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 Higginsville
Higginsville South Lagoon
0.5 mi SE of Mt Moriah Road and Shelby Road Intersection
Higginsville, MO 64037

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 18, 2023
Effective Date

John Hoke, Director, Water Protection Program

October 17, 2025
Expiration Date

CONSTRUCTION PERMIT

I. CONSTRUCTION DESCRIPTION

The construction proposed includes the construction of an activated sludge treatment facility to replace the current Higginsville South Lagoon. This new treatment facility will be built adjacent to the current lagoon on city-owned land and will also include the construction of a new influent pump station and headworks, as well as an UV disinfection system downstream of the treatment facility prior to discharge. The activated sludge plant will utilize the current lagoon as an equalization basin and will be sized for 1.2 MGD of treatment, to allow for future regionalization of the city's other treatment facilities to centralize wastewater treatment for the city.

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

II. COST ANALYSIS FOR COMPLIANCE

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

The Department is required to determine "findings of affordability" because the permit applies to a **combined or separate sanitary sewer system for a publically-owned treatment works.**

The Department has made a reasonable search for empirical data indicating the permit is affordable. The search consisted of a review of Department records that might contain economic data on the community, a review of information provided by the applicant as part of the application, and public comments received in response to public notices of this draft permit. If the empirical cost data was used by the permit writer, this data may consist of median household income, any other ongoing projects that the Department has knowledge, and other demographic financial information that the community provided as contemplated by Section 644.145.3. See **APPENDIX 1 – AFFORDABILITY ANALSYS**.

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 submitted by McClure Engineering on September 27, 2023; signed and sealed by Dane Drysdale, P.E. on September 5, 2023; and approved by the Department on October 18, 2023.

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 Kansas City 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 may 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 informationor 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 Higginsville 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.

IV. REVIEW SUMMARY

1. CONSTRUCTION PURPOSE

The proposed upgrade serves multiple purposes for the City of Higginsville, both in the short-term and long-term. In the short-term, the construction will upgrade the level of treatment provided to meet new *E. coli* and ammonia limits, improving effluent quality coming from the Higginsville South WWTF. In the long-term, the total capacity expansion will allow for future projects where the effluent from the three other treatment facilities owned by the city can be pumped to the Higginsville South WWTF, allowing for treatment and discharge to be more centralized, which should help simplify operation and maintenance for the city.

2. FACILITY DESCRIPTION

The Higginsville South WWTF is located 0.5 mi SE of the intersection of Mt. Moriah Road and Shelby Road, Higginsville, Missouri, in Lafayette County. The facility has a design average flow of 600,000 gpd and serves a hydraulic population equivalent of approximately 6,000 people. The proposed construction will expand the design average flow for the facility to 1.2 MGD, with the intention of the facility receiving flows from the 3 other treatment facilities currently operated by the city. The facility is being converted from a two-cell lagoon to an activated sludge plant that will utilize the existing lagoon infrastructure for flow equalization and sludge storage.

3. COMPLIANCE PARAMETERS

The proposed project is required to meet final effluent limits as established in the Antidegradation review dated February 8, 2022.

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

Parameter	Units	Daily Maximum	Weekly Average	Monthly Average
Flow	MGD	*		*
Biochemical Oxygen Demand$_5$	mg/L		15	10
Total Suspended Solids	mg/L		20	15
Ammonia as N-January	mg/L	8.4		1.4
Ammonia as N-Feburary	mg/L	8.4		1.4
Ammonia as N-March	mg/L	8.4		1.4
Ammonia as N-April	mg/L	6.9		0.8
Ammonia as N-May	mg/L	8.4		0.8
Ammonia as N-June	mg/L	6.9		0.8
Ammonia as N-July	mg/L	6.9		0.8
Ammonia as N-August	mg/L	8.4		0.8
Ammonia as N-September	mg/L	6.9		0.8
Ammonia as N-October	mg/L	6.9		1.4
Ammonia as N-November	mg/L	8.4		1.4

Ammonia as N-December	mg/L	8.4		1.4
pH	SU	6.5-9.0		6.5-9.0
Oil & Grease	mg/L	15		10
E. Coli	#/100mL		1,030	206
Total Nitrogen	mg/L	*		*
Total Phosphorus	mg/L	*		*

*Monitoring Only

4. ANTIDEGRADATION

The Department has reviewed the antidegradation report for this facility and issued the Water Quality and Antidegradation Review dated February 8, 2022, due to increased design flow to account for eventually regionalizing other city wastewater flow to the Higginsville South WWTF site. See **APPENDIX 2 – WATER QUALITY AND ANTIDEGRADATION REVIEW**.

5. REVIEW of MAJOR TREATMENT DESIGN CRITERIA

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

- Wet Weather Flow Equalization – Utilized during wet weather events where the peak flow is greater than the design peak capacity of the treatment facility. Once the wet weather event subsides, the flow should be returned to the head of the treatment facility for full secondary treatment. The equalization basin, which is repurposed Lagoon Cell 1 from the old treatment plant, has an effective volume of 27 MG, with a total volume of 54 MG. The equalization basin has a surface area of 33.3 acres, with a sidewater depth of 5 feet.
- Sludge Storage Basin – Conversion of existing Lagoon Cell 2 to a sludge storage basin with a 3.3 acre surface area, a 5 ft sidewater depth, and a volume of 5.4 MG. The sludge will be received from the aerobic digesters.

Construction will cover the following items:

- Influent Pump Station – Construction of a triplex influent pump station with each 30 HP submersible pump capable of operating at 746.9 gpm at 92.3 feet of TDH.
- Screening – Installation of screening devices removes nuisance inorganic materials from raw wastewater.
    - Mechanical Fine Screen – One mechanically cleaned spiral fine screen with a maximum perforation sizing of 0.25-inch. The screening devices shall be capable of treating a design average flow of 586,000 gpd and a peak hourly flow of 3.7 MGD. The addition of a second mechanically cleaned fine screen provides redundancy and improved screening of inorganic materials. The addition of a washer/compactor and screenings conveyor will mitigate the increased volume of screenings captured by washing, dewatering, and compacting the screenings prior to disposal.
- Grit Removal – Installation of grit removal facilities removes grit and inert inorganics from raw wastewater. Grit removal prevents downstream abrasion and wear on mechanical components and accumulation at the bottom of basins or channels.

- Aerated Horizontal Flow Grit Chamber – The aerated grit chamber is designed to handle a peak flow of 6 MGD. The size of the grit removal chamber is 21-ft 1-in by 5-ft 3-in by 8-ft 6-in. Aeration for the chamber will be performed with coarse bubble aeration, utilizaing a blower with a 0.9 hp capacity. Estimated removal efficiency for the grit chamber is 95%.

- Activated Sludge Plant – Installation of an activated sludge treatment plant capable of treating a design average flow of 1.2 MGD. The following components are integrated into the pre-cast concrete package plant:
  - Biological Phosphorus Anaerobic Tank – A single biological phosphorus anaerobic selector tank with dimensions of 48-ft by 17-ft 6-in by 16-ft sidewater depth with a total volume of 13,440 ft³ accepts the influent entering the activated sludge plant. The available retention time in the selector tank is 2 hours and 1 minute. Mixing for the selector tank is provided via two submersible mixers, powered via a 2.7 hp motor. Backup mixing for the selector tank is provided by wall-mounted aeration, with 4 aerator units. Flow exits the selector tank via transfer pipes which direct flow to two aeration tanks operating in parallel.
  - First Stage Aeration Chambers – Two 41-ft 5-in by 30-ft by 16-ft sidewater depth aeration chambers operating in parallel by means of a transfer pipe with a total volume of 39,760 ft^3 will be provided. Aeration by means of three 75 hp blowers capable of supplying 551 standard cubic feet per minute (scfm) each to 16 fine bubble diffusers per chamber. The aeration chambers are designed for an average daily loading of 1,121 lbs BOD_5. A transfer pipe allows wastewater from the aeration chamber to move by gravity to the digester.
  - Aerobic Digesters – Construction of two sludge digester tanks with dimensions of 12-ft by 57-ft 9-in by 16-ft sidewater depth, and a total volume between the two tanks of 22,176 ft³. The design basis of the digester is a maximum influent concentration of 12,000 mg/L (1.2%) with a flowrate of 1.2 MGD. Installation of six coarse bubble diffusers will provide aeration and mixing of the sludge to prevent anaerobic conditions. Three blowers with 75 HP motors are capable of providing a maximum air rate of 343 scfm. The aerobic digester is prior to the sludge holding basin. The facility must ensure compliance with any applicable §503(b) requirements for vector attraction reduction and pathogen reduction depending on the proposed use(s) of the biosolids
  - Second Stage Aeration Chambers – Two 79-ft 4-in by 15-ft by 16-feet sidewater depth aeration chambers operating in parallel with a total volume of 38,080 ft^3 will be provided. Aeration by means of three 75 hp blowers capable of supplying 487 scfm each to 10 coarse bubble diffusers per chamber. The aeration chambers are designed for an average daily loading of 1,121 lbs BOD_5. A transfer pipe allows wastewater from the aeration chamber to move by gravity to the clarifier.
  - Final Clarifiers – There are two final clarifiers in parallel with each other as a part of the split in the treatment track that will have a combined settling volume of 49,152 ft³. An air lift surface skimmer is provided to remove grease

and floatables and return to the first/second aeration chamber. The clarified effluent will flow by gravity to the disinfection system, separate from the activated sludge plant. Return activated sludge is cycled back to the biological phosphorus tank to flow back through the activated sludge plant, while the waste activated sludge can flow back to the aerobic digester.

- Disinfection – The process of removal, deactivation, or killing of pathogenic microorganisms.
  - Open Channel Ultraviolet (UV) – An open channel, gravity flow, low pressure, high intensity UV disinfection system capable of treating a peak flow of 3 MGD while delivering a minimum UV intensity of 30 mJ/cm^2 with an expected ultraviolet transmissivity of 65 percent or greater. The single open channel UV system consists of two banks in series with 1 modules per bank and 12 lamps per module. The disinfected effluent will flow by gravity through flow measurement equipment and to Outfall No. 001.

6. OPERATING PERMIT

The Higginsville South WWTF Missouri State Operating Permit MO-0023108 will require a modification to reflect the construction activities. The modified permit was public noticed from May 19, 2023, to June 20, 2023, 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.

Joshua Brown
Financial Assistance Center
joshua.brown@dnr.mo.gov

APPENDICES

- **1 – AFFORDABILITY ANALYSIS**
- **2 – WATER QUALITY AND ANTIDEGRADATION REVIEW**

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

Higginsville South WWTF, Permit Modification
City of Higginsville
Missouri State Operating Permit #MO-0023108

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

New Permit Requirements

The permit requires compliance with increased frequency of sampling for ammonia limits and increased frequency of monitoring requirements for Total Kjeldahl Nitrogen, Nitrate + Nitrite, and Total Phosphorus.

Connections
The number of connections was reported by the permittee on the Financial Questionnaire

Connection Type	Number
Residential	1,682
Commercial	239
Industrial	1
Total	**1,922**

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

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

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

Criterion 1 Table. Current Financial Information for the City of Higginsville	
Current Monthly User Rates per 5,000 gallons*	$57.50
Median Household Income (MHI)[1]	$70,231
Current Annual Operating Costs (excludes depreciation)	$640,334

*User Rates were updated to reflect a rate increase implemented to fund facility upgrades

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

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

Criterion 2A Table. Estimated Cost Breakdown of New Permit Requirements			
New Requirement	Frequency	Estimated Cost	Estimated Annual Cost
Total Phosphorus	Monthly	$26	$208
Total Kjeldahl Nitrogen	Monthly	$35	$280
Nitrate + Nitrite	Monthly	$44	$352
Ammonia	Monthly	$22	$176
Oil and Grease	Monthly	$75	$600
Total Estimated Annual Cost of New Permit Requirements			$1,616

Criterion 2B Table. Estimated Costs for New Permit Requirements		
(1)	Estimated Annual Cost	$1,616
(2)	Estimated Monthly User Cost for New Requirements [2]	$0.07
	Estimated Monthly User Cost for New Requirements as a Percent of MHI [3]	0.0012%
(3)	Total Monthly User Cost*	$57.57
	Total Monthly User Cost as a Percent of MHI [4]	0.984%

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

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

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

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

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

The community reported that their outstanding debt for their current wastewater collection and treatment systems is $3,115,000. The community reported that each user pays $42.50 monthly, of which, $9.78 is used toward payments on the current outstanding debt.

As shown in Criterion 2, the user rate plus the amount for the additional sampling requirements is $42.67.

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

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

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

Criterion 5 Table. Socioeconomic Data [1, 5-9] for the City of Higginsville

No.	Administrative Unit	Higginsville City	Missouri State	United States
1	Population (2021)	4,696	6,141,534	329,725,481
2	Percent Change in Population (2000-2021)	0.3%	9.8%	17.2%
3	2021 Median Household Income (in 2022 Dollars)	$70,231	$65,928	$74,545
4	Percent Change in Median Household Income (2000-2021)	26.9%	-1.1%	1.1%
5	Median Age (2021)	40.6	38.8	38.4
6	Change in Median Age in Years (2000-2021)	2.0	2.7	3.1
7	Unemployment Rate (2021)	4.0%	4.5%	5.5%
8	Percent of Population Below Poverty Level (2021)	15.1%	12.8%	12.6%
9	Percent of Household Received Food Stamps (2021)	15.0%	10.1%	11.4%
10	(Primary) County Where the Community Is Located	Lafayette County		

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

The city reported a $17.5 million dollar bond was passed for a new WWTF and force main/lift station project. All four lagoons will be forced to one location for treatment. Completion of this project will result in eventual closure of the 1-70 South lagoon.

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

The new requirements associated with this permit will not impose a financial burden on the community, nor will they require the City of Higginsville to seek funding from an outside source.

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

The community did not report any other relevant local economic conditions.

The Department contracted with Wichita State University to complete an assessment tool that would allow for predictions on rural Missouri community populations and future sustainability. The purpose of the study is to use a statistical modeling analysis in order to determine factors associated with each rural Missouri community that would predict the future population changes that could occur in each community. A stepwise regression model was applied to 19 factors which were determined as predictors of rural population change in Missouri. The model established a hierarchy of the predicting factors which allowed the model to place a weighted value on each of the factors. A total of 745 rural towns and villages in Missouri received a weighted value for each of the predicting factors. The weighted values for each town / village were then added together to determine an overall decision score. The overall decision scores were then divided into five categories and each town was assigned to a different categorical group based on the overall decision score. The categorical groups were developed from the range of overall scores across all rural towns and villages within Missouri.

Based on the assessment tool, the City of Higginsville has been determined to be a category 5 community. This means that the City of Higginsville is predicted to be stable over time.

CONCLUSION AND FINDING

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

This analysis examined whether the new sampling requirements affect the ability of an individual customer or household to pay a utility bill without undue hardship or unreasonable sacrifice in the essential lifestyle or spending patterns of the individual or household. After reviewing the above criteria, the Department finds that the new sampling requirements may result in a low burden with regard to the community's overall financial capability and a low financial impact for most individual customers/households; therefore, the new permit requirements are affordable.

References

1. (A) 2021 MHI in 2021 Dollar: United States Census Bureau. 2017-2021 American Community Survey 5-Year Estimates, Table B19013: Median Household Income in the Past 12 Months (in 2021 Inflation-Adjusted Dollars). https://data.census.gov/cedsci/table?q=B19013&tid=ACSDT5Y2021.B19013.
   (B) 2000 MHI in 1999 Dollar:
      (1) For United States, United States Census Bureau (2003) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-2-1 Part 1. United States Summary, Table 5. Work Status and Income in 1999: 2000, Washington, DC. https://www.census.gov/content/dam/Census/library/publications/2003/dec/phc-2-1-pt1.pdf.
      (2) For Missouri State, United States Census Bureau (2003) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-2-27, Missouri, Table 10. Work Status and Income in 1999: 2000, Washington, DC. https://www.census.gov/content/dam/Census/library/publications/2003/dec/phc-2-1-pt1.pdf.
   (C) 2022 CPI, 2021 CPI and 1999 CPI: U.S. Department of Labor Bureau of Labor Statistics (2022) Consumer Price Index - All Urban Consumers, U.S. City Average. All Items. 1982-84=100 (unadjusted) - CUUR0000SAO. https://data.bls.gov/cgi-bin/surveymost?bls.
   (D) 2021 MHI in 2022 Dollar = 2021 MHI in 2021 Dollar x 2022 CPI /2021 CPI; 2000 MHI in 2021 Dollar = 2000 MHI in 1999 Dollar x 2022 CPI /1999 CPI.
   (E) Percent Change in Median Household Income (2000-2021) = (2021 MHI in 2022 Dollar - 2000 MHI in 2022 Dollar) / (2000 MHI in 2022 Dollar).
2. ($1,616/1,922)/12 = $0.07 (Estimated Monthly User Cost for New Requirements)
3. ($0.07/($70,231/12))100% = 0.0012% (New Sampling Only)
4. ($57.57/($70,231/12))100% = 0.984% (Total User Cost)
5. (A) Total Population in 2021: United States Census Bureau. 2017-2021 American Community Survey 5-Year Estimates, Table B01003: Total Population - Universe: Total Population. https://data.census.gov/cedsci/table?q=B01003&tid=ACSDT5Y2021.B01003.
   (B) For United States, United States Census Bureau (2002) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-1-1 Part 1. United States Summary, Table 1. Age and Sex: 2000, Washington, DC. https://www.census.gov/content/dam/Census/library/publications/2003/dec/phc-2-1-pt1.pdf.
   (2) For Missouri State, United States Census Bureau (2002) 2000 Census of Population and Housing, Summary Population and Housing Characteristics, PHC-1-27, Missouri, Table 2. Age and Sex: 2000, Washington, DC. https://www2.census.gov/library/publications/2003/dec/phc-2-1-pt2.pdf.
   (C) Percent Change in Population (2000-2021) = (Total Population in 2021 - Total Population in 2000) / (Total Population in 2000).
6. Median Age in 2021: United States Census Bureau. 2017-2021 American Community Survey 5-Year Estimates, Table B01002: Median Age by Sex - Universe: Total population. https://data.census.gov/cedsci/table?q=B01002&tid=ACSDT5Y2021.B01002.
   (B) For United States, United States Census Bureau (2002) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-1-1 Part 1. United States Summary, Table 1. Age and Sex: 2000, Washington, DC., Page 2. https://www.census.gov/content/dam/Census/library/publications/2003/dec/phc-2-1-pt1.pdf.
   (2) For Missouri State, United States Census Bureau (2002) 2000 Census of Population and Housing, Summary Population and Housing Characteristics, PHC-1-27, Missouri, Table 2. Age and Sex: 2000, Washington, DC., Pages 64-92. https://www2.census.gov/library/publications/2003/dec/phc-2-1-pt2.pdf.
   (C) Change in Median Age in Years (2000-2021) = (Median Age in 2021 - Median Age in 2000).
7. United States Census Bureau. 2017-2021 American Community Survey 5-Year Estimates, S2301: Employment Status for the Population 16 Years and Over - Universe: Population 16 years and Over. https://data.census.gov/cedsci/table?q=unemployment&tid=ACSST5Y2021.S2301.
8. United States Census Bureau. 2017-2021 American Community Survey 5-Year Estimates, Table S1701: Poverty Status in the Past 12 Months. https://data.census.gov/cedsci/table?q=S1701&tid=ACSST5Y2021.S1701.

United States Census Bureau. 2017-2021 American Community Survey 5-Year Estimates, Table S2201: Food Stamps/Supplemental Nutrition Assistance Program (SNAP) - Universe: Households. https://data.census.gov/cedsci/table?q=S2201&tid=ACSST

Water Quality and Antidegradation Review

For the Protection of Water Quality
and Determination of Effluent Limits for Discharge to
Tributary to Maries Creek
by
Higginsville Wastewater Treatment Facility

February 2022

Table of Contents

1. Facility Information

FACILITY NAME: Higginsville WWTF NPDES #: MO-0023108

FACILITY TYPE: POTW – SIC #4952
FACILITY DESCRIPTION: Currently the City of Higginsville owns and operates four permitted wastewater treatment lagoon facilities. The city has proposed to construct a regional facility to take flows from the existing facilities and provide treatment by the preferred alternative of an Aero-Mod SEQUOX activated Sludge system and UV disinfection. The existing South Lagoon treatment system has a design flow of 0.6 MGD while the expanded design flow will be 1.2 MGD. The City may submit a permit modification application for the Higginsville north Lagoon (MO-0023116) to reflect a change in operation to a controlled discharge with no proposed increase in design flow to that facility. As part of the regionalization project Higginsville I-70 North Lagoon (MO-0023094) and I-70 South Lagoon (MO-0111848) will be decommissioned and the operating permits terminated following construction and issuance of the modified South Lagoon operating permit.

COUNTY:	Lafayette	UTM COORDINATES:	X = 439141 Y = 4321713
12- DIGIT HUC:	10300104-0203	LEGAL DESCRIPTION:	Section 18, T49N, R25W
EDU*:	Central Plains	ECOREGION:	Western Corn Belt Plains

* - Ecological Drainage Unit

2. Water Quality 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 Missouri Department of Natural Resources (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 Antidegradation Implementation Procedure (AIP)* for new and expanded wastewater discharges.

2.1. *Water Quality History:*

Review of DMR results from January, 2016 to January, 2022 show no reported permit violations from Higginsville South Lagoon MO-0023108, I-70 South (MO-0111848), or Higginsville North Lagoon (MO-0023116). Higginsville I-70 North (MO-0023094) show two violations related to WET test reporting in March, 2017. A class II inspection, dated 1/23/2019, of the Higginsville South Lagoon facility resulted in unsatisfactory findings. A return to compliance was issued on 2/22/2019.

OUTFALL	DESIGN FLOW (CFS)	TREATMENT LEVEL	RECEIVING WATERBODY	DISTANCE TO CLASSIFIED SEGMENT (MI)
001	1.86	Secondary	Tributary to Maries Creek	0.0
			Maries Creek	0.03

3. Receiving Waterbody Information

WATERBODY NAME	CLASS	WBID	LOW-FLOW VALUES (CFS)			DESIGNATED USES**
			1Q10	7Q10	30Q10	
100K Extent-Remaining Stream	C	3960	-	-	-	General Criteria
Maries Creek	C	3960	-	-	-	AQL, IRR, LWP, SCR, WBC(B), HHP

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

RECEIVING WATER BODY SEGMENT #1: Tributary to Maries Creek
Upper end segment* UTM coordinates: X = 439141 Y = 4321713 (Outfall)
Lower end segment* UTM coordinates: X= 439199/ Y= 4321691 (Confluence with Maries Creek)

*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.

4. General Comments

McClure Engineering prepared, on behalf of the City of Higginsville, the *Antidegradation Alternatives Analysis Proposed Aero-Mod SEQUOX Facility* dated October, 2021. Applicant elected to assume that all pollutants of concern (POC) are significantly degrading the receiving stream in the absence of existing water quality. An alternative analysis was conducted to fulfill the requirements of the AIP. Dissolved oxygen modeling is exempt in accordance with the Departments DO modeling and BOD Effluent Limit Development Guidance dated December 30, 2009.

A Missouri Department of Conservation Natural Heritage Review was obtained by the applicant; see Appendix B for recommendations regarding Indiana Bats and Northern Long-Eared Bats.

5. Antidegradation Review Information

The following is a review of the *Antidegradation Alternatives Analysis* received October 14, 2021.

5.1. TIER DETERMINATION

Below is a list of pollutants of concern reasonably expected to be in the discharge (see Appendix C), Pollutants of concern are defined as those pollutants "proposed for discharge that affects beneficial use(s) in waters of the state. POCs include pollutants that create conditions unfavorable to beneficial uses in the water body receiving the discharge or proposed to receive the discharge." (AIP, Page 7). Tier 2 was assumed for all POCs (see Appendix C).

Table 1. Pollutants of Concern and Tier Determination

POLLUTANTS OF CONCERN	TIER*	DEGRADATION	COMMENT
BOD_5/DO	2	Significant	
Total Suspended Solids (TSS)	**	Significant	
Ammonia	2	Significant	
pH	***	Significant	Permit limits applied
Escherichia coli (*E. coli*)	2	Significant	Permit limits applied
Total Phosphorus	*	Significant	
Oil & Grease	2	Significant	Permit limits applied

* Tier assumed. ** Tier determination not possible: No in-stream standards for these parameters. *** Standards for these parameters are ranges

The following Antidegradation Review Summary attachments in Appendix D were used by the applicant:

For pollutants of concern, the attachments are:
☒ Attachment A, Tier 2 with significant degradation.

5.2. EXISTING WATER QUALITY

No existing water quality data was submitted. All POCs were considered to be Tier 2 and significantly degraded in the absence of existing water quality.

5.3. NO DISCHARGE EVALUATION

According to 10 CSR 20-6.010 (4)(A)5.B., reports for the purpose of constructing a wastewater treatment facility shall consider the feasibility of constructing and operating a no discharge facility. Because Missouri's antidegradation implementation procedures specify 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. Part of that analysis as shown below is the non-degrading or no discharge evaluation. See Section 5.4.1 discussion for the regionalization alternative.

Land application systems were considered, however; due the volume of wastewater that would need to be irrigated, 438,000,000 gallons per year, would require approximately 672 acres of land. The cost and availability of this amount of land make a no discharge alternative economically inefficient and infeasible.

5.4. Demonstration of Necessity and Social and Economic Importance

Missouri's antidegradation implementation procedures specify 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. Three discharging alternatives from less degrading to degrading alternatives were evaluated. No discharge land application was eliminated as impracticable due to the significant acres needed to provide treatment for the 1.2 MGD design flow. Only those alternatives that were considered practicable were included in the economic efficiency analysis. This analysis showed that the return on environmental benefits with increasing cost of treatment did not justify more expenditure beyond the base case treatment alternative (see Appendix D, Attachment A). The Aero-Mod SEQUOX extended aeration was the preferred alternative based on this analysis. The affordability analysis further argued the value of constructing the sand filter.

Table 2: Alternatives Analysis Comparison

	Alternative 1: Extended Aeration Aero-Mod SEQUOX	Alternative 2: SBR Aqua-Aerobics	Alternative 3: SBR Sanitaire ICEAS
BOD	10	10	10
TSS	15	15	15
Ammonia (s/w)	0.8 / 1.4	1.4/2.9	1.4/2.9
Total Phosphorus	1.0	1.0	1.0
Total Nitrogen	5.0	5.0	5.0
Practical	Y	Y	Y
Economical	Y	Y	Y
Life Cycle Cost*	$13,903,092	$13,762,807	$15,429,535
Ratio	1.01:1	1:1	1.12:1

* Life cycle cost at 20 year design life and 2.875% interest

5.4.1. Regionalization Alterative

Within Section II B 1. of the AIP, discussion of the potential for discharge to a regional wastewater collection system is mentioned. The applicant provided discussion of this alternative. The proposed wastewater treatment facility will serve as the regional facility as discussed in the introduction taking flows from 3 additional facilities owned by the city. There is no larger regional facility that is currently in operation that could take the proposed 1.2 MGD of this service area.

Needs a Waiver to prevent conflict with area wide management plan approved under Section 208 of the Clean Water Act and/or under 10 CSR 20-6.010(2) (C) Continuing Authorities? (Y or N) N

5.3.2 Losing Stream Alterative 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 Discharge does not discharge to a losing stream segment or will not discharge with 2 miles of a losing stream segment.

5.3.3 Social and Economic Importance Evaluation

The applicant first identified the community that will be affected by the proposed degradation of water quality. The affected community is likely within an 8-mile radius from the discharge site. Secondly, a number of relevant factors were identified including affordable housing, needed growth, increased land value and tax base, and environmental factors. Within a Social and Economic Benefits section each factor was evaluated. Appendix D, Attachment A: Tier 2 with Significant Degradation form contains a summary of this information.

6. General Assumptions of the Water Quality and Antidegradation Review

1. 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.
2. 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.
3. Changes to Federal and State Regulations made after the drafting of this WQAR may alter Water Quality Based Effluent Limits (WQBEL).
4. Effluent limitations derived from Federal or Missouri State Regulations (FSR) may be WQBEL or Effluent Limit Guidelines (ELG).
5. WQBEL supersede ELG only when they are more stringent. Mass limits derived from technology based limits are still appropriate.
6. A WQAR does not allow discharges to waters of the state, and shall not be construed as a National Pollution Discharge Elimination System or Missouri State Operating Permit to discharge or a permit to construct, modify, or upgrade.
7. Limitations and other requirements in a WQAR may change as Water Quality Standards, Methodology, and Implementation procedures change.
8. Nothing in this WQAR removes any obligations to comply with county or other local ordinances or restrictions.

7. Mixing Considerations

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

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

8. Permit Limits and Monitoring Information

Wasteload Allocation Study Conducted (Y or N):	N	Use Attainability Analysis Conducted (Y or N):	N	Whole Body Contact Use Retained (Y or N):	Y

OUTFALL #001

Table 3. Effluent Limits Outfall 001

Parameter	Units	Daily Maximum	Weekly Average	Monthly Average	Basis for Limit (Note 2)	Monitoring Frequency
Flow	MGD	*		*	FSR	Once/month

BIOCHEMICAL OXYGEN DEMAND$_5$ ***	MG/L		15	10	PEL	Once/month
BOD % REMOVAL	%			85	FSR	Once/month
TOTAL SUSPENDED SOLIDS	MG/L		20	15	PEL	Once/month
TSS % REMOVAL	%			85	FSR	Once/month
PH	SU	6.5– 9.0		6.5 – 9.0	FSR	Once/month
AMMONIA AS N (JANUARY)	MG/L	8.4		1.4	PEL	Once/month
AMMONIA AS N (FEBRUARY)	MG/L	8.4		1.4	PEL	Once/month
AMMONIA AS N (MARCH)	MG/L	8.4		1.4	PEL	Once/month
AMMONIA AS N (APRIL)	MG/L	6.9		0.8	PEL	Once/month
AMMONIA AS N (MAY)	MG/L	8.4		0.8	PEL	Once/month
AMMONIA AS N (JUNE)	MG/L	6.9		0.8	PEL	Once/month
AMMONIA AS N (JULY)	MG/L	6.9		0.8	PEL	Once/month
AMMONIA AS N (AUGUST)	MG/L	8.4		0.8	PEL	Once/month
AMMONIA AS N (SEPTEMBER)	MG/L	6.9		0.8	PEL	Once/month
AMMONIA AS N (OCTOBER)	MG/L	6.9		1.4	PEL	Once/month
AMMONIA AS N (NOVEMBER)	MG/L	8.4		1.4	PEL	Once/month
AMMONIA AS N (DECEMBER)	MG/L	8.4		1.4	PEL	Once/month
ESCHERICHIA COLIFORM (*E. COLI*)	NOTE 1		1030**	206**	FSR	Once/week
OIL & GREASE	MG/L	15		10	FSR	Once/month
TOTAL NITROGEN	MG/L	*		*	FSR	Once/month
TOTAL PHOSPHORUS	MG/L	*		*	FSR	Once/month

NOTE 1 – COLONIES/100 ML
NOTE 2– WATER QUALITY-BASED EFFLUENT LIMITATION – WQBEL; OR MINIMALLY DEGRADING EFFLUENT LIMIT – MDEL; OR PREFERRED ALTERNATIVE EFFLUENT LIMIT – PEL; OR TECHNOLOGY-BASED EFFLUENT LIMIT – TBEL; OR NO DEGRADATION EFFLUENT LIMIT – NDEL; OR FEDERAL/STATE REGULATION – FSR; OR NOT APPLICABLE – N/A. ALSO, PLEASE SEE THE **GENERAL ASSUMPTIONS OF THE WQAR #4 & #5.**

* Monitoring requirements only.

** The Monthly and Weekly Average for *E. coli* shall be reported as a Geometric Mean. The Weekly Average for *E. coli* will be expressed as a geometric mean if more than one (1) sample is collected during a calendar week (Sunday through Saturday).

*** This facility is required to meet a removal efficiency of 85% or more for BOD_5 and TSS. Influent BOD_5 and TSS data should be reported to ensure removal efficiency requirements are met.

9. Receiving Water Monitoring Requirements

No receiving water monitoring requirements recommended at this time.

10. Derivation and Discussion of Limits

Wasteload allocations and limits were calculated using two methods:

1) Water quality-based – Using water quality criteria or water quality model results and the dilution equation below:

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

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).

2) Alternative Analysis-based – Using the preferred alternative's treatment capacity for conventional pollutants such as BOD_5 and TSS that are provided by the consultant as the WLA, the 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). For toxic and nonconventional pollutant such as ammonia, the treatment capacity is applied as the significantly-degrading effluent monthly average (AML). A maximum daily can be derived by dividing the AML by 1.19 to determine the long-term average (LTA). The LTA is then multiplied by 3.11 to obtain the maximum daily limitation. This is an accepted procedure that is defined in USEPA's "Technical Support Document For Water Quality-based Toxics Control" (EPA/505/2-90-001).

Note: Significantly-degrading effluent limits have been based on the authority included in Section III. Permit Consideration of the AIP. Also under 40 CFR 133.105, permitting authorities shall require more stringent limitations than equivalent to secondary treatment limitations for 1) existing facilities if the permitting authority determines that the 30-day average and 7-day average BOD_5 and TSS effluent values could be achievable through proper operation and maintenance of the treatment works, and 2) new facilities if the permitting authority determines that the 30-day average and 7-day average BOD_5 and TSS effluent values could be achievable through proper operation and maintenance of the treatment works, considering the design capability of the treatment process.

10.1. OUTFALL #001 – MAIN FACILITY OUTFALL

10.2. LIMIT DERIVATION

- **Flow**. In accordance with [40 CFR Part 122.44(i)(1)(ii)] the volume of effluent discharged from each outfall is needed to assure compliance with permitted effluent limitations. If the permittee is unable to obtain effluent flow, then it is the responsibility of the permittee to inform the Department, which may require the submittal of an operating permit modification.

- **Biochemical Oxygen Demand (BOD_5).** BOD_5 limits of 10 mg/L monthly average, 15 mg/L average weekly limits were proposed, and will serve as preferred alternative limits.

  Influent monitoring may be required for this facility in its Missouri State Operating Permit.

- **Biochemical Oxygen Demand (BOD_5) 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 BOD_5 and TSS for Publicly Owned Treatment Works (POTWs)/municipals. This facility is required to meet 85% removal efficiency for BOD_5.

- **Total Suspended Solids (TSS).** 15 mg/L monthly average, 20 mg/L average weekly limit. Influent monitoring may be required for this facility in its Missouri State Operating Permit.

- **pH**. – 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.

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

		Western Corn Belt	
		Median pH	75th Percentile Temp ° C
Default Monthly Values	January	8.0	2.3
	February	8.0	2.7
	March	8.0	9.1
	April	8.1	15.8
	May	8.0	20.3
	June	8.1	26.0
	July	8.1	28.8
	August	8.0	28.1
	September	8.1	23.6
	October	8.1	16.1
	November	8.0	10.3
	December	8.0	4.0

January	**February**
Chronic WLA: Ce = ((1.86 + 0)2.4 – (0 * 0.01)) / 1.86	Chronic WLA: Ce = ((1.86 + 0)2.4 – (0 * 0.01)) / 1.86
Ce = 2.4	Ce = 2.4
Acute WLA: Ce = ((1.86 + 0)8.4 – (0 * 0.01)) / 1.86	Acute WLA: Ce = ((1.86 + 0)8.4 – (0 * 0.01)) / 1.86
Ce = 8.4	Ce = 8.4
AML = WLAc = 2.4 mg/L	AML = WLAc = 2.4 mg/L
MDL = WLAa = 8.4 mg/L	MDL = WLAa = 8.4 mg/L

March	**April**
Chronic WLA: Ce = ((1.86 + 0)2.4 – (0 * 0.01)) / 1.86	Chronic WLA: Ce = ((1.86 + 0)1.9 – (0 * 0.01)) / 1.86
Ce = 2.4	Ce = 1.9
Acute WLA: Ce = ((1.86 + 0)8.4 – (0 * 0.01)) / 1.86	Acute WLA: Ce = ((1.86 + 0)6.9 – (0 * 0.01)) / 1.86
Ce = 8.4	Ce = 6.9
AML = WLAc = 2.4 mg/L	AML = WLAc = 1.9 mg/L
MDL = WLAa = 8.4 mg/L	MDL = WLAa = 6.9 mg/L

May	**June**
Chronic WLA: Ce = ((1.86 + 0)1.6 – (0 * 0.01)) / 1.86	Chronic WLA: Ce = ((1.86 + 0)1 – (0 * 0.01)) / 1.86
Ce = 1.6	Ce = 1
Acute WLA: Ce = ((1.86 + 0)8.4 – (0 * 0.01)) / 1.86	Acute WLA: Ce = ((1.86 + 0)6.9 – (0 * 0.01)) / 1.86
Ce = 8.4	Ce = 6.9
AML = WLAc = 1.6 mg/L	AML = WLAc = 1 mg/L
MDL = WLAa = 8.4 mg/L	MDL = WLAa = 6.9 mg/L

July	**August**
Chronic WLA: Ce = ((1.86 + 0)0.8 – (0 * 0.01)) / 1.86	Chronic WLA: Ce = ((1.86 + 0)1 – (0 * 0.01)) / 1.86
Ce = 0.8	Ce = 1
Acute WLA: Ce = ((1.86 + 0)6.9 – (0 * 0.01)) / 1.86	Acute WLA: Ce = ((1.86 + 0)8.4 – (0 * 0.01)) / 1.86
Ce = 6.9	Ce = 8.4
AML = WLAc = 0.8 mg/L	AML = WLAc = 1 mg/L
MDL = WLAa = 6.9 mg/L	MDL = WLAa = 8.4 mg/L

September	**October**
Chronic WLA: Ce = ((1.86 + 0)1.1 – (0 * 0.01)) / 1.86	Chronic WLA: Ce = ((1.86 + 0)1.8 – (0 * 0.01)) / 1.86
Ce = 1.1	Ce = 1.8
Acute WLA: Ce = ((1.86 + 0)6.9 – (0 * 0.01)) / 1.86	Acute WLA: Ce = ((1.86 + 0)6.9 – (0 * 0.01)) / 1.86
Ce = 6.9	Ce = 6.9
AML = WLAc = 1.1 mg/L	AML = WLAc = 1.8 mg/L
MDL = WLAa = 6.9 mg/L	MDL = WLAa = 6.9 mg/L

November	**December**
Chronic WLA: Ce = ((1.86 + 0)2.4 – (0 * 0.01)) / 1.86	Chronic WLA: Ce = ((1.86 + 0)2.4 – (0 * 0.01)) / 1.86
Ce = 2.4	Ce = 2.4
Acute WLA: Ce = ((1.86 + 0)8.4 – (0 * 0.01)) / 1.86	Acute WLA: Ce = ((1.86 + 0)8.4 – (0 * 0.01)) / 1.86
Ce = 8.4	Ce = 8.4
AML = WLAc = 2.4 mg/L	AML = WLAc = 2.4 mg/L
MDL = WLAa = 8.4 mg/L	MDL = WLAa = 8.4 mg/L

Water Quality Based Effluent Limits (WQBEL) VS Preferred Effluent Limits (PEL)

Month	**MDL**	**AML**	**MDL**	**AML**
January	8.4	2.4	8.4	1.4
February	8.4	2.4	8.4	1.4
March	8.4	2.4	8.4	1.4
April	6.9	1.9	6.9	0.8
May	8.4	1.6	8.4	0.8

June	6.9	1.0	6.9	0.8
July	6.9	0.8	6.9	0.8
August	8.4	1.0	8.4	0.8
September	6.9	1.1	6.9	0.8
October	6.9	1.8	6.9	1.4
November	8.4	2.4	8.4	1.4
December	8.4	2.4	8.4	1.4

The applicant proposed PELs are protective of water quality standards and demonstrated less-degrading to preserve waterbody assimilative capacity.

- ***Escherichia coli (E. coli)***. Monthly average of 206 per 100 mL as a geometric mean and Daily Maximum of 1030 during the recreational season (April 1 – October 31), to protect Whole Body Contact Recreation (B) designated use of the receiving stream, as per 10 CSR 20-7.031(5)(C). An effluent limit for both monthly average and daily maximum is required by 40 CFR 122.45(d).

  Rule for monitoring requirements is 10 CSR 20-7.015 (9)(D)7.A, B, and C.
  For facilities greater than 100,000 gpd: At a minimum, weekly monitoring is required during the recreational season (April 1 – October 31), with compliance to be determined by calculating the geometric mean of all samples collected during the reporting period (samples collected during the calendar week for the weekly average, and samples collected during the calendar month for the monthly average). The weekly average requirement is consistent with EPA federal regulation 40 CFR 122.45(d). Please see **GENERAL ASSUMPTIONS OF THE WQAR #7.**

  Weekly monitoring is required at all times with compliance to be determined by E. coli water quality standards established in section (5)(C) of 10 CSR 20-7.031 and the effluent rule short time limits in 7.015 (9)(B)1.E. Please see **GENERAL ASSUMPTIONS OF THE WQAR #7.**

- **Oil & Grease**. Conventional pollutant, [10 CSR 20-7.031, Table A]. Effluent limitation for protection of aquatic life; 10 mg/L monthly average, 15 mg/L daily maximum.

NUTRIENTS

- **Total Phosphorus and Total Nitrogen**. Monitoring required for facilities greater than 1,000,000 gpd design flow per 10 CSR 20-7.015(9)(D)8. Once per month sampling for one permit cycle or up to 5 years if permit cycle is less than 5 years.

11. ANTIDEGRADATION REVIEW PRELIMINARY DETERMINATION

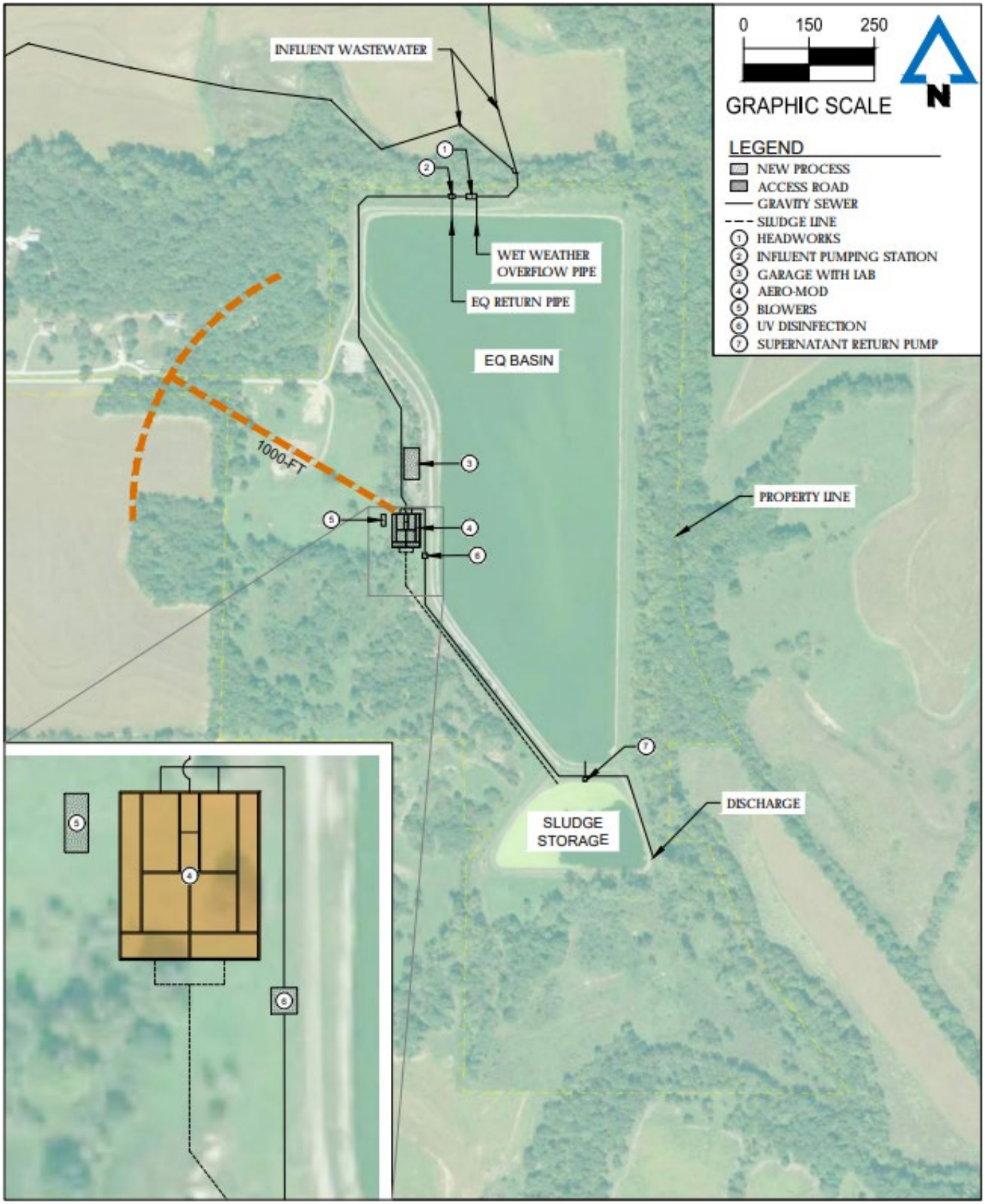
The proposed new facility discharge, Higginsville WWTF, 1.2 MGD will result in significant degradation of the segment identified in Tributary to Maries Creek. Aero-Mod SEQUOX Extended Aeration was determined to be the base case technology (lowest cost alternative that meets technology and water quality based effluent limitations. The cost effectiveness of the other technologies were evaluated, and Aero-Mod SEQUOX was found to be cost effective and was determined to be the preferred alternative.

It has also been determined that the other treatment options presented (Aqua-Aerobics SBR and Sanitaire ICEAS SBR) may also be considered reasonable alternatives provided they are designed to be capable of meeting the effluent limitations developed based on the preferred alternative. If any of these options are selected, you may proceed with the appropriate facility plan, construction permit application, or other future submittals without the need to modify this Antidegradation review document.

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: Aaron Sawyer
Date: 02/08/2022
Unit Chief: John Rustige, P.E.

Appendix A: Map of Discharge Location



Appendix B: Natural Heritage Review

(*Applicant must check for rare and endangered aquatic species that may be affected by the discharge by using the following web link: http://mdcgis.mdc.mo.gov/heritage/. The results of the survey must indicate whether there are known endangered species on the site.)*

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: Higginsville WWTP and Pumping Stations #9110
User Project Number: MEC 190720-000
Project Description: New WWTP at South Lagoon. Divert most of North lagoon wastewater to South mechanical treatment plant. Divert all of the I-70 wastewater to the South Mechanical Treatment Plant. Tributary to Maries Creek. Lafayette county.

Project Type: Waste Transfer, Treatment, and Disposal, Liquid waste/Effluent, Wastewater treatment plant, Construction or expansion
Contact Person: Dane Drysdale
Contact Information: ddrysdale@mcclurevision.com or 4178606469

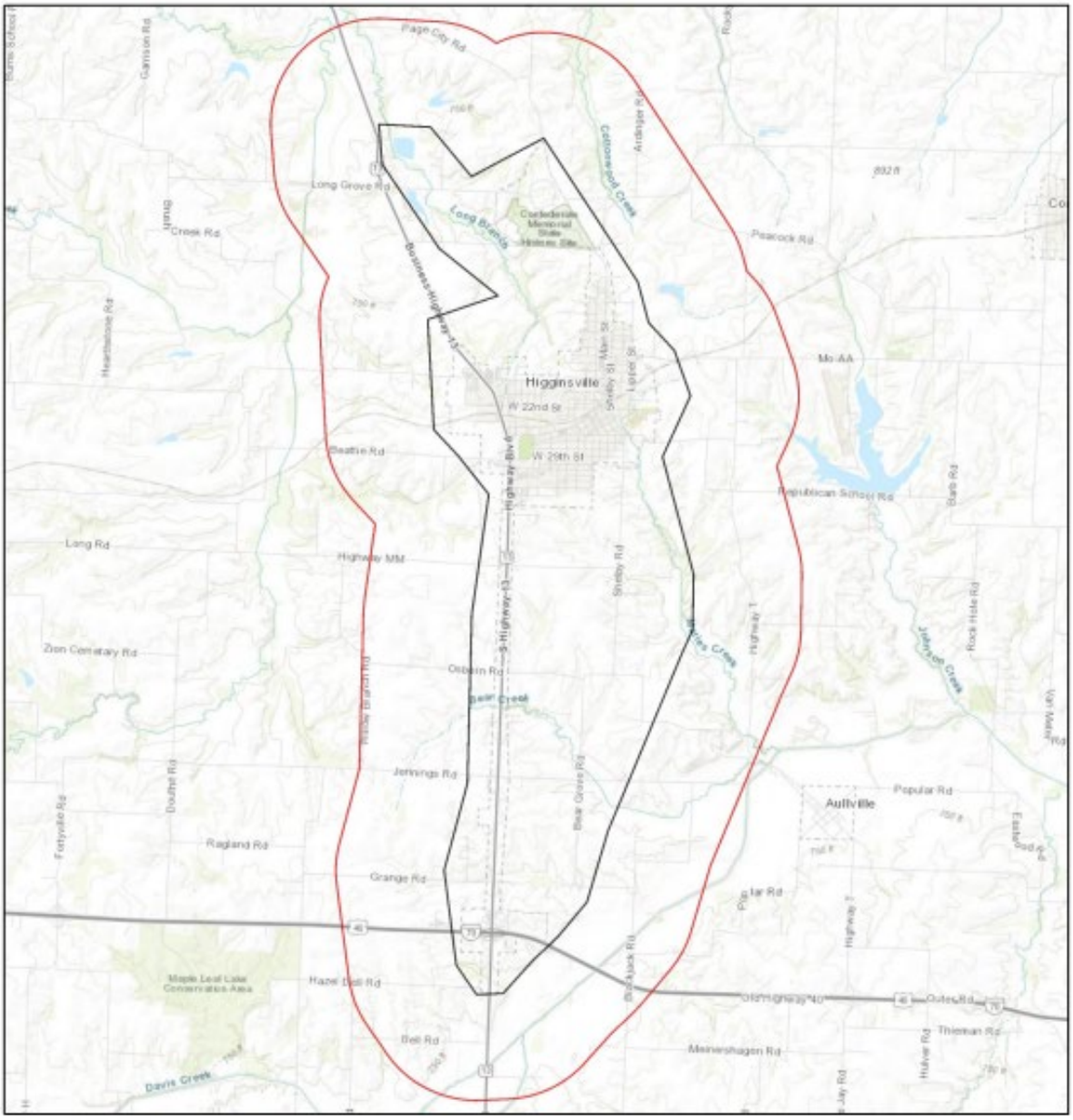
Disclaimer: The NATURAL HERITAGE REVIEW REPORT produced by this website identifies if a species tracked by the Natural Heritage Program is known to occur within or near the area submitted for your project, and shares suggested recommendations on ways to avoid or minimize project impacts to sensitive 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.

Higginsville WWTP and Pumping Stations



January 19, 2022

1:82,994

0 0.5 1 2 mi

0 1 2 4 km

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:

The project occurs on or near public land, Confederate Memorial State Historic Site, please contact DNR.

Your project is near a designated Natural Area . Please contact MDC Natural Areas Coordinator, 573-751-4115 for more information.

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.
Revegetation of disturbed areas is recommended to minimize erosion, as is restoration with of native plant species compatible with the local landscape and for wildlife needs. Annuals like ryegrass may be combined with native perennials for quicker green-up. Avoid aggressive exotic perennials such as crown vetch and sericea lespedeza.
Management Recommendations for Construction Projects Affecting Missouri Streams and Rivers is a Conservation Department publication available at http://mdc.mo.gov/sites/default/files/resources/2013/02/constprojnearstreams_2013.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.**

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 https://mdc.mo.gov/sites/default/files/mo_nature/downloads/2021_SOCC.pdf for a complete list of species and communities of conservation concern. Detailed information about the animals and some plants mentioned may be accessed at https://mdc12.mdc.mo.gov/applications/mofwis/mofwis_search1.aspx. If you would like printed copies of best management practices cited as internet URLs, please contact the Missouri Department of Conservation.

Appendix C: Antidegradation Review Summary Attachments

The attachments that follow contain summary information provided by the applicant, Higginsville WWTF., Department staff determined that changes must be made to the information contained within these attachments. The following were modified and can be found within the Department WQAR:

1) Attachment A: Antidegradation Review Summary/Request

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			COUNTY
Higginsville Wastewater Treatment Plant (Previously Higginsville South Lagoon)			Lafayette
ADDRESS (PHYSICAL)	CITY	STATE	ZIP CODE
2,225-ft E. of Shelby Rd, 0.75 mi. N. of Osborn Rd	Higginsville	MO	64037
PERMIT NUMBER	PROPOSED DESIGN FLOW	SIC / NAICS CODE	
MO-0023108	1.200 MGD		

2. OWNER

NAME			
City of Higginsville			
ADDRESS	CITY	STATE	ZIP CODE
P.O. Box 110	Higginsville	MO	64037
EMAIL ADDRESS		TELEPHONE NUMBER WITH AREA CODE	
watertreatment@ctcis.net		660-584-2106	

3. CONTINUING AUTHORITY The regulatory requirement regarding continuing authority is found in 10 CSR 20-6.010(2).

NAME	SECRETARY OF STATE CHARTER NUMBER		
City of Higginsville			
ADDRESS	CITY	STATE	ZIP CODE
P.O. Box 110	Higginsville	MO	64037
EMAIL ADDRESS		TELEPHONE NUMBER WITH AREA CODE	
watertreatment@ctcis.net		660-584-2106	

4. CONSULTANT

PREPARER NAME	COMPANY NAME		
Dane Drysdale	McClure		
ADDRESS	CITY	STATE	ZIP CODE
1901 Pennsylvania Drive	Columbia	MO	65202
EMAIL ADDRESS		TELEPHONE NUMBER WITH AREA CODE	
ddrysdale@mcclurevision.com		573-814-1568	

5. RECEIVING WATER BODY SEGMENT #1

NAME: Tributary to Maries Creek (100K Extent-Remaining Streams)

5.1 Upper end of segment – Location of discharge
UTM: X= _____, Y= _____ OR Lat 39°02'46.73" N, Long 93°42'11.92" W

5.2 Lower end of segment –
UTM: X= _____, Y= _____ OR Lat 39°02'30.29" N, Long 93°42'08.83" W

Per the Missouri Antidegradation Implementation Procedure (AIP), the definition of a segment, "a segment is a section of water that is bound, at a minimum, by significant existing sources and confluences with other significant water bodies."

6. WATER BODY SEGMENT #2 (IF APPLICABLE, Use another form if a third segment is needed)

NAME:

6.1 Upper end of segment – End of Segment #1
UTM: X= _____, Y= _____ OR Lat _____, Long _____

6.2 Lower end of segment –
UTM: X= _____, Y= _____ OR Lat _____, Long _____

7. DECHLORINATION

If chlorination and dechlorination is the existing or proposed method of disinfection treatment, will the effluent discharged be equal to or less than the Water Quality Standards for Total Residual Chlorine stated in Table A1 of 10 CSR 20-7.031?

☐ Yes ☐ No – What is the proposed method of disinfection? Ultraviolet 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

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.

Both a regional treatment facility and a surface land application system were considered to not be viable alternatives. No WWTP in the area would have enough capacity to accept flow from Higginsville. There is not enough available land for a surface land application system.

Regionalization within Higginsville will occur with the proposed wastewater alternative by means of three pump stations. Elimination of discharging permits MO-0023094 and MO-0111848 is proposed. Drastic reduction in flow and converting from continuous discharging lagoon to a controlled discharging lagoon for discharging permit MO-0023116 is proposed.

Majority of the flow generated in Higginsville would be conveyed to the new WWTP.

9. ADDITIONAL REQUIREMENTS

Complete and submit the following with this submittal:

- ☑ Copy of the Geohydrologic Evaluation – Submit request through the Missouri Geological Survey website
- ☑ Copy of the Missouri Natural Heritage from the Missouri Department of Conservation website
- ☑ Attach your Antidegradation Review Report and all supporting documentation as these forms are only a summary.
- ☐ If applicable, submit a copy of any Existing Water Quality data used in this process. Include the date range of the data, source(s) of the data, and location of data collection relative to the outfall. If using your own collected water quality data, submit a copy of the Quality Assurance Project Plan (QAPP) approved by the department's Watershed Protection Section. For more detailed information, see the Missouri Antidegradation Implementation Procedure (AIP), Section II.A.1.

10. PATH / TIER REVIEW ATTACHMENTS ENCLOSED

Path A: Tier 2 – Non-Degradation Mass Balance	☐ **Yes**	☐ **No**
Path B: Tier 2 – Minimal Degradation	☐ **Yes**	☐ **No**
Path C: Tier 2 – Significant Degradation	☑ **Yes**	☐ **No**
Path D: Tier 1 – Preliminary Review Request	☐ **Yes**	☐ **No**
Path E: Temporary Degradation	☐ **Yes**	☐ **No**

11. APPLICANT PROPOSED ANTIDEGRADATION REVIEW EFFLUENT LIMITS

Preliminary effluent limits for the proposed project are dependent upon the path selected:

Applicable Pollutants of Concern	Concentration*		Path / Tier Review Attachment Used for POC Evaluation	Average Monthly Limit	Daily Maximum Limit or Average Weekly Limit
	mg/L	µg/L			
BODs	X		Tier 2	10	15
TSS	X		Tier 2	15	20
Ammonia (Summer)	X		Tier 2	1.4	3.9
Ammonia (Winter)	X		Tier 2	2.9	6.8
Total Phosphorus	X		Tier 2	monitoring	monitoring
Total Nitrogen	X		Tier 2	monitoring	monitoring
Oil & Grease	X		Tier 2	10	15
pH			Tier 2	6.5-9.0	
E. coli			Tier 2	206	1,030

* Place an X in appropriate box for the concentration units for each Pollutant of Concern.

12. PROPOSED PROJECT SUMMARY

The proposed project primarily involves upgrading the Higginsville South Lagoon (MO-0023108) to an Aero-Mod SEQUOX Activated Sludge WWTP with Ultraviolet Disinfection and increasing the design average flow of the treatment system from 0.600 MGD to 1.200 MGD. The treatment facility upgrades occurring at the Higginsville South Lagoon will also include a headworks building with mechanical screening and flow measurement, an influent pumping station, the conversion of existing lagoon cell #1 to an equalization basin, the conversion of existing lagoon cell #2 to a sludge storage basin, a new ultraviolet (UV) disinfection system, and a garage with lab.

The proposed project also involves construction of three new pump stations. The addition of a new pump station is proposed at both the Higginsville I-70 North Lagoon (MO-0023094) and the Higginsville I-70 South Lagoon (MO-0111848) for the purpose of conveying all wastewater from those sites to the new Aero-Mod SEQUOX Activated Sludge WWTP. These two existing lagoons will be converted to equalization basins and no longer discharge. A third pump station is proposed on the Higginsville North Lagoon (MO-0023116) interceptor sewer to capture the majority of the flow and convey the wastewater to the new Aero-Mod SEQUOX Activated Sludge WWTP. The North Lagoon will be converted to a controlled discharge facility, discharging outside of the recreational season.

Consolidating the four existing lagoon systems to one centralized, advanced wastewater treatment facility will provide a higher level of effluent wastewater quality and comply with new effluent limitation regulations found.

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 *New Technology Definitions and Requirements fact sheet*.

13. CONTINUING AUTHORITY WAIVER (For New Discharges)

In accordance with 10 CSR 20-6.010(2)(C), applicants proposing use of a lower preference continuing authority, when the higher level authority is available, must submit a waiver from the existing higher authority one or other documentation for the department's review, provided it does not conflict with any area-wide management plan approved under section 208 of the Federal Clean Water Act or by the Missouri Clean Water Commission. Is the waiver necessary? ☐ Yes ☑ No
If yes, provide a copy.

14. APPLICATION FEE

☐ CHECK NUMBER ☐ JETPAY CONFIRMATION NUMBER

15. SIGNATURE

I am authorized and hereby certify that I am familiar with the information contained in this document and to the best of my knowledge and belief such information is true, complete and accurate.

SIGNATURE	DATE
Dane Drysale Digitally signed by Dane Drysale DN: C=US, E=ddrysdale@mcclurevision.com, CN=Dane Drysale Reason: I am approving this document Date: 2021.10.07 16:26:19-05'00'	10-7-2021
PRINT NAME	TITLE
Dane Drysdale	Project Manager

PLEASE IDENTIFY YOUR STATUS FOR THIS PROJECT: ☐ OWNER ☐ CONTINUING AUTHORITY ☑ CONSULTANT

2) Attachment B: Tier 2 Significant Degradation Application

MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM, WATER POLLUTION CONTROL BRANCH

ANTIDEGRADATION REVIEW SUMMARY
PATH C: TIER 2 – SIGNIFICANT DEGRADATION

1. FACILITY

NAME	COUNTY
Higginsville Wastewater Treatment Plant	Lafayette

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		30	WQS
TSS	X		30	WQS
Ammonia (Summer)	X		1.4	WQS
Ammonia (Winter)	X		2.9	WQS
Total Nitrogen	X		monitoring	WQS
Total Phosphorus	X		monitoring	WQS
Oil & Grease	X		10	WQS
pH			6.5-9.0	WQS
E. coli			206	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):

Both a regional treatment facility and a surface land application system were considered to not be viable alternatives. No WWTP in the area would have enough capacity to accept flow from Higginsville. There is not enough available land for a surface land application system.

Regionalization within Higginsville will occur with the proposed wastewater alternative by means of three pump stations. Elimination of discharging permits MO-0023094 and MO-0111848 is proposed. Drastic reduction in flow and converting from continuous discharging lagoon to a controlled discharging lagoon for discharging permit MO-0023116 is proposed.

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	Aero-Mod SEQUOX with UV	Activated Sludge
2	Aqua-Aerobics with UV	Sequencing Batch Reactor
3	Sanitaire ICEAS with UV	Sequencing Batch Reactor
4		
5		
6		

* Same technology may be multiple alternatives as you have the base unit and add to it with more capacity to provide additional treatment.

4. DETERMINATION OF THE REASONABLE ALTERNATIVE

Per the Antidegradation Implementation Procedure Section II.B.2, "a reasonable alternative is one that is practicable, economically efficient and affordable." Provide basis and supporting documentation in the Antidegradation Review report. **Please do not write "See Report" for any box below.**

Practicability Summary:

"The practicability of an alternative is considered by evaluating the effectiveness, reliability, and potential environmental impacts," according to the Antidegradation Implementation Procedure Section II.B.2.a. Examples of factors to consider, including secondary environmental impacts, are given in the Antidegradation Implementation Procedure Section II.B.2.a.

All of the discharging alternatives evaluated are considered practicable. There is adequate area at the Higginsville South Lagoon for each of the three alternatives. The treatment technologies evaluated are reliable with a very low risk of potential upsets or accidents with treatment.

Economic Efficiency Basis:

What is the design life cycle for the comparison? 20

What interest rate was used in the present worth calculations? 2.875

Economic Efficiency Summary:

Alternatives that are deemed practicable must undergo a direct cost comparison in order to determine economic efficiency. Means to determine economic efficiency are provided in the Antidegradation Implementation Procedure Section II.B.2.b.

The alternatives were compared on effluent quality, cost to construct, cost to operate, and cost to maintain. All of the alternatives evaluated were economically efficient and within 120% of the lowest cost alternative.

TABLE OF THE ALTERNATIVES EVALUATION (Attach additional page if necessary)

PARAMETERS	Alternatives #					
	1	2	3	4	5	6
BOD_5 – mg/L	10	45	10			
TSS – mg/L	15	70	15			
Ammonia (Summer) – mg/L	1.4	1.4	1.4			
Ammonia (Winter) – mg/L	2.9	2.9	2.9			
E. Coli – #/100 mL	206	206	206			
Total Nitrogen – mg/L						
Total Phosphorus – mg/L						
pH	6.5-9.0	6.5-9.0	6.5-9.0			
Oil & Grease	10	10	10			
Construction Cost – $	10,872,000	10,363,000	11,592,000			
Operating Cost – $	3,031,092	3,399,807	3,837,535			
Present Worth – $	13,903,092	13,762,807	15,429,535			
Ratio present worth to base case	1.01	1.0	1.12			

Affordability Summary:

Alternatives identified as most practicable and economically efficient are considered affordable if the applicant does not supply an affordability analysis. An affordability analysis per the Antidegradation Implementation Procedure Section II.B.2.c, "may be used to determine if the alternative is too expensive to reasonably implement."

An affordability analysis was not performed for the purpose of this Antidegradation Review. The preferred alternative, Alternative 1, is considered affordable.

Justification for Preferred Alternative:

Alternative 1 is the preferred alternative. With Alternative 1, treated wastewater released to the receiving stream will be of the highest quality of the three alternatives evaluated. The cost of Alternative 1 is also within 1% of the lowest cost treatment alternative. Additionally, common wall construction with the Aero-Mod will help reduce footprint to conserve land at the South Lagoon. If there is ever the need to expand the WWTP again, remaining space will be available on the land owned by the City of Higginsville at the South Lagoon site.

Reasons for Rejecting the other Evaluated Alternatives:

One detractor with the SBR treatment type is that a post-equalization basin is needed. The number of separate tanks and processes makes the WWTP more complicated to operate. The less things constructed results in less items to cause maintenance problems for City Staff. Another detractor for the SBR treatment type is the need for a separate anaerobic digester structure and post- equalization basin. Alternative 1 has an aerated digester built adjacent to the aeration basin using common-wall-construction, making it easier for the operator to travel between process structures, especially during inclement weather. Alternative 2 and 3 require more maintenance and time from the operators when compared to Alternative 1.

Comments/Discussion:

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 affected community are the citizens of Higginsville and the businesses that operate within the city limits.

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.

Relevant factors include sewer rates, income levels, improved water quality, enhanced environmental conditions, community growth and tax bases.

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.

Increasing treatment capacity and designing for future growth will allow for continued growth of the community. The selection of an economically efficient and affordable treatment alternative will minimize the financial impact on the current and future residents and businesses in Higginsville. In addition, construction of improved treatment processes will benefit the receiving stream network, aquatic life, and the recreational uses associated, helping to make Higginsville a better place to live and do business.

PROPOSED PROJECT SUMMARY:

The proposed project primarily involves upgrading the Higginsville South Lagoon (MO-0023108) to an Aero-Mod SEQUOX Activated Sludge WWTF and increasing the design average flow of the treatment system from 0.600 MGD to 1.20 MGD. The treatment facility upgrades occurring at the Higginsville South Lagoon will also include a headworks building with screening and flow measurement, an influent pumping station, the conversion of existing lagoon cell #1 to an equalization basin, the conversion of existing lagoon cell #2 to a sludge storage basin, a new ultraviolet (UV) disinfection system, and a garage with lab.

The proposed project also involves construction of three new pump stations. The addition of a new pump station is proposed at both the Higginsville I-70 North Lagoon (MO-0023094) and the Higginsville I-70 South Lagoon (MO-0111848) for the purpose of conveying wastewater to the new Aero-Mod SEQUOX Activated Sludge WWTP. These two existing lagoons will be converted to equalization basins and no longer discharge. A third pump station is proposed on the Higginsville North Lagoon (MO-0023116) interceptor sewer to capture the majority of the flow and convey the wastewater to the new Aero-Mod SEQUOX Activated Sludge WWTP. The North Lagoon will be converted to a controlled discharge facility, discharging outside of the recreational season.

Consolidating the four existing lagoon systems to one centralized, advanced wastewater treatment facility will provide a higher level of effluent wastewater quality and comply with new effluent limitation regulations found.

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.

MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM

APPLICATION FOR CONSTRUCTION PERMIT – WASTEWATER TREATMENT FACILITY

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

APPLICATION OVERVIEW

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

PART A – BASIC INFORMATION

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

1.1 Is this a Federal/State funded project? ☑ YES ☐ N/A Funding Agency: SRF Project #: _____

1.2 Has the Missouri Department of Natural Resources approved the proposed project's antidegradation review?
☑ YES Date of Approval: 2/8/22 ☐ N/A

1.3 Has the department approved the proposed project's facility plan*?
☑ YES Date of Approval: _____ ☐ 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: 2022-12-19
☑ 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
Higginsville Wastewater Treatment Plant

2.2 ESTIMATED PROJECT CONSTRUCTION COST
$ 13,996,013

2.3 PROJECT DESCRIPTION
Construction of a new influent pump station with flow equalization tie-in to existing Lagoon Cell #1, a new headworks with package screening and grit removal system, a new Aero-Mod SEQUOX activated sludge treatment system, and UV disinfection.

2.4 SLUDGE HANDLING, USE AND DISPOSAL DESCRIPTION
Sludge from the Aero-Mod aerobic digesters will be stored in existing Lagoon Cell #2. Sludge to be land applied by a contract hauler on an as needed basis, estimated once every five years.

2.5 DESIGN INFORMATION

A. Current population: 4,817 ; Design population: 6,594

B. Actual Flow: 0.417 gpd; Design Average Flow: 1.2 gpd;
Actual Peak Daily Flow: 1.713 gpd; Design Maximum Daily Flow: 3.0 gpd; Design Wet Weather Event: 7.172

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	TELEPHONE NUMBER WITH AREA CODE	E-MAIL ADDRESS
Higginsville Wastewater Treatment Plant	660-584-2106	watertreatment@ctcis.net

ADDRESS (PHYSICAL)	CITY	STATE	ZIP CODE	COUNTY
0.5 mi SE of Mt Moriah and Shelby Rd. inter	Higginsville	MO	64037	Lafayette

Wastewater Treatment Facility: Mo- 0023108 (Outfall 1 Of 1)

3.1 Legal Description: ____ ¼, ____ ¼, ____ ¼, Sec. 18, T 49N, R 25W
(Use additional pages if construction of more than one outfall is proposed.)

3.2 UTM Coordinates Easting (X): 439141 Northing (Y): 4321713
For Universal Transverse Mercator (UTM), Zone 15 North referenced to North American Datum 1983 (NAD83)

3.3 Name of receiving streams: Tributary to Maries Creek

4.0 PROJECT OWNER

NAME	TELEPHONE NUMBER WITH AREA CODE	E-MAIL ADDRESS
City of Higginsville	660-584-2106	cityadm@ctcis.net

ADDRESS	CITY	STATE	ZIP CODE
1922 Main Street	Higginsville	MO	64037

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	TELEPHONE NUMBER WITH AREA CODE	E-MAIL ADDRESS
City of Higginsville	660-584-2106	cityadm@ctcis.net

ADDRESS	CITY	STATE	ZIP CODE
1922 Main Street	Higginsville	MO	64037

5.1 A letter from the continuing authority, if different than the owner, is included with this application. ☐ YES ☐ NO ☑ N/A

5.2 COMPLETE THE FOLLOWING IF THE CONTINUING AUTHORITY IS A MISSOURI PUBLIC SERVICE COMMISSION REGULATED ENTITY.

A. Is a copy of the certificate of convenience and necessity included with this application? ☐ YES ☐ NO

5.3 COMPLETE THE FOLLOWING IF THE CONTINUING AUTHORITY IS A PROPERTY OWNERS ASSOCIATION.

A. Is a copy of the as-filed restrictions and covenants included with this application? ☐ YES ☐ NO

B. Is a copy of the as-filed warranty deed, quitclaim deed or other legal instrument which transfers ownership of the land for the wastewater treatment facility to the association included with this application? ☐ YES ☐ NO

C. Is a copy of the as-filed legal instrument (typically the plat) that provides the association with valid easements for all sewers included with this application? ☐ YES ☐ NO

D. Is a copy of the Missouri Secretary of State's nonprofit corporation certificate included with this application? ☐ YES ☐ NO

6.0 ENGINEER

ENGINEER NAME / COMPANY NAME	TELEPHONE NUMBER WITH AREA CODE	E-MAIL ADDRESS
Dane Drysdale, P.E. / McClure	417-860-6469	ddrysdale@mcclurevision.com

ADDRESS	CITY	STATE	ZIP CODE
1901 Pennsylvania Drive	Columbia	MO	65202

7.0 APPLICATION FEE

☐ CHECK NUMBER ☐ JETPAY CONFIRMATION NUMBER

8.0 PROJECT OWNER: I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

PROJECT OWNER SIGNATURE: Jeanette Dobson

PRINTED NAME	DATE
Jeanette Dobson	12/21/22

TITLE OR CORPORATE POSITION	TELEPHONE NUMBER WITH AREA CODE	E-MAIL ADDRESS
City Adm.	660-584-2106	cityadm@ctcis.net

Mail completed copy to: MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM
P.O. BOX 176
JEFFERSON CITY, MO 65102-0176

END OF PART A.
REFER TO THE APPLICATION OVERVIEW TO DETERMINE WHETHER PART B NEEDS TO BE COMPLETE.

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

8.0 FACILITY INFORMATION

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

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

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

9.0 STORAGE BASINS

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

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

9.3 Storage basin dimensions at inside top of berm (feet). Report freeboard as feet from top of berm to emergency spillway or overflow pipe.
Basin #1: Length _____ Width _____ Depth _____ Freeboard _____ Depth _____ Safety _____ % Slope _____
Basin #2: Length _____ Width _____ Depth _____ Freeboard _____ Depth _____ Safety _____ % Slope _____
Basin #3: Length _____ Width _____ Depth _____ Freeboard _____ Depth _____ Safety _____ % Slope _____

9.4 Storage Basin operating levels (report as feet below emergency overflow level).
Basin #1: Maximum operating water level _____ ft Minimum operating water level _____ ft
Basin #2: Maximum operating water level _____ ft Minimum operating water level _____ ft
Basin #3: Maximum operating water level _____ ft Minimum operating water level _____ ft

9.5 Design depth of sludge in storage basins.
Basin #1: _____ ft Basin #2: _____ ft Basin #3: _____ ft

9.6 Existing sludge depth, if the basins are currently in operation.
Basin #1: _____ ft Basin #2: _____ ft Basin #3: _____ ft

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

10.0 LAND APPLICATION SYSTEM

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

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

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

10.4 Land application rate (design flow including 1-in-10 year storm water flows):
Design: _____ inches/year _____ inches/hour _____ inches/day _____ inches/week
Actual: _____ inches/year _____ inches/hour _____ inches/day _____ inches/week

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

10.6 Actual months used for irrigation (check all that apply):
☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec

10.7 Land application rate is based on:
☐ Hydraulic Loading ☐ Other (describe) _____
☐ Nutrient Management Plan (N&P) If N&P is selected, is the plan included? ☐ YES ☐ NO