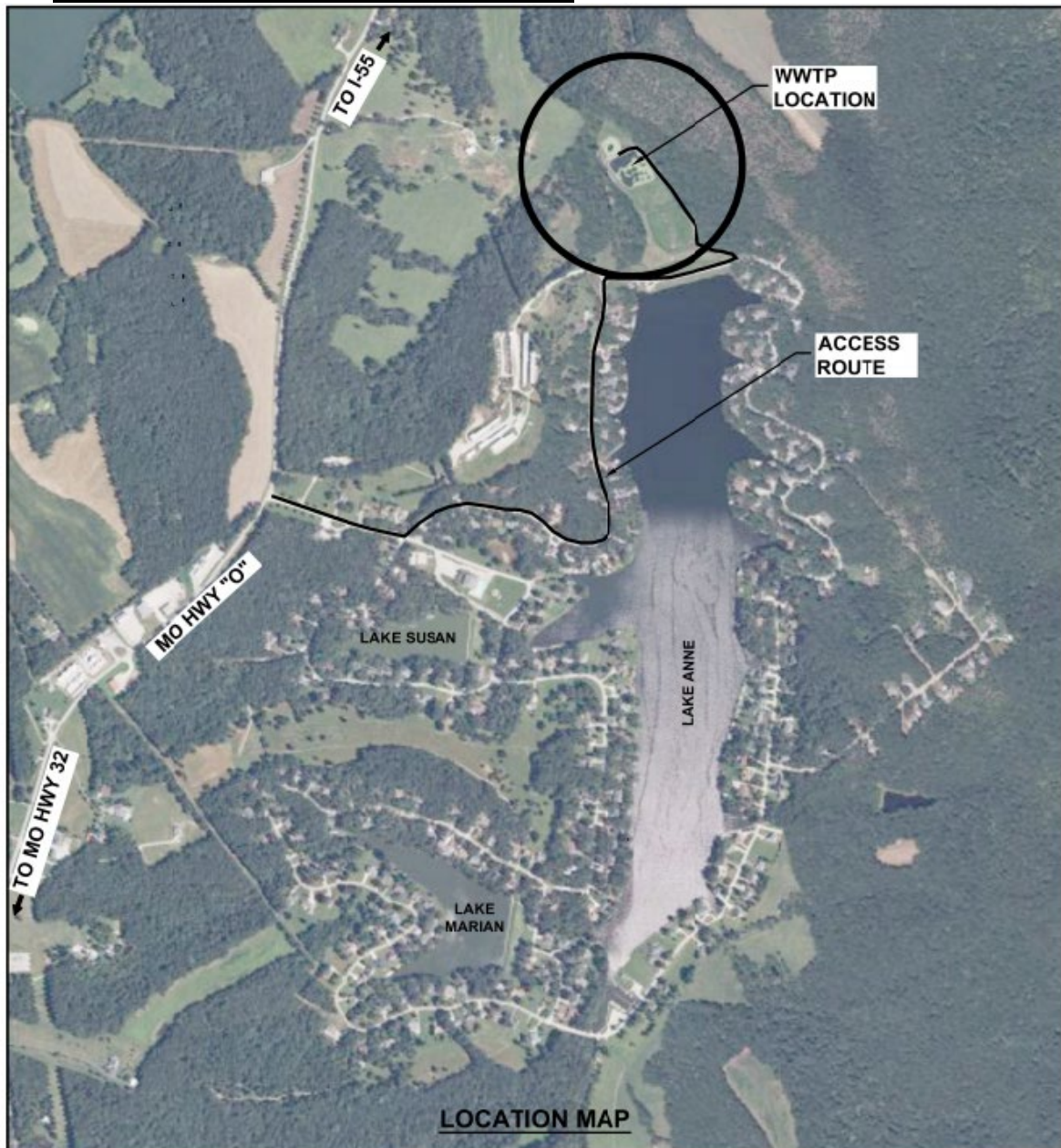
Reviewer: Tasneem Khan, P.E.
Date: March 2026

Reviewer: Cailie Carlile, P.E.

- **Appendix A1: Map of Discharge Location**



- **Appendix A2: Map of Discharge Location**



- **Appendix B: Geohydrologic Evaluation Report 2025**



December 19, 2025

Cody Luebbering
Geosyntec
2009 East McCarty St.
Jefferson City, MO 65101

RE: Lake forest Estates CWD WWTF- Stream Gauging Eval

Dear Cody Luebbering :

On December 19, 2025 , the Missouri Geological Survey received a request to perform a geohydrologic evaluation for the above referenced project located in Ste. Genevieve County . Included with this letter is a report that details the geologic and hydrologic conditions at the site and the potential for groundwater contamination in the event of wastewater treatment failure.

Thank you for the evaluation request. If you are in need of further assistance or have questions regarding the report, please contact our office at P.O Box 250, Rolla, Mo 65402-0250, by telephone at 573-368-2100 or gspeg@dnr.mo.gov.

Sincerely,

MISSOURI GEOLOGICAL SURVEY

Fletcher N. Bone
Geologist
Environmental Geology Section

	Missouri Department Of Natural Resources Missouri Geological Survey Geological Survey Program Environmental Geology Section	Project ID Number LWE26120 County Ste. Genevieve County
Request Details		
Project: Lake forest Estates CWD WWTF- Stream Gauging Eval <u>Organization Official</u> Name: Mark Basler Address: 13765 Lakewood Drive City: Ste. Genevieve State: MO Zip: 63670 Phone: 573-483-9833 Email: lfecwd.office@gmail.com		Legal Description: Quadrangle: Latitude: Longitude: <u>Preparer</u> Name: Cody Luebbering Address: 2009 East McCarty St. City: Jefferson City State: MO Zip: 65101 Phone: 573-694-8620 Email: cluebbering@geosyntec.com
Project Details		
Report Date: 12/19/2025 Date of Field Visit: 12/11/2025		Previous Reports: LWL99144
<u>Facility Type</u> ☐ Mechanical treatment plant ☐ Recirculating filter bed ☐ Land application ☒ Lagoon or storage basin ☐ Subsurface soil absorption system ☐ Lagoon or storage basin W/Land App ☐ Lagoon or storage basin W/SSAS ☐ Other type of facility	<u>Type of Waste</u> ☐ Animal ☒ Human ☐ Process or industrial ☐ Leachate ☐ Other waste type	<u>Funding Source</u> ☒ IWT ☐ WWL-SRF <u>Additional Information</u> ☐ Plans were submitted ☐ Site was investigated by NRCS ☐ Soil or geotechnical data were submitted
Geologic Stream Classification: ☒ Gaining ☐ Losing ☐ No discharge		
<u>Overall Geologic Limitations</u> ☐ Slight ☒ Moderate ☐ Severe	<u>Collapse Potential</u> ☐ Not applicable ☐ Slight ☒ Moderate ☐ Severe	<u>Topography</u> ☒ <4% ☐ 4% to 8% ☐ 8% to 15% ☐ >15%
<u>Landscape Position</u> ☐ Broad uplands ☒ Floodplain ☐ Ridgetop ☒ Alluvial plain ☐ Hillslope ☐ Terrace ☐ Narrow ravine ☐ Sinkhole		
<u>Bedrock:</u> The uppermost bedrock is Ordovician-age Powell formation.		
<u>Surficial Materials:</u> The surficial materials are gravelly alluvium and gravelly, organic-rich, sandy silt residuum and colluvium.		

 Missouri Department Of Natural Resources Missouri Geological Survey Geological Survey Program Environmental Geology Section		Project ID Number LWE26120 County Ste. Genevieve County
<u>Recommended Construction Procedures for Earthen Facility</u> ☐ Installation of clay pad and Compaction ☐ Diversion of subsurface flow ☒ Artificial sealing ☐ Rock excavation ☐ Limit excavation depth	<u>Determine Overburden Properties</u> ☐ Particle size analysis ☐ Atterberg limits ☐ 95% Max. dry density test method ☐ Overburden thickness ☐ Permeability coefficient-undisturbed ☒ Permeability coefficient-remolded	<u>Determine Hydrologic Conditions</u> ☐ Groundwater elevation ☐ Direction of groundwater flow ☐ 25-Year flood level ☒ 100-Year flood level

Remarks:

On December 11, 2025, scientists from Geosyntec performed stream gauging on Establishment Creek as a QA/QC measure after a portion of Establishment Creek had been classified as losing. In total, 6 locations were gauged and the subsequent data was given to MGS to reevaluate the classification of losing for this portion of Establishment Creek. After review of the data, it is determined that this reach of Establishment Creek is classified as gaining and therefore the overall geologic limitations rating has been changed from severe to moderate. The reach evaluated is from the proposed discharge point (-90.2208020, 37.9623600) to the confluence with Indian Creek (-90.1994660, 37.9752230).



12/19/2025

- **Appendix C: GEOHYDROLOGIC EVALUATION REPORT 2024**



MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

Michael L. Parson
Governor

Dru Buntin
Director

LWE24067
Ste. Genevieve County

May 10, 2024

Richard Cochran
Waters Engineering, Inc.
P.O. Box 567
Sikeston, MO 63801

RE: Lake Forest Estates WWTF

Dear Richard Cochran:

On March 01, 2024, the Missouri Geological Survey received a request to perform a geohydrologic evaluation for the above referenced project located in Ste. Genevieve County. Included with this letter is a report that details the geologic and hydrologic conditions at the site and the potential for groundwater contamination in the event of wastewater treatment failure.

Thank you for the evaluation request. If you are in need of further assistance or have questions regarding the report, please contact our office at P.O Box 250, Rolla, Mo 65402-0250, by telephone at 573-368-2100 or gspeg@dnr.mo.gov.

Sincerely,

MISSOURI GEOLOGICAL SURVEY

Fletcher N. Bone
Geologist
Environmental Geology Section

c: Mark Basler
WPP
Southeast Regional Office

	Missouri Department Of Natural Resources Missouri Geological Survey Geological Survey Program Environmental Geology Section	Project ID Number LWE24067 County Ste. Genevieve County
Request Details		
Project: Lake Forest Estates WWTF Organization Official Name: Mark Basler Address: 13765 Lakewood Drive City: Ste. Genevieve State: MO Zip: 63670 Phone: 573-483-9833 Email: lfecwd.office@gmail.com		Legal Description: Quadrangle: Latitude: Longitude: Preparer Name: Richard Cochran Address: P.O. Box 567 City: Sikeston State: MO Zip: 63801 Phone: 573-471-5680 Email: rcochran@waterseng.com
Project Details		
Report Date: 05/10/2024 Date of Field Visit: 04/25/2024		Previous Reports: LWL99144 LWE02127
Facility Type ☒ Mechanical treatment plant ☐ Recirculating filter bed ☒ Land application ☐ Lagoon or storage basin ☐ Subsurface soil absorption system ☐ Lagoon or storage basin W/Land App ☐ Lagoon or storage basin W/SSAS ☐ Other type of facility	Type of Waste ☐ Animal ☒ Human ☐ Process or industrial ☐ Leachate ☐ Other waste type	Funding Source ☒ IWT ☐ WWL-SRF Additional Information ☐ Plans were submitted ☐ Site was investigated by NRCS ☐ Soil or geotechnical data were submitted
Geologic Stream Classification: ☐ Gaining ☒ Losing ☐ No discharge		
Overall Geologic Limitations ☐ Slight ☐ Moderate ☒ Severe	Collapse Potential ☐ Not applicable ☒ Slight ☐ Moderate ☐ Severe	Topography ☒ <4% ☒ 4% to 8% ☒ 8% to 15% ☒ >15%
Landscape Position ☐ Broad uplands ☒ Floodplain ☐ Ridgetop ☒ Alluvial plain ☒ Hillslope ☐ Terrace ☐ Narrow ravine ☐ Sinkhole		
Bedrock: The uppermost bedrock is Ordovician-age Powell formation.		
Surficial Materials: The surficial materials are gravelly alluvium and gravelly, organic-rich, sandy silt residuum and colluvium.		

 Missouri Department Of Natural Resources Missouri Geological Survey Geological Survey Program Environmental Geology Section		Project ID Number LWE24067 County Ste. Genevieve County
Recommended Construction Procedures for Earthen Facility ☐ Installation of clay pad and Compaction ☐ Diversion of subsurface flow ☒ Artificial sealing ☐ Rock excavation ☐ Limit excavation depth	Determine Overburden Properties ☐ Particle size analysis ☐ Atterberg limits ☐ 95% Max. dry density test method ☐ Overburden thickness ☐ Permeability coefficient-undisturbed ☒ Permeability coefficient-remolded	Determine Hydrologic Conditions ☐ Groundwater elevation ☐ Direction of groundwater flow ☐ 25-Year flood level ☒ 100-Year flood level

Remarks:

On April 25, 2024, a geologist from the Missouri Geological Survey conducted a geohydrologic evaluation for proposed upgrades to an existing wastewater treatment facility (WWTF) for Lake Forest Estates WWTF. The existing facility is an aerated lagoon that is proposed to be converted to a Sequencing Batch Reactor with division of existing tertiary cells and construction of a new discharge equalization basin. A land application area of approximately 75 acres was also evaluated during the site visit. The purpose of the site visit is to observe the geologic and hydrologic elements and determine the potential for groundwater contamination in the event of wastewater treatment failure.

Surface water runoff from the facility and proposed land application area is generally north and west towards Big Bottom Creek. The facility is located within an alluvial and flood plain of Big Bottom Creek whereas the proposed land application area is located on a steep, west-facing hillslope adjacent to Big Bottom Creek.

During this site visit, Big Bottom Creek, Indian Creek, and Establishment Creek were evaluated and formally classified for approximately 2 miles downstream of the current discharge point. Big Bottom Creek was classified as losing down to its confluence with Indian Creek, where the stream becomes gaining. Losing characteristics include, obvious flow loss, erratic stream gradient, poorly sorted materials, potentiometric surface greater than 20 feet below the stream, and flat-bottomed or rectangular stream bed. From the confluence of Big Bottom Creek and Indian Creek down to approximately 2 miles downstream on Establishment Creek, the streams were classified as gaining.

Surficial materials consist of gravelly alluvium and gravelly, organic-rich, sandy silt residuum and colluvium. The surficial materials at the existing site are gravelly alluvium which have high permeability. The surficial materials at the proposed land application area are residuum and colluvium which are gravelly, organic-rich, sandy silt and have high permeability. The proposed land application area is mostly glade with very thin to non-existent soils, with bedrock cropping out at the surface in many areas.

The uppermost bedrock is Ordovician-age Powell formation which consists of dolomite, sandstone and shale layers. The permeability of the these units are low to moderate below a thin weathered zone.

There are no known springs, sinkholes, or geologic structures of relevance located within 1 mile of the site. There are no known public drinking water wells located within 1/4 mile of the site.

Based on the characteristics observed, the site receives a severe geologic limitations rating and a slight collapse potential rating. In the event of wastewater treatment failure, the local, shallow, and regional groundwater, and surface waters of Big Bottom Creek, Indian Creek, and Establishment Creek, may be adversely impacted.

 Missouri Department Of Natural Resources Missouri Geological Survey Geological Survey Program Environmental Geology Section		Project ID Number LWE24067 County Ste. Genevieve County
---	--	--



05/10/2024

- **Appendix D: Natural Heritage Review**



Missouri Department of Conservation

Missouri Department of Conservation's Mission is to protect and manage the forest, fish, and wildlife resources of the state and to facilitate and provide opportunities for all citizens to use, enjoy and learn about these resources.

Natural Heritage Review Level Two Report: State Listed Endangered Species and/or Missouri Species/Natural Communities of Conservation Concern

There are records of state-listed Endangered Species, or Missouri Species or Natural Communities of Conservation Concern within or near the defined Project Area. Please contact Missouri Department of Conservation for further coordination.

Foreword: Thank you for accessing the Missouri Natural Heritage Review Website developed by the Missouri Department of Conservation with assistance from the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, Missouri Department of Transportation and NatureServe. The purpose of this report is to provide information to federal, state and local agencies, organizations, municipalities, corporations, and consultants regarding sensitive fish, wildlife, plants, natural communities, and habitats to assist in planning, designing, and permitting stages of projects.

PROJECT INFORMATION

Project Name and ID Number: Lake Forest Estates Water District WWTF Outfall Relocation #17665

Project Description: Lake Forest Estates WWTF relocation the existing outfall to a different receiving water.

Project Type: Waste Transfer, Treatment, and Disposal, Liquid waste/Effluent, Effluent Discharge, Effluent discharge - renewal or modification of discharge to stream

Contact Person: Cody Luebbering

Contact Information: cluebbering@geosyntec.com or 5734434100

Disclaimer: This NATURAL HERITAGE REVIEW REPORT identifies if a species or natural community tracked by the Natural Heritage Program is known to occur within or near the project area submitted, and shares recommendations to avoid or minimize project impacts to sensitive species or natural habitats. Incorporating information from the Natural Heritage Program into project plans is an important step in reducing impacts to Missouri's sensitive natural resources. If an occurrence record is present, or the proposed project might affect federally listed species, the user must contact the Department of Conservation or U.S. Fish and Wildlife Service for more information.

This Natural Heritage Review Report is not a site clearance letter for the project. Rather, it identifies public lands and records of sensitive resources located close to and/or potentially affected by the proposed project. If project plans or location change, this report may no longer be valid. Because land use conditions change and animals move, the existence of an occurrence record does not mean the species/habitat is still present. Therefore, reports include information about records near but not necessarily on the project site. Lack of an occurrence record does not mean that a sensitive species or natural community is not present on or near the project area. On-site verification is the responsibility of the project. However, the Natural Heritage Program is only one reference that should be used to evaluate potential adverse project impacts and additional information (e.g. wetland or soils maps, on-site inspections or surveys) should be considered. Reviewing current landscape and habitat information, and species' biological characteristics would additionally ensure that Missouri Species of Conservation Concern are appropriately identified and addressed in planning efforts.

U.S. Fish and Wildlife Service – Endangered Species Act (ESA) Coordination: Lack of a Natural Heritage Program occurrence record for federally listed species in your project area does not mean the species is not present, as the area may never have been surveyed. Presence of a Natural Heritage Program occurrence record does not mean the project will result in negative impacts. This report does not fulfill Endangered Species Act consultation with the U.S. Fish and Wildlife Service (USFWS) for listed species. Direct contact with the USFWS may be necessary to complete consultation and it is required for actions with a federal connection, such as federal funding or a federal permit; direct contact is also required if ESA concurrence is necessary. Visit [IPaC: Home \(fws.gov\)](https://www.fws.gov/ipac) to initiate USFWS Information for Planning and Conservation (IPaC) consultation. Contact the Columbia Missouri Ecological Field Services Office (573-234-2132, or by mail at 101 Park Deville Drive, Suite A, Columbia, MO 65203) for more information.

Transportation Projects: If the project involves the use of Federal Highway Administration transportation funds, these recommendations may not fulfill all contract requirements. Please contact the Missouri Department of Transportation at 573-526-4778 or visit [Home Page | Missouri Department of Transportation \(modot.org\)](https://www.modot.org) for additional information on recommendations.

Species or Communities of Conservation Concern within the Area:

There are records of state-listed Endangered Species, or Missouri Species or Natural Communities of Conservation Concern within or near the defined Project Area. Please contact the Missouri Department of Conservation for further coordination.

Email (preferred): NaturalHeritageReview@mdc.mo.gov
MDC Natural Heritage Review
Science Branch
P.O. Box 180
Jefferson City, MO
65102-0180
Phone: 573-522-4115 ext. 3182

Other Special Search Results:

No results have been identified for this project location.

Project Type Recommendations:

Waste Transfer, Treatment, and Disposal - Liquid Effluent Discharge - New or Renewal of Permit: [Clean Water Act](#) permits issued by other agencies regulate both construction and operation of wastewater systems, and provide many important protections for fish and wildlife resources throughout the project area and at some distance downstream. Fish and wildlife almost always benefit when unnatural pollutants are removed from water, and concerns are minimal if construction is managed to minimize erosion and sedimentation/runoff to nearby streams and lakes, including adherence to any Clean Water Act permit conditions. Revegetation of disturbed areas is recommended to minimize erosion, as is restoration with of native plant species compatible with the local landscape and for wildlife needs. Annuals like ryegrass may be combined with native perennials for quicker green-up. Avoid aggressive exotic perennials such as crown vetch and sericea lespedeza.

Project Location and/or Species Recommendations:

Endangered Species Act Coordination - If this project has the potential to alter habitat (e.g. tree removal, projects in karst habitat) or cause direct mortality of bats, please coordinate directly with U.S. Fish and Wildlife Service (Ecological Services, 101 Park Deville Drive, Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132 Ext. 100 for Ecological Services) for further coordination under the Endangered Species Act. Indiana bats (*Myotis sodalis*, federal- and state-listed endangered) and Northern long-eared bats (*Myotis septentrionalis*, federal-listed endangered) may occur near the project area. Both of these species of bats hibernate during winter months in caves and mines. During the summer months, they roost and raise young under the bark of trees in wooded areas, often riparian forests and upland forests near perennial streams. During project activities, avoid degrading stream quality and where possible leave snags standing and preserve mature forest canopy. Do not enter caves known to harbor Indiana bats or Northern long-eared bats, especially from September to April.

Gray Bat: The submitted project location is within the range of the Gray Myotis (i.e., Gray Bat) in Missouri. Depending on habitat conditions of your project's location, Gray Myotis (*Myotis grisescens*, federal and state-listed endangered) could occur within the project area, as they forage over streams, rivers, lakes, and reservoirs. Avoid entry or disturbance of any cave inhabited by Gray Myotis and when possible retain forest vegetation along the stream and from the cave opening to the stream. Please see [Best Management Practices for Construction and Development Projects Gray bat \(mo.gov\)](#).

Karst: This county has known karst geologic features (e.g., caves, springs, and sinkholes, all characterized by subterranean water movement). Few karst features are recorded in Natural Heritage records, and ones not noted here may be encountered at the project site or affected by the project. Cave fauna (many of which are Species of Conservation Concern) are influenced by changes to water quality; please check your project site for any karst features and make every effort to protect groundwater in the project area. Additional information and specific recommendations are available at [Management Recommendations for Construction and Development Projects Affecting Missouri Karst Habitat \(mo.gov\)](#).

Invasive exotic species are a significant issue for fish, wildlife and agriculture in Missouri. Seeds, eggs, and larvae may be moved to new sites on boats or construction equipment. Please inspect and clean equipment thoroughly before moving between project sites. See [Managing Invasive Species in Your Community | Missouri Department of Conservation \(mo.gov\)](#) for more information.

- Remove any mud, soil, trash, plants or animals from equipment before leaving any water body or work area.
- Drain water from boats and machinery that have operated in water, checking motor cavities, live-well, bilge and transom wells, tracks, buckets, and any other water reservoirs.
- When possible, wash and rinse equipment thoroughly with hard spray or HOT water (>140° F, typically available at do-it-yourself car wash sites), and dry in the hot sun before using again.

Streams and Wetlands – Clean Water Act Permits: Streams and wetlands in the project area should be protected from activities that degrade habitat conditions. For example, soil erosion, water pollution, placement of fill, dredging, in-stream activities, and riparian corridor removal, can modify or diminish aquatic habitats. Streams and wetlands may be protected under the Clean Water Act and require a permit for any activities that result in fill or other modifications to the site. Conditions provided within the U.S. Army Corps of Engineers (USACE) Clean Water Act Section 404 permit ([Kansas City District Regulatory Branch \(army.mil\)](#)) and the Missouri Department of Natural Resources (DNR) issued Clean Water Act Section 401 Water Quality Certification ([Section 401 Water Quality Certification | Missouri Department of Natural Resources \(mo.gov\)](#)), if required, should help minimize impacts to the aquatic organisms and aquatic habitat within the area. Depending on your project type, additional permits may be required by the Missouri Department of Natural Resources, such as permits for stormwater, wastewater treatment facilities, and confined animal feeding operations. Visit [Wastewater Permits | Missouri Department of Natural Resources \(mo.gov\)](#) for more information on DNR permits. Visit both the USACE and DNR for more information on Clean Water Act permitting.

For further coordination with the Missouri Department of Conservation and the U.S. Fish and Wildlife Services, please see the contact information below:

Email (preferred): NaturalHeritageReview@mdc.mo.gov
MDC Natural Heritage Review
Science Branch
P.O. Box 180
Jefferson City, MO
65102-0180
Phone: 573-522-4115 ext. 3182

U.S. Fish and Wildlife Service
Ecological Service
101 Park Deville Drive
Suite A
Columbia, MO
65203-0007
Phone: 573-234-2132

Miscellaneous Information

FEDERAL Concerns are species/habitats protected under the Federal Endangered Species Act and that have been known near enough to the project site to warrant consideration. For these, project managers must contact the U.S. Fish and Wildlife Service Ecological Services (101 Park Deville Drive Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132; Fax 573-234-2181) for consultation.

STATE Concerns are species/habitats known to exist near enough to the project site to warrant concern and that are protected under the Wildlife Code of Missouri (RSMo 3 CSR 1 0). "State Endangered Status" is determined by the Missouri Conservation Commission under constitutional authority, with requirements expressed in the Missouri Wildlife Code, rule 3CSR 1 0-4.111. Species tracked by the Natural Heritage Program have a "State Rank" which is a numeric rank of relative rarity. Species tracked by this program and all native Missouri wildlife are protected under rule 3CSR 10-4.110 General Provisions of the Wildlife Code.

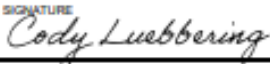
See [Missouri Species and Communities of Conservation Concern Checklist \(mo.gov\)](#) for a complete list of species and communities of conservation concern, and visit [mdc.mo.gov/your-property/responsible-construction/species-impact-best-practices](#) for all species-specific Best Management Practices. Detailed information about the animals and some plants mentioned may be accessed at [Missouri Fish and Wildlife Information System \(MOFWIS\)](#) and [MDC Field Guides](#). Please contact the Missouri Department of Conservation to request printed copies of any materials linked in this document.

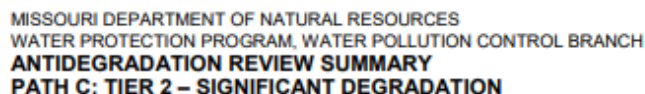
• **Appendix E: Antidegradation Review Summary Attachments**

The attachments that follow contain summary information provided by the applicant, Lake Forest Estates Clean Water District WWTF. Department staff determined that changes must be made to the information contained within these attachments. The following were modified per discussion with the applicant and can be found within the department WQAR: Final effluent limits provided in the antidegradation report were rounded to one decimal place to match the numbers obtained by 2013 ammonia criteria.

	MISSOURI DEPARTMENT OF NATURAL RESOURCES WATER PROTECTION PROGRAM, WATER POLLUTION CONTROL BRANCH ANTIDEGRADATION REVIEW SUMMARY / REQUEST	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: left; padding: 2px;">FOR DEPARTMENT USE ONLY</th> </tr> <tr> <td colspan="2" style="padding: 2px;">APP NO. _____</td> </tr> <tr> <td style="padding: 2px;">FEE RECEIVED _____</td> <td style="padding: 2px;">CHECK NO. _____</td> </tr> <tr> <td colspan="2" style="padding: 2px;">DATE RECEIVED _____</td> </tr> </table>	FOR DEPARTMENT USE ONLY		APP NO. _____		FEE RECEIVED _____	CHECK NO. _____	DATE RECEIVED _____	
FOR DEPARTMENT USE ONLY										
APP NO. _____										
FEE RECEIVED _____	CHECK NO. _____									
DATE RECEIVED _____										
1. FACILITY										
NAME Lake Forest Estates Clean Water District Wastewater Treatment Facility		COUNTY Ste. Genevieve								
ADDRESS (PHYSICAL) 0.6 mile NE Hwy O and Lakewood Dr.	CITY Ste. Genevieve	STATE MO								
PERMIT NUMBER MO-0035742	PROPOSED DESIGN FLOW 0.1183 MGD	ZIP CODE 63670								
SIC / NAICS CODE 4952										
2. OWNER										
NAME Lake Forest Estates Clean Water District										
ADDRESS 13765 Lakewood Dr.	CITY Ste. Genevieve	STATE MO								
EMAIL ADDRESS lfecwd.office@gmail.com	ZIP CODE 63670									
TELEPHONE NUMBER WITH AREA CODE 5734839833										
3. CONTINUING AUTHORITY The regulatory requirement regarding continuing authority is found in 10 CSR 20-6.010(2).										
NAME SARIE AS OWNER		SECRETARY OF STATE CHARTER NUMBER D001296688								
ADDRESS	CITY	STATE MO								
EMAIL ADDRESS	ZIP CODE 65101									
TELEPHONE NUMBER WITH AREA CODE 5734995443										
4. CONSULTANT										
PREPARER NAME Cody Luebbering		COMPANY NAME Geosyntec Consultants								
ADDRESS 2009 East McCarty St., Suite 1	CITY Jefferson City	STATE MO								
EMAIL ADDRESS cluebbering@geosyntec.com	ZIP CODE 65101									
TELEPHONE NUMBER WITH AREA CODE 5734995443										
5. RECEIVING WATER BODY SEGMENT #1										
NAME Establishment Creek										
5.1 Upper end of segment – Location of discharge UTM: X= 744180, Y= 4205294 OR Lat _____, Long _____										
5.2 Lower end of segment – UTM: X= 745967, Y= 4206750 OR Lat _____, Long _____										
Per the Missouri Antidegradation Implementation Procedure (AIP), the definition of a segment, "a segment is a section of water that is bound, at a minimum, by significant existing sources and confluences with other significant water bodies."										
6. WATER BODY SEGMENT #2 (IF APPLICABLE, Use another form if a third segment is needed)										
NAME										
6.1 Upper end of segment – End of Segment #1 UTM: X= _____, Y= _____ OR Lat _____, Long _____										
6.2 Lower end of segment – UTM: X= _____, Y= _____ OR Lat _____, Long _____										
7. DECHLORINATION										
If chlorination and dechlorination is the existing or proposed method of disinfection treatment, will the effluent discharged be equal to or less than the Water Quality Standards for Total Residual Chlorine stated in Table A1 of 10 CSR 20-7.031?										
☐ Yes ☒ No – What is the proposed method of disinfection? <u>Ultraviolet disinfection</u>										
Based on the disinfection treatment system being designed for total removal of Total Residual Chlorine, minimal degradation for Total Residual Chlorine is assumed and the facility will be required to meet the water quality based effluent limits. These compliance limits for Total Residual Chlorine are much less than the method detection limit of 0.13 mg/L.										

8. SUMMARIZE THE FEASIBILITY OF CONSTRUCTING A NO-DISCHARGE TREATMENT WASTEWATER FACILITY					
According to the Antidegradation Implementation Procedure Sections I.B. and II.B.1., the feasibility of no-discharge alternatives must be considered. No-discharge alternatives may include connection to a regional treatment facility, surface land application, subsurface land application, and recycle or reuse. Non-discharging alternatives land application and regionalization were evaluated and determined to be not practicable. See WQAR report and MDNR Form MO-780-2805 for detailed explanation.					
9. ADDITIONAL REQUIREMENTS					
Complete and submit the following with this submittal: ☒ Copy of the Geohydrologic Evaluation – Submit request through the Missouri Geological Survey website ☒ Copy of the Missouri Natural Heritage from the Missouri Department of Conservation website ☒ Attach your Antidegradation Review Report and all supporting documentation as these forms are only a summary. ☐ If applicable, submit a copy of any Existing Water Quality data used in this process. Include the date range of the data, source(s) of the data, and location of data collection relative to the outfall. If using your own collected water quality data, submit a copy of the Quality Assurance Project Plan (QAPP) approved by the department's Watershed Protection Section. For more detailed information, see the Missouri Antidegradation Implementation Procedure (AIP), Section II.A.1.					
10. PATH / TIER REVIEW ATTACHMENTS ENCLOSED					
Path A: Tier 2 – Non-Degradation Mass Balance		☐ Yes	☐ No		
Path B: Tier 2 – Minimal Degradation		☐ Yes	☐ No		
Path C: Tier 2 – Significant Degradation		☒ Yes	☐ No		
Path D: Tier 1 – Preliminary Review Request		☐ Yes	☐ No		
Path E: Temporary Degradation		☐ Yes	☐ No		
11. APPLICANT PROPOSED ANTIDEGRADATION REVIEW EFFLUENT LIMITS					
Preliminary effluent limits for the proposed project are dependent upon the path selected:					
Applicable Pollutants of Concern	Concentration*		Path / Tier Review Attachment Used for POC Evaluation	Average Monthly Limit	Daily Maximum Limit or Average Weekly Limit
BOD ₅	X		Tier 2 Significant	30	35
TSS	X		Tier 2 Significant	30	35
Ammonia (Summer)	X		Tier 2 Significant, August	1.0	2.9
Ammonia (Winter)	X		Tier 2 Significant, October	2.0	6.9
Total Phosphorus	X		Tier 2 Significant	Monitor	Monitor
Total Nitrogen	X		Tier 2 Significant	Monitor	Monitor
E. coli	#100mL		Tier 2 Significant	206	1,030
pH	SU		Tier 2 Significant	6.0-9.0	6.0-9.0
Dissolved Oxygen	X		Tier 2 Significant	5.0	5.0
* Place an X in appropriate box for the concentration units for each Pollutant of Concern.					

12. PROPOSED PROJECT SUMMARY	
LFECWD is proposing to upgrade the existing lagoon WWTF to a sequencing batch reactor WWTF and relocate Outfall #001 from Big Bottom Creek to the larger Establishment Creek.	
Applicants choosing to use a new wastewater technology that are considered an "unproven technology" in Missouri must comply with the requirements set forth in the <i>New Technology Definitions and Requirements</i> fact sheet.	
13. CONTINUING AUTHORITY WAIVER (For New Discharges)	
In accordance with 10 CSR 20-6.010(2)(C), applicants proposing use of a lower preference continuing authority, when the higher level authority is available, must submit a waiver from the existing higher authority one or other documentation for the department's review, provided it does not conflict with any area-wide management plan approved under section 208 of the Federal Clean Water Act or by the Missouri Clean Water Commission. Is the waiver necessary? ☐ Yes ☐ No If yes, provide a copy.	
14. APPLICATION FEE	
☐ CHECK NUMBER	☐ ETPAY CONFIRMATION NUMBER
15. SIGNATURE	
I am authorized and hereby certify that I am familiar with the information contained in this document and to the best of my knowledge and belief such information is true, complete and accurate.	
SIGNATURE 	DATE 01/15/2026
PRINT NAME Cody Luebbering	TITLE Principal Scientist
PLEASE IDENTIFY YOUR STATUS FOR THIS PROJECT: ☐ OWNER ☐ CONTINUING AUTHORITY ☐ CONSULTANT	



NAME	COUNTY
Lake Forest Estates Clean Water District Wastewater Treatment Facility	Ste. Genevieve

Pollutants of Concern to be considered include those pollutants reasonably expected to be present in the discharge per the Antidegradation Implementation Procedure Section II.A. and assumed or demonstrated to cause significant degradation. The tier protection levels are specified and defined in rule at 10 CSR 20-7.031(2).

Concentration*	Concentration*	Concentration*	Concentration*
----------------	----------------	----------------	----------------

[illegible]

* Provide the Basis for the Base Case Limit: WQS – Water Quality Standard, WLA – Wasteload Allocation, ELG – Effluent Limit Guideline, or describe other.

Supply a summary of the non-discharging alternatives considered. For Discharges likely to cause significant degradation, an analysis of non-degrading and less-degrading alternatives must be provided," as stated in the Antidegradation Implementation Procedure Section I.B.1. These alternatives include no-discharge. Attach all supportive documentation in the Antidegradation Review report.

Adequate land is not available for application of wastewater. The only available land higher in the watershed was noted by the MDNR Geohydrologic Evaluation to contain karst and bedrock features.

Minimum of three (preferably five or more) discharging alternatives* ranging from less-degrading to degrading including Preferred Alternative (All treatment levels for POCs must at a minimum meet water quality standards):		
Discharging Alternative #	Treatment Type	Description
1	Aerated Lagoon	Base Case (upgraded aeration system and outfall relocation)
2	SBR	SBR with outfall relocation
3	SBR tertiary treatment	SBR with tertiary treatment and outfall relocation
4		
5		
6		
* Same technology may be multiple alternatives as you have the base unit and add to it with more capacity to provide additional treatment.		
4. DETERMINATION OF THE REASONABLE ALTERNATIVE		
Per the Antidegradation Implementation Procedure Section II.B.2, "a reasonable alternative is one that is practicable, economically efficient and affordable." Provide basis and supporting documentation in the Antidegradation Review report. Please do not write "See Report" for any box below.		
Practicability Summary: "The practicability of an alternative is considered by evaluating the effectiveness, reliability, and potential environmental impacts," according to the Antidegradation Implementation Procedure Section II.B.2.a. Examples of factors to consider, including secondary environmental impacts, are given in the Antidegradation Implementation Procedure Section II.B.2.a. Non-degrading alternatives are not practical for reasons specified in Section 3. Of the less degrading alternatives identified in Section (lagoon aeration upgrades with discharge to adjacent watershed, conversion of lagoons to SBR with outfall relocation, and conversion of SBR with tertiary treatment and outfall relocation), the discharge to adjacent watershed (Big Bottom Creek) is not practical due to the very stringent effluent limitations established by the Big Bottom Creek TMDL for ammonia, BOD, TSS, total phosphorus, and total nitrogen. The only alternatives that are practical are the less degrading conversion of aerated lagoon (base case), lagoon to SBR with outfall relocation and conversion of SBR with tertiary treatment and outfall relocation.		
Economic Efficiency Basis: What is the design life cycle for the comparison? What interest rate was used in the present worth calculations? 2.5%		
Economic Efficiency Summary: Alternatives that are deemed practicable must undergo a direct cost comparison in order to determine economic efficiency. Means to determine economic efficiency are provided in the Antidegradation Implementation Procedure Section II.B.2.b. The only alternatives that are practicable are the less degrading alternatives of conversion of lagoons to SBR with outfall relocation and conversion of SBR with tertiary treatment and outfall relocation.		

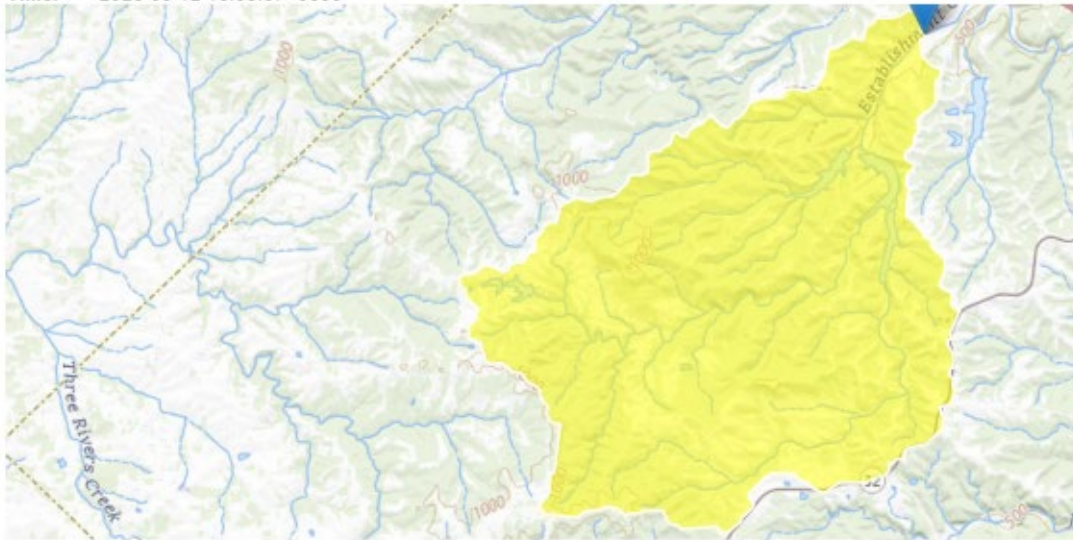
TABLE OF THE ALTERNATIVES EVALUATION (Attach additional page if necessary)						
PARAMETERS	Alternatives #					
	1	2	3	4	5	6
BOD ₅ – mg/L	30	30	10			
TSS – mg/L	30	30	10			
Ammonia (Summer) – mg/L	1.1	1.0	0.6			
Ammonia (Winter) – mg/L	2.4	2.0	1.5			
E. Coli – #/100 mL	206	206	206			
Total Nitrogen – mg/L	NA	NA	5.0			
Total Phosphorus – mg/L	NA	NA	0.5			
Construction Cost – \$	4,400,200	4,637,150	6,164,250			
Operating Cost – \$	907,300	1,263,850	1,379,700			
Present Worth – \$	5,307,500	5,901,000	7,543,950			
Ratio present worth to base case	100%	111%	142%			
Affordability Summary: Alternatives identified as most practicable and economically efficient are considered affordable if the applicant does not supply an affordability analysis. An affordability analysis per the Antidegradation Implementation Procedure Section II.B.2.c, "may be used to determine if the alternative is too expensive to reasonably implement." Applicant does not supply an affordability analysis.						
Justification for Preferred Alternative: The preferred alternative is the lagoon conversion to an SBR with outfall relocation to Establishment Creek. This less degrading alternative results in better ammonia effluent quality and is 111% economic efficiency compared to the base case (aerated lagoon with relocated outfall).						
Reasons for Rejecting the other Evaluated Alternatives: In addition to rejecting non-degrading (land application and regionalization) and less degrading alternative (discharge to Big Bottom Creek) due to practicability, the less degrading alternative lagoon conversion to SBR with tertiary treatment and outfall relocation was rejected due to economic efficiency (143% of base case).						
Comments/Discussion: See WQAR for detailed descriptions.						

5. SOCIAL AND ECONOMIC IMPORTANCE OF THE PREFERRED ALTERNATIVE
If the preferred alternative will result in significant degradation, then it must be demonstrated that it will allow important economic and social development in accordance to the Antidegradation Implementation Procedure Section II.E. Social and Economic Importance is defined as the social and economic benefits to the community that will occur from any activity involving a new or expanding discharge.
Identify the affected community: The affected community is defined in 10 CSR 20-7.031(2)(B) as the community "in the geographical area in which the waters are located. Per the Antidegradation Implementation Procedure Section II.E.1, "the affected community should include those living near the site of the proposed project as well as those in the community that are expected to directly or indirectly benefit from the project." The nearby communities directly affected by the WWTF would be the citizens of Ste. Genevieve County, Missouri.
Identify relevant factors that characterize the social and economic conditions of the affected community: Examples of social and economic factors are provided in the Antidegradation Implementation Procedure Section II.E.1., but specific community examples are encouraged. According to the United States Census Bureau, social and economic factors relevant to the citizens of Ste. Genevieve County are: • Median household income in Ste. Genevieve County is approximately \$61,310 compared to the State of Missouri median household income of \$68,920; • The percent persons in poverty in Ste. Genevieve County is approximately 9.6% compared to the state average of 12.3%; • The percent of persons over the age of 25 with a bachelor's degree or higher is approximately 18.4% compared to the state average of 31.9%
Describe the important social and economic development associated with the project: Determining benefits for the community and the environment should be site specific and in accordance with the Antidegradation Implementation Procedure Section II.E.1. An SEI benefit is that the proposed WWTF SBR upgrade and outfall relocation project will resolve the low dissolved oxygen water quality issue in Big Bottom Creek, for which a TMDL has been developed and approved.
PROPOSED PROJECT SUMMARY: LFECWD is pursuing a Tier 2, significant degradation for WWTF upgrades to an SBR technology and Outfall #001 relocation from Big Bottom Creek to Establishment Creek. This project will correct the low dissolved oxygen in Big Bottom Creek from the existing LFECWD WWTF.
Attach the Antidegradation Review report and all supporting documentation. This is a technical document, which must be signed, sealed and dated by a registered professional engineer of Missouri.

- **Appendix F: StreamStats Report**

Establishment Creek StreamStats Report

Region ID: MO
Workspace ID: MO20250812200741600000
Clicked Point (Latitude, Longitude): 37.96249, -90.22046
Time: 2025-08-12 15:08:07 -0500



Collapse All

➤ Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
BSHAPE	Basin Shape Factor for Area	4.6	dimensionless
DRNAREA	Area that drains to a point on a stream	31	square miles
IMPNLCD01	Percentage of impervious area determined from NLCD 2001 impervious dataset	0.35	percent
STREAM_VARG	Streamflow variability index as defined in WRIR 02-4068, computed from regional grid	0.55	dimensionless

➤ Peak-Flow Statistics

Peak-Flow Statistics Parameters [Peak Rural Statewide Region 2 SIR 2014 5165]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
BSSHAPE	Basin Shape Factor	4.6	dimensionless	2.04	26.89
DRNAREA	Drainage Area	31	square miles	0.17	4008.92

Peak-Flow Statistics Parameters [Peak Urban Statewide SIR 2010 5073]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	31	square miles	0.28	189
IMPNLCD01	Percent Impervious NLCD2001	0.35	percent	2.3	46

Peak-Flow Statistics Flow Report [Peak Rural Statewide Region 2 SIR 2014 5165]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct, RMSE: Root Mean Squared Error, PseudoR^2: Pseudo R Squared (other -- see report)

Statistic	Value	Unit	ASEp
50-percent AEP flood	2340	ft^3/s	43.5
20-percent AEP flood	4440	ft^3/s	31.8
10-percent AEP flood	6100	ft^3/s	28
4-percent AEP flood	8440	ft^3/s	24.1
2-percent AEP flood	10200	ft^3/s	24.2
1-percent AEP flood	12000	ft^3/s	24.4
0.5-percent AEP flood	13900	ft^3/s	24.6
0.2-percent AEP flood	16200	ft^3/s	27

Peak-Flow Statistics Disclaimers [Peak Urban Statewide SIR 2010 5073]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Peak-Flow Statistics Flow Report [Peak Urban Statewide SIR 2010 5073]

Statistic	Value	Unit
50-percent AEP flood	1490	ft^3/s
20-percent AEP flood	2710	ft^3/s
10-percent AEP flood	3750	ft^3/s
4-percent AEP flood	5280	ft^3/s
2-percent AEP flood	6620	ft^3/s

Statistic	Value	Unit
1-percent AEP flood	8040	ft ³ /s
0.2-percent AEP flood	12000	ft ³ /s
<i>Peak-Flow Statistics Citations</i>		
Southard, R.E., 2010, Estimation of the Magnitude and Frequency of Floods in Urban Basins in Missouri: U.S. Geological Survey Scientific Investigations Report 2010-5073, 27 p. (http://pubs.usgs.gov/sir/2010/5073/) Southard, R.E., and Veilleux, A.G., 2014, Methods for estimating annual exceedance-probability discharges and largest recorded floods for unregulated streams in rural Missouri: U.S. Geological Survey Scientific Investigations Report 2014-5165, 39 p. (http://pubs.usgs.gov/sir/2014/5165/)		

➤ Low-Flow Statistics

Low-Flow Statistics Parameters [LowFlow Region 2 SIR 2013 5090]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	31	square miles	0.21	7380
STREAM_VARG	Streamflow Variability Index from Grid	0.55	dimensionless	0.273	0.926

Low-Flow Statistics Flow Report [LowFlow Region 2 SIR 2013 5090]

Statistic	Value	Unit
1 Day 10 Year Low Flow	0.317	ft ³ /s
2 Day 10 Year Low Flow	0.353	ft ³ /s
3 Day 10 Year Low Flow	0.368	ft ³ /s
7 Day 10 Year Low Flow	0.413	ft ³ /s
10 Day 10 Year Low Flow	0.441	ft ³ /s
30 Day 10 Year Low Flow	0.556	ft ³ /s
60 Day 10 Year Low Flow	0.734	ft ³ /s

Low-Flow Statistics Citations

Southard, R.E., 2013, Computed statistics at streamgages, and methods for estimating low-flow frequency statistics and development of regional regression equations for estimating low-flow frequency statistics at ungaged locations in Missouri: U.S. Geological Survey Scientific Investigations Report 2013-5090, 28 p. (<http://pubs.usgs.gov/sir/2013/5090/>)

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

USGS Software Disclaimer: This software has been approved for release by the U.S. Geological Survey (USGS). Although the software has been subjected to rigorous review, the USGS reserves the right to update the software as needed pursuant to further analysis and review. No warranty, expressed or implied, is made by the USGS or the U.S. Government as to the functionality of the software and related material nor shall the fact of release constitute any such warranty. Furthermore, the software is released on condition that neither the USGS nor the U.S. Government shall be held liable for any damages resulting from its authorized or unauthorized use.

USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.29.2

StreamStats Services Version: 1.2.22

NSS Services Version: 2.2.1

- **Appendix G: DO modeling**

7. DISSOLVED OXYGEN MODEL

10 CSR 20-7.031 establishes dissolved oxygen criterion for warm water aquatic life habitats to be a minimum of 5.0 mg/L. Dissolved oxygen is not a direct POC in wastewater; however, BOD₅, TSS, and ammonia in the WWTF effluent may have an impact on receiving stream dissolved oxygen concentrations. Dissolved oxygen modeling confirms if the proposed BOD₅, TSS, and ammonia limits are protective of the receiving stream dissolved oxygen criterion. The July ammonia WQBELs and Ozark Highland Ecoregion default values are equivalent to the TBELs and serve as the basis for modeling.

7.1 Model Inputs

A Level I Streeter-Phelps dissolved oxygen spreadsheet model was developed to evaluate if effluent limitations for the LFECWD WWTF are protective of the warm water aquatic life designated use. The model simulates steady-state dissolved oxygen concentrations in the receiving stream reach, with width and depth inputs suggested by the Mannings velocity equation. Model inputs and assumptions are discussed in detail below.

7.1.1 Facility Discharge Information

LFECWD WWTF discharge information is summarized below in **Figure 2**.

- The DAF is 0.1183 MGD or 0.183 cfs.
- The carbonaceous biochemical oxygen demand (CBOD₅) was set at 30.0 mg/L, equivalent to the AWL.
 - BOD₅ values determined by adding 5.0 mg/L to the CBOD₅ value per 10 CSR 20-7.015; therefore, the base case BOD₅ AWL value is 35.0 mg/L.
- Effluent dissolved oxygen was set equal to 5.0 mg/L.
- Effluent ammonia concentration of 3.4 mg/L simulates the July MDL using the 2013 ammonia criteria at 26.5 C water temperature and 7.8 S.U. pH.

INPUT		
1. EFFLUENT CHARACTERISTICS	▼	
Discharge (cfs):	▼	0.183
CBOD ₅ (mg/L):	▼	30
Ammonia as Nitrogen (mg/L):	▼	3.4
NBOD (mg/L):	▼	15.538
Dissolved Oxygen (mg/L):	▼	5
Temperature (deg C):	▼	26.5

FIGURE 2: Model Facility Discharge Information

7.1.2 Receiving Stream Information

Establishment Creek maintains permanent flow that supports aquatic life as presented in **Section 2**. Therefore, an upstream flow of 0.413 cfs equivalent to the USGS stream stats model 7Q10 low flow value was used. Hydrogeometry and transport inputs (**Figure 3**) are described as follows:

- Slope: The average stream slope, as estimated using geographic information system/light detection and ranging data, is -0.004.
- Velocity: The reach average stream velocity was calculated by the model to be 0.57 feet per second.
- Elevation: The elevation was set equal to 440 feet (ft).
- Width & Depth: Values of 10.4 ft width and 0.1 ft depth were based on estimations suggested by the model.
- Establishment Creek flow downstream of Outfall #001 was calculated by summing the 7Q10 USGS low flow and the LFECWD WWTF design average flow:
- Reaeration Rates: Reaeration values were calculated using different methods and the minimum calculated reaeration rate was used (**Figure 3**)
- BOD₅ Decay Rate: Value was left at MDNR model default.

2. RECEIVING WATER CHARACTERISTICS

Upstream Discharge (cfs):	0.413
Upstream CBOD5 (mg/L):	1.0
Upstream NBOD (mg/L):	0.457
Upstream Dissolved Oxygen (mg/L):	5
Upstream Temperature (deg C):	26.2
Elevation (ft NGVD):	435
Downstream Average Channel Slope (ft/ft):	0.0040
Downstream Average Channel Depth (ft):	0.1
Downstream Average Channel Velocity (fps):	0.572751896

3. REAERATION RATE (Base e) AT 20 deg C (day⁻¹): **Applicable value below here:**

15.82

Reference	Applic. Vel (fps)	Applic. Dep (ft)	Suggested Values
Churchill	1.5 - 6	2 - 50	318.37
O'Connor and Dobbins	.1 - 1.5	2 - 50	310.16
Owens	.1 - 6	1 - 2	1052.67
Tsivoglou-Wallace	.1 - 6	.1 - 2	15.82
Melching Flores			72.41

4. BOD DECAY RATE (Base e) AT 20 deg C (day⁻¹):

2.19

Reference	Suggested Value
Wright and McDonnell, 1979	2.01

FIGURE 3: Model Receiving Stream and Rates Information

7.2 Model Outputs

Based on model inputs described above, the preferred alternative for the LFECWD WWTF upgrade and Outfall #001 relocation will maintain and protect downstream warm water aquatic life designated uses of Establishment Creek. The minimum dissolved oxygen concentration of 5.0 mg/L occurs at the Outfall #001 discharge and immediately increases dissolved oxygen as the effluent travels downstream (**Figure 4**). The model will be provided to the MDNR upon request.

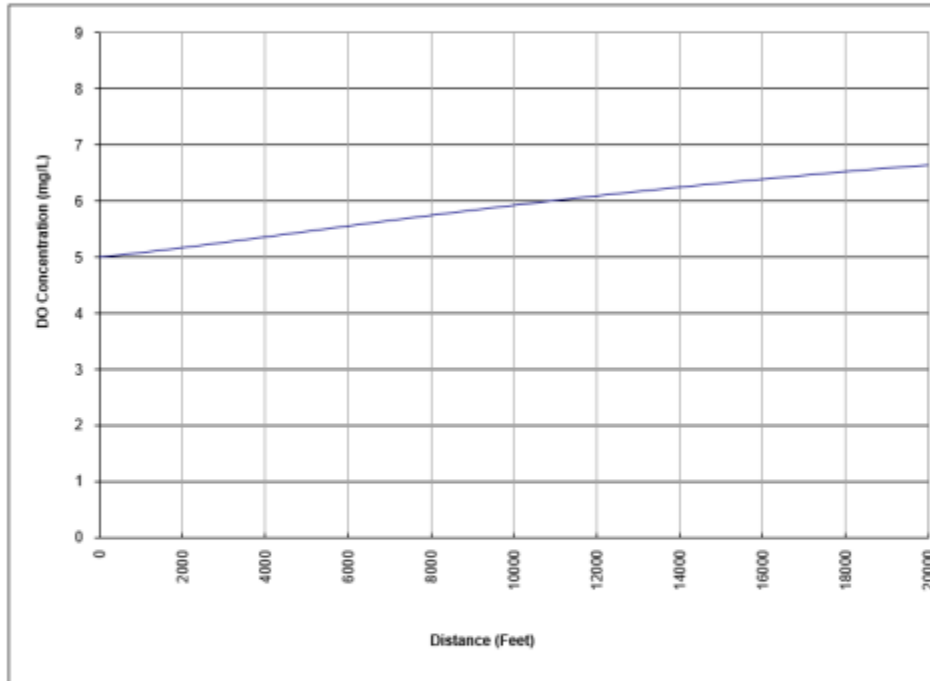


FIGURE 4: Model Dissolved Oxygen Curve



MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM
**APPLICATION FOR CONSTRUCTION PERMIT –
WASTEWATER TREATMENT FACILITY**

FOR DEPARTMENT USE ONLY	
APP NO.	CP NO.
FEE RECEIVED	CHECK NO.
DATE RECEIVED	

APPLICATION OVERVIEW

The Application for Construction Permit – Wastewater Treatment Facility form has been developed in a modular format and consists of Part A and B. **All applicants must complete Part A.** Part B should be completed for applicants who currently land-apply wastewater or propose land application for wastewater treatment. **Please read the accompanying instructions before completing this form. Submittal of an incomplete application may result in the application being returned.**

PART A – BASIC INFORMATION

1.0 APPLICATION INFORMATION (Note – If any of the questions in this section are answered NO, this application may be considered incomplete and returned.)

- 1.1 Is this a Federal/State funded project? ☒ YES ☐ N/A Funding Agency: USDA Project #: N/A
- 1.2 Has the Missouri Department of Natural Resources approved the proposed project's antidegradation review?
☒ YES Date of Approval: 4/1/26 ☐ N/A
- 1.3 Has the department approved the proposed project's facility plan*?
☒ YES Date of Approval: 4/12/21 ☐ NO (If No, complete No. 1.4.)
- 1.4 [Complete only if answered No on No. 1.3.] Is a copy of the facility plan* for wastewater treatment facilities included with this application?
☐ YES ☐ NO ☐ Exempt because _____
- 1.5 Is a copy of the appropriate plans* and specifications* included with this application?
☒ YES Denote which form is submitted: ☒ Hard copy ☒ Electronic copy (See instructions.) ☐ NO
- 1.6 Is a summary of design* included with this application? ☒ YES ☐ NO
- 1.7 Has the appropriate operating permit application (A, B, or B2) been submitted to the department?
☐ YES Date of submittal: _____
☐ Enclosed is the appropriate operating permit application and fee submittal. Denote which form: ☐ A ☐ B ☐ B2
☒ N/A: However, In the event the department believes that my operating permit requires revision to permit limitation such as changing equivalent to secondary limits to secondary limits or adding total residual chlorine limits, please share a draft copy prior to public notice? ☒ YES ☐ NO
- 1.8 Is the facility currently under enforcement with the department or the Environmental Protection Agency? ☐ YES ☒ NO
- 1.9 Is the appropriate fee or JetPay confirmation included with this application? ☐ YES ☐ NO
See Section 7.0

* Must be affixed with a Missouri registered professional engineer's seal, signature and date.

2.0 PROJECT INFORMATION

2.1 NAME OF PROJECT Wastewater System Improvements	2.2 ESTIMATED PROJECT CONSTRUCTION COST \$ 7,395,415.00
2.3 PROJECT DESCRIPTION Modification of existing aerated lagoon into Sequencing Batch Reactor with UV disinfection and effluent pumping. Effluent to be pumped through forcemain to Establishment Creek.	
2.4 SLUDGE HANDLING, USE AND DISPOSAL DESCRIPTION Storage digester with land application as needed.	
2.5 DESIGN INFORMATION A. Current population: <u>773</u> ; Design population: <u>935</u> B. Actual Flow: <u>111,3</u> gpd; Design Average Flow: <u>118,3</u> gpd; Actual Peak Daily Flow: <u>556,0</u> gpd; Design Maximum Daily Flow: <u>500,0</u> gpd; Design Wet Weather Event: <u>500,0</u>	
2.6 ADDITIONAL INFORMATION A. Is a topographic map attached? ☒ YES ☐ NO B. Is a process flow diagram attached? ☒ YES ☐ NO	

3.0 WASTEWATER TREATMENT FACILITY				
NAME Lake Forest Estates Clean Water District WWTF		TELEPHONE NUMBER WITH AREA CODE 573-483-9833		E-MAIL ADDRESS lfecwd.office@gmail.com
ADDRESS (PHYSICAL) 13100 Lakewood Drive	CITY Ste. Genevieve	STATE MO	ZIP CODE 63670	COUNTY Ste. Genevieve
Wastewater Treatment Facility: Mo- 0035742 (Outfall 1 Of 1)				
3.1 Legal Description: _____ ¼, _____ ¼, _____ ¼, Sec. _____, T _____, R _____ Land Grant 2046, Ste. Genevieve Co. (Use additional pages if construction of more than one outfall is proposed.)				
3.2 UTM Coordinates Easting (X): 745263 Northing (Y): 4204623 For Universal Transverse Mercator (UTM), Zone 15 North referenced to North American Datum 1983 (NAD83)				
3.3 Name of receiving streams: <u>Establishment Creek</u>				
4.0 PROJECT OWNER				
NAME Lake Forest Estates Clean Water District		TELEPHONE NUMBER WITH AREA CODE 573-483-9833		E-MAIL ADDRESS lfecwd.office@gmail.com
ADDRESS 13765 Lakewood Drive	CITY Ste. Genevieve	STATE MO	ZIP CODE 63670	
5.0 CONTINUING AUTHORITY: A continuing authority is a company, business, entity or person(s) that will be operating the facility and/or ensuring compliance with the permit requirements.				
NAME Same as above		TELEPHONE NUMBER WITH AREA CODE		E-MAIL ADDRESS
ADDRESS	CITY	STATE	ZIP CODE	
5.1 A letter from the continuing authority, if different than the owner, is included with this application. ☐ YES ☐ NO ☒ N/A				
5.2 COMPLETE THE FOLLOWING IF THE CONTINUING AUTHORITY IS A MISSOURI PUBLIC SERVICE COMMISSION REGULATED ENTITY.				
A. Is a copy of the certificate of convenience and necessity included with this application? ☐ YES ☐ NO				
5.3 COMPLETE THE FOLLOWING IF THE CONTINUING AUTHORITY IS A PROPERTY OWNERS ASSOCIATION.				
A. Is a copy of the as-filed restrictions and covenants included with this application? ☐ YES ☐ NO				
B. Is a copy of the as-filed warranty deed, quitclaim deed or other legal instrument which transfers ownership of the land for the wastewater treatment facility to the association included with this application? ☐ YES ☐ NO				
C. Is a copy of the as-filed legal instrument (typically the plat) that provides the association with valid easements for all sewers included with this application? ☐ YES ☐ NO				
D. Is a copy of the Missouri Secretary of State's nonprofit corporation certificate included with this application? ☐ YES ☐ NO				
6.0 ENGINEER				
ENGINEER NAME / COMPANY NAME Richard Cochran, Jr./ Waters Engineering, Inc.		TELEPHONE NUMBER WITH AREA CODE 573-471-5680		E-MAIL ADDRESS rcochran@waterseng.com
ADDRESS P.O. Box 567	CITY Sikeston	STATE MO	ZIP CODE 63801	
7.0 APPLICATION FEE				
☐ CHECK NUMBER ☐ JETPAY CONFIRMATION NUMBER				
8.0 PROJECT OWNER: I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, 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 and imprisonment for knowing violations.				
PROJECT OWNER SIGNATURE 				
PRINTED NAME Mark Basler			DATE 04/02/36	
TITLE OR CORPORATE POSITION Chairman		TELEPHONE NUMBER WITH AREA CODE 573-483-9833		E-MAIL ADDRESS lfecwd.office@gmail.com
Mail completed copy to: MISSOURI DEPARTMENT OF NATURAL RESOURCES WATER PROTECTION PROGRAM P.O. BOX 176 JEFFERSON CITY, MO 65102-0176				
END OF PART A.				
REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHETHER PART B NEEDS TO BE COMPLETE.				

PART B – LAND APPLICATION ONLY**(Submit only if the proposed construction project includes land application of wastewater.)****8.0 FACILITY INFORMATION**

8.1 Type of wastewater to be irrigated: ☐ Domestic ☐ State/National Park ☐ Seasonal business
☐ Municipal ☐ Municipal with a pretreatment program or significant industrial users
☐ Other (explain) _____

8.2 Months when the business or enterprise will operate or generate wastewater:
☐ 12 months per year ☐ Part of the year (list months): _____

8.3 This system is designed for:
☐ No-discharge.
☐ Partial irrigation when feasible and discharge rest of time.
☐ Irrigation during recreational season, April – October, and discharge during November – March.
☐ Other (explain) _____.

9.0 STORAGE BASINS

9.1 Number of storage basins: _____ (Use additional pages if greater than three basins.)

9.2 Type of basins: ☐ Steel ☐ Concrete ☐ Fiberglass ☐ Earthen ☐ Earthen with membrane liner

9.3 Storage basin dimensions at inside top of berm (feet). Report freeboard as feet from top of berm to emergency spillway or overflow pipe.

Basin #1:	Length _____	Width _____	Depth _____	Freeboard _____	Depth _____	Safety _____	% Slope _____
Basin #2:	Length _____	Width _____	Depth _____	Freeboard _____	Depth _____	Safety _____	% Slope _____
Basin #3:	Length _____	Width _____	Depth _____	Freeboard _____	Depth _____	Safety _____	% Slope _____

9.4 Storage Basin operating levels (report as feet below emergency overflow level).

Basin #1:	Maximum operating water level _____ ft	Minimum operating water level _____ ft
Basin #2:	Maximum operating water level _____ ft	Minimum operating water level _____ ft
Basin #3:	Maximum operating water level _____ ft	Minimum operating water level _____ ft

9.5 Design depth of sludge in storage basins.

Basin #1: _____ ft Basin #2: _____ ft Basin #3: _____ ft

9.6 Existing sludge depth, if the basins are currently in operation.

Basin #1: _____ ft Basin #2: _____ ft Basin #3: _____ ft

9.7 Total design sludge storage: _____ dry tons and _____ cubic feet

10.0 LAND APPLICATION SYSTEM

10.1 Number of irrigation sites _____ Total Acres _____ Maximum % field slopes _____
Location: _____ ¼, _____ ¼, _____ ¼, _____ Sec. _____ T _____ R _____ County _____ Acres
Location: _____ ¼, _____ ¼, _____ ¼, _____ Sec. _____ T _____ R _____ County _____ Acres
Location: _____ ¼, _____ ¼, _____ ¼, _____ Sec. _____ T _____ R _____ County _____ Acres
(Use additional pages if greater than three irrigation sites.)

10.2 Type of vegetation: ☐ Grass hay ☐ Pasture ☐ Timber ☐ Row crops
☐ Other (describe) _____

10.3 Wastewater flow (dry weather) gallons per day: Average annual _____ Seasonal _____ Off-season _____

10.4 Land application rate (design flow including 1-in-10 year storm water flows):

Design:	_____ inches/year	_____ inches/hour	_____ inches/day	_____ inches/week
Actual:	_____ inches/year	_____ inches/hour	_____ inches/day	_____ inches/week

10.5 Total irrigation per year (gallons): Design: _____ gal Actual: _____ gal

10.6 Actual months used for irrigation (check all that apply):

☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec

10.7 Land application rate is based on:

☐ Hydraulic Loading ☐ Other (describe) _____
☐ Nutrient Management Plan (N&P) If N&P is selected, is the plan included? ☐ YES ☐ NO