Permit No. CP0002543

STATE OF MISSOURI

DEPARTMENT OF NATURAL RESOURCES

MISSOURI CLEAN WATER COMMISSION

CONSTRUCTION PERMIT

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

YOUNG LIFE
Clearwater Cove Young Life WWTF
2565 State Highway H
Lampe, MO 65681

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.

September 19, 2025
Effective Date

September 18, 2027
Expiration Date

Heather Peters, Director, Water Protection Program

CONSTRUCTION PERMIT

I. CONSTRUCTION DESCRIPTION

Construction and installation of a coarse screen headworks, two Fluence Aspiral L3 Membrane Aerated Biofilm Reactor (MABR) units, one Aspiral clarifier container with tertiary filter, and UV disinfection unit. The existing concrete basin which contains a membrane bioreactor (MBR) unit will be altered to contain both a flow equalization tank, and an aerated sludge holding basin. The design average flow of the facility is 37,000 gallons per day (gpd) to accommodate peak camp usage, but the anticipated average flow will be 15,000 gpd. The existing treatment components will be decommissioned except for the concrete tanks and the UV disinfection system which will be utilized for disinfection.

This is a **DEMONSTRATION** project and additional monitoring requirements are included in the operating permit in accordance with the Approval Process for Innovative Technology Factsheet and 10 CSR 20-6.010(5). After the one-year demonstration period an engineering report detailing the performance of the facility must be submitted to the department for review.

A closure plan will need to be submitted to the Southwest Regional Office for review and approval prior to any closure activities of the components of the decommissioned membrane bioreactor plant.

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 not required to complete a cost analysis for compliance because the facility is not a combined or separate sanitary sewer system for a publicly-owned treatment works.

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 Gary Lee, P.E., with Lee and Company, LLC, 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 Southwest 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 one 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. A United States Army Corps of Engineers (USACE) Clean Water Act Section 404 Department of the Army permit and a Section 401 Water Quality Certification issued by the department may be required for the activities described in this permit. This permit is not valid until these requirements are satisfied or notification is provided that no Section 404 permit is required by the USACE. You must contact your local USACE district since they determine what waters are jurisdictional and which permitting requirements may apply. You may call the department's Water Protection Program, Operating Permits Section at 573-522-4502 for more information. See https://dnr.mo.gov/water/business-industry-other-entities/permits-certification-engineering-fees/section-401-water-quality for more information.

7. In accordance with 10 CSR 20-6.010(12), a full closure plan shall be submitted to the department's Southwest Regional Office for review and approval of any permitted wastewater treatment system being replaced. The closure plan must meet the requirements outlined in Standard Conditions Part III of the Missouri State Operating Permit No. MO-0137774. Closure shall not commence until the submitted closure plan is approved by the department.

8. 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 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 300 feet. 10 CSR 20-8.140(2)(C)1.

    - 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 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.

    - 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)

    - A means of flow measurement shall be provided at all wastewater treatment facilities. 10 CSR 20-8.140(7)(E)

    - Effluent 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:
        - Where continuous ventilation is needed (e.g., housed facilities), provide at least 12 complete air changes per hour. Where continuous ventilation would cause excessive heat loss, provide intermittent ventilation of at least 30 complete air changes per hour when facility personnel enter the area. Base air change demands on 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 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)

- The materials utilized for storage, piping, valves, pumping, metering, and splash guards, etc., for chemical handling, shall be specially selected considering the physical and chemical characteristics of each hazardous or corrosive chemical. 10 CSR 20-8.140(9)(A)1.

- Secondary containment storage areas contain the stored volume of chemical until it can be safely transferred to alternate storage or released to the wastewater treatment plant at controlled rates that will not damage the facilities, inhibit the treatment processes, or contribute to stream pollution. Secondary containment shall be designed as follows:
  - A minimum volume of 125% of the volume of the largest storage container located within the containment area plus the space occupied by any other tanks located within the containment area when not protected from precipitation; 10 CSR 20-8.140(9)(A)2.A.
  - A minimum volume of one hundred 110% of the volume of the largest storage container located within the containment area plus the space occupied by any other tanks located within the containment area when protected from precipitation; 10 CSR 20-8.140(9)(A)2.B.
  - Walls and floors of the secondary containment structure constructed of suitable material that is compatible with the specifications of the product being stored. 10 CSR 20-8.140(9)(A)2.C.

- All pumps or feeders for hazardous or corrosive chemicals shall have guards that will effectively prevent spray of chemicals into space occupied by facility personnel. 10 CSR 20-8.140(9)(A)3.

- All piping containing or transporting corrosive or hazardous chemicals shall be identified with labels every ten feet (10') and with at least two labels in each room, closet, or pipe chase. 10 CSR 20-8.140(9)(A)4.A.

- All connections (flanged or other type), except those adjacent to storage or feeder areas, shall have guards that will direct any chemical leakage away from space occupied by facility personnel. 10 CSR 20-8.140(9)(A)4.B.

- Facilities shall be provided for automatic shutdown of pumps and sounding of alarms when failure occurs in a pressurized chemical discharge line. 10 CSR 20-8.140(9)(A)5.

- Dust collection equipment shall be provided to protect facility personnel from dusts injurious to the lungs or skin and to prevent polymer dust from settling on walkways that become slick when wet. 10 CSR 20-8.140(9)(A)6.

- The following shall be provided to fulfill the particular needs of each chemical housing facility:
    - Provide storage for a minimum of 30 days' supply, unless local suppliers and conditions indicate that such storage can be reduced without limiting the supply; 10 CSR 20-8.140(9(B) 1.
    - Construct the chemical storage room of fire and corrosion resistant material; 10 CSR 20-8.140(9)(B)2.
    - Equip doors with panic hardware. To prevent unauthorized access, doors lock but do not need a key to exit the locked room using the panic hardware; 10 CSR 20-8.140(9)(B)3.
    - Provide chemical storage areas with drains, sumps, finished water plumbing, and the hose bibs and hoses necessary to clean up spills and to wash equipment; 10 CSR 20-8.140(9)(B)4.
    - Construct chemical storage area floors and walls of material that is suitable to the chemicals being stored and that is capable of being cleaned; 10 CSR 20-8.140(9)(B)5.
    - Install floor surfaces to be smooth, chemical resistant, slip resistant, and well drained with three inches per ten feet minimum slope; 10 CSR 20-8.140(9)(B)6.
    - Provide adequate lighting; 10 CSR 20-8.140(9)(B)7.
    - Comply with the NEC recommendation for lighting and electrical equipment based on the chemicals stored. 10 CSR 20-8.140(9)(B)8.
    - Store chemical containers in a cool, dry, and well-ventilated area; 10 CSR 20-8.140(9)(B)9.
    - Design vents from feeders, storage facilities, and equipment exhaust to discharge to the outside atmosphere above grade and remote from air intakes; 10 CSR 20-8.140(9)(B)10.
    - Locate storage area for chemical containers out of direct sunlight; 10 CSR 20-8.140(9)(B)11.
    - Maintain storage temperatures in accordance with relevant Material Safety Data Sheets (MSDS). 10 CSR 20-8.140(9)(B)12.
    - Control humidity as necessary when storing dry chemicals; 10 CSR 20-8.140(9) (B)13.
    - Design the storage area with designated areas for "full" and "empty" chemical containers; 10 CSR 20-8.140(9)(B)14.
    - Provide storage rooms housing flammable chemicals with an automatic sprinkler system designed for 0.4 gallons per minute per square foot (gpm/ft^2) and a minimum duration of 20 minutes; 10 CSR 20-8.140(9)(B)15.

- Store incompatible chemicals separately to ensure the safety of facility personnel and the wastewater treatment system. Store any two chemicals that can react to form a toxic gas in separate housing facilities; 10 CSR 20-8.140(9)(B)16.
- Design an isolated fireproof storage area and explosion proof electrical outlets, lights, and motors for all powdered activated carbon storage and handling areas in accordance with federal, state, and local requirements; 10 CSR 20-8.140(9)(B)18.
- Vent acid storage tanks to the outside atmosphere, but not through vents in common with day tanks; 10 CSR 20-8.140(9)(B)19.
- Keep concentrated acid solutions or dry powder in closed, acid-resistant shipping containers or storage units; 10 CSR 20-8.140(9)(B)20.
- Pump concentrated liquid acids in undiluted form from the original container to the point of treatment or to a covered storage tank. Do not handle in open vessels. 10 CSR 20-8.140(9)(B)21.

- The following shall be provided, where applicable, for the design of chemical handling:
  - Make provisions for measuring quantities of chemicals used for treatment or to prepare feed solutions over the range of design application rates; 10 CSR 20-8.140(9)(C)1.
  - Select storage tanks, piping, and equipment for liquid chemicals specific to the chemicals; 10 CSR 20-8.140(9)(C)2.
  - Install all liquid chemical mixing and feed installations on corrosion resistant pedestals; 10 CSR 20-8.140(9)(C)3.
  - Provide sufficient capacity of solution storage or day tanks feeding directly for 24- hour operation at design average flow; 10 CSR 20-8.140(9)(C)4.
  - Provide a minimum of two chemical feeders for continuous operability. Provide a standby unit or combination of units of sufficient capacity to replace the largest unit out-of-service; 10 CSR 20-8.140(9)(C)5.
  - Chemical feeders shall—
    - Be designed with chemical feed equipment to meet the maximum dosage requirements for the design average flow conditions; 10 CSR 20-8.140(9) (C)6.A.
    - Be able to supply, at all times, the necessary amounts of chemicals at an accurate rate throughout the range of feed; 10 CSR 20-8.140(9)(C)6.B.
    - Provide proportioning of chemical feed to the rate of flow where the flow rate is not constant; 10 CSR 20-8.140(9)(C)6.C.
    - Be designed to be readily accessible for servicing, repair, and observation; 10 CSR 20-8.140(9)(C)6.D.
    - Protect the entire feeder system against freezing; 10 CSR 20-8.140(9)(C)6. E.
    - Be located adjacent to points of application to minimize length of feed lines; 10 CSR 20-8.140(9)(C)6.F.
    - Provide for both automatic and manual operation for chemical feed control systems; 10 CSR 20-8.140(9)(C)6.G.

- Utilize automatic chemical dose or residual analyzers, and where provided, include alarms for critical values and recording charts; 10 CSR 20-8.140 (9)(C)6.H.
- Provide screens and valves on the chemical feed pump suction lines; 10 CSR 20-8.140(9)(C)6.I.
- Provide an air break or anti-siphon device where the chemical solution enters the water stream; 10 CSR 20-8.140(9)(C)6.J.
- Dry chemical feed system shall—
  - Be equipped with a dissolver capable of providing a minimum retention period of five minutes at the maximum feed rate; 10 CSR 20-8.140(9)(C)7. A.
  - Be equipped with two solution vessels and transfer piping for polyelectrolyte feed installations; 10 CSR 20-8.140(9)(C)7.B.
  - Have an eductor funnel or other appropriate arrangement for wetting the polymer during the preparation of the stock feed solution on the makeup tanks; 10 CSR 20-8.140(9)(C)7.C.
  - Provide adequate mixing by means of a large diameter, low-speed mixer; 10 CSR 20-8.140(9)(C)7.D.
  - Make provisions to measure the dry chemical volumetrically or gravimetrically; 10 CSR 20-8.140(9)(C)7.E.
  - Completely enclose chemicals and prevent emission of dust; 10 CSR 20-8.140(9)(C)7.F.

- Provide for uniform strength of solution consistent with the nature of the chemical solution for solution tank dosing; 10 CSR 20-8.140(9)(C)8.
- Use solution feed pumps to feed chemical slurries that are not diaphragm or piston type positive displacement types; 10 CSR 20-8.140(9)(C)9.
- Provide continuous agitation to maintain slurries in suspension; 10 CSR 20-8.140 (9)(C)10.
- Provide a minimum of 2 flocculation tanks or channels having a combined detention period of 20 – 30 minutes. Provide independent controls for each tank or channel; 10 CSR 20-8.140(9)(C)11.
- Insulate pipelines carrying soda ash at concentrations greater than 20% solution to prevent crystallization; 10 CSR 20-8.140(9)(C)12.
- Prohibit bagging soda ash in a damp or humid place. 10 CSR 20-8.140(9)(C)13.

- The following chemical safety items shall be provided in addition to the safety provisions in section (8) of this rule:
  - Appropriate personal protective equipment (PPE). 10 CSR 20-8.140(9)(D)1.
  - Eye wash fountains and safety showers utilizing potable water shall be provided in the laboratory and on each level or work location involving hazardous or corrosive chemical storage, mixing (or slaking), pumping, metering, or transportation unloading. The design of eye wash fountains and safety showers shall include the following:
    - Eye wash fountains with water of moderate temperature, 50–90 degrees Fahrenheit (°F), suitable to provide 15–30 minutes of continuous irrigation of the eyes; 10 CSR 20-8.140(9) (D)2.A.

        - Emergency showers capable of discharging 20 gallons per minute (gpm) of water of moderate temperature, 50°–90°F, and at pressures of 30 to 50 pounds per square inch (psi); 10 CSR 20-8.140(9)(D)2.B.
        - Eye wash fountains and emergency showers located no more than 25 feet from points of hazardous chemical exposure; CSR 20-8.140 (9)(D)2.C.
        - Eye wash fountains and showers that are to be fully operable during all weather conditions; 10 CSR 20-8.140(9)(D)2.D.
    - Warning signs requiring use of goggles shall be located near chemical stations, pumps, and other points of frequent hazard. 10 CSR 20-8.140(9)(D)3.

- The identification and hazard warning data included on chemical shipping containers, when received, shall appear on all containers (regardless of size or type) used to store, carry, or use a hazardous substance. 10 CSR 20-8.140(9)(E)

- 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 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)

- Effective flow splitting devices and control appurtenances (*e.g.* gates and splitter boxes) shall be provided to permit proper proportioning of flow and solids loading to each settling unit, throughout the expected range of flows. 10 CSR 20-8.160(2)(B)

- Walls of settling tanks shall extend at least 6 inches above the surrounding ground surface and shall provide not less than 12 inches of freeboard. 10 CSR 20-8.160(3)(E)

- Safety features shall appropriately include machinery covers, life lines, handrails on all stairways and walkways, and slip resistant surfaces. For additional safety follow the provisions listed in 10 CSR 20-8.140(8). 10 CSR 20-8.160(5)(A)

- The design shall provide for convenient and safe access to routine maintenance items such as gear boxes, scum removal mechanism, baffles, weirs, inlet stilling baffle areas, and effluent channels. 10 CSR 20-8.160(5)(B)

- For electrical equipment, fixtures, and controls in enclosed settling basins and scum tanks, where hazardous concentrations of flammable gases or vapors may accumulate, follow the provisions in 10 CSR 20-8.140(7)(B). The fixtures and controls shall be conveniently located and safely accessible for operation and maintenance. 10 CSR 20-8.160(5)(C)

- Aerobic Solids Digestion High Level Emergency Overflow. An unvalved emergency overflow shall be provided that will convey digester overflow to the treatment plant headworks, the aeration process, or to another liquid sludge storage facility and that has an alarm for high level conditions. 10 CSR 20-8.170(5)

- For solids pumping systems, audio-visual alarms shall be provided in accordance with 10 CSR 20-8.140(7)(C) for:
    - Pump failure; 10 CSR 20-8.170(6)(A)
    - Pressure loss; 10 CSR 20-8.170(6)(B) and
    - High pressure. 10 CSR 20-8.170(6)(C)

- Dosing. Both timer and float switch controls are required; timers are the primary method of operation and the float switch control is a back-up. 10 CSR 20-8.180(3)(C)

- Emergency Power. Disinfection and dechlorination processes, when used, shall be provided during all power outages. 10 CSR 20-8.190(2)(A)

- Effluent 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.

- If no flow equalization is provided for a batch discharger, the UV dosage shall be based on the peak batch flow. 10 CSR 20-8.190(5)(A)2.

- 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 30,000 microwatt seconds per centimeters squared (µW • s/cm2). 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.

- 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.

9. Upon completion of construction:

    A. YOUNG LIFE will become the continuing 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 that the operating permit modification be issued.

IV. REVIEW SUMMARY

1. CONSTRUCTION PURPOSE

The existing Membrane Bioreactor treatment facility at Young Life is undersized for peak usage conditions and experiences clogging issues related to the headworks screen. The new MABR is larger and expected to provide improved ammonia and total nitrogen treatment and correct these issues.

2. FACILITY DESCRIPTION

The MABR system is new construction and is considered a demonstration project.

The Clearwater Cove Young Life WWTF is located at 2565 State Highway H, City of Lampe, in Stone County, Missouri. The facility has a design average flow of 37,000 gpd and serves a hydraulic population equivalent of approximately 370 people to accommodate peak usage conditions. Under normal usage conditions, flow is anticipated to be approximately 15,000 gpd.

3. COMPLIANCE PARAMETERS

The proposed project is required to meet final BOD_5 effluent limits of 10 mg/L monthly average and TSS effluent limits of 15 mg/L monthly average as established in the Antidegradation review dated January 2025.

As this is a demonstration project, for the first year of operation following construction, additional monitoring will be required at several sampling points across the system, before and after each unit process. See **APPENDIX - SAMPLING**.

The limits following the completion of construction will be applicable to the facility:

Parameter	Units	Monthly average limit
Biochemical Oxygen Demand$_5$	mg/L	10
Total Suspended Solids	mg/L	15
Ammonia as N-summer	mg/L	1.4
Ammonia as N-winter	mg/L	2.9
Total Phosphorus	mg/L	0.5
Total Nitrogen	mg/L	10
Oil and Grease	mg/L	10
pH	SU	6.5-9.0
Aluminum	ug/L	267.4
Iron	ug/L	816
E. coli	#/100mL	126

4. ANTIDEGRADATION

The department has reviewed the antidegradation report for this facility and issued the Water Quality and Antidegradation Review dated January 2025, due to an increase in design flow. See **APPENDIX – ANTIDEGRADATION**.

5. REVIEW of MAJOR TREATMENT DESIGN CRITERIA

- Components are designed for a Population Equivalent of 370 based on hydraulic loading to the system.

- Flow Equalization – Peak flow equalization is utilized to reduce the variability of influent wastewater flow. As a result, a consistent discharge to downstream treatment components is achieved and these processes may not have restricted capacity due to the peak hourly flow. The existing diurnal flow equalization tank in the Titan MBR plant is being expanded to 18,827 gallons. Water is dosed to the MABR unit via 3 HP duplex grinder pumps capable of operating at 170 gpm at 11 ft of head.

- Flow Measurement – Installation of accurate flow measurement devices will give the treatment facility a means of improved data analysis.
    - Electromagnetic Meter – An influent 4-inch electromagnetic flow meter shall measure the untreated wastewater between the equalization basin and the MABR units.

- Fine screen – Two mechanical fine screens will be implemented to control for fibrous material present in the current waste stream.
    - The existing mechanical augur with 3mm coarse screen will be reused in the new system to remove solids prior to the equalization basin.
    - A mechanical, rotating drum, fine screen with perforated openings of 1.5mm will be installed above the clarifier unit on the third treatment tank. The screen is self-cleaning by means of exterior scraper and interior backwash 50 psi jet. Water will pass through this screen between the equalization basin and the MABR units.

- MABR Packaged Treatment Unit – Installation of two parallel Fluence Aspiral L3 MABR units contained within standard 8.33 ft x 40 ft x 9.5 ft shipping containers. Each container is subdivided into fine sub-units. Three with membrane stacks, and two with low mixing aerators in each container.
    - From the dosing tank, water flows into the three MABR module compartments in series in each container. Each 4,300-gallon tank compartment is 8 ft x 9 ft x 8 ft. The aerated membrane stack sits in the center of this compartment, providing oxygen to the wastewater. Each membrane stack has an effective surface area of 5,059 ft^2. Air is diffused through the membrane stack from inside the membrane layers at a rate of 0.37 SCFM. Course bubbles are intermittently provided to promote mixing in the compartment.

- The remaining two units in each container are low dissolved oxygen aeration compartments in series. This is referred to as the conventional activated sludge chamber. The 4,300-gallon compartments are 8 ft x 9 ft x 8 ft each. 12 fine bubbles diffusers each provide 5 SCFM of air, for a total of 60 SCFM per train.

- Fluence Clarifier Unit – Installation of three Fluence Clarifiers and a Tertiary filter unit contained within standard a 8.5 ft x 40 ft x 9.5 ft shipping container. The container is subdivided into five units. Three with secondary clarifiers, one with selector basin, and one with a tertiary filter and optional chlorine dosing tank.
  - The first three compartments in the series are the secondary clarifier units. Each unit is 7.5 ft x 8.5 ft x 7.5 ft. The secondary clarifier utilizes a unique, center-fed circular weir design. The weir is 26.25 ft in length. The surface overflow rate is 216.7 gpd/sqft. The solids loading rate is 13.77 lbs/day/sqft at design average flow. No peak flow is anticipated due to attenuation in the equalization basin. Solids are removed from surface via scraper and chamber floor via sump. The side water depth is 8.25 ft. Alum will be dosed in this tank for chemical phosphorus removal.
  - The fourth compartment in the series is the tertiary media filter unit. This compartment is 8 ft x 9.5 ft x 9.5 ft. The compartment containing the filter unit is a dry compartment that also holds the chemical dosing pumps.
    - The filter unit has a 3.3-ft diameter and contains a 10-in thick gravel layer, and a 25-in thick sand layer. Two filters will be installed in parallel.
    - The process air blower is a 3-HP motor. One process blower will be utilized per MABR packaged unit. The blower supplies 22 lbs/day to the membrane stacks.
    - The mixing air blower is a 5.5 HP motor. One mixing blower will be utilized per MABR packaged unit. The blower supplies 173 lbs/day to the conventional activated sludge chambers.
  - The selector basin is located between the clarifiers and the media filter spatially, but wastewater enters this basin before treatment in the MABR units. The basin is 2.5 ft x 8.5 ft x 7.5 ft with a working volume of 792 gallons.

- WAS Feed – The WAS airlift pump will be capable of pumping 44 gpm at 40 ft of TDH with a 0.8-HP motor. The WAS pumps are utilized to pump WAS from the secondary clarifiers to the sludge holding basin.

- RAS Feed – The RAS feed is controlled by a telescopic valve which actuates water level in the clarifier.

- UV disinfection – The existing UV disinfection system will be utilized in the new facility during the recreation season.

- Emergency Power – A 255-kW standby diesel generator and automatic transfer switch will be provided to operate the treatment facility in event of power failure.

6. OPERATING PERMIT

Operating permit MO-0137774 will require a modification to reflect the construction activities. The modified Clearwater Cove YOUNG LIFE WWTF, MO-0137774, was successfully public noticed from July 21, 2025, to August 24, 2025, with no comments received to address the increase in design flow, change to sampling protocol, and innovative technology conditions. 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.

This facility does not meet the requirements of the MOGD, issued on July 1, 2025, for the following reason: this is a demonstration project.

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

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APPENDIX

- **Antidegradation**

Water Quality and Antidegradation Review

For the Protection of Water Quality,
and
Determination of Effluent Limits

Tributary to Table Rock Lake

Requested by
Gary Lee, P.E.
Lee & Company, LLC

For
Clearwater Cove WWTP
MO-0137774
Young Life

January 2025

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1. PURPOSE OF ANTIDEGRADATION REVIEW REPORT

An Antidegradation Review Request was submitted by Gary Lee, P.E. for Young Life Camp for the Clearwater Cove WWTP to evaluate an expansion of the wastewater treatment facility to serve additional cabins. The current system is designed to treat 18,500 gallons per day (gpd), and the new system will treat 37,000 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% 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); 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 determine that all pollutants of concern (POC), except for nutrients, require a demonstration of necessity (i.e., alternatives analysis) and a determination of social and economic importance in the absence of existing water quality data for the receiving lake. An alternatives analysis was conducted to fulfill the requirements of the Antidegradation Implementation Policy (AIP).

Due to the impairment of Table Rock Lake for chlorophyll-a and total Nitrogen, total Nitrogen and total Phosphorus are evaluated as non-degrading POCs.

The preferred treatment technology is a Membrane Aerated Biofilm Reactor (MABR). The MABR is considered an innovative technology by the department and will require increased influent and effluent monitoring during the first year of operation. The receiving waterbody is a tributary to Table Rock Lake. The proposed design flow is 37,000 gpd.

The following is a review of the *Wastewater Treatment Facility Antidegradation Review Report* for Clearwater Cove WWTP prepared by Gary Lee, P.E. of Lee & Company, L.L.C. dated October 5, 2023. This supersedes the previous Antidegradation reviews from July 29, 2013, and April 23, 2021.

2. PERFORMANCE BASED LIMITS

Table 2-1: Performance Based Limits

PARAMETER	Unit	Basis	Daily Maximum	Monthly Average
Flow	MGD	FSR	*	*
BOD_5	mg/L	TBEL	15	10
TSS	mg/L	TBEL	20	15
*Escherichia coli***	#/100mL	FSR	126	
Ammonia as N (Jan 1 – Mar 31) (Apr 1 – June 30) (Jul 1 – Sept 30) (Oct 1 – Dec 31)	mg/L	TBEL	 4.35 2.1 2.1 4.35	 2.9 1.4 1.4 2.9
Total Phosphorus	mg/L	NDEL	*	0.5
Total Nitrogen	mg/L	NDEL	*	10
Oil & Grease	mg/L	FSR	*	10
Aluminum	ug/L	WQBEL	750	267.4
Iron	ug/L	WQBEL	1,643	816
PARAMETER	Unit	Basis for Limits		Minimum/ Maximum
pH	SU	FSR		6.5-9.0

* - Monitoring requirement only

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

*** - Parameter not previously established in previous state operating permit.

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

PBL – Performance Based Limit FSR – Federal or State Regulation

BPJ – Best Professional Judgment

3. FACILITY INFORMATION

The Clearwater Cove WWTP is a treatment facility which serves the Clearwater Cove Camp by Young Life, primarily for under privileged children to learn about religion and building positive relationships with their peers. The camp is a non-for-profit and is operated by volunteers and employees.

Facility Name:	Clearwater Cove WWTP
Address:	3565 Highway H, Lampe
Permit #:	MO-0137774
County:	Stone
Facility Type:	Domestic
Owner:	Young Life
Continuing Authority:	Young Life
Sec. of State Charter No:	E00017084
UTM Coordinates:	X = 457716, Y = 4048902
Legal Description:	Sec. 30, T22N, R23W, Stone County
12 digit watershed:	110100011401
Ecological Drainage Unit:	Ozark

A. FACILITY PERFORMANCE HISTORY:

A review of the past 5 years of Discharge Monitoring Report data show exceedances in the following parameters:
TSS (11/30/2018, 02/28/2018),
Ammonia (02/28/2019, 06/30/2021, 06/30/2022, 06/30/2023),
Phosphorus (01/31/2018, 02/28/2018, 07/31/2018,09/30/2019, 03/31/2022, 03/31/2023),
Aluminum (01/31/2018, 02/28/2018, 06/30/2018, 09/30/2018, 10/31/2018, 11/30/2018, 02/28/2019, 04/30/2019, 09/30/2019, 03/31/2020, 06/30/2020, 12/31/2020, 03/31/2021, 03/31/2022, 06/30/2023)
Process changes to the Alum dosing will take place as part of the BMPs evaluated during this review.

B. NATURAL HERITAGE REVIEW

A Missouri department of Conservation Natural Heritage Review was obtained by the applicant. 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.
- At stream and drainage crossings, avoid erosion, silt introduction, petroleum or chemical pollution, and disruption or realignment of stream banks and beds.
- 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.
- Remove any trash, mud, plants, or animals from working equipment before moving to another site.

C. GEOHYDROLOGIC EVALUATION

A Geohydrologic Evaluation was submitted with the request and the receiving stream is gaining for discharge purposes (see Appendix B).

4. RECEIVING WATERBODY INFORMATION

A. RECEIVING WATERBODY

Table 4-1: Outfalls Table

OUTFALL	DESIGN FLOW (CFS)	TREATMENT LEVEL	EFFLUENT TYPE
001	0.057	Secondary	Domestic

Table 4-2: Receiving Stream(s)

WATER-BODY NAME	CLASS	WBID	DESIGNATED USES*	12-DIGIT HUC	DISTANCE TO CLASSIFIED SEGMENT (MI)
Little Indian Creek	-	5069	General Criteria	110100011401	0
Table Rock Lake	L	7313	AQL, HPP, IRR, LWW, SCR, WBC-A	110100011401	1.2

* **AHP** = Aquatic Habitat Protection - To ensure the protection and propagation of fish, shellfish, and wildlife. AHP is further subcategorized as: **WWH** = Warm Water Habitat; **CLH** = Cool Water Habitat; **CDH**= Cold Water Habitat; **EAH** = Ephemeral Aquatic Habitat; **MAH** = Modified Aquatic Habitat; **LAH** = Limited Aquatic Habitat; **DWS** = Drinking water supply; **GRW** = Groundwater; **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 4-3: Receiving Stream Segments

Receiving Water Body Segment Outfall #1:		
Upper end segment* UTM coordinates:	X = 457733 ; Y = 40488887	outfall
Lower end segment* UTM coordinates:	X = 457724 ; Y = 4049405	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.

B. LOSING STREAM ALTERNATIVE DISCHARGE LOCATION

Under 10 CSR 20-7.015(4) (A), discharges to losing stream shall be permitted only after other alternatives including land application, discharge to gaining stream and connection to a regional facility have been evaluated and determined to be unacceptable for environmental and/or economic reasons.

The current outfall discharges to a Tributary to Little Indian Creek, which is a losing segment at the outfall. There are no other gaining water bodies within five miles of the outfall. As discussed in 5B. below, land application and regionalization are not practical alternatives.

C. MIXING CONSIDERATIONS AND LOW FLOW VALUES

The proposed receiving waterbody is a Tributary of Little Indian Creek, which is a class C stream. The applicant elected to use USGS StreamStats to establish low flow values.

Table 4-4: Receiving Stream(s) Low-Flow Values

RECEIVING STREAM	LOW-FLOW VALUES (CFS)		
	1Q10	7Q10	30Q10
Little Indian Creek	0.0	0.0	0.0

I. MIXING CONSIDERATIONS

Mixing Zone: Not Allowed [10 CSR 20-7.031(5)(A)4.B.(I)(a)].

Zone of Initial Dilution: Not Allowed [10 CSR 20-7.031(5)(A)4.B.(I)(b)].

D. EXISTING WATER QUALITY

No existing water quality data was submitted. The facility discharges to a tributary to Table Rock Lake. Table Rock Lake is 303(d) listed for chlorophyll-a and Nitrogen.

Section 303(d) of the federal Clean Water Act requires that each state identify waters that are not meeting water quality standards and for which adequate water pollution controls have not been required. Water quality standards protect such beneficial uses of water as whole body contact (such as swimming), maintaining fish and other aquatic life, and providing drinking water for people, livestock and wildlife. The 303(d) list helps state and federal agencies keep track of waters that are impaired but not addressed by normal water pollution control programs.

- This facility is not considered to be a source of the above listed pollutant(s) or considered to contribute to the impairment of Table Rock Lake. Facilities under 100,000 gpd are not considered to be contributors to the impairment.
- Discharges in the watershed are required to meet a total monthly phosphorus effluent limit of 0.5 mg/L regardless of design flow.

E. RECEIVING WATER MONITORING REQUIREMENTS

No receiving water monitoring requirements recommended at this time.

5. ANTIDEGRADATION REVIEW INFORMATION

A. 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.

- Tier 1 Pollutants for this review include: total phosphorus and total nitrogen as Table Rock Lake is on the 2022 303(d) list for nutrient impairments.

  The proposed discharge is to Table Rock Lake, which is on the 2022 303(d) list for chlorophyll-a, and nitrogen. Chlorophyll-a is an indicator for total phosphorus and total nitrogen exceedances in the waterbody. The department has not developed a total maximum daily load (TMDL) for Table Rock Lake. Following the department's Nutrient Implementation Policy and 10 CSR 20-7.015(3), the proposed project has an effluent limit of 10 mg/L for total nitrogen and 0.5 mg/L for total phosphorus. Young Life plans to construct a new treatment facility capable of consistently meeting these effluent requirements. All technologies evaluated meet this requirement.

  While the treatment plant is designed to provide down to 0.5 mg/L there is still the potential when a TMDL is developed for Table Rock Lake, that the facility's permit may be reopened to establish more protective wasteload allocations.

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, oil and grease, aluminum, iron, 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 located at Table Rock Lake, 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).

Table 5-1: Pollutants of Concern and Tier Determinations

Pollutants of Concern	Tier	Review Type	Comment
Biological Oxygen Demand (BOD_5)/DO	2	Alternatives Analysis	
Total Suspended Solids (TSS)	2	Alternatives Analysis	
Ammonia as N	2	Alternatives Analysis	
Escherichia coli (E. coli)	2		Losing Stream
Oil and Grease	2	FSR	
Phosphorus, Total	1	Table Rock Lake 303(d) List	Table Rock Lake Watershed
Nitrogen, Total	1	Table Rock Lake 303(d) List	Nutrient Implementation Policy
Aluminum, Total Recoverable	2		
Iron, Total Recoverable	2		
pH	***	FSR	10 CSR 20-7.015(G)(3) applied

* Tier assumed.

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

*** Standards for these parameters are ranges.

B. NECESSITY OF DEGRADATION

The AIP specifies that if the proposed activity does result in a reduction by 10% 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% 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 the Membrane Aerated Biofilm Reactor (MABR) option.

II. REGIONALIZATION

The closest permitted treatment facility with adequate space to accept flows is the Kimberling City WWTF, located approximately 10 miles away on the other side of the lake. The estimate cost for construction of force main, acquiring easements, and lift station is $8,000,000. This option is not economically feasible or practicable.

III. NO DISCHARGE EVALUATION

Slopes in the site area are 4-15%, and the geohydrologic evaluation indicates the presence of karst geography and caves within the project area. Additionally, there are no neighbors with suitable land application space. The minimum required storage time for land application would be 75 days, resulting in a basin and field footprint of at least 21 acres. Due to site restrictions this option was deemed unpracticable.

IV. ALTERNATIVES TO NO DISCHARGE

ALTERNATIVE #1

Alternative 1 is to construct an Orenco AdvanTex Textile Filter system. A Blue pro upflow phosphorus filter would be included to meet lake nutrient criteria. The modular system is easy to modify if needed in the future. This option was not selected due to the improved treatment capabilities of the MABR system.

ALTERNATIVE #2

Alternative 2 is to construct a Titan Membrane Bioreactor (MBR). Operation and maintenance costs are higher, but capital cost is lower than the base case. This treatment technology would treat for phosphorus and have a smaller footprint than the base case system, but due to the cost this option was not chosen.

ALTERNATIVE #3

Alternative 3 is to construct a Aeromod extended aeration system. This treatment plant would have a higher operation and maintenance cost than the base case, as well as a larger footprint. The upside of this plant is that the operator would likely be more familiar with this technology, although the treatment consistency is lower than the base case. This option was not chosen due to the operating cost and construction requirements.

ALTERNATIVE #4 BASE CASE

Alternative 4 is to construct a Membrane Aerated Biofilm Reactor (MABR). This treatment option has a small plant footprint, and easy installation. The MABR technology supplies oxygen to the microbes without requiring wastewater to pass through a membrane, which is expected to perform better with the grinder pumps than the existing fixed film system. This option would require more operator attention, especially during the innovative design monitoring period during the first year. The MABR is economically affordable, making this the chosen alternative.

Table 5-2: Alternatives Analysis Comparison

Pollutant	Alternative 1 Orenco Textile Flter	Alternative 2 MBR	Alternative 3 Extended Aeration	Alternative 4 (Base Case) MABR
BOD_5	≤ 10 mg/l	≤ 10 mg/l	≤ 10 mg/l	≤ 10 mg/l
TSS	≤ 15 mg/l	≤ 15 mg/l	≤ 15 mg/l	≤ 15 mg/l
Ammonia as N	≤ 1.3 mg/l	≤ 1.3 mg/l	≤ 1.3 mg/l	≤ 1.3 mg/l
Escherichia coli (E. coli)	≤ 126 CFU/100ml	≤ 126 CFU/100ml	≤ 126 CFU/100ml	≤ 126 CFU/100ml
Phosphorus, Total	≤ 0.5 mg/l	≤ 0.5 mg/l	≤ 0.5 mg/l	≤ 0.5 mg/l
Nitrogen, Total	10 mg/l	10 mg/l	10 mg/l	10 mg/l
Aluminum, Total Recoverable	≤ 373.8 µg/l	≤ 373.8 µg/l	≤ 373.8 µg/l	≤ 373.8 µg/l
Iron, Total Recoverable	≤ 839.7 µg/l	≤ 839.7 µg/l	≤ 839.7 µg/l	≤ 839.7 µg/l
Life Cycle Cost**	$3,396,435	$3,699,000	$2,878,790	$2,827,000
Ratio	120%	131%	101%	100%
Practicable	Y	Y	Y	Y

* monitoring requirement

**Life cycle cost at 20 year design life and 6% interest

C. SOCIAL AND ECONOMIC IMPORTANCE

The Young Life Clearwater Cove Camp is a summer camp for Missouri youths, with an emphasis on under privileged kids. The camp also emphasizes sustainability and environmental responsibility. The social benefits of providing these children with unique experiences and relationships are felt all over Missouri, but the affected community is primarily the citizens of Stone and Taney County. The campground itself provides 42 job opportunities in the community, but additional camp expenditures will further benefit the local economy. The total estimated economic impact to be generated from this expansion is ~$31,670,000. After the proposed construction, the facility will serve up to 396 guests at once.

6. DERIVATION AND DISCUSSION OF PARAMETERS, LIMITS, AND PERFORMANCE BASED EFFLUENT LEVELS

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:

$$C = \frac{(C_s \times Q_s) + (C_e \times Q_e)}{(Q_e + Q_s)}$$ (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 BOD_5 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: Performance 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 BOD_5 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 BOD_5 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.

- **Biochemical Oxygen Demand (BOD_5).**
  Effluent limits of 10 mg/L average monthly and 15 mg/L average daily maximum 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(4) for losing stream dischargers.

- **Total Suspended Solids (TSS).**
  Effluent limits of 15 mg/L average monthly and 20 mg/L average daily maximum 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(4) for losing stream dischargers.

- ***Escherichia coli (E. coli).*** Effluent limits of 126 CFU per 100 mL monthly average and 630 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. Clearwater Cove WWTF will utilize UV irradiation for disinfection.
- **Total Ammonia Nitrogen.** Performance based effluent levels were established as a result of a discharging technology alternatives analysis conducted by the applicant.

  The proposed alternative analysis performance-based levels are:

Ammonia as N	Units	AML
1st Quarter (Jan-March)	mg/L	2.1
2nd Quarter (April-June)	mg/L	1.3
3rd Quarter (July-Sept)	mg/L	1.3
4th Quarter (Oct-Dec)	mg/L	2.1

To verify that the proposed alternative analysis performance-based levels 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 performance-based levels 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 6-1: Ammonia Criteria as of October 2024

Quarter	Temp (°C)*	pH (SU)*	Total Ammonia Nitrogen CCC (mg/L)	Total Ammonia Nitrogen CMC (mg/L)
1st Quarter (Jan-March)	11.0	7.8	3.1	12.1
2nd Quarter (April-June)	21.2	7.8	2.0	12.1
3rd Quarter (July-Sept)	26.0	7.8	1.5	12.1
4th Quarter (Oct-Dec)	15.5	7.8	2.9	12.1

* Ecoregion Data (Ozark Highlands)

WBQEL equation

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

1st Quarter

Chronic WLA: Ce = ((0.037+ 0.0)2.1 – (0.0 * 0.01))/ 0.037= 2.1 mg/L
Acute WLA: Ce = ((0.037+ 0.0)12.1 – (0.0 * 0.01))/ 0.037= 12.1 mg/L
AML = 2.1 mg/L
MDL = 12.1 mg/L

2nd Quarter

Chronic WLA: Ce = ((0.037+ 0.0)1.3 – (0.0 * 0.01))/ 0.037= 1.3 mg/L
Acute WLA: Ce = ((0.037+ 0.0)12.1 – (0.0 * 0.01))/ 0.037= 12.1 mg/L
AML = 1.3 mg/L
MDL = 12.1 mg/L

3rd Quarter

Chronic WLA: Ce = ((0.037+ 0.0)1.3 – (0.0 * 0.01))/ 0.037= 1.3 mg/L
Acute WLA: Ce = ((0.037+ 0.0)12.1 – (0.0 * 0.01))/ 0. 37= 12.1 mg/L
AML = 1.3 mg/L
MDL = 12.1 mg/L

4th Quarter

Chronic WLA: Ce = ((0.037+ 0.0)2.1 – (0.0 * 0.01))/ 0.037= 2.1 mg/L

Acute WLA: Ce = ((0.037+ 0.0)12.1 – (0.0 * 0.01))/ 0.037= 12.1 mg/L

AML = 2.1 mg/L

MDL = 12.1 mg/L

Table 6-2: Comparison of WQBEL and Performance Based Levels

Month	Monthly Average Limit	
	WQBEL (mg/L)	PBL (mg/L)
1st Quarter (Jan-March)	3.1	**2.1**
2nd Quarter (April-June)	2.0	**1.3**
3rd Quarter (July-Sept)	1.5	**1.3**
4th Quarter (Oct-Dec)	2.9	**2.1**

- **Oil & Grease.** Conventional pollutant, [10 CSR 20-7.031(4)(B)]. Waters shall be free from oil, scum, and floating debris in sufficient amounts to be unsightly or prevent full maintenance of beneficial uses.

- **Total Phosphorus.** The facility is located in the watershed of Table Rock Lake and must therefore meet the lake's phosphorus limit of 0.5 mg/L [10 CSR 20-7.015(3)]

- **Total Nitrogen.** The preferred alternative selected for ammonia treatment serves as the base case for total nitrogen and phosphorus. The applicant evaluated alternatives for total phosphorus and total nitrogen removal per the Lake Nutrient Implementation Policy and the knowledge that Table Rock Lake is on the 303(d) list for nutrient impairments. Effluent limits of 10 mg/L average monthly were established as a result of a discharging technology alternatives analysis conducted by the applicant. Total Nitrogen is calculated as Total Kjeldahl Nitrogen + Nitrate + Nitrite.

- **pH.** The preferred alternative selected for ammonia treatment serves as the base case for pH with effluent limit range of 6.5-9.0 SU. No mixing zone is allowed due to the classification of the receiving stream, therefore the water quality standard must be met at the outfall.

Metals.

Non-hardness Dependent Metals:

Note: Minimally degrading effluent limits were determined for these metals. Limits were determined using the method described in the beginning of the Derivation and Discussion of Limits of this section. These limits were compared to the reasonable potential analysis

to determined the need for limits or monitoring only upon renewal, these limits will be compared to the calculated receiving water concentration (from current discharge monitoring data) and applied if exceedances occur.

- **Aluminum, Total Recoverable.** Protection of Aquatic Life Chronic Criteria = 373.84 ug/L, Acute Criteria = 750 µg/L. This facility uses chemicals for phosphorous removal that may contain aluminum. A reasonable potential analysis was conducted and it has been determined that the facility has reasonable potential to exceed water quality standards for Aluminum (Total Recoverable). If no Aluminum was used in a given sampling period, an actual analysis is not necessary. Simply report as "0 µg/L".

- **Iron, Total Recoverable.** Protection of Aquatic Life Chronic Criteria = 1,643 µg/L, Acute Criteria = 819 ug/L. This facility has the potential to use chemicals for phosphorous removal that may contain iron. A reasonable potential analysis was conducted and it has been determined that the facility has reasonable potential to exceed water quality standards for Iron (Total Recoverable). If no iron was used in a given sampling period, an actual analysis is not necessary. Simply report as "0 µg/L".

Chronic WLA: $C_e = ((0.037+ 0.0)1{,}000 – (0.0 * 0.0))/ 0.037$
$C_e = 1{,}000$ µg/L

$LTA_C = 1{,}000\ (0.569) = 568.955$ µg/L [CV = 0.522, 99th Percentile]
MDL = 568.955 (2.776) = 1,579.4 µg/L [CV = 0.522, 99th Percentile]
AML = 568.955 (1.476) = 839.7 µg/L [CV = 0.522, 95th Percentile, n = 4]

7. 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 (WQBEL).
D. Effluent limitations derived from FSR may be WQBEL 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.

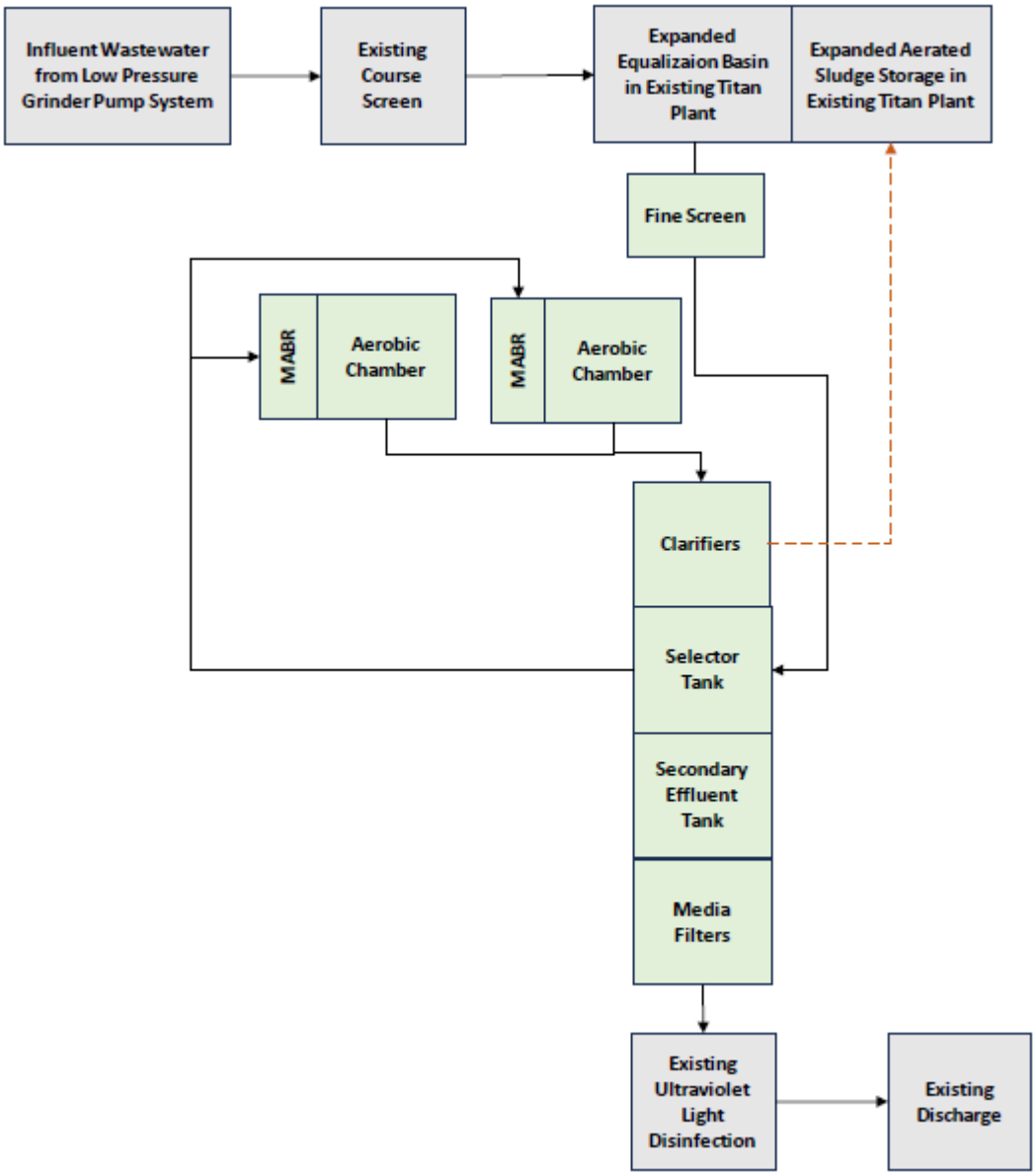
8. ANTIDEGRADATION REVIEW PRELIMINARY DETERMINATION

The proposed new facility discharge location will result in a reduction by 10% or more of the pollutant assimilative capacity of the tributary to Table Rock Lake. Construction of a new MABR treatment technology was determined to be the preferred alternative based on expected treatment capabilities, ease of installation, and footprint of the plant. The cost effectiveness and logistics of other discharging technologies as well as non-discharging alternatives was evaluated and found not to be cost effective or practicable.

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: Alex Bielefeldt
Date: January 2025
Reviewer: Cailie Carlile, P.E.

- **Process Flow Diagram**


Influent Wastewater from Low Pressure Grinder Pump System
Existing Course Screen
Expanded Equalizaion Basin in Existing Titan Plant
Expanded Aerated Sludge Storage in Existing Titan Plant
Fine Screen
MABR
Aerobic Chamber
MABR
Aerobic Chamber
Clarifiers
Selector Tank
Secondary Effluent Tank
Media Filters
Existing Ultraviolet Light Disinfection
Existing Discharge