

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES
MISSOURI CLEAN WATER COMMISSION



CONSTRUCTION PERMIT

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

City of Clever
Clever WWTP
0.25 miles southwest of S. Westgate Dr. & Old Wire Rd. intersection
Clever, MO 65631

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.

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.

October 17, 2024

Effective Date

November 16, 2026

Expiration Date


John Holte, Director, Water Protection Program

CONSTRUCTION PERMIT

I. CONSTRUCTION DESCRIPTION

The proposed construction includes an influent bar and mechanical screens, influent pump station, an additional oxidation ditch, two secondary clarifiers, tertiary filtration system, ultraviolet (UV) disinfection system, waste sludge holding basin, sludge transfer lift station, flow monitoring, upgrades to the chemical feed delivery system used for phosphorus reduction, replacement of the emergency generator at the laboratory building, and plant piping revisions. The proposed upgrades to the Clever Wastewater Treatment Plant (WWTP) will increase the capacity of the average daily flow to 460,000 gallons per day (gpd), which will treat project flow received by the plant. The capacity expansion will allow for the facility to treat projected flow and organic loadings that discharge to a tributary in the James River Basin.

This project will also include general site work appropriate to the scope and purpose of the project; removal and disposal of the existing spiral screen, gates and manually-cleaned bar screen, influent lift station and controls, existing emergency generator located at the laboratory building, existing flow diversion structure and equipment, existing earth mound located on the east side of the site; and all other appurtenant work to make a complete and usable wastewater treatment plant.

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.

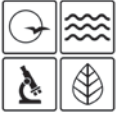
The department is not required to determine Cost Analysis for Compliance because the permit contains no new conditions or requirements that convey a new cost to the facility.

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 in accordance with the plans and specifications signed and sealed by Gary Shaffer, P.E. on February 8, 2024, submitted by Shaffer & Hines, Inc. on March 9, 2024, and approved by the department on October 17, 2024.
3. Regulation 10 CSR 20-4.040(18)(B)1 requires that projects be publicly advertised, allowing sufficient time for bids to be prepared and submitted. Projects should be advertised at least 30 days prior to bid opening.

4. The department must be contacted in writing prior to making any changes to the approved 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).
5. As per 10 CSR 20-4.040, all changes in contract price or time within the approved scope of work must be by change order in accordance with Section 19 of this rule.
6. 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 electronic Sanitary Sewer Overflow/Bypass Reporting system at <https://dnr.mo.gov/mogem/> or Southwest Regional Office per 10 CSR 20-7.015(9)(G).
7. 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.
8. A United States Army Corps of Engineers (USACE) Section 404 Department of Army permit (§404) along with the department's Section 401 Water Quality Certification or waiver (§401) may be required for the activities described in this permit. This permit is not valid until these requirements are satisfied. If construction activity will disturb any land below the ordinary high water mark of jurisdictional waters of the U.S., then a §404/§401 will likely be required. Since the USACE makes determinations on what is jurisdictional, you must contact the USACE to determine permitting requirements. See <https://dnr.mo.gov/water/business-industry-other-entities/permits-certification-engineering-fees/section-401-water-quality> for more information or you may contact the department's Water Protection Program at 573-522-4502, or wpsc401cert@dnr.mo.gov.
9. Upon completion of construction:
 - A. The City of Clever will become the continuing authority for operation and maintenance of these facilities;
 - B. Submit an electronic copy of the as-builts if the project was not constructed in accordance with previously submitted plans and specifications;
 - C. Submit the enclosed form 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. When the facility applies for their next operating permit renewal, they will be expected to include an updated facility description on their application.



WASTEWATER CONSTRUCTION STATEMENT OF WORK COMPLETED

PART A – BASIC INFORMATION – All applicants must complete Part A.

1. THIS FORM IS FOR:

- Construction is complete.
- Construction is substantially complete and operable. Expected date of completion: _____

2. ISSUANCE OF AN OPERATING PERMIT:

- Request issuance of the new/modified site-specific operating permit previously public noticed. MO-_____
- Request general operating permit at least 60 days prior to operation by submitting the appropriate application and fee.
MO-G _____; Form B or Form E;
- Appropriate fee or JetPay confirmation included with this application?
Check Number _____ JetPay confirmation number _____
- No issuance of a new/modified operating permit is necessary.

3. PROJECT INFORMATION

NAME OF THE PROJECT	ESTIMATED PROJECT CONSTRUCTION COST \$	FINAL PROJECT CONSTRUCTION COST \$
CONSTRUCTION PERMIT # CP	RECEIVING WASTEWATER TREATMENT FACILITY # MO-	DEPARTMENT FUNDED PROJECT #

4. RECORD DRAWINGS

- If construction is complete, an electronic copy of as-builts or record drawings is required and included with this form when:
- Non-department funded projects, in which changes from the previously submitted plans and specifications occurred.
- Department funded projects.
- N/A

5. CERTIFICATION: I hereby affirm, to the best of my knowledge and belief, based on inspections, observations, testing of the construction and upon reports submitted by others, that this wastewater project is substantially complete and operable. The construction was completed in accordance with the department's issued construction permit.

- Owner Owner's Designee Engineer

AUTHORIZED SIGNATURE	PRINTED NAME	DATE	
AFFILIATION	EMAIL ADDRESS	TELEPHONE NUMBER WITH AREA CODE	
ADDRESS	CITY	STATE	ZIP CODE

Mail completed form and any attachments to one of the following:

<p>For Non-department-Funded Projects:</p> <p>MISSOURI DEPARTMENT OF NATURAL RESOURCES WATER PROTECTION PROGRAM ATTN: ENGINEERING SECTION P.O. BOX 176 JEFFERSON CITY, MO 65102-0176</p>	<p>For Department-Funded Projects:</p> <p>MISSOURI DEPARTMENT OF NATURAL RESOURCES WATER PROTECTION PROGRAM ATTN: FINANCIAL ASSISTANCE CENTER P.O. BOX 176 JEFFERSON CITY, MO 65102-0176</p>
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END OF PART A.

PART B – DEPARTMENT-FUNDED PROJECTS: Submit only if the wastewater construction project involves department funding. Make additional copies of Part B for each contractor company if multiple contracts were awarded for the project.

CONSTRUCTION PERMIT #	DEPARTMENT FUNDED PROJECT #
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NAME OF THE PROJECT

6. CONTRACTOR COMPANY

CONTRACT NUMBER

NAME	TELEPHONE NUMBER WITH AREA CODE
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ADDRESS	CITY	STATE	ZIP CODE
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7. INSPECTIONS CONDUCTED BY ENGINEER

DATES AND NOTES OF CONSTRUCTION INSPECTIONS DURING CONSTRUCTION

PERCENT PROJECT COMPLETE	DATE OF FINAL INSPECTION IF COMPLETE
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8. ENGINEER: I hereby affirm, to the best of my knowledge and belief, based on inspections, observations, testing of the construction and upon reports submitted by others, that this wastewater project is substantially complete and operable. The construction was completed in accordance with the department's issued construction permit.

SIGNATURE	PRINTED NAME	DATE
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CONSULTING FIRM NAME	LICENSE # AND SEAL
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ADDRESS	LICENSE # AND SEAL
CITY	

CITY	STATE	ZIP CODE
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9. ADDENDA APPROVAL

ISSUED ADDENDUM #	DEPARTMENT APPROVAL DATE

10. CHANGE ORDER APPROVAL

EXECUTED CHANGE ORDER #	DEPARTMENT APPROVAL DATE

END OF PART B.

**INSTRUCTIONS FOR COMPLETING
WASTEWATER CONSTRUCTION STATEMENT OF WORK COMPLETED**

This form is for wastewater facilities that are complete or substantially complete and operable. This form requires an engineer to certify the wastewater facility is (substantially) complete and operable. Substantially complete and operable is the stage of construction when the project is sufficiently complete so that the project owner may use the project for its intended use.

New wastewater treatment facilities wishing to discharge shall obtain an operating permit from the department before any discharge occurs. Refer to 10 CSR 20-6.010.

Part A – Basic Information

1. Check the appropriate box and indicate the expected date of completion, if applicable.
2. Check the applicable box and associated MSOP number. Applicants for MOGD and MOG823 must fill out Form B - Application for Operating Permit for Domestic Wastewater (< 100,000 gallons per day), Form--MO 780-1512. For all other general operating permits, applicants must fill out Form E - Application for General Permit, Form--MO 780-0795. See dnr.mo.gov/env/wpp/permits/issued/wpcpermits-general.htm for a list of general operating permits. Include payment or payment confirmation for the fee with your application. See 10 CSR 20-6.011(2) and Wastewater Treatment Facility Permit Fees -- PUB2564.
3. Complete the project information. The estimated and final project construction cost will be useful to the department in conducting affordability analyses.
4. Check the applicable box. If this form is used to obtain a MSOP when substantially complete and operable, the form must be updated and resubmitted when construction is for all department funded projects. Attach an electronic copy of the as-built plans or record drawings to this form in accordance with 10 CSR 20-8.110(11), if required. The electronic copy shall be submitted in PDF searchable format on a compact disc. If the record drawings are scanned, set the resolution to 200 dpi at 17 inches by 22 inches at a minimum.
5. Indicate who is signing the form by checking the correct box. For department funded projects the owner must complete this certification. The project owner should match the information provided in the original construction permit application.

Part B – Department Funded Projects

All department funded wastewater construction projects are required to complete and submit Part B of this form. If multiple contracts were awarded for the project, make additional copies of Part B for each contractor company.

6. Complete contractor company information.
7. List all construction inspection dates conducted by the engineer. Attach additional sheets as necessary.
8. Complete the engineer certification and information.
9. List all addenda and corresponding information. An addendum is a change to the approved plans and specifications prior to the bid opening. Addenda must be approved by the department in accordance with 10 CSR 20-8.110(11). Attach additional sheets as necessary.
10. List all change orders and corresponding information. A change order is a change to the approved plans and specifications after the bid award and contract execution. Change order(s) must be approved by the department in accordance with 10 CSR 20-4.040(19) and 10 CSR 20-8.110(11). Attach additional sheets as necessary.

Mail the completed form to the department as shown in Part A.

If there are any questions concerning this form, please contact the Missouri Department of Natural Resources, Water Protection Program at 800-361-4827 or 573-751-1300 or visit dnr.mo.gov/env/wpp/permits/ww-construction-permitting.htm.

IV. REVIEW SUMMARY

1. CONSTRUCTION PURPOSE

The Clever WWTP is approaching its design hydraulic and organic loading capacity. The facility is also currently under enforcement by the department for failure to meet permit limits. The proposed upgrades to the Clever WWTP will increase the capacity of the average daily flow from 210,000 gpd to 460,000 gpd and a peak flow of 1,458,089 gpd while meeting proposed limits. The proposed construction will allow for the facility to adequately treat projected hydraulic and organic loadings as well as biologically remove phosphorus and nitrogen.

2. FACILITY DESCRIPTION

The existing Clever WWTP provides biological treatment using two oxidation ditches. The facility will expand the design average flow to 460,000 gpd by the planned construction. The proposed upgrades include constructing an influent spiral-type screen and manually-cleaned bar screen, influent pump station with a 2-hour storage basin, influent diversion structure, 250,000 gpd oxidation ditch, two secondary clarifiers, secondary clarifier diversion structure, tertiary sand filter, UV disinfection, flow monitoring, waste sludge holding basin, sludge transfer lift station, upgrades to the chemical feed delivery system used for phosphorus reduction, replacement of the emergency generator at the laboratory building, and plant piping revisions.

Additionally, the project includes the removal and disposal of the existing spiral screen, gates and manually-cleaned bar screen, influent pump station and controls, existing emergency generator at the laboratory building, existing flow diversion structure and equipment, existing earth mound located on the east side of the site and general site work appropriate to the scope and purpose of the project.

The Clever WWTP is located 0.25 miles southwest of the South Westgate Drive & Old Wire Road intersection, Clever, Missouri, in Christian County. Currently, the facility has a design average flow of 210,000 gpd and serves a population equivalent of approximately 3,000 people.

3. COMPLIANCE PARAMETERS

The proposed project is required to meet final effluent limits as established in the Antidegradation review dated June 30, 2022.

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

Parameter	Units	Daily maximum limit	Monthly average limit
Ammonia as N (January)	mg/L	12.7	2.2
Ammonia as N (February)	mg/L	10.6	1.8
Ammonia as N (March)	mg/L	10.1	1.6
Ammonia as N (April)	mg/L	7.4	1.3

Parameter	Units	Daily maximum limit	Monthly average limit
Ammonia as N (May)	mg/L	5.6	1.0
Ammonia as N (June)	mg/L	4.0	0.8
Ammonia as N (July)	mg/L	3.3	0.7
Ammonia as N (August)	mg/L	2.7	0.6
Ammonia as N (September)	mg/L	4.2	0.8
Ammonia as N (October)	mg/L	6.7	1.2
Ammonia as N (November)	mg/L	9.3	1.5
Ammonia as N (December)	mg/L	12.7	1.9

4. ANTIDegradation

The department has reviewed the antidegradation report for this facility and issued the Water Quality and Antidegradation Review dated June 30, 2022, due to increase in design flow capacity. See APPENDIX – ANTIDegradation.

5. REVIEW OF MAJOR TREATMENT DESIGN CRITERIA

Existing Components:

- Mechanical Coarse Screen – A mechanically-cleaned bar screen/manually-cleaned bar screen combination is located ahead of the existing influent lift station. The mechanically-cleaned bar screen was originally designed based on a peak flow of 762,300 gallons per day (gpd). The clear opening between bars for the mechanically-cleaned bar screen is 5/8 inch to one inch and the screen is placed in a 2 feet wide concrete channel at an incline of approximately 40 degrees. In the event the mechanical screen requires maintenance a 1 feet wide concrete bypass channel around the screen has been provided equipped with a manually-cleaned bar screen.
- Influent Pump Station – The influent pump station is located downstream of the mechanically-cleaned bar screen. All wastewater collected from the City of Clever is pumped from the influent pump station to the flow diversion structure via a 6-inch diameter force main.
- 70,000 gpd Oxidation Ditch – Influent wastewater flow exits the flow diversion structure and enters the 70,000 gpd oxidation ditch via an 8-inch diameter ductile iron inlet pipe. Aeration to this basin is provided by two 20 horsepower (HP) rotary lobe style positive displacement blowers capable of delivering 557 cubic feet per minute (cfm) of air at a discharge gauge pressure of 4.66 pounds per square inch gauge (psig). Aeration within the basin is accomplished by four banks of retrievable fine bubble diffuser heads and mixing of the contents of the basin is accomplished by four retrievable mixers.
- 140,000 gpd Oxidation Ditch – Influent wastewater flow exits the flow diversion structure and enters the 140,000 gpd oxidation ditch via 8-inch diameter ductile iron plant piping. The 140,000 gpd oxidation ditch has an effective volume of approximately 133,000 gallons. Aeration is provided in this basin by means of two horizontally

mounted brush rotors each having an overall effective length of 8.0 lineal feet and powered by two 15 HP motors.

- 70,000 gpd Secondary Clarifier – Currently clarification of the effluent from the 70,000 gpd oxidation ditch is accomplished with two secondary clarifiers each having a diameter of 20 feet, a total surface area of 314 square feet (sf) and a side water depth of 12 feet. The scraper mechanisms for each clarifier is powered by 0.50 HP motors.
- 140,000 gpd Secondary Clarifier – Currently clarification of the effluent from the 140,000 gpd oxidation ditch is accomplished with two secondary clarifiers each having a diameter of 27.5 feet, a total surface area of 594 square feet and a side water depth of 12 feet. The scraper mechanism for each clarifier is powered by 0.50 HP motors.
- Tertiary Filtration – Treated clarified effluent enters two prefabricated steel tertiary sand filters. One constructed in 1983 has a total surface area of 60.0 square feet. The other prefabricated tertiary filter constructed in 1999 has a total surface area of 72 square feet. One prefabricated tertiary filter is capable of treating 140,000 gpd while the other can treat 70,000. It is a requirement that these filters be sized to accommodate the peak flow rate at a filter loading of 5 gallons per minute per square foot with the largest unit out of service.
- Open Channel Ultraviolet (UV) – Filtered effluent is disinfected by means of two banks of ultraviolet lamps installed in a 2 feet wide concrete channel which can accommodate a peak design flow rate of 720,000 gpd. Currently, the disinfection system has insufficient capacity with one bank of bulbs out of service and additional UV bulbs will be required to increase the disinfection capacity in the near future.
- Parshall Flume – After disinfection the wastewater enters the flow metering structure consisting of a 2 feet wide concrete channel equipped with a Parshall flume having a 3-inch throat.
- Waste Sludge Storage – Two waste sludge storage basins are equipped with floating aerators and have volumes of approximately 50,000 gallons (at the 70,000 gpd oxidation ditch/clarifiers) and 72,000 gallons (at the 140,000 gpd oxidation ditch/clarifiers). Waste sludge lift stations located adjacent to the clarifiers transfer sludge to these basins and sludge loading stations at each basin allow for sludge removal by truck.

New Components:

- Mechanical Coarse Screen – One mechanically-cleaned, spiral-type screen with a maximum spacing of 1-inch. The screening device shall be capable of treating a design average flow of 0.460 MGD and a peak hourly flow of 1.5 MGD. A manually-cleaned coarse bar screen shall be in the dual channel with a clear bar spacings of 5/8-inch and 1-inch and be positioned at an angle of 40 degrees from the horizontal to allow for manual raking of the screen. The addition of a manually-cleaned coarse bar screen

provides redundancy and a means of unit isolation for the mechanically-cleaned coarse screen. The screening structure is followed by influent pump station.

- Influent Pump Station – Construction of a duplex influent pump station with a valve vault, wet well, controls, and 2 hours of emergency storage basin. Each 20 HP submersible pump capable of operating at 1,013 gallons per minute (gpm) at 47 feet of total dynamic head (TDH).
- Oxidation Ditch – The design solids retention time (SRT) will range between 12 to 24 days with a design mixed liquor suspended solids (MLSS) of 5,783 mg/L. The concentration is slightly elevated over typical values; however, biological nutrient removal efficiencies at the plant are acceptable. The hydraulic retention time is 24.9 hours at design flow of 0.250 MGD. The side water depth of the treatment train is 10 ft. Process design calculations were provided for an organic load of 15 lb BOD per 1,000 cubic feet. Total peak oxygen required is 1,181 lbs/day, with a standard oxygen transfer rate design of 4.45 lb O₂ /ft-hr. The peak SOR is 41.40 lb/hr and the ratio between AOR/SOR is 0.84 (Metcalf & Eddy).
- Secondary Clarifier – Two secondary clarifiers will be constructed to provide clarification for 0.250 MGD each. The clarifiers will have a 32-ft diameter and the sidewater depth will be 12 ft. The weir loading rate is 18,295 gpd per linear foot which meets the requirements of 10 CSR 20-8.160(3)(C)2 of being less than 1,000 gpd/sf. The solids loading rate is 10 lbs/day/sf which meets the requirements of 10 CSR 20-8.160(3)(B)3 of less than 10 lbs/day/sf at peak flow.
- Tertiary Filtration – The filtration system will be capable of treating a design average flow of 0.250 MGD and a peak hourly flow of 0.805 MGD. The filter shall be capable of operating at an average hydraulic loading of 2 gallons per minute per square foot of filter surface area and a peak loading rate of 5 gallons per minute per square foot of filter surface area. The filter media will consist of high grade silica sand. The filter media support system shall consist of fused aluminum oxide porous plates with the filter having a multitude of 8-inch wide compartments. The backwash pump is capable of 20 gpm per square foot of cell area at 20 ft TDH with a 0.25 HP motor.
- Open Channel Ultraviolet – An open channel, gravity flow, low pressure, high intensity UV disinfection system capable of treating a peak flow of 1,458,089 gpd while delivering a minimum UV intensity of 30 mJ/cm² with an expected ultraviolet transmissivity of 65% or greater. The single open channel UV system consists of two banks in series with 8 modules per bank and 6 lamps per module. The disinfected effluent will flow by gravity through flow measurement equipment and to Outfall No. 001.
- Parshall Flume – Construction of two 6-inch throat effluent parshall flumes with ultrasonic flow sensor. One shall measure the wastewater in the effluent discharge channel of the proposed influent flow diversion structure and the other will be placed after UV disinfection prior to discharge at Outfall No. 001.

- Sludge Transfer Lift Station – Construction of a duplex waste activated sludge (WAS) and return activated sludge (RAS) pump station and associated valves. The motor driven, variable speed, nonclog pump will be capable of pumping 261 gpm at 23.57 ft of TDH with a 10 HP motor for RAS and be capable of pumping 261 gpm at 29.35 ft of TDH with a 10 HP motor for WAS. The pumps are utilized to pump RAS and WAS from the secondary clarifiers, oxidation ditch, and sludge storage basin back to the oxidation ditch and sludge storage basin. The control system shall consist of one adjustable frequency converter. Pumps will generally be alternated on a 24-hour basis to distribute the wear.
- Sludge Storage Basin – Construction of one sludge storage basin with a 42 ft diameter, 13.5 ft sidewater depth, and volume of 122,520 gallons of sludge. Installation of a floating aerator will provide aeration and mixing of the sludge to prevent anaerobic conditions. An ultrasonic level sensor will measure the volume of sludge present. The sludge will be received from the sludge lift station.
- Chemical Feed – Proposed upgrades include liquid alum for the existing chemical feed system to promote chemical phosphorus removal, two chemical feed pumps to be located in the existing 8-ft by 12-ft prefabricated chemical feed building, a flash mixer in the proposed secondary clarifier diversion structure outlet, a flash mixer downstream of the proposed oxidation ditch outlet, piping to the two flash mixers, and chemical feed piping to feed the proposed oxidation ditch and clarifier diversion structure. The flash mixers will be capable of mixing at 1600 rpm.
- In-plant piping to allow for transferring the backwash from the proposed tertiary sand filter back to the influent mechanical screening structure.

6. OPERATING PERMIT

Missouri State Operating Permit MO-0102318 will require a modification to reflect the construction activities. The modified Clever WWTP operating permit was successfully public noticed from August 2, 2024, to September 3, 2024, 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.

Angie Garcia, E.I.
Financial Assistance Center
angie.garcia@dnr.mo.gov

APPENDICES

- **Antidegradation Review**
- **Process Flow Diagram**
- **Summary of Design**

APPENDIX – ANTIDEGRADATION REVIEW

Water Quality and Antidegradation Review

For the Protection of Water Quality
and Determination of Effluent Limits for Discharge to

Tributary to Spring Creek
by
City of Clever
City of Clever WWTP Improvements



June 2022

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PURPOSE OF ANTIDegradation REVIEW REPORT

The Clever Wastewater Treatment Facility is a 210,000 gpd extended aeration plant receiving actual flows of about 240,000 gpd based on Discharge Monitoring Report (DMR) data from the past five years of operation. The facility currently includes influent screening, two oxidation ditches, four secondary clarifiers, chemical addition for phosphorus treatment, tertiary filtration, and ultraviolet disinfection. Sludge is stored in a holding basin before being disposed by land application. Shaffer & Hines, Inc. prepared, on behalf of the City of Clever, the *Antidegradation Report – Wastewater Treatment Plant Improvements for the City of Clever, Missouri*, which outlines proposed upgrades to the plant. As a result of the upgrades, the design flow will be increased to 460,000 gpd. Three non-discharging alternatives and three discharging alternatives were analyzed, and construction of a new oxidation ditch was chosen as the preferred alternative. For this alternative, the scope of the project includes the replacement of existing 6-inch force main at the influent lift station with 8-inch force main, and the construction of: a second mechanically-cleaned influent bar screen, flow diversion structure upgrades, an oxidation ditch, two 32-ft diameter secondary clarifiers, a 27-ft diameter sludge storage basin, additional banks for UV bulbs, and upgrades to the chemical feed system.

The applicant elected to assume that all pollutants of concern (POC), except Total Nitrogen and Total Phosphorus, significantly degrade the receiving stream in the absence of existing water quality. An alternatives analysis was conducted to fulfill the requirements of the Antidegradation Implementation Policy (AIP).

FACILITY INFORMATION

Facility Name:	Clever WWTF
Address:	0.06 miles South on Old Wire Rd from S. Westgate Dr., Clever, MO 65631
Permit #:	MO-0102318
County:	Christian
Facility Type:	POTW
Owner:	City of Clever
Continuing Authority:	City of Clever
UTM Coordinates:	X = 457179 ; Y = 4097872
Legal Description:	Sec. 20, T27N, R23W
Ecological Drainage Unit:	Ozark/White

FACILITY HISTORY

The original plant was constructed in 1983 with a design flow of 70,000 gpd. The plant was later expanded in 1999 to add 140,000 gpd of additional capacity. The facility was last inspected on December 3, 2019 and it was determined that at the time of inspection, the facility was out of compliance with the Missouri Clean Water Law and MSOP MO-0102318. The following violations were listed in the inspection report, not including effluent limitation exceedances, which are discussed in the *Facility Performance History* section:

- failure to submit a DMR for the month of April 2018
- failure to properly notify the department of all bypasses
- failure to clearly mark facility outfalls
- failure to properly operate and maintain the facility; at the time of the inspection
 - One clarifier was out of service
 - The tertiary filter was out of service
 - The UV disinfection system was not fully operational
 - One of the pumps at the Kennedy lift station was out of service
- failure to submit annual sludge reports for 2015 through 2018
- failure to develop a program for maintenance and repair of the collection systems to meet the requirements of Special Condition 10 of the operating permit
- failure to provide operators at the proper level of certification

FACILITY PERFORMANCE HISTORY:

A review of the past 5 years of Discharge Monitoring Report data show exceedances in the following parameters: Ammonia (5/20, 8/19), total phosphorus (1/21, 5/20, 3/17, 2/17, 1/17), aluminum (5/20), E. coli (6/20, 2/19), and fecal coliform (1/17). The facility is currently under enforcement for failing to meet permit limits.

RECEIVING WATERBODY INFORMATION

OUTFALL(S) TABLE:

OUTFALL	DESIGN FLOW (CFS)	TREATMENT LEVEL	EFFLUENT TYPE
001	0.713	Tertiary	Domestic

RECEIVING STREAM(S) TABLE:

WATER-BODY NAME	CLASS	WBID	DESIGNATED USES*	12-DIGIT HUC	DISTANCE TO CLASSIFIED SEGMENT (MI)
Tributary to Spring Creek	--	--	General Criteria	11010002-0503	0.86
100K Extent Remaining Streams	C	3960	AQL, IRR, LWW, SCR, WBC-B, HHP		

* Protection of Warm Water Aquatic Life (AQL), Cold Water Fishery (CDF), Cool Water Fishery (CLF), Whole Body Contact Recreation – Category A (WBC-A), Whole Body Contact Recreation – Category B (WBC-B), Secondary Contact Recreation (SCR), Human Health Protection (HHP), Irrigation (IRR), Livestock & Wildlife Watering (LWW), Drinking Water Supply (DWS), Industrial (IND), Groundwater (GRW).

RECEIVING STREAM(S) LOW-FLOW VALUES:

RECEIVING STREAM	LOW-FLOW VALUES (CFS)		
	1Q10	7Q10	30Q10
Tributary to Spring Creek	0.0	0.0	0.0

Receiving Water Body Segment Outfall #1:		
Upper end segment* UTM coordinates:	X = 457179 ; Y = 4097872	outfall
Lower end segment* UTM coordinates:	X = 456043 ; Y = 4097404	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.

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

EXISTING WATER QUALITY

No existing water quality data was submitted. The facility discharges to a Tributary to Spring Creek. The discharge lies within the James River watershed, which has an approved Total Maximum Daily Load (TMDL) for nutrients. Table Rock Lake is also downstream, which is listed on the 2020 303(d) list as impaired for Chlorophyll-a, Total Nitrogen, and Nutrient/Eutrophication Biological Indicators.

MIXING CONSIDERATIONS

The facility discharges to a stream with 7Q10 low flows of less than one-tenth cubic feet per second, and therefore there is no allowance for a mixing zone or zone of initial dilution.

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)].

PERMIT LIMITS AND MONITORING INFORMATION

Proposed Monitoring Parameters and Effluent Limits

PARAMETER	Unit	Basis for Limits	Daily Maximum	Weekly Average	Monthly Average	Previous Permit Limit	Sampling Frequency	Reporting Frequency	Sample Type
Flow	MGD	FSR	*		*	*/*	once/weekday	once/month	24 hr. total
BOD ₅	mg/L	PEL		15	10	15/10	once/month	once/month	composite
TSS	mg/L	PEL		20	15	20/15	once/month	once/month	composite
Ammonia as N (January) (February) (March) (April) (May) (June) (July) (August) (September) (October) (November) (December)	mg/L	PEL	12.7 10.6 10.1 7.4 5.6 4.0 3.3 2.7 4.2 6.7 9.3 12.7		2.2 1.8 1.6 1.3 1.0 0.8 0.7 0.6 0.8 1.2 1.5 1.9	10.8/2.7 10.8/2.7 10.8/2.7 6.0/1.2 6.0/1.2 6.0/1.2 6.0/1.2 6.0/1.2 6.0/1.2 10.8/2.7 10.8/2.7 10.8/2.7	once/month	once/month	grab
<i>Escherichia coli</i> **	#/100mL	FSR	126		*	126/*	once/week	once/month	grab
Total Phosphorus	mg/L	FSR	*		0.5	0.5	once/month	once/month	grab
Total Nitrogen	mg/L	TMDL	*		10	*/*	once/month	once/month	grab
PARAMETER	Unit	Basis for Limits	Minimum		Maximum	Previous Permit Limit	Sampling Frequency	Reporting Frequency	Sample Type
pH	SU	FSR	6.5		9.0	6.5/9.0	once/month	once/month	grab
PARAMETER	Unit	Basis for Limits	Daily Minimum		Monthly Avg. Min	Previous Permit Limit	Sampling Frequency	Reporting Frequency	Sample Type
BOD ₅ Percent Removal	%	FSR			85	85	once/month	once/month	calculated
TSS Percent Removal	%	FSR			85	85	once/month	once/month	calculated

* - Monitoring requirement only

** - Effluent Limits of 126 #/100mL daily maximum and monitoring only for monthly average for E. coli are applicable year round due to losing stream designation. No more than 10 % of samples over the course of a calendar year shall exceed the 126 #/100mL daily maximum.

Basis for Limitations Codes:

MDEL – Minimally Degrading Effluent Limit

NDEL – Non-Degrading Effluent Limit

PEL – Preferred Effluent Limit

TMDL – TMDL or Permit in lieu of TMDL

TBEL – Technology-Based Effluent Limit

QBEL – Water Quality-Based Effluent Limit

FSR – State or Federal Regulation/Law

RECEIVING WATER MONITORING REQUIREMENTS

No receiving water monitoring requirements recommended at this time.

ANTIDegradation REVIEW INFORMATION

In accordance with Missouri’s Water Quality Standard [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, which 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 AIP for new and expanded wastewater discharges.

The AIP specifies that if the proposed activity results in significant degradation then a demonstration of necessity (i.e., alternatives analysis) and a determination of social and economic importance are required.

The following is a review of the *Antidegradation Report – Wastewater Treatment Plant Improvements for the City of Clever, Missouri* dated April, 2022.

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 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.

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 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.

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).

Pollutants of Concern and Tier Determination

Pollutants of Concern	Tier	Degradation	Comment
Biological Oxygen Demand (BOD ₅)/DO	2*	Significant	
Total Suspended Solids (TSS)	2*	Significant	
Ammonia as N	2*	Significant	
<i>Escherichia coli</i> (<i>E. coli</i>)	2*	N/A	Permit limits applied
Phosphorus, Total	1		Permit limits applied
Nitrogen, Total	1		
pH	**	N/A	Permit limits applied

* Tier assumed.

** Standards for these parameters are ranges.

Tier 1 Review

The Clever WWTF discharges to a tributary to Spring Creek and lies within the watershed of James River which itself feeds into Table Rock Lake. Table Rock Lake is on the 2020 EPA Approved Section 303(d) list for total nitrogen and chlorophyll-a. A TMDL for nutrients was approved for James River on November 30, 2004, with total nitrogen and total phosphorus being targeted for reduction. Thus total nitrogen and total phosphorus are categorized as tier 1 pollutants of concern for this discharge. The facility currently has effluent limitations for total phosphorus in accordance with 10 CSR 20-7.015(3)(E), but is only required to monitor total nitrogen in the effluent. To address the impairment to the James River arm of Table Rock Lake, it is anticipated that facilities within this watershed will be given total

nitrogen effluent limits of 10 mg/L after the issuance of the renewed operating permits. Furthermore, it is expected that the facility will have the ability to utilize nutrient trading in accordance with Missouri's Nutrient Trading Program, which is currently not finalized.

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.

B. NECESSITY OF DEGRADATION

The AIP specifies that if the proposed activity does result in significant degradation 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 be significant 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.

Regionalization

Regionalization eliminates the need for a discharge permit by sending flows to a capable regional facility. For this alternative, a regional lift station would be constructed to pump the city's wastewater approximately 6 miles to the City of Republic WWTP, and the existing plant would be abandoned. The applicant estimates that this alternative would have a total equivalent present worth cost of about \$11.1 million. While regionalization would eliminate the need for the City of Clever to operate and maintain its wastewater treatment facility, it was not considered the preferred alternative due to concerns about the increase in user rates for citizens of the City of Clever, as well as the unknown costs and difficulties associated with obtaining easements to construct the force main connecting to the City of Republic.

No Discharge Evaluation

Slow-rate land application and subsurface irrigation were no-discharge options that were evaluated by the applicant. Both alternatives would first utilize a storage lagoon to provide at least 75 days of storage and would ultimately apply at a rate of 2 feet/year. While these no-discharge alternatives would eliminate the need for several of the proposed upgrades, they were considered impracticable due to the extensive amount of land needed and the associated expense and difficulty of obtaining the land area. The presence of karst topography also raised concerns about the suitability of the site for the construction of lagoons. This is reflected in the Geohydrologic Report, which gives the site a severe geologic limitations classification and a severe collapse potential.

Alternatives to No discharge

The following three alternatives to no-discharge were analyzed by the applicant: construction of a sequencing batch reactor, expansion of the existing oxidation ditch system, and construction of a diffused air extended aeration system.

The construction of a sequencing batch reactor to operate in parallel to the existing oxidation ditches serves as the first discharging alternative. This alternative calls for the construction of a post-reactor flow equalization basin. Unlike the other two discharging options, the construction of new secondary clarifiers would be unnecessary due to the nature of sequencing batch reactors. This alternative has an estimated present worth value of about \$10.9 million, and is therefore the least expensive alternative evaluated and serves as the base-case.

Expansion of the existing system would involve the construction of an additional oxidation ditch, two new accompanying secondary clarifiers, and a new waste sludge storage basin. This alternative has an estimated present worth value of about \$11.6 million and is the preferred alternative due to the city's familiarity with the treatment process, as well as the ability of oxidation ditches to achieve removal performance objectives while retaining relatively low maintenance and costs.

The final discharging alternative would convert the existing oxidation ditches into sludge holding basins and necessitate the construction of two new secondary clarifiers and a new 460,000 gpd extended aeration process. This alternative has an estimated present worth value of about \$12.6 million and therefore is the most expensive of the discharging alternatives.

Alternatives Analysis Comparison

Parameter	Alternative 1 (Base Case) Sequencing Batch Reactor	Alternative 2 Oxidation Ditch	Alternative 3 Diffused Air Extended Aeration
BOD ₅	≤ 10 mg/l	≤ 10 mg/l	≤ 10 mg/l
TSS	≤ 15 mg/l	≤ 15 mg/l	≤ 15 mg/l
Ammonia as N (January)	2.2 mg/L	2.2 mg/L	2.2 mg/L
(February)	1.8 mg/L	1.8 mg/L	1.8 mg/L
(March)	1.6 mg/L	1.6 mg/L	1.6 mg/L
(April)	1.3 mg/L	1.3 mg/L	1.3 mg/L
(May)	1.0 mg/L	1.0 mg/L	1.0 mg/L
(June)	0.8 mg/L	0.8 mg/L	0.8 mg/L
(July)	0.7 mg/L	0.7 mg/L	0.7 mg/L
(August)	0.6 mg/L	0.6 mg/L	0.6 mg/L
(September)	0.8 mg/L	0.8 mg/L	0.8 mg/L
(October)	1.2 mg/L	1.2 mg/L	1.2 mg/L
(November)	1.5 mg/L	1.5 mg/L	1.5 mg/L
(December)	1.9 mg/L	1.9 mg/L	1.9 mg/L
Escherichia coli (E. coli)	≤ 126 CFU/100ml	≤ 126 CFU/100ml	≤ 126 CFU/100ml
Phosphorus, Total	≤ 0.5 mg/l	≤ 0.5 mg/l	≤ 0.5 mg/l
Nitrogen, Total	10 mg/l	10 mg/l	10 mg/l
Preferred Alternative	No	Yes	No
Present Worth Value	\$10,881,612.27	\$11,653,542.73	\$12,575,978.57
Ratio	100%	107%	116%

C. 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 Spring Creek, which is a losing segment at the outfall. Moving the outfall in order to discharge to a gaining stream is not considered a practical alternative due to the location of the existing outfall and distance to gaining segments. As discussed in B. above, land application and regionalization are not practical alternatives.

D. SOCIAL AND ECONOMIC IMPORTANCE

The affected community consists of residents of the City of Clever. The city's WWTP serves approximately 1,140 residential lots, and the population was estimated to be 2,876 as of 2021. The treatment plant is operating beyond its design flow, and the City of Clever has continued to see population growth in recent years. Upgrading the design flow of the facility will allow the city to accommodate the continued growth of the region, allowing for continued residential development and economic growth while maintaining environmental protection by providing high-quality effluent.

E. NATURAL HERITAGE REVIEW

A Missouri Department of Conservation Natural Heritage Review was obtained by the applicant. The Missouri Bladderpod, along with three species of bats, Indiana, Northern Long-Eared, and the Gray Myotis, 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.
- Revegetate disturbed areas to minimize erosion using native plant species
- Where possible, leave snags standing and preserve mature forest canopy
- 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 and dry in the hot sun before using it again
- 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.

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:

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

Where C = downstream concentration
C_s = upstream concentration
Q_s = upstream flow
C_e = effluent concentration
Q_e = effluent flow

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 significantly-degrading 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: Significantly-degrading 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 10 mg/L average monthly and 15 mg/L average weekly 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)(B)1.
- **Total Suspended Solids (TSS).** Effluent limits of 15 mg/L average monthly and 20 mg/L average weekly 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)(B)2.
- **Escherichia coli (E. coli).** Discharges to losing streams shall not exceed 126 CFU per 100 mL as a daily maximum at any time, as per 10 CSR 20-7.031(5)(C). Monitoring only for a monthly average. No more than 10% of samples over the course of the calendar year shall exceed 126 CFU per 100 mL as a daily maximum as per 10 CSR 20-7.015(9)(B)1.G.
- **Total Ammonia Nitrogen.** Effluent limits enumerated below were established as a result of a discharging technology alternatives analysis conducted by the applicant. These limits are calculated based on the Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater 2013 and utilize ecoregional data from the Ozark Highland Ecoregion.

2013 EPA Aquatic Life Ambient Water Quality Criteria for Total Ammonia Nitrogen CCC and CMC
 Calculated with Ozark Highlands Ecoregional Data for the Expanded Clever WWTF

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

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

January

Chronic WLA: $C_e = ((0.713 + 0.0)2.2 - (0.0 * 0.01)) / 0.713$ Ce = 2.2
 Acute WLA: $C_e = ((0.713 + 0.0)12.7 - (0.0 * 0.01)) / 0.713$ Ce = 12.7
 AML = WLA_c = 2.2 mg/L
 MDL = WLA_a = 12.7 mg/L

February

Chronic WLA: $C_e = ((0.713 + 0.0)1.8 - (0.0 * 0.01)) / 0.713$ Ce = 1.8
 Acute WLA: $C_e = ((0.713 + 0.0)10.6 - (0.0 * 0.01)) / 0.713$ Ce = 10.6
 AML = WLA_c = 1.8 mg/L
 MDL = WLA_a = 10.6 mg/L

March

Chronic WLA: $C_e = ((0.713 + 0.0)1.6 - (0.0 * 0.01)) / 0.713$ Ce = 1.6
 Acute WLA: $C_e = ((0.713 + 0.0)10.1 - (0.0 * 0.01)) / 0.713$ Ce = 10.1
 AML = WLA_c = 1.6 mg/L
 MDL = WLA_a = 10.1 mg/L

April

Chronic WLA: $C_e = ((0.713 + 0.0)1.3 - (0.0 * 0.01)) / 0.713$ Ce = 1.3
 Acute WLA: $C_e = ((0.713 + 0.0)7.4 - (0.0 * 0.01)) / 0.713$ Ce = 7.4
 AML = WLA_c = 1.3 mg/L
 MDL = WLA_a = 7.4 mg/L

May

Chronic WLA: $C_e = ((0.713 + 0.0)1.0 - (0.0 * 0.01)) / 0.713$ Ce = 1.0
 Acute WLA: $C_e = ((0.713 + 0.0)5.6 - (0.0 * 0.01)) / 0.713$ Ce = 5.6
 AML = WLA_c = 1.0 mg/L
 MDL = WLA_a = 5.6 mg/L

June

Chronic WLA: $C_e = ((0.713 + 0.0)0.8 - (0.0 * 0.01)) / 0.713$ Ce = 0.8
 Acute WLA: $C_e = ((0.713 + 0.0)4.0 - (0.0 * 0.01)) / 0.713$ Ce = 4.0
 AML = WLA_c = 0.8 mg/L
 MDL = WLA_a = 4.0 mg/L

July

Chronic WLA: $C_e = ((0.713 + 0.0)0.7 - (0.0 * 0.01)) / 0.713$ Ce = 0.7
 Acute WLA: $C_e = ((0.713 + 0.0)3.3 - (0.0 * 0.01)) / 0.713$ Ce = 3.3

AML = WLAc = 0.7 mg/L
MDL = WLAa = 3.3 mg/L

August

Chronic WLA: $C_e = ((0.713 + 0.0)0.6 - (0.0 * 0.01)) / 0.713$ Ce = 0.6
Acute WLA: $C_e = ((0.713 + 0.0)2.7 - (0.0 * 0.01)) / 0.713$ Ce = 2.7
AML = WLAc = 0.6 mg/L
MDL = WLAa = 2.7 mg/L

September

Chronic WLA: $C_e = ((0.713 + 0.0)0.8 - (0.0 * 0.01)) / 0.713$ Ce = 0.8
Acute WLA: $C_e = ((0.713 + 0.0)4.2 - (0.0 * 0.01)) / 0.713$ Ce = 4.2
AML = WLAc = 0.8 mg/L
MDL = WLAa = 4.2 mg/L

October

Chronic WLA: $C_e = ((0.713 + 0.0)1.2 - (0.0 * 0.01)) / 0.713$ Ce = 1.2
Acute WLA: $C_e = ((0.713 + 0.0)6.7 - (0.0 * 0.01)) / 0.713$ Ce = 6.7
AML = WLAc = 1.2 mg/L
MDL = WLAa = 6.7 mg/L

November

Chronic WLA: $C_e = ((0.713 + 0.0)1.5 - (0.0 * 0.01)) / 0.713$ Ce = 1.5
Acute WLA: $C_e = ((0.713 + 0.0)9.3 - (0.0 * 0.01)) / 0.713$ Ce = 9.3
AML = WLAc = 1.5 mg/L
MDL = WLAa = 9.3 mg/L

December

Chronic WLA: $C_e = ((0.713 + 0.0)1.9 - (0.0 * 0.01)) / 0.713$ Ce = 1.9
Acute WLA: $C_e = ((0.713 + 0.0)12.7 - (0.0 * 0.01)) / 0.713$ Ce = 12.7
AML = WLAc = 1.9 mg/L
MDL = WLAa = 12.7 mg/L

- **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.** It is anticipated that the facility, and others within the James River watershed, will be subject to monthly average total nitrogen effluent limits of 10 mg/L to address the impairment of Table Rock Lake for nutrients. The department is currently in the process of establishing a statewide water quality trading program and accompanying permit language. The department intends to modify permit conditions for this expanded facility to reflect these developments in order to provide the maximum flexibility to allow trading or other compliance approaches that may be developed in the future.
- **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. Technology based effluent limitations of 6.0-9.0 SU [10 CSR 20-7.015] are not protective of the Water Quality Standard, which states that water contaminants shall not cause pH to be outside the 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.
- **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 and TSS 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 BOD₅ and TSS for Publicly Owned Treatment Works (POTWs)/municipals. This facility is required to meet 85% removal efficiency for TSS.

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. 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.

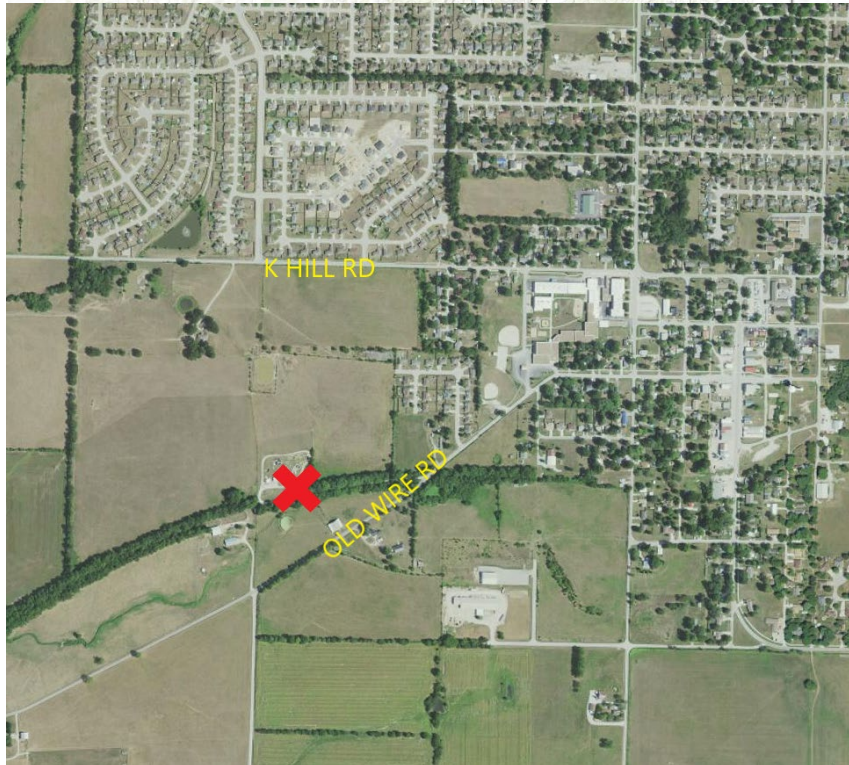
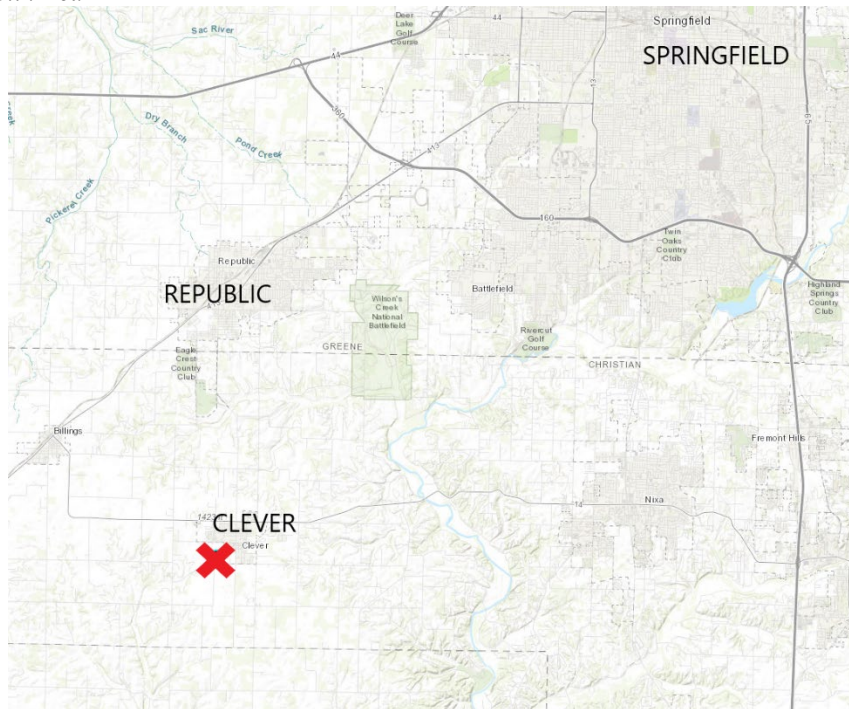
ANTIDEGRADATION REVIEW PRELIMINARY DETERMINATION

The proposed facility upgrades will result in significant degradation of the unnamed tributary to Spring Creek, with the exception of total nitrogen and total phosphorus. Alternative 1, Construction of a 250,000 gpd sequencing batch reactor to operate in parallel with the existing oxidation ditches was determined to be the base case technology (lowest cost alternative that meets technology and water quality based effluent limitations). Expansion of the existing oxidation ditch system, Alternative 2, was selected as the preferred alternative and was considered economically efficient.

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: Thomas Silkwood
Date: June 2022
Unit Chief: John Rustige, P.E.

Appendix A: Map of Discharge Location
Outfall Marked with Red "X"



Appendix B: Geohydrologic Evaluation
Geohydrologic Evaluation – Mechanical Treatment Plant



April 19, 2022

Gary Shaffer
731 W. Mt. Vernon
Nixa, MO 65714

RE: City of Clever WWTP

Dear Gary Shaffer:

On March 23, 2022, the Missouri Geological Survey received a request to perform a geohydrologic evaluation for the above referenced project located in Christian 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

Molly Starkey
Geologist
Environmental Geology Section

c: Gary Shaffer
WPP
Southwest Regional Office



   	Missouri Department Of Natural Resources Missouri Geological Survey Geological Survey Program Environmental Geology Section	Project ID Number LWE22084 County Christian
Request Details		
Project: City of Clever WWTP	Legal Description: 20 T27N R23W Quadrangle: REPUBLIC Latitude: 37 1 36.56 Longitude: -93 28 54.35	
Organization Official Name: Gary Shaffer Address: 731 W. Mt. Vernon City: Nixa State: MO Zip: 65714 Phone: 417-725-4663 Email:	Preparer Name: Gary Shaffer Address: 731 W. Mt. Vernon City: Nixa State: MO Zip: 65714 Phone: 417-725-4663 Email: gs@shaffertines.com	
Project Details		
Report Date: Date of Field Visit: 04/14/2022	Previous Reports: Not Applicable	
Facility Type <input checked="" type="checkbox"/> Mechanical treatment plant <input type="checkbox"/> Recirculating filter bed <input type="checkbox"/> Land application <input type="checkbox"/> Lagoon or storage basin <input type="checkbox"/> Subsurface soil absorption system <input type="checkbox"/> Lagoon or storage basin W/Land App <input type="checkbox"/> Lagoon or storage basin W/SSAS <input type="checkbox"/> Other type of facility	Type of Waste <input type="checkbox"/> Animal <input checked="" type="checkbox"/> Human <input type="checkbox"/> Process or industrial <input type="checkbox"/> Leachate <input type="checkbox"/> Other waste type	Funding Source <input checked="" type="checkbox"/> IWT <input type="checkbox"/> WWL-SRF Additional Information <input type="checkbox"/> Plans were submitted <input type="checkbox"/> Site was investigated by NRCS <input type="checkbox"/> Soil or geotechnical data were submitted
Geologic Stream Classification: <input type="checkbox"/> Gaining <input checked="" type="checkbox"/> Losing <input type="checkbox"/> No discharge		
Overall Geologic Limitations <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Severe	Collapse Potential <input checked="" type="checkbox"/> Not applicable <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Severe	Topography <input type="checkbox"/> <4% <input checked="" type="checkbox"/> 4% to 8% <input type="checkbox"/> 8% to 15% <input type="checkbox"/> >15%
Landscape Position <input checked="" type="checkbox"/> Broad uplands <input type="checkbox"/> Floodplain <input type="checkbox"/> Ridgetop <input type="checkbox"/> Alluvial plain <input checked="" type="checkbox"/> Hillslope <input type="checkbox"/> Terrace <input type="checkbox"/> Narrow ravine <input type="checkbox"/> Sinkhole		
Bedrock: Mississippian-age Burlington Keokuk Limestone		
Surficial Materials: Brown gravelly silt loam above very gravelly clayey silt		

 Missouri Department Of Natural Resources Missouri Geological Survey Geological Survey Program Environmental Geology Section		Project ID Number LWE22084 County Christian
Recommended Construction Procedures for Earthen Facility <input type="checkbox"/> Installation of clay pad and Compaction <input type="checkbox"/> Diversion of subsurface flow <input type="checkbox"/> Artificial sealing <input type="checkbox"/> Rock excavation <input type="checkbox"/> Limit excavation depth	Determine Overburden Properties <input type="checkbox"/> Particle size analysis <input type="checkbox"/> Atterberg limits <input type="checkbox"/> 95% Max. dry density test method <input type="checkbox"/> Overburden thickness <input type="checkbox"/> Permeability coefficient-undisturbed <input type="checkbox"/> Permeability coefficient-remolded	Determine Hydrologic Conditions <input type="checkbox"/> Groundwater elevation <input type="checkbox"/> Direction of groundwater flow <input type="checkbox"/> 25-Year flood level <input type="checkbox"/> 100-Year flood level

Remarks:

On April 14, 2022, a geologist with the Missouri Geological Survey conducted a site visit and geohydrologic evaluation for the City of Clever. The purpose of the site visit was to observe the geologic and hydrologic characteristics of the site and determine the potential impacts to water quality in the event of treatment failure.

The city is planning improvements to its wastewater facilities and is exploring multiple potential options for waste treatment. This report is for the proposed mechanical treatment plant. The site is located immediately west of the Clever city limits in a broad upland area. Surface water drainage on site is south into an unnamed tributary to Spring Creek. This is also the receiving stream for the discharge from the current wastewater treatment facility.

Surficial materials at the site were sampled in multiple locations using a handheld auger. The surficial materials were consistently a thin layer of silt loam with 5 to 10% gravel above very gravelly silty clay loam residuum. The thickness of the upper horizon was approximately 6 inches thick, although in one location the transition to residuum was very gradual over the upper 18 inches of soil. The surficial materials have moderate overall permeability.

The uppermost bedrock on the majority of the site is the Mississippian-age Burlington Keokuk Limestone. Also present on the uppermost hillcrests is a thin layer of Pennsylvanian-age sandstone. Overall the bedrock has high secondary permeability in karst conduits. There are 8 known sinkholes within two miles of the site and the receiving stream has previously been classified as losing. The receiving stream had significant flow on the date of the site visit as a result of the large precipitation event on the previous day, but other stream characteristics including substrate, channel morphology, and vegetation were consistent with the previous classification.

Based on the geologic and hydrologic characteristics of the site it receives a severe overall geologic limitations rating. In the event of treatment failure the local, shallow, and regional groundwater quality, as well as the surface waters of the unnamed tributary may be adversely impacted.

Geohydrologic Evaluation – Storage Basin



April 19, 2022

Gary Shaffer
731 W. Mt. Vernon
Nixa, MO 65714

RE: City of Clever WWTP

Dear Gary Shaffer:

On March 23, 2022, the Missouri Geological Survey received a request to perform a geohydrologic evaluation for the above referenced project located in Christian 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 gspg@dnr.mo.gov.

Sincerely,


MISSOURI GEOLOGICAL SURVEY


Molly Starkey
Geologist
Environmental Geology Section

c: Gary Shaffer
WPP
Southwest Regional Office



04/19/2022

	Missouri Department Of Natural Resources Missouri Geological Survey Geological Survey Program Environmental Geology Section	Project ID Number LWE22085 County Christian
Request Details		
Project: City of Clever WWTP		Legal Description: 20 T27N R23W Quadrangle: REPUBLIC Latitude: 37 1 38.61 Longitude: -93 28 50.86
Organization Official Name: Gary Shaffer Address: 731 W. Mt. Vernon City: Nixa State: MO Zip: 65714 Phone: 417-725-4663 Email:		Preparer Name: Gary Shaffer Address: 731 W. Mt. Vernon City: Nixa State: MO Zip: 65714 Phone: 417-725-4663 Email: gs@shafferhines.com
Project Details		
Report Date: 04/19/2022 Date of Field Visit: 04/14/2022		Previous Reports: Not Applicable
Facility Type <input type="checkbox"/> Mechanical treatment plant <input type="checkbox"/> Recirculating filter bed <input type="checkbox"/> Land application <input type="checkbox"/> Lagoon or storage basin <input type="checkbox"/> Subsurface soil absorption system <input checked="" type="checkbox"/> Lagoon or storage basin W/Land App <input type="checkbox"/> Lagoon or storage basin W/SSAS <input type="checkbox"/> Other type of facility	Type of Waste <input type="checkbox"/> Animal <input checked="" type="checkbox"/> Human <input type="checkbox"/> Process or industrial <input type="checkbox"/> Leachate <input type="checkbox"/> Other waste type	Funding Source <input checked="" type="checkbox"/> IWT <input type="checkbox"/> WWL-SRF Additional Information <input type="checkbox"/> Plans were submitted <input type="checkbox"/> Site was investigated by NRCS <input type="checkbox"/> Soil or geotechnical data were submitted
Geologic Stream Classification: <input type="checkbox"/> Gaining <input type="checkbox"/> Losing <input checked="" type="checkbox"/> No discharge		
Overall Geologic Limitations <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Severe	Collapse Potential <input type="checkbox"/> Not applicable <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Severe	Topography <input type="checkbox"/> <4% <input checked="" type="checkbox"/> 4% to 8% <input type="checkbox"/> 8% to 15% <input type="checkbox"/> >15%
Landscape Position <input checked="" type="checkbox"/> Broad uplands <input type="checkbox"/> Floodplain <input type="checkbox"/> Ridgetop <input type="checkbox"/> Alluvial plain <input checked="" type="checkbox"/> Hillslope <input type="checkbox"/> Terrace <input type="checkbox"/> Narrow ravine <input type="checkbox"/> Sinkhole		
Bedrock: Mississippian-age Burlington Keokuk Limestone		
Surficial Materials: Brown gravelly silt loam above very gravelly clayey silt		

 Missouri Department Of Natural Resources Missouri Geological Survey Geological Survey Program Environmental Geology Section		Project ID Number LWE22085 County Christian
Recommended Construction Procedures for Earthen Facility <input type="checkbox"/> Installation of clay pad and Compaction <input type="checkbox"/> Diversion of subsurface flow <input type="checkbox"/> Artificial sealing <input type="checkbox"/> Rock excavation <input type="checkbox"/> Limit excavation depth	Determine Overburden Properties <input type="checkbox"/> Particle size analysis <input type="checkbox"/> Atterberg limits <input type="checkbox"/> 95% Max. dry density test method <input type="checkbox"/> Overburden thickness <input type="checkbox"/> Permeability coefficient-undisturbed <input type="checkbox"/> Permeability coefficient-remolded	Determine Hydrologic Conditions <input type="checkbox"/> Groundwater elevation <input type="checkbox"/> Direction of groundwater flow <input type="checkbox"/> 25-Year flood level <input type="checkbox"/> 100-Year flood level

Remarks:

On April 14, 2022, a geologist with the Missouri Geological Survey conducted a site visit and geohydrologic evaluation for the City of Clever. The purpose of the site visit was to observe the geologic and hydrologic characteristics of the site and determine the potential impacts to water quality in the event of treatment failure.

The city is planning improvements to its wastewater facilities and is exploring multiple potential options for waste treatment. This report is for the proposed lagoon and land application of wastewater. The site is located immediately west of the Clever city limits in a broad upland area. Surface water drainage on site is south into an unnamed tributary to Spring Creek. This is also the receiving stream for the discharge from the current wastewater treatment facility. The grounds of the current treatment facility and the neighboring property were investigated, after permission was obtained from the neighboring landowner. The proposed land application area is 110 acres.

Surficial materials at the site were sampled in multiple locations using a handheld auger. The surficial materials were consistently a thin layer of silt loam with 5 to 10% gravel above very gravelly silty clay loam residuum. The thickness of the upper horizon was approximately 6 inches thick, although in one location the transition to residuum was very gradual over the upper 18 inches of soil. The surficial materials have moderate overall permeability.

The uppermost bedrock on the majority of the site is the Mississippian-age Burlington Keokuk Limestone. Also present on the uppermost hillcrests is a thin layer of Pennsylvanian-age sandstone. Overall the bedrock has high secondary permeability in karst conduits. There are 8 known sinkholes within two miles of the site and the receiving stream has previously been classified as losing. The receiving stream had significant flow on the date of the site visit as a result of the large precipitation event on the previous day, but other stream characteristics including substrate, channel morphology, and vegetation were consistent with the previous classification.

Based on the geologic and hydrologic characteristics of the site, it receives a severe collapse potential rating and therefore a severe overall geologic limitations rating. A reinforced concrete structure would be required at this location. In the event of treatment failure the local, shallow, and regional groundwater quality, as well as the surface waters of the unnamed tributary may be adversely impacted.

Appendix C: Natural Heritage Review

City of Clever Wastewater Treatment Plan Expansion #10670



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 website 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: City of Clever Wastewater Treatment Plan Expansion #10670

User Project Number: 215003

Project Description: Lat:37 03' 07" Long: 93 47' 93" Plant currently and will continue to discharge to a tributary of Spring Creek, Christian County, Missouri.

Project Type: Waste Transfer, Treatment, and Disposal, Liquid waste/Effluent, Wastewater treatment plant, Construction or expansion

Contact Person: Gary Shaffer

Contact Information: gs@shafferhines.com or 4177254663

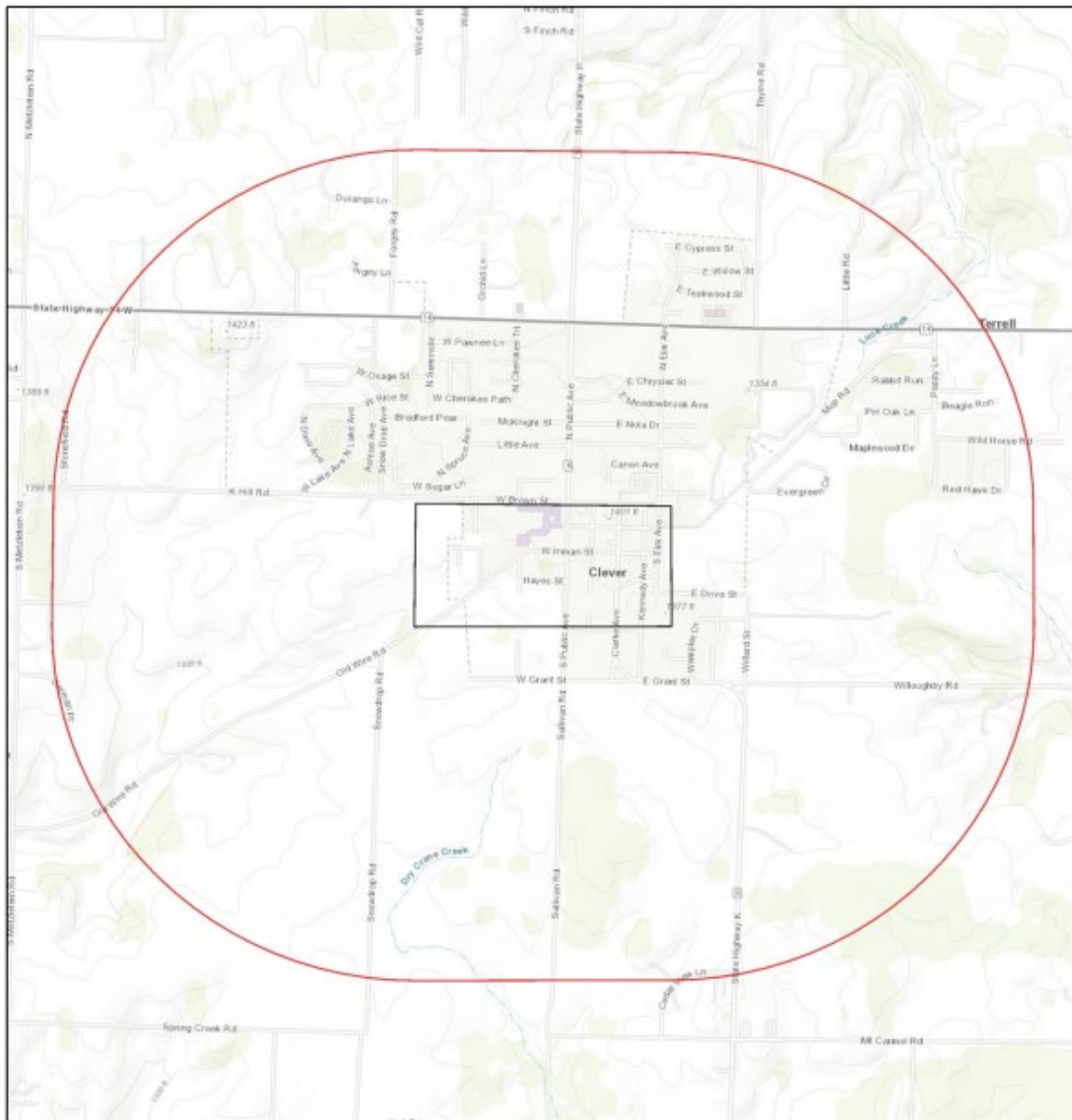
Disclaimer: The NATURAL HERITAGE REVIEW REPORT produced by this website identifies if a species tracked by the Natural Heritage Program is known to occur within or near the area submitted for your project, and shares suggested recommendations on ways to avoid or minimize project impacts to sensitive species or special habitats. 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. The Natural Heritage Program tracks occurrences of sensitive species and natural communities where the species or natural community has been found. Lack of an occurrence record does not mean that a sensitive plant, animal or natural community is not present on or near the project area. Depending on the project, current habitat conditions, and geographic location in the state, surveys may be necessary. Additionally, 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.

The Natural Heritage Report is not a site clearance letter for the project. It provides an indication of whether or not public lands and sensitive resources are known to be (or are likely to be) located close to the proposed project. Incorporating information from the Natural Heritage Program into project plans is an important step that can help reduce unnecessary impacts to Missouri's sensitive fish, forest and wildlife resources. However, the Natural Heritage Program is only one reference that should be used to evaluate potential adverse project impacts. Other types of information, such as wetland and soils maps and 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. The information within this report is not intended to replace 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 the USFWS Information for Planning and Conservation (IPaC) website at <https://ecos.fws.gov/ipac/> for further information. This site was developed to help streamline the USFWS environmental review process and is a first step in ESA coordination. The Columbia Missouri Ecological Field Services Office may be reached at 573-234-2132, or by mail at 101 Park Deville Drive, Suite A, Columbia, MO 65203.

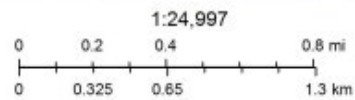
Transportation Projects: If the project involves the use of Federal Highway Administration transportation funds, these recommendations may not fulfill all contract requirements. Please contact the Missouri Department of Transportation at 573-526-4778 or visit <https://www.modot.org/> for additional information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

City of Clever Wastewater Treatment Plan Expansion



March 19, 2022

- Project Boundary
- Buffered Project Boundary



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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:

Your project is near a designated Natural Area . Please contact Missouri Department of Conservation (NaturalHeritageReview@mdc.mo.gov) for further coordination.

Project Type Recommendations:

Waste Transfer, Treatment and Disposal -Wastewater treatment plant: New or Maintenance; [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 Permit" conditions.

Revegetate disturbed areas to minimize erosion using native plant species compatible with the local landscape and wildlife needs. Annual ryegrass may be combined with native perennials for quicker green-up. Avoid aggressive exotic perennials such as crownvetch and *Sericea lespedeza*. Management Recommendations for Construction Projects Affecting Missouri Rivers and Streams is available at <https://mdc.mo.gov/sites/default/files/2020-06/Streams.pdf>

Project Location and/or Species Recommendations:

Endangered Species Act Coordination - Indiana bats (*Myotis sodalis*, federal- and state-listed endangered) and Northern long-eared bats (*Myotis septentrionalis*, federal-listed threatened) 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. **If any trees need to be removed for your project, please contact the 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.**

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.

The project location submitted and evaluated is within the range of the Missouri Bladderpod. Missouri Bladderpod (*Physaria filiformis*, federal-listed threatened, state-listed endangered) may occur in the project area on limestone glades or limestone rock outcrops along roadsides or in pastures. The species may persist as a seed bank for several years and not be found during plant surveys. Soil disturbance or fire can stimulate seed germination in the fall, yielding flowering plants the following spring. Best Management Practices may be viewed at <https://mdc.mo.gov/sites/default/files/2020-06/MissouriBladderpodBMP.pdf>.

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 <https://mdc.mo.gov/community-conservation/managing-invasive-species-your-community> 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 (<http://www.nwk.usace.army.mil/Missions/RegulatoryBranch.aspx>) and the Missouri Department of Natural Resources (DNR) issued Clean Water Act Section 401 Water Quality Certification (<http://dnr.mo.gov/env/wpp/401/index.html>), 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 <http://dnr.mo.gov/env/wpp/permits/index.html> 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 10-4.111. 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. Detailed information about the animals and some plants mentioned may be accessed at [Missouri Fish and Wildlife Information System \(MOFWIS\)](#). Please contact the Missouri Department of Conservation to request printed copies of any materials linked in this document.

City of Clever Wastewater Treatment Plan Expansion #10671



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

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PROJECT INFORMATION

Project Name and ID Number: City of Clever WWTP 2 #10671

User Project Number: 215003 (2)

Project Description: Lat: 37 02' 63" Long: 93 47'51", Tributary to Spring Creek, Christian County, Missouri

Project Type: Waste Transfer, Treatment, and Disposal, Liquid waste/Effluent, Wastewater treatment plant, Construction or expansion

Contact Person: Gary Shaffer

Contact Information: gs@shafferhines.com or 4177254663

Disclaimer: The NATURAL HERITAGE REVIEW REPORT produced by this website identifies if a species tracked by the Natural Heritage Program is known to occur within or near the area submitted for your project, and shares suggested recommendations on ways to avoid or minimize project impacts to sensitive species or special habitats. 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. The Natural Heritage Program tracks occurrences of sensitive species and natural communities where the species or natural community has been found. Lack of an occurrence record does not mean that a sensitive plant, animal or natural community is not present on or near the project area. Depending on the project, current habitat conditions, and geographic location in the state, surveys may be necessary. Additionally, 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.

The Natural Heritage Report is not a site clearance letter for the project. It provides an indication of whether or not public lands and sensitive resources are known to be (or are likely to be) located close to the proposed project. Incorporating information from the Natural Heritage Program into project plans is an important step that can help reduce unnecessary impacts to Missouri's sensitive fish, forest and wildlife resources. However, the Natural Heritage Program is only one reference that should be used to evaluate potential adverse project impacts. Other types of information, such as wetland and soils maps and 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. The information within this report is not intended to replace 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 the USFWS Information for Planning and Conservation (IPaC) website at <https://ecos.fws.gov/ipac/> for further information. This site was developed to help streamline the USFWS environmental review process and is a first step in ESA coordination. The Columbia Missouri Ecological Field Services Office may be reached at 573-234-2132, or by mail at 101 Park Deville Drive, Suite A, Columbia, MO 65203.



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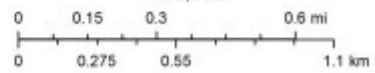
City of Clever WWTP 2



March 19, 2022

1:19,568

-  Project Boundary
-  Buffered Project Boundary



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, Geotbase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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:

Your project is near a designated Natural Area . Please contact Missouri Department of Conservation (NaturalHeritageReview@mdc.mo.gov) for further coordination.

Project Type Recommendations:

Waste Transfer, Treatment and Disposal -Wastewater treatment plant: New or Maintenance; [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 Permit" conditions.

Revegetate disturbed areas to minimize erosion using native plant species compatible with the local landscape and wildlife needs. Annual ryegrass may be combined with native perennials for quicker green-up. Avoid aggressive exotic perennials such as crownvetch and *Sericea lespedeza*. Management Recommendations for Construction Projects Affecting Missouri Rivers and Streams is available at <https://mdc.mo.gov/sites/default/files/2020-06/Streams.pdf>

Project Location and/or Species Recommendations:

Endangered Species Act Coordination - Indiana bats (*Myotis sodalis*, federal- and state-listed endangered) and Northern long-eared bats (*Myotis septentrionalis*, federal-listed threatened) 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. **If any trees need to be removed for your project, please contact the 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.**

The project location submitted and evaluated is within the range of the Missouri Bladderpod. Missouri Bladderpod (*Physaria filiformis*, federal-listed threatened, state-listed endangered) may occur in the project area on limestone glades or limestone rock outcrops along roadsides or in pastures. The species may persist as a seed bank for several years and not be found during plant surveys. Soil disturbance or fire can stimulate seed germination in the fall, yielding flowering plants the following spring. Best Management Practices may be viewed at <https://mdc.mo.gov/sites/default/files/2020-06/MissouriBladderpodBMP.pdf>.

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

<https://mdc.mo.gov/community-conservation/managing-invasive-species-your-community> 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 (<http://www.nwk.usace.army.mil/Missions/RegulatoryBranch.aspx>) and the Missouri Department of Natural Resources (DNR) issued Clean Water Act Section 401 Water Quality Certification (<http://dnr.mo.gov/env/wpp/401/index.html>), 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 <http://dnr.mo.gov/env/wpp/permits/index.html> 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. Detailed information about the animals and some plants mentioned may be accessed at [Missouri Fish and Wildlife Information System \(MOFWIS\)](#). Please contact the Missouri Department of Conservation to request printed copies of any materials linked in this document.

Appendix D: Antidegradation Review Summary Attachments

Antidegradation Review Summary / Request Form



MISSOURI DEPARTMENT OF NATURAL RESOURCES
 WATER PROTECTION PROGRAM, WATER POLLUTION CONTROL BRANCH
ANTIDEGRADATION REVIEW SUMMARY / REQUEST

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

1. FACILITY			
NAME City of Clever WWTP		COUNTY Christian	
ADDRESS (PHYSICAL) 499 Old Wire Road		CITY Clever	STATE MO
		ZIP CODE 65631	
PERMIT NUMBER MO-0102318	PROPOSED DESIGN FLOW 460,000 gpd	SIC / NAICS CODE 221320	
2. OWNER			
NAME City of Clever			
ADDRESS P.O. Box 52		CITY Clever	STATE MO
		ZIP CODE 65631	
EMAIL ADDRESS cityclerk@clevermo.com		TELEPHONE NUMBER WITH AREA CODE 417-743-2544	
3. CONTINUING AUTHORITY			
The regulatory requirement regarding continuing authority is found in 10 CSR 20-6.010(2).			
NAME City of Clever		SECRETARY OF STATE CHARTER NUMBER	
ADDRESS P.O. Box 52		CITY Clever	STATE MO
		ZIP CODE 65631	
EMAIL ADDRESS cityclerk@clevermo.com		TELEPHONE NUMBER WITH AREA CODE 417-743-2544	
4. CONSULTANT			
PREPARER NAME Gary W. Shaffer		COMPANY NAME Shaffer & Hines, Inc.	
ADDRESS P.O. Box 493		CITY Nixa	STATE MO
		ZIP CODE 65714	
EMAIL ADDRESS gs@shafferhines.com		TELEPHONE NUMBER WITH AREA CODE 417-725-4663	
5. RECEIVING WATER BODY SEGMENT #1			
NAME Tributary to Spring Creek			
5.1 Upper end of segment – Location of discharge UTM: X= 457179, Y= 4097872 OR Lat _____, Long _____			
5.2 Lower end of segment – UTM: X= _____, Y= _____ 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 n/a/			
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? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No – What is the proposed method of disinfection? U.V. Disinfection			
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					
<p>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.</p> <p>The Antidegradation Report considered three non-discharging wastewater treatment alternatives;</p> <ol style="list-style-type: none"> 1. Slow-Rate Land Application 2. Subsurface Irrigation 3. Regionalization - Utilizing the City of Republic's wastewater treatment plant. <p>Each alternative was evaluated for practicability, economic efficiency and affordability. The results of the evaluation for each of the alternatives is provided in the attached Antidegradation Report.</p>					
9. ADDITIONAL REQUIREMENTS					
<p>Complete and submit the following with this submittal:</p> <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Copy of the Geohydrologic Evaluation – Submit request through the Missouri Geological Survey website <input checked="" type="checkbox"/> Copy of the Missouri Natural Heritage from the Missouri Department of Conservation website <input checked="" type="checkbox"/> Attach your Antidegradation Review Report and all supporting documentation as these forms are only a summary. <input type="checkbox"/> 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		<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Path B: Tier 2 – Minimal Degradation		<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Path C: Tier 2 – Significant Degradation		<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No		
Path D: Tier 1 – Preliminary Review Request		<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Path E: Temporary Degradation		<input type="checkbox"/> Yes	<input type="checkbox"/> 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
	mg/L	µg/L			
BOD ₅	X			10	15
TSS	X			15	20
Ammonia (Summer)	X			1.2	monitor only
Ammonia (Winter)	X			2.7	monitor only
Total Phosphorus	X			0.5	monitor only
Total Nitrogen	X			10	monitor only
E. coli, #/100 ml				monitor only	126
Aluminum		X		305	monitor only
Iron		X		687	monitor only
pH				6.5 - 9.0	6.5 - 9.0
* Place an X in appropriate box for the concentration units for each Pollutant of Concern.					

12. PROPOSED PROJECT SUMMARY															
<p>Six wastewater treatment alternatives were evaluated to address the wastewater treatment needs of the City of Clever. While it was felt that each of these wastewater treatment alternatives would achieve the anticipated wastewater effluent limits it was felt that the negative characteristics of the majority of the alternatives outweighed their benefits. To determine the affordability of each alternative a present worth analysis was performed with the following results:</p> <p>Present Worth Values for Wastewater Treatment Alternatives</p> <p>Non-Discharging Alternatives</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">WW Alternative</th> <th style="text-align: right;">Present Worth</th> </tr> </thead> <tbody> <tr> <td>Slow-Rate Land Application</td> <td style="text-align: right;">\$12,485,070.74</td> </tr> <tr> <td>Subsurface Land Application</td> <td style="text-align: right;">\$13,430,886.70</td> </tr> <tr> <td>Regionalization</td> <td style="text-align: right;">\$11,143,913.08</td> </tr> </tbody> </table> <p>Discharging Alternatives</p> <table style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td>Oxidation Ditch</td> <td style="text-align: right;">\$11,653,542.73</td> </tr> <tr> <td>Extended Aeration</td> <td style="text-align: right;">\$12,575,978.57</td> </tr> <tr> <td>Sequencing Batch Reactor</td> <td style="text-align: right;">\$10,881,612.27</td> </tr> </tbody> </table>		WW Alternative	Present Worth	Slow-Rate Land Application	\$12,485,070.74	Subsurface Land Application	\$13,430,886.70	Regionalization	\$11,143,913.08	Oxidation Ditch	\$11,653,542.73	Extended Aeration	\$12,575,978.57	Sequencing Batch Reactor	\$10,881,612.27
WW Alternative	Present Worth														
Slow-Rate Land Application	\$12,485,070.74														
Subsurface Land Application	\$13,430,886.70														
Regionalization	\$11,143,913.08														
Oxidation Ditch	\$11,653,542.73														
Extended Aeration	\$12,575,978.57														
Sequencing Batch Reactor	\$10,881,612.27														
<p>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 fact sheet</i>.</p>															
13. CONTINUING AUTHORITY WAIVER (For New Discharges)															
<p>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? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, provide a copy.</p>															
14. APPLICATION FEE															
<p><input checked="" type="checkbox"/> CHECK NUMBER <input type="checkbox"/> JETPAY CONFIRMATION NUMBER</p>															
15. SIGNATURE															
<p>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.</p>															
SIGNATURE	DATE														
	4/20/2022														
PRINT NAME	TITLE														
Gary W. Shaffer	Civil Engineer														
PLEASE IDENTIFY YOUR STATUS FOR THIS PROJECT: <input type="checkbox"/> OWNER <input type="checkbox"/> CONTINUING AUTHORITY <input checked="" type="checkbox"/> CONSULTANT															

**Instructions for Completing
Antidegradation Review Summary for Public Notice**


All blanks must be filled in when the application is submitted to the Missouri Department of Natural Resources. This includes the **required signatures**.

Note: Please use appropriate Path attachment forms to complete the submittal.

Application Information

1. Provide facility name, physical location and requested information.
2. Provide the legal name, mailing address, phone number and email address of the owner. The owner identified in this section and subsequently reflected on the certificate page of the operating permit, is the owner of the regulated activity or discharge being applied for and is not necessarily the owner of the real property on which the activity or discharge is occurring.
3. Complete Continuing Authority contact information. In accordance with 10 CSR 20-6.010(2), a continuing authority is a company, business, entity or person(s) that will be operating the facility or ensuring compliance with the permit requirements. A continuing authority is not, however, an entity or individual that is contractually hired by the permittee to sample or operate and maintain the system for a defined time period, such as a certified operator or analytical laboratory. A continuing authority's name and charter number must be listed exactly as it appears on the Missouri Secretary of State's (SoS's) webpage, unless the continuing authority is an individual(s), government, or otherwise not required to register with the SoS.
4. Provide the name and contact information of the consultant for the project.
5. Provide the project's receiving stream information. The department's mapping system is available online.
6. Same as 4, if applicable.
7. Mark appropriate box.
8. Summarize the feasibility of a no-discharge system.
9. Submit the additional documents.
10. Check the boxes of the appropriate forms included in this submittal.
11. Complete the table for all pollutants of concern with both the proposed average monthly limits, and daily maximum or average weekly limits that the Antidegradation submittal proposed for the selected wastewater treatment design.
12. Summarize the proposed project.
13. Mark appropriate box. Submit waiver, if appropriate.
14. Check the appropriate box and include check or confirmation number. Applicants can pay fees online by credit card or eCheck through a system called JetPay.
 - Per Section 37.001, RSMo, a transaction fee will be included. The transaction fee is paid to the third party vendor JetPay, not the Department of Natural Resources.
 - Be sure to select the correct fee type and corresponding URL to ensure your payment is applied appropriately. If you are unsure what type of fee to pay, please contact the Water Protection Program's Budget, Fees and Grants Management Unit by phone at 573-522-1485 for assistance.
 - Upon successful completion of your payment, JetPay provides a payment confirmation. Submit this form with a copy of the payment confirmation if requesting a new permit or a permit modification. For permit renewals of active permits, the department will invoice fees annually in a separate request.
 - If you are unable to make your payment online, but want to pay with credit card, you may email your name, phone number, and invoice number, if applicable, to WPPFEES@dnr.mo.gov. The Budget, Fees and Grants Management Unit will contact you to assist with the credit card payment. **Please do not include your credit card information in the email.**
 - Applicants can find fee rates in 10 CSR 20-6.011 (dnr.mo.gov/pubs/pub2564.htm).
- Antidegradation: <https://magic.collectorsolutions.com/magic-ui/payments/mo-natural-resources/769/>
15. Application must be signed.

If there are any questions concerning this form, contact the Department of Natural Resources, Water Protection Program at 800-361-4827 or 573-751-1300 or visit dnr.mo.gov/env/wpp.



MISSOURI DEPARTMENT OF NATURAL RESOURCES
 WATER PROTECTION PROGRAM, WATER POLLUTION CONTROL BRANCH
ANTIDegradation REVIEW SUMMARY
PATH C: TIER 2 – SIGNIFICANT DEGRADATION

1. FACILITY				
NAME City of Clever WWTP			COUNTY Christian	
2. SUMMARY OF THE POLLUTANTS OF CONCERN				
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).				
What are the proposed pollutants of concern and their respective effluent limits that the selected treatment option will comply with:				
Pollutants of Concern*	Concentration*		Base Case Limit	Basis (WQS, WLA, ELG, Other)**
	mg/L	µg/L		
BOD ₅	X		10 monthly avg	WQS
TSS	X		15 monthly avg	WQS
Ammonia (Summer)	X		1.2 monthly avg	WQS
Ammonia (Winter)	X		2.7 monthly avg	WQS
Total Nitrogen	X		10 monthly avg	WQS
Total Phosphorus	X		0.5 monthly avg	WQS
E. coli, #/100 ml			126 monthly avg	WQS
Aluminum		X	305 monthly avg	WQS
Iron		X	687 monthly avg	WQS
pH			6.5 - 9.0	WQS
* Place an X in appropriate box for the concentration units for each Pollutant of Concern				
** Provide the Basis for the Base Case Limit: WQS – Water Quality Standard, WLA – Wasteload Allocation, ELG – Effluent Limit Guideline, or describe other.				
3. IDENTIFYING ALTERNATIVES				
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 II.B.1. These alternatives include no-discharge. Attach all supportive documentation in the Antidegradation Review report.				
Feasibility of non-discharging alternatives (regionalization, land application, subsurface irrigation, and recycling or reuse): The Antidegradation Report considered three non-discharging alternatives; slow-rate land application, subsurface irrigation and regionalization (pumping all wastewater to the City of Republic). Each alternative was evaluated for practicability, economic efficiency and affordability. The hydrogeologic report indicates that the plant site and surrounding area has a severe overall geologic limitations rating meaning that the slow-rate land application and the subsurface irrigation alternatives are not feasible. The regionalization alternative proposes pumping the total wastewater contributions from the City of Clever to the City of Republic's existing Wastewater Treatment Plant through an intergovernmental agreement which would be entered into between the two cities. It is predicted that wastewater user charge rates will increase due to the rate being established by the City of Republic. The City of Clever will have little if any input on what this user charge rate will be. The unit price indicated in the opinion of cost for force main does not reflect the need for preparing and writing easements, negotiation with landowners and final payments for the required easements. Unless a comprehensive analysis is conducted to clarify the numerous unknowns associated with this alternative it appears that this would be an unattractive alternative.				

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		
2		
3		
4		
5		
6		
1 Oxidation Ditch	modified activated sludge	250,000 gpd ditch/clarification/filtration/disinfection
2 Diffused Aeration Basin	activated sludge	460,000 gpd aeration basin/clarification/filtration/disinfection
3 Sequencing Batch Reactor	modified activated sludge	250,000 gpd SBR/flow equalization/filtration/disinfection
* 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.		
<p>Practicability Summary:</p> <p>"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.</p> <p>A modified activated sludge biological treatment process utilizes long solids retention times to remove biodegradable organics. Typical treatment systems consist of a single or multi-basin configuration followed by secondary clarification, filtration and disinfection.</p> <p>The activated sludge process is a fully demonstrated secondary wastewater treatment technology, applicable in any situation where activated sludge treatment (conventional or extended aeration) is appropriate.</p> <p>The activated sludge process has the ability to achieve removal performance objectives with low operational requirements and operation and maintenance costs.</p>		
<p>Economic Efficiency Basis:</p> <p>What is the design life cycle for the comparison? 20 years</p> <p>What interest rate was used in the present worth calculations? 3 percent</p>		
<p>Economic Efficiency Summary:</p> <p>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.</p> <p>Discharging Alternatives</p> <p>Oxidation Ditch \$11,653,542.73 Extended Aeration \$12,575,978.57 Sequencing Batch Reactor \$10,881,612.27</p> <p>While not the alternative with the lowest present worth cost, the recommended alternative for the proposed project is the 250,000 gpd Oxidation Ditch Wastewater Treatment Alternative which consists of expanding the existing wastewater treatment plant within the existing plant site.</p>		

TABLE OF THE ALTERNATIVES EVALUATION (Attach additional page if necessary)						
PARAMETERS	Alternatives #					
	1	2	3	4	5	6
BOD ₅ – mg/L	0	0	0	10	10	10
TSS – mg/L	0	0	0	15	15	15
Ammonia (Summer) – mg/L	0	0	0	1.2	1.2	1.2
Ammonia (Winter) – mg/L	0	0	0	2.7	2.7	2.7
E. Coli – #/100 mL	0	0	0	126	126	126
Total Nitrogen – mg/L	0	0	0	10	10	10
Total Phosphorus – mg/L	0	0	0	0.5	0.5	0.5
	Non-Discharge	Non-Discharge	Regionalization	Oxidation Ditch	Extended Air	SBR
Construction Cost – \$	4716018	5971061	8523101	4057349	5439215	3209759
Operating Cost – \$	593808	593808	297151	534871	534871	534871
Present Worth – \$	12485071	13430887	11143913	11653543	12575979	10881612
Ratio present worth to base case	2.65	2.25	1.31	2.87	2.31	3.39
Affordability Summary:						
<p>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."</p> <p>The oxidation ditch wastewater treatment alternative has a present worth value of \$11,653,542.73 which, while not the least present worth value, is consistent with the costs of other alternatives. Because the design flows anticipated in this report are significant it is felt that the use of this process will be an attractive alternative.</p> <p>While the community's financial capability to implement this wastewater treatment alternative was not specifically evaluated in</p>						
Justification for Preferred Alternative:						
<p>The primary justification for selecting the Oxidation Ditch Wastewater Treatment Alternative was the City's familiarity with the treatment process. Implementation of this alternative will not significantly change the daily operation routine which has taken place in the past.</p> <p>While the capacity of the plant will be increased, this additional capacity will basically result from constructing additional units to supplement each of the treatment units which currently exist at the plant.</p>						
Reasons for Rejecting the other Evaluated Alternatives:						
<p>Due to geologic concerns the slow-rate land application and the subsurface irrigation alternatives were considered to be not feasible. The regional alternative has many unanswered questions, most of which would adversely impact selection of this alternative. The extended aeration alternative and particularly the sequencing batch reactor alternative would require significant changes in operation and maintenance over that which currently exists.</p>						
Comments/Discussion:						
<p>Prior to starting the report a meeting was held to discuss the project. In attendance was public works personnel, the wastewater treatment plant operator and the engineering consultant. The alternatives presented in the antidegradation report were discussed and the alternative preferred by far was the oxidation ditch. The City has operated an oxidation ditch to treat their wastewater contributions since the 1980's and feel comfortable with this approach going forward.</p>						

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 City of Clever is located in Christian County. There are approximately 1,140 residential lots within the city which currently utilize the City's wastewater treatment plant. Based on the 2021 population of 2,876, the population density would be 2.52 persons/lot. This figure compares favorably with the County-wide population density of 2.69 persons/lot in Christian County.

Water usage, and subsequently wastewater generated within the City is primarily due to residential water usage. Residential water usage accounts for ninety-seven percent of the total water sold while commercial usage accounts for approximately three percent. Currently there is only one water user which is listed as an industrial user.

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.

Demographically, the median age in the City is 31 years old, the average household income is \$57,419 and seventy-four percent are homeowners while twenty-six percent are renters.

Due to a lack of commercial and industrial establishments the majority of residents work in larger cities located near the City of Clever such as Springfield, Republic and Nixa.

The City of Clever provides an attractive option for purchasing a home, especially to first time homebuyers, due to lower housing costs coupled with its proximity to these larger cities.

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.

The ability to provide adequate wastewater treatment is critical for continued residential development to occur within the city. Without additional wastewater treatment capacity future residential developments will not be allowed to proceed. As stated, residential housing is the primary economic driver within the city and without it the city will suffer negative economic impacts.

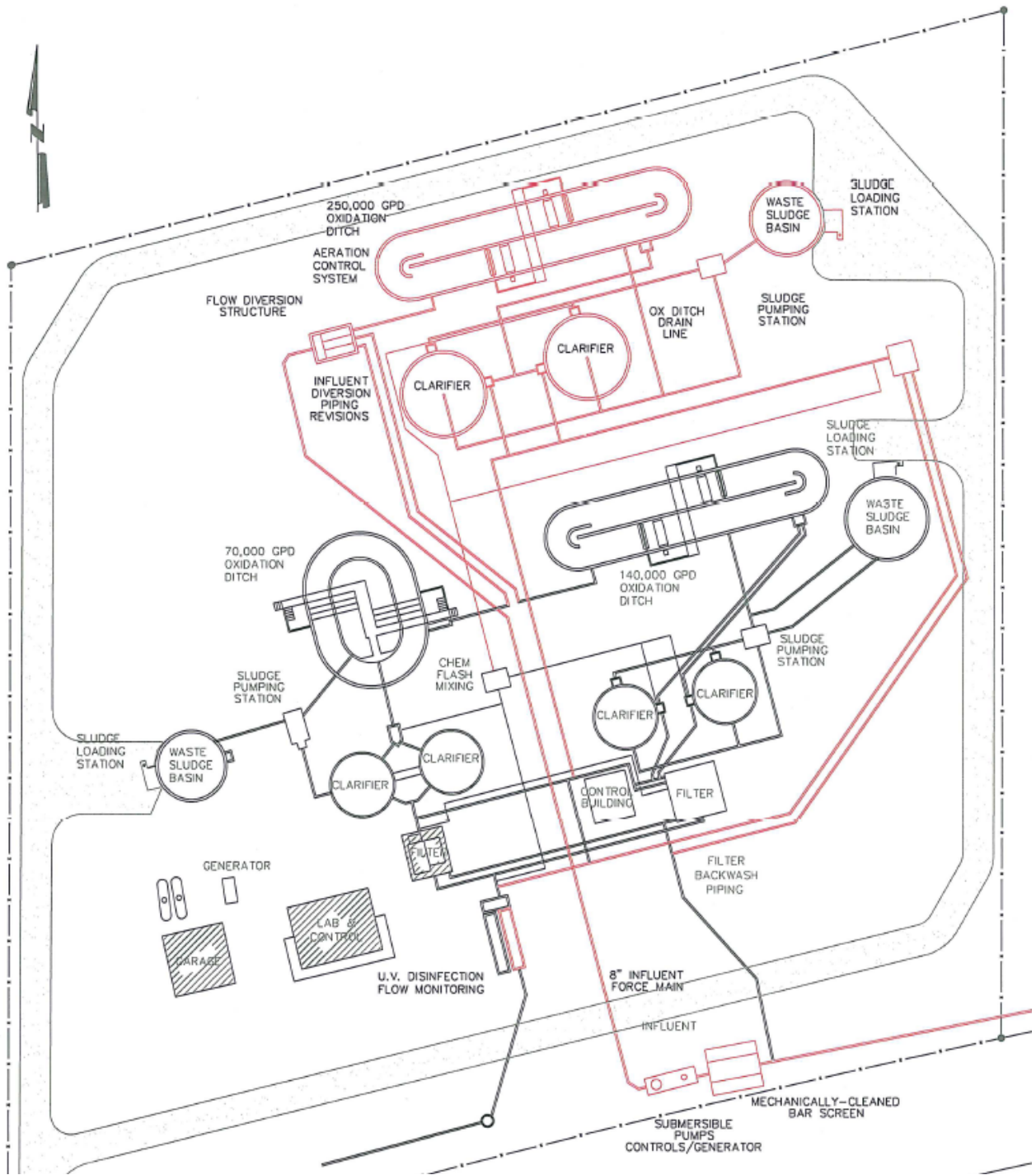
PROPOSED PROJECT SUMMARY:

Each of the proposed improvements associated with the proposed wastewater treatment plant project were aimed at enhancing the environment. The installation of additional capacity for biological and chemical phosphorus removal will reduce phosphorus concentrations in the plant effluent to 0.50 mg/l thereby reducing the phosphorus loading to the receiving stream. In addition, it is anticipated that a monthly nitrogen limit of 10 mg/l will be placed on the treatment plant as well. The addition of mechanical screening, pumping capacity at the influent lift station and increased capacity of the oxidation ditch, tertiary filtration, additional ultra-violet disinfection, and expansion of the chemical feed system will increase the capacity of these respective units to accommodate the anticipated hydraulic and organic loadings in the design year of 2041. Once completed, the project will reduce the likelihood of discharging improperly treated wastewater to the receiving stream.

The annual user charge is anticipated to increase from \$31.17 per month for a typical residential user or \$374.04 for an annual charge to \$51.49 per month for a typical residential user or \$617.86 for an annual charge. The proposed improvements will basically increase the existing monthly sewer bill by \$20.30 per month.

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 – PROCESS FLOW DIAGRAM



APPENDIX – SUMMARY OF DESIGN

SUMMARY OF DESIGN
WASTEWATER TREATMENT PLANT IMPROVMENTS

For the

CITY OF CLEVER, MISSOURI

July, 2023
Revised February, 2024
Revised September, 2024

Prepared by

SHAFFER & HINES, INC.
CONSULTING ENGINEERS – PROFESSIONAL LAND SURVEYORS
P.O. Box 493
Nixa, Missouri 65714
(417) 725-4663
gs@shafferhines.com



HYDRAULIC AND ORGANIC LOADINGS

DESIGN AVERAGE FLOW, DESIGN PEAK HOURLY FLOW AND DESIGN MAXIMUM DAILY FLOW

Based on population growth data over the past six years it was assumed that the City's population would grow at a rate of 3.1 percent annually over the next 20 year period. Based on actual flow data recorded at the plant for the years 2016 through 2022 it was determined that a daily per capita usage of 85.50 gpcd occurred. It was also determined that the maximum daily flow averaged 2.13 times the average daily flow during this time. To determine the design maximum daily flow a peaking factor of 3.22 was employed to approximate the Peak Hourly Flow vs. Average Daily Flow based on the department's peaking factor equation.

PROJECTED AVERAGE AND PEAK FLOWS

<u>Year</u>	<u>Population</u>	<u>Q avg. , gpd</u>	<u>Q peak, gpd</u>
2016	2,486	304,333	1,068,209
2017	2,534	162,083	568,911
2018	2,592	191,333	671,579
2019	2,667	252,917	887,739
2020	2,770	249,000	873,990
2021	2,876	197,000	634,340
2021	2,876	245,898	791,792
2022	2,965	253,521	816,337
2023	3,057	261,380	841,644
2024	3,152	269,483	867,734
2025	3,250	277,837	894,634
2026	3,350	286,450	922,368
2027	3,454	295,330	950,961
2028	3,561	304,485	980,441
2029	3,672	313,924	1,010,835
2030	3,785	323,655	1,042,171
2031	3,903	333,689	1,074,478
2032	4,024	344,033	1,107,787
2033	4,149	354,698	1,142,128
2034	4,277	365,694	1,177,534
2035	4,410	377,030	1,214,038
2036	4,546	388,718	1,251,673
2037	4,687	400,769	1,290,475
2038	4,833	413,192	1,330,479
2039	4,982	426,001	1,371,724
2040	5,137	439,207	1,414,248
2041	5,296	452,823	1,458,089
2042	5,460	466,845	1,503,241

PROJECTED BOD AND TSS LOADING

The results of actual monitoring reports from the plant for the years 2016 through 2022 were utilized to predict existing and projected organic loadings. It was assumed that the flow to the plants would be split with 15 percent being diverted to the 70,000 gpd oxidation ditch, 30 percent being diverted to the 140,000 gpd oxidation ditch and 55 percent being diverted to the proposed 250,000 gpd oxidation ditch. The plants will basically act independently of each other. Anticipated BOD and TSS loadings to each plant are presented in Table VIII.

TABLE VIII

PROJECTED BOD AND TSS LOADING

<u>Year</u>	<u>Population</u>	<u>BOD, lb/day</u>	<u>TSS, lb/day</u>
2016	2,486	423	497
2017	2,534	431	507
2018	2,592	441	518
2019	2,667	453	533
2020	2,770	471	554
2021	2,876	489	575
2022	2,965	504	593
2023	3,057	520	611
2024	3,152	536	630
2025	3,250	552	650
2026	3,350	570	670
2027	3,454	587	691
2028	3,561	605	712
2029	3,672	624	734
2030	3,785	644	757
2031	3,903	663	781
2032	4,024	684	805
2033	4,149	705	830
2034	4,277	727	855
2035	4,410	750	882
2036	4,546	773	909
2037	4,687	797	937
2038	4,833	822	967
2039	4,982	847	996
2040	5,137	873	1,027
2041	5,296	900	1,059

INDIVIDUAL PROCESS UNITS

The existing wastewater treatment plant can accommodate an average daily flow of 210,000 gallons per day in accordance with the Missouri State Operating Permit MO-0102318 issued in June, 2018. While flow data recorded at the plant over the past several years has fluctuated it appears that the theoretical capacity of the existing plant, while able to accommodate the City's current wastewater treatment needs, is rapidly approaching its theoretical design capacity. Based on projections of hydraulic and organic loadings for the next 20 years it was determined that the 210,000 gpd capacity of the existing wastewater treatment plant would need to be increased to accommodate an average daily flow 452,823 gpd and a peak flow of 1,458,089 gpd. The construction of a 250,000 gpd oxidation ditch, in addition to the existing plant, would result in a total treatment capacity of 460,000 gpd. The proposed project consists of upgrading the existing treatment plant and would basically consist of the following improvements.

1. Mechanically-Cleaned Screen – Replacement of the existing mechanically-cleaned influent bar screen located upstream of the existing influent lift station with a screen having a larger capacity thereby minimizing potential operational problems at the lift station as well as the individual treatment units within the plant. The screen would be placed in the existing screening building to prevent freezing from occurring during the winter months.

In accordance with the projected hydraulic loading the proposed mechanically-cleaned screen will be designed for a peak flow of 1,458,090 gallons per day. The existing bypass channel will be equipped with a proposed manually-cleaned bar screen. The clear opening between bars for the manually-cleaned bar screen will be one inch maximum and the clear opening between bars for the mechanically-cleaned bar screen will be 5/8 inch to one inch.

2. Influent Lift Station - Based on an anticipated peak flow of 1,458,090 gpd (1,013 gpm) in the year 2041, the existing influent lift station will be removed and replaced with a proposed influent lift station equipped with submersible pumps and controls capable of delivering 1,013 gpm at a TDH of 47 feet.

It is proposed that the existing emergency generator which serves the influent lift station will require replacement with a larger generator to provide power to the proposed lift station as well as the proposed plant expansion.

Typically, velocities in force mains are designed to accommodate flows at a velocity between 2 feet per second and 8 feet per second. At the proposed flowrate the velocity in the existing 6-inch force main will exceed 11 feet per second. It is proposed to replace the existing 6-inch force main with an 8-inch diameter force main. The velocity within the 8-inch force main at 1,013 gpm will be approximately 6.30 feet per second.

In accordance with MDNR requirements a 2-hour emergency storage must be provided in case of power outages, mechanical failures, etc. At a peak flow of 1,013 gpm an emergency storage volume

of 121,560 gallons will be required. It was determined that there is 20,789 gallons of available storage in the existing incoming gravity sewers, manholes, and screening structure. To obtain the remaining required volume (121,560 gallons – 20,789 gallons = 100,771 gallons) a concrete storage basin having dimensions of 20'W x 57.5'L x 12'D will provide 103,224 gallons. Therefore the available emergency storage would be 122.4 minutes at a peak flow of 1,013 gpm.

3. Flow Diversion Structure - Screened wastewater from the influent lift station is pumped to an existing flow diversion structure via a 6-inch diameter force main which currently diverts the flow to the existing 70,000 gallon per day oxidation ditch and the existing 140,000 gallon per day oxidation ditch. In order to divert flow to the proposed 250,000 gpd oxidation ditch it is proposed to eliminate the existing diversion structure and construct a proposed flow diversion structure capable of monitoring and diverting flows between the three oxidation ditches.

4. 250,000 gpd Oxidation Ditch Volume and Air Supply - Using the Missouri Department of Natural Resources BOD maximum loading rate of 15 lbs of BOD per 1,000 cu. ft of aeration basin volume and assuming that the plant will receive 55 percent of the ultimate BOD loading of 900 lbs per day the required oxidation ditch volume was determined to be:

$$(15 \text{ lbs BOD} / 1,000 \text{ cu. ft.}) \times (900 \text{ lbs BOD/day} \times 0.55) \times 7.48 \text{ gal/cu. ft.} = 246,840 \text{ gal.}$$

Currently both of the wastewater treatment plants employ an aeration control system to modify oxygen levels in both existing oxidation ditches thereby allowing for biological uptake of phosphorus without the necessity of providing anaerobic selector basins. It is proposed to provide a similar aeration control system for the proposed 250,000 gpd oxidation ditch.

The air supply for the proposed oxidation ditch will be accomplished by mechanical aeration. (VFD controlled horizontally mounted brush aerators) At the time of installation the manufacturer of the aeration system for the ditch will be required to provide certified testing results which would verify adequate mechanical aerator performance.

In accordance with Missouri Department of Natural Resources requirements, the air supply will be:

$$\text{Required Aeration} = 1.80 \text{ lbs O}_2 / \text{lb. BOD (per 10 CSR 20-8)}$$

$$= 4.60 \text{ lbs O}_2 / \text{lb. NH}_3 - \text{N (per 10 CSR 20-8)}$$

$$\text{lb O}_2 = 1.80 \times \text{lb BOD}_5 + 4.60 \times \text{lb NH}_3 - \text{N}$$

Assuming that 15 percent of the incoming flow will be diverted to the 70,000 gpd oxidation ditch and 30 percent will be diverted to the 140,000 gpd ditch, approximately 55 percent, or 250,000 gpd will be diverted to the proposed oxidation ditch. Assuming that approximately 55 percent of the total anticipated BOD loading of 900 pounds per day in the year 2041 will be treated at the proposed plant, the oxygen requirements for removal of 495 lbs/day of BOD and 30 mg/l of ammonia nitrogen (anticipated concentration) from the proposed 250,000 gpd oxidation ditch are:

$$\text{BOD} = 900 \text{ lbs BOD/day} \times 0.55 = 495 \text{ lbs/day}$$

$$\text{NH}_3 = 30 \text{ mg/l} \times 8.33 \times 0.25 \text{ MG} = 63 \text{ lbs/day}$$

$$\text{Required Oxygen} = 1.80 \times 495 + 4.60 \times 63 = 1,181 \text{ lbs/day}$$

Preliminary calculations suggest that the oxidation ditch will have an internal width of 35 feet and a straight section of 74 feet for a total length of 109 feet. The proposed sidewater depth of the oxidation ditch was assumed to be 10 feet. Taking into account the reduction in volume resulting from the internal walls the resulting volume of the oxidation ditch was determined to be 260,163 gallons.

Manufacturer's literature indicates a typical average oxygen transfer rate of five pounds of oxygen per hour per lineal foot of aerator or 3.5 lbs of oxygen per horsepower per hour. Assuming two rotors each having 17.0 lineal feet of aerators powered by 25 horsepower motors. Each rotor must be able to supply the required oxygen therefore the aeration capacity would be:

$$17.0 \text{ lineal feet} \times 5 \text{ lb O}_2/\text{hr} \times 24 \text{ hrs/day} = 2040 \text{ lbs O}_2 \text{ per day, or:}$$

$$3.5 \text{ lbs O}_2/\text{HP/hr} \times 24 \text{ hrs/day} = 2100 \text{ lbs O}_2 \text{ per day}$$

The required solids retention time will be dependent on the amount of RAS/WAS by the plant operator as he adjusts his MLSS concentration. Literature suggests that a solids retention time of 12-24 days is desirable for nitrification and 5-12 days for phosphorus removal.

Based on the oxidation ditch volume of 260,063 gallons and an average flow of 250,000 gallons per day the hydraulic retention time in the proposed ditch will be 1.04 days or 24.9 hours.

The MLSS in the oxidation ditch will be dependent on the amount of RAS/WAS by the plant operator. Values of MLSS of between 3,000 and 5,000 mg/l are typical but higher concentrations may be desirable for biological nutrient removal. A review of the existing plant's MLSS concentration revealed an average MLSS concentration of 5,783 mg/l which is slightly elevated over typical values however, biological nutrient removal efficiencies at the plant are acceptable.

Assuming that an insignificant oxygen demand from peak flows due to I/I the total peak oxygen required in lb/day will be approximately 1,181 lbs/day. Further, assuming a standard oxygen transfer rate has an efficiency of 0.63 vs the actual oxygen transfer rate, the required aeration to the oxidation ditch would be $1,183 \text{ lbs per day} / 0.63 = 1,771.50 \text{ lbs per day}$ would be required. Based on the manufacturers literature an oxygen delivery rate of 3.5/hp/hr and 25 hp brush rotors would deliver 2,100 lbs of oxygen per day.

$$\text{Based on this the AOR/SOR ratio would be } 1771.50/2,100 = 0.84$$

5. Secondary Clarifiers - As was mentioned previously it was assumed that approximately 55 percent of the incoming wastewater flow would be diverted to the proposed 250,000 gpd oxidation ditch and subsequently enter proposed secondary clarifiers to be located immediately downstream.

The remaining 45 percent of incoming wastewater flow would be diverted to the existing 70,000 gpd oxidation ditch and the existing 140,000 gpd oxidation ditch and their attendant secondary clarifiers. Because these two existing sets of clarifiers were designed specifically to treat the waste flows from their respective oxidation ditches it was assumed for purposes of this report that they will continue to do so and no attempt was made to combine the effluent lines from the oxidation ditches.

It is proposed that clarification of the effluent from the 250,000 gpd oxidation ditch will be accomplished with two secondary clarifiers each having a diameter of 32 feet and each clarifier having a total surface area of 805 square feet and a side water depth of 12 feet. The scraper mechanisms for each clarifier will be powered by 0.50 H.P. motors.

Using Missouri Department of Natural Resources requirements, the clarifier surface overflow rate (SOR) at peak design flow rate must be 1,000 gallons per square feet per day or less. Assuming the peak design flow entering the proposed oxidation ditch in year of 2041 is 250,000 gpd x 3.22 = 805,000 gallons per day the secondary clarifiers will each be sized as follows:

$$805,000 \text{ gpd} / x \text{ sq. ft.} = 1,000 \text{ gpd/sq. ft.}$$

$$\text{Clarifier sq. ft.} = 805,000 \text{ gpd} / 1,000 \text{ gpd/sq. ft.} = 805 \text{ sq. ft.} = 3.14 \times \text{dia.}^2 / 4$$

$$\text{Clarifier Diameter} = 32 \text{ feet} \quad \text{Number of Clarifiers} = 2$$

Using Missouri Department of Natural Resources requirements, the clarifier Weir loading rate in gallons per day for the secondary clarifiers at peak design flow rate must be 20,000 gallons per square feet per linear foot or less. Each clarifier will be provided with 44 linear feet of weir. Assuming the peak design flow entering the proposed clarifier in year of 2041 is 250,000 gpd x 3.22 = 805,000 gallons per day the secondary clarifiers weirs will be sized as follows:

$$805,000 \text{ gpd} / \text{linear ft. of weir} = 20,000 \text{ gpd/linear ft. of weir (max.)}$$

$$\text{Actual Clarifier weir loading} = 805,000 \text{ gpd} / 44 \text{ linear ft.} = 18,295 \text{ gpd/linear ft. of weir}$$

Using Missouri Department of Natural Resources requirements, the clarifier solids loading rate in pounds per day per square feet for the secondary clarifiers at peak design flow rate must be 35 pounds per day per square feet or less. Each clarifier has an area of 805 square feet. Assuming the peak design TSS entering the proposed clarifiers in year of 2041 is 1,059 lbs TSS/day x 3.22 = 3,409 lbs per day and assuming a 150 percent return sludge to the oxidation ditch the solids loading to the secondary clarifiers the solids loading was determined to be as follows:

$$\begin{aligned} &3,409 \text{ pounds TSS/day/} + 1.5 \times 3,409 \text{ pounds TSS/day per square foot of clarifier} = \\ &3,409 + (1.5 \times 3,409) \text{ pounds/per/day/ square foot of clarifier} = 10.6 \text{ pounds/day/square} \\ &\text{foot} \end{aligned}$$

5. Waste Sludge Storage – Total sludge production from the plant was based on the activated sludge process, DNR recommends 0.028 dry tons per population equivalent, and for the

extended aeration process, DNR recommends 0.021 dry tons per population equivalent. Because the oxidation ditch for Clever is actually a hybrid of both the activated sludge and extended aeration process an average of these sludge production numbers was used which yields a sludge production number of 0.024 dry tons per population equivalent. If we assume the design population will be 5,296 people the sludge production would be $5,296 \times 0.024 = 127$ dry tons per year.

Additional sludge storage will be required to accommodate sludge production at the proposed 250,000 gpd oxidation ditch. The volume required was determined as follows:

Design P.E. = 5,296 (Design Year 2041)
 $BOD_5 = 0.17 \times 5,296 = 900$ lbs BOD/day (assume 55% goes to waste sludge basin)=495 lbs BOD/day
 $(900 \times 0.55) - (30 \text{ mg/l} \times 8.34 \text{ lbs/MG/mg/l} \times 0.25 \text{ MGD}) = 432.45$ BOD removed
 $432.45 \times 0.65 \text{ lbs sludge/lbs BOD} = 281.09$ lbs sludge/day
(Assume 1.65 percent solids in sludge, basin depth of 12 feet and 60 day storage)
 $(281 \text{ lbs sludge/day} \times 60 \text{ days} \times 1/8.34 \text{ lbs/MG}) / 0.0165 = 122,520$ gallons sludge
 $122,520 \text{ gallons sludge} / 7.48 = 16,379$ cu. ft.
Diameter of Basin = $(3.14 \times d^2 / 4) \times 12' = 16,379$ cu. ft. $d = 42$ feet

MDNR recommends that adequate aeration be provided to provide suspension of solids within the basin while maintaining a dissolved oxygen concentration of between 1.0 and 2.0 mg/l. To accomplish this requires 30 cfm/1,000 cu. ft. of basin volume with the largest blower out of service.

Aeration Requirement = $15,697 \text{ cu. ft.} / 30 \text{ cfm} / 1,000 \text{ cu. ft.} = 471 \text{ cfm}$

It is also proposed to construct a vacuum-type sludge loading station to transfer the contents of the waste sludge basin to the City's sludge hauling vehicle.

7. Sludge Transfer Station - It is proposed to provide a sludge pumping station adjacent to the clarifiers which will transfer the waste sludge to the waste sludge basin. The sludge pumps must be capable of pumping between 50% and 150% of the average flow to the proposed 250,000 gpd oxidation ditch therefore the pumps must be capable of delivering between 87 gpm and 261 gpm. Plant piping will allow for either returning sludge to the oxidation ditch or wasting sludge to waste sludge holding.

8. Tertiary Filtration - It is a requirement that tertiary filters be sized to accommodate the peak flow rate at a filter loading of 5 gpm per square foot with the largest unit out of service.

Currently there are two (2) prefabricated steel tertiary filters constructed in 1983 each of which has a total surface area of 60.0 square feet and one prefabricated tertiary filter constructed in 1999 having a total surface area of 72 square feet. In-plant piping completed in 2014 connected these filters providing the capability for the filters to act as a unit.

It was assumed that the proposed tertiary filter would serve the proposed 250,000 gpd oxidation ditch and would need to be sized to accommodate a peak flow of:

$$250,000 \text{ gpd} \times 3.22 = 805,000 \text{ gpd}$$

Based on a loading rate of 5 gpm per square foot the surface area of the tertiary filter would be:

$$(805,000 \text{ gpd}) / (5.00 \text{ gpm/sq. ft. / day}) \times (1,440 \text{ min. / day}) = 112 \text{ sq. ft.}$$

Note that the estimated total peak design flow rate in the year 2041 is projected to be 1,458,089 gpd and the accompanying filtration rate with the proposed tertiary filter offline will be:

$$1,458,089 \text{ gpd} / 1,440 \times 192 \text{ sq. ft.} = 5.27 \text{ gpm/sq. ft. / day (Assumes utilizing both filters constructed in 1983 and the filter constructed in 1999 and leaving the proposed filter serving the proposed 250,000 gpd plant offline)}$$

While the 5.0 gpm per square foot is slightly exceeded at the ultimate peak flow using only the existing filters and with the proposed tertiary offline, it seems reasonable to continue to employ the existing filters rather than replace them.

9. Ultra-Violet Disinfection - Currently the filtered effluent is disinfected by means of two banks of ultraviolet lamps which were designed to accommodate a flow rate of 720,000 gallons per day, 500 gallons per minute, or 250 gallons per minute per bank.

Based on MDNR requirements that the ultra-violet disinfection system have the capacity to provide disinfection at peak flow with one bank of bulbs out of service. Assuming a peak flow in the year 2041 of 1,458,089 gpd, or 1,013 gallons per minute, the capacity of the proposed ultra-violet disinfection system must be capable of disinfecting:

$$1,013 \text{ gpm} - 250 \text{ gpm (out of service)} = 763 \text{ gallons per minute}$$

It is proposed to replace the and construct a new U.V. disinfection structure with two banks of U.V. bulbs.

10. Chemical Feed System - It is proposed that the existing liquid chemical feed system used to "polish" the effluent in both oxidation ditches thereby reducing phosphorus concentrations in the effluent to 0.50 mg/l or less be upgraded. Currently two fractional H.P. solenoid metering pumps each capable of delivering a minimum of 1.0 g/hr. at a pressure of 110 psi are employed. A third pump is available as a standby. In addition, a portable chemical storage building and a liquid alum containment structure was provided in 2014. The alum is currently injected at two locations, ahead of the secondary clarifiers serving each oxidation ditch and ahead of the tertiary filters. Flash mixing structures were placed downstream of each oxidation ditch/secondary clarifier and upstream of the tertiary filters to insure a complete mix of alum with the wastewater prior to filtration.

It is proposed to provide two additional metering pumps, chemical feed piping and flash mixing structures to provide the capability of injecting alum ahead of the proposed secondary clarifiers and ahead of the proposed tertiary filter.

11. In-Plant Piping Improvements - It is proposed to provide in-plant piping to allow for the isolation of each of the two proposed secondary clarifiers serving the proposed 250,000 gpd

oxidation ditch in the event one should need to be removed from service. This will consist of the low tech approach of installing slide gates in the inlet side of the flash mixing structure located between the existing clarifiers.

In addition, it is also proposed to provide in-plant piping to allow for transferring the backwash from the proposed tertiary sand filter back to the influent mechanical screening structure.

UNIT LOADINGS AND TREATMENT EFFICIENCIES

The following discussion provides estimated loadings to and removal efficiencies through each unit operation in addition to total removal efficiency and effluent quality (both concentrations and mass);

The following table presents the anticipated characteristics of the influent wastewater.

ANTICIPATED INFLUENT CHARACTERISTICS

<u>Parameter</u>	<u>Concentration</u>
BOD	240 mg/l
TSS	282 mg/l
Total P	15 mg/l
Ammonia as N	40 mg/l

Mechanically-Cleaned Bar Screen – The first unit operation, a mechanically-cleaned bar screen/manually-cleaned bar screen combination, will be located ahead of the existing influent lift station to reduce solids loading to the wastewater treatment plant thereby improving influent pump performance, reducing sludge production, and improving plant operation. The bar screen was designed for an average daily flow of 450,000 gallons per day and a peak flow of 1,458,090 gallons per day.

Literature suggests that a BOD reduction of 20 to 35 percent can be achieved through the screen and a similar reduction in TSS was assumed. Reductions in Phosphorus and Nitrogen through the screen were assumed to be negligible.

Assuming a 25 percent removal efficiency the reduction in BOD and TSS through the screen would be:

BOD Removal in Influent Screen

$$(240 \text{ mg/l} \times 0.25) = 60 \text{ mg/l}$$

$$60 \text{ mg/l} \times 1 \text{ MG} / 8.34 \text{ pounds/MG/mg/l} \times 450,000 \text{ gpd} = 16 \text{ pounds per day}$$

TSS Removal in Influent Screen

$$(282 \text{ mg/l} \times 0.25) = 70 \text{ mg/l}$$

$$70 \text{ mg/l} \times 1 \text{ MG} / 8.34 \text{ pounds/MG/mg/l} \times 450,000 \text{ gpd} = 19 \text{ pounds per day}$$

Influent Lift Station – The proposed lift station upgrade was based on an anticipated peak flow of 1,458,090 gpd (1,013 gpm) in the year 2041, the non-clog wastewater pumps in the existing influent lift station will be removed and proposed pumps and controls capable of delivering 1,013 gpm at a TDH of 31 feet will be installed.

Reductions in BOD, TSS, Phosphorus and Nitrogen through the influent lift station were assumed to be negligible.

Flow Diversion Structure - Screened wastewater from the influent lift station will be pumped to a proposed flow diversion structure via an 8-inch diameter force main which will divert the flow to the existing 70,000 gallon per day oxidation ditch, the existing 140,000 gallon per day oxidation ditch and the proposed 250,000 gallon per day oxidation ditch.

Reductions in BOD, TSS, Phosphorus and Nitrogen through the flow diversion structure were assumed to be negligible.

250,000 gpd Oxidation Ditch - It was assumed that the proposed 250,000 gallon per day oxidation ditch will receive 55 percent of the BOD, TSS, TN and TP loading. Based on the assumption that a removal efficiency of 25 percent removal of BOD and TSS was accomplished in the influent screen the loading to the proposed oxidation ditch would be.

BOD to Ox Ditch

$$240 \text{ mg/l} - 60 \text{ mg/l} = 180 \text{ mg/l}$$

TSS to Ox Ditch

$$282 \text{ mg/l} - 70 \text{ mg/l} = 212 \text{ mg/l}$$

The proposed oxidation ditch will be equipped with an aeration control system to modify oxygen levels in the ditch thereby allowing for biological nutrient uptake of Phosphorus and Nitrogen. Literature suggests that removal efficiencies for BOD, TSS, TN and TP are 96 percent, 97 percent, 90 percent and 90 percent, respectively. It was further assumed that the Ammonia Nitrogen concentration in the influent would be 40 mg/l and the total Phosphorus concentration in the influent would be 15 mg/l. Based on these pollutant concentrations and removal efficiencies the reductions will be:

BOD Removal in Ox Ditch

$$(180 \text{ mg/l} \times 0.96) = 173 \text{ mg/l}$$

$$173 \text{ mg/l} \times 1 \text{ MG} / 8.34 \text{ pounds/MG/mg/l} \times 250,000 \text{ gpd} = 83 \text{ pounds per day}$$

TSS Removal in Ox Ditch

$$(212 \text{ mg/l} \times 0.97) = 206 \text{ mg/l}$$

$$206 \text{ mg/l} \times 1 \text{ MG} / 8.34 \text{ pounds/MG/mg/l} \times 250,000 \text{ gpd} = 99 \text{ pounds per day}$$

Total Phosphorus Removal in Ox Ditch

Total Phosphorus = 15 mg/l x 0.90 = 13 mg/l

13 mg/l x 1 MG / 8.34 pounds/MG/mg/l x 250,000 gpd = 6 pounds per day

Ammonia Nitrogen Removal in Ox Ditch

Ammonia Nitrogen = 40 mg/l x 0.90 = 36 mg/l

36 mg/l x 1 MG / 8.34 pounds/MG/mg/l x 250,000 gpd = 17 pounds per day

Secondary Clarifiers - As was mentioned previously it was assumed that approximately 55 percent of the incoming wastewater flow would be diverted to the proposed 250,000 gpd oxidation ditch and subsequently enter the proposed secondary clarifiers to be located immediately downstream.

It is proposed that clarification of the effluent from the 250,000 gpd oxidation ditch will be accomplished with two secondary clarifiers each having a diameter of 32 feet, a total surface area of 805 square feet and a side water depth of 12 feet. Literature suggests that removal efficiencies for BOD and TSS in the secondary clarifiers will be 30 percent and 55 percent, respectively.

Based on the assumption that a removal efficiency of 25 percent of BOD and TSS was accomplished in the influent screen and removal efficiencies for BOD, TSS, TN and TP of 96 percent, 97 percent, 90 percent and 90 percent, respectively were accomplished in the proposed oxidation ditch, the pollutant loading to the proposed secondary clarifiers would be.

BOD to Clarifiers

240 mg/l – 60 mg/l - 173 mg/l = 7 mg/l

TSS to Clarifiers

282 mg/l – 70 mg/l - 206 mg/l = 6 mg/l

Total Phosphorus to Clarifiers

15 mg/l – 13 mg/l = 2 mg/l

Ammonia Nitrogen to Clarifiers

40 mg/l – 36 mg/l = 4 mg/l

Literature suggests that a BOD reduction of 25 to 40 percent and a TSS reduction of 50 to 60 percent can be achieved through the secondary clarifiers.

A chemical feed system is proposed which will deliver alum and flash mixing at the discharge structure of the oxidation ditch immediately upstream of the secondary clarifiers to further reduce Phosphorus and Nitrogen concentrations. Literature suggests that chemically induced reductions in Phosphorus and Nitrogen levels within secondary clarifiers were 50 percent and 80 percent, respectively.

BOD Removal in Clarifiers

$$(7 \text{ mg/l} \times 0.25) = 1.8 \text{ mg/l}$$

$$1.8 \text{ mg/l} \times 1 \text{ MG} / 8.34 \text{ pounds/MG/mg/l} \times 250,000 \text{ gpd} = 0.86 \text{ pounds per day}$$

TSS Removal in Clarifiers

$$(6 \text{ mg/l} \times 0.50) = 3 \text{ mg/l}$$

$$3 \text{ mg/l} \times 1 \text{ MG} / 8.34 \text{ pounds/MG/mg/l} \times 250,000 \text{ gpd} = 1.44 \text{ pounds per day}$$

Total Phosphorus Removal in Clarifiers

$$\text{Total Phosphorus} = 2 \text{ mg/l} \times 0.50 = 1 \text{ mg/l}$$

$$1 \text{ mg/l} \times 1 \text{ MG} / 8.34 \text{ pounds/MG/mg/l} \times 250,000 \text{ gpd} = 0.48 \text{ pounds per day}$$

Ammonia Nitrogen Removal in Clarifiers

$$\text{Ammonia Nitrogen} = 4 \text{ mg/l} \times 0.80 = 3.20 \text{ mg/l}$$

$$3.20 \text{ mg/l} \times 1 \text{ MG} / 8.34 \text{ pounds/MG/mg/l} \times 250,000 \text{ gpd} = 1.53 \text{ pounds per day}$$

Tertiary Filtration - it was assumed that approximately 55 percent of the incoming wastewater flow would be diverted to the proposed tertiary filter located immediately downstream of the secondary clarifiers.

Based on the assumption that a removal efficiency of 25 percent of BOD and TSS was accomplished in the influent screen, removal efficiencies for BOD, TSS, TN and TP of 96 percent, 97 percent, 90 percent and 90 percent were accomplished in the oxidation ditch, and removal efficiencies for BOD, TSS, TN and TP of 25 percent, 50 percent, 50 percent and 80 percent were accomplished in the secondary clarifiers, the pollutant loading to the proposed tertiary filter would be.

BOD to Tertiary Filter

$$240 \text{ mg/l} - 60 \text{ mg/l} - 173 \text{ mg/l} - 1.80 \text{ mg/l} = 5.20 \text{ mg/l}$$

TSS to Tertiary Filter

$$282 \text{ mg/l} - 70 \text{ mg/l} - 206 \text{ mg/l} - 3.00 = 3.00 \text{ mg/l}$$

Total Phosphorus to Tertiary Filter

$$15 \text{ mg/l} - 13 \text{ mg/l} - 1.00 \text{ mg/l} = 1.00 \text{ mg/l}$$

Ammonia Nitrogen to Tertiary Filter

$$40 \text{ mg/l} - 36 \text{ mg/l} - 3.20 \text{ mg/l} = 0.80 \text{ mg/l}$$

Literature suggests that a minimum BOD reduction of 50 percent and a TSS reduction of 50 to 60 percent can be achieved through tertiary filtration.

A chemical feed system is proposed which will deliver alum and flash mixing at the discharge portion of the secondary clarifier structure immediately upstream of the tertiary filter to further reduce Phosphorus and Nitrogen concentrations. Literature suggests that chemically induced reductions in Phosphorus and Nitrogen levels within tertiary filters were 65 percent and 80 percent, respectively.

BOD Removal in Tertiary Filter

$$(5.20 \text{ mg/l} \times 0.50) = 2.86 \text{ mg/l}$$

$$2.86 \text{ mg/l} \times 1 \text{ MG} / 8.34 \text{ pounds/MG/mg/l} \times 250,000 \text{ gpd} = 1.37 \text{ pounds per day}$$

TSS Removal in Tertiary Filter

$$(3.00 \text{ mg/l} \times 0.50) = 1.50 \text{ mg/l}$$

$$1.50 \text{ mg/l} \times 1 \text{ MG} / 8.34 \text{ pounds/MG/mg/l} \times 250,000 \text{ gpd} = 0.72 \text{ pounds per day}$$

Total Phosphorus Removal in Tertiary Filter

$$\text{Total Phosphorus} = 1.00 \text{ mg/l} \times 0.65 = 0.65 \text{ mg/l}$$

$$0.65 \text{ mg/l} \times 1 \text{ MG} / 8.34 \text{ pounds/MG/mg/l} \times 250,000 \text{ gpd} = 0.31 \text{ pounds per day}$$

Ammonia Nitrogen Removal in Tertiary Filter

$$\text{Ammonia Nitrogen} = 0.80 \text{ mg/l} \times 0.80 = 0.64 \text{ mg/l}$$

$$0.64 \text{ mg/l} \times 1 \text{ MG} / 8.34 \text{ pounds/MG/mg/l} \times 250,000 \text{ gpd} = 0.31 \text{ pounds per day}$$

Ultra-Violet Disinfection - The filtered effluent will be disinfected by means of two banks of ultraviolet lamps.

Based on the assumption that removal efficiency of 25 percent of BOD and TSS was accomplished in the influent screen, removal efficiencies for BOD, TSS, TN and TP of 96 percent, 97 percent, 90 percent and 90 percent were accomplished in the oxidation ditch, removal efficiencies for BOD, TSS, TN and TP of 25 percent, 50 percent, 50 percent and 80 percent were accomplished in the secondary clarifiers and removal efficiencies for BOD, TSS, TN and TP of 50 percent, 50 percent, 65 percent and 80 percent were accomplished in the tertiary filter, the pollutant loading to the proposed UV disinfection structure would be.

BOD to UV Disinfection

$$240 \text{ mg/l} - 60 \text{ mg/l} - 173 \text{ mg/l} - 1.80 \text{ mg/l} - 2.86 \text{ mg/l} = 2.34 \text{ mg/l}$$

TSS to UV Disinfection

$$282 \text{ mg/l} - 70 \text{ mg/l} - 206 \text{ mg/l} - 3.00 \text{ mg/l} - 1.50 \text{ mg/l} = 1.50 \text{ mg/l}$$

Total Phosphorus to UV Disinfection

$$15 \text{ mg/l} - 13 \text{ mg/l} - 1.00 \text{ mg/l} - 0.65 \text{ mg/l} = 0.35 \text{ mg/l}$$

Ammonia Nitrogen to UV Disinfection

$$40 \text{ mg/l} - 36 \text{ mg/l} - 3.20 \text{ mg/l} - 0.64 \text{ mg/l} = 0.16 \text{ mg/l}$$

Literature suggests that a minimum BOD and a TSS reduction within the UV structure, a 5 percent reduction in Ammonia Nitrogen and a 15 percent removal of Total Phosphorus.

BOD Removal in UV Disinfection

Negligible

TSS Removal in UV Disinfection

Negligible

Total Phosphorus Removal

$$\text{Total Phosphorus} = 0.35 \text{ mg/l} \times 0.15 = 0.05 \text{ mg/l}$$

$$0.05 \text{ mg/l} \times 1 \text{ MG} / 8.34 \text{ pounds/MG/mg/l} \times 250,000 \text{ gpd} = 0.03 \text{ pounds per day}$$

Ammonia Nitrogen Removal

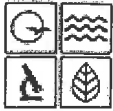
Negligible

ANTICIPATED EFFLUENT CHARACTERISTICS

<u>Parameter</u>	<u>Concentration</u>
BOD	2.34 mg/l
TSS	1.50 mg/l
Total P	0.30 mg/l
Ammonia as N	0.16 mg/l

ANTICIPATED NPDES EFFLUENT LIMITATIONS

<u>Parameter</u>	<u>Max. Daily Concentration</u>	<u>Monthly Concentration</u>
BOD	15 mg/l	10 mg/l
TSS	20 mg/l	15 mg/l
Total P	0.50 mg/l	
Ammonia as N		
April 1 – Sept. 30	6.0 mg/l	1.20 mg/l
Oct. 1 – Mar. 31	10.8 mg/l	2.70 mg/l



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 \$1000.00	CHECK NO. 4455
DATE RECEIVED 11-17-23 JB	

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: DNR Project #: C295917-01
- 1.2 Has the Missouri Department of Natural Resources approved the proposed project's antidegradation review?
 YES Date of Approval: 6/30/22 N/A
- 1.3 Has the department approved the proposed project's facility plan*?
 YES Date of Approval: 9/29/23 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: 7/31/23
 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 City of Clever, MO Wastewater Treatment Plant Improvements	2.2 ESTIMATED PROJECT CONSTRUCTION COST \$ 3,381,124.00
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2.3 PROJECT DESCRIPTION
 Expansion of the existing WWTP from 210,000 gpd to 460,000 gpd by the addition of an influent screen, influent lift station, 250,000 gpd oxidation ditch, 2- 32' dia. secondary clarifiers, waste sludge holding, tertiary filtration and U.V. disinfection.

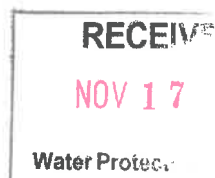
2.4 SLUDGE HANDLING, USE AND DISPOSAL DESCRIPTION
 Currently the City of Clever land applies waste sludge to surrounding farm land. It is the intent to continue this practice in the future.


2.5 DESIGN INFORMATION

- A. Current population: 3057; Design population: 5460
- B. Actual Flow: 210 gpd; Design Average Flow: 452 gpd;
 Actual Peak Daily Flow: 350 gpd; Design Maximum Daily Flow: 1458 gpd; Design Wet Weather Event: 1750

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 Clever Wastewater Treatment Plant		TELEPHONE NUMBER WITH AREA CODE 417-743-2544		E-MAIL ADDRESS cityclerk@clevermo.com
ADDRESS (PHYSICAL) 499 Old Wire Road	CITY Clever	STATE MO	ZIP CODE 65631	COUNTY Christian
Wastewater Treatment Facility: Mo- 0102318 (Outfall 1 Of 1)				
3.1 Legal Description: _____ ¼, _____ ¼, <u>SW</u> ¼, Sec. <u>20</u> , T <u>27N</u> , R <u>23W</u> (Use additional pages if construction of more than one outfall is proposed.)				
3.2 UTM Coordinates Easting (X): <u>457179</u> Northing (Y): <u>4097872</u> For Universal Transverse Mercator (UTM), Zone 15 North referenced to North American Datum 1983 (NAD83)				
3.3 Name of receiving streams: <u>Tributary to Spring Creek</u>				
4.0 PROJECT OWNER				
NAME City of Clever		TELEPHONE NUMBER WITH AREA CODE 417-743-2544		E-MAIL ADDRESS cityclerk@clevermo.com
ADDRESS P.O. Box 52	CITY Clever	STATE MO	ZIP CODE 65631	
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 City of Clever		TELEPHONE NUMBER WITH AREA CODE 417-743-2544		E-MAIL ADDRESS cityclerk@clevermo.com
ADDRESS P.O. Box 52	CITY Clever	STATE MO	ZIP CODE 65631	
5.1 A letter from the continuing authority, if different than the owner, is included with this application. <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> 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? <input type="checkbox"/> YES <input type="checkbox"/> 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? <input type="checkbox"/> YES <input type="checkbox"/> 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? <input type="checkbox"/> YES <input type="checkbox"/> 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? <input type="checkbox"/> YES <input type="checkbox"/> NO				
D. Is a copy of the Missouri Secretary of State's nonprofit corporation certificate included with this application? <input type="checkbox"/> YES <input type="checkbox"/> NO				
6.0 ENGINEER				
ENGINEER NAME / COMPANY NAME Gary Shaffer/Shaffer & Hines, Inc.		TELEPHONE NUMBER WITH AREA CODE 417-725-4663		E-MAIL ADDRESS gs@shafferhines.com
ADDRESS P.O. Box 493	CITY Nixa	STATE MO	ZIP CODE 65714	
7.0 APPLICATION FEE				
<input checked="" type="checkbox"/> CHECK NUMBER <input type="checkbox"/> 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 Scott Hackworth			DATE 10/02/2023	
TITLE OR CORPORATE POSITION Mayor		TELEPHONE NUMBER WITH AREA CODE 417-743-2544		E-MAIL ADDRESS cityclerk@clevermo.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.				