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 Ashland
Ashland WWTF
850 Richardson Drive
Ashland, MO 65010

for the construction of (described facilities):

See attached.

Permit Conditions:

See attached.

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

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

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

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

August 22, 2025
Effective Date

August 21, 2027
Expiration Date

Heather Peters, Director, Water Protection Program

CONSTRUCTION PERMIT

I. CONSTRUCTION DESCRIPTION

This project is for wastewater treatment improvements to serve Ashland Wastewater Treatment Facility (WWTF), MO0106844. The project includes constructing a new 1.0 million gallon per day (MGD) Aero-Mod SEQUOX biological nutrient removal (BNR) activated sludge treatment system, adding a fermentation tank to the existing 0.6 MGD Aero-Mod SEQUEOX system to enhance phosphorous biological removal, constructing an influent control flow structure, installing a new flow equalization pump station, and adding three in-plant magnetic flow meters. The new 1.0 MGD treatment system and the existing 0.6 MGD treatment system will operate in parallel. The project increases the design capacity of Ashland WWTF to 1.6 MGD.

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

II. COST ANALYSIS FOR COMPLIANCE

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

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

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

III. CONSTRUCTION PERMIT CONDITIONS

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

1. This construction permit does not authorize discharge.

2. All construction shall be consistent with plans and specifications signed and sealed by Kyle J. Landwehr, P.E. with Bartlett & West, Inc. and as described in this permit.

3. The department must be contacted in writing prior to making any changes to the plans and specifications that would directly or indirectly have an impact on the capacity, flow, system layout, or reliability of the proposed wastewater treatment facilities or any design parameter that is addressed by 10 CSR 20-8, in accordance with 10 CSR 20-8.110(11).

4. State and federal law does not permit bypassing of raw wastewater, therefore steps must be taken to ensure that raw wastewater does not discharge during construction. If a sanitary sewer overflow or bypass occurs, report the appropriate information to the department's Northeast Regional Office per 10 CSR 20-7.015(9)(G).

5. In addition to the requirements for a construction permit, 10 CSR 20-6.200 requires land disturbance activities of one acre or more to obtain a Missouri state operating permit to discharge stormwater. The permit requires best management practices sufficient to control runoff and sedimentation to protect waters of the state. Land disturbance permits will only be obtained by means of the department's ePermitting system available online at https://dnr.mo.gov/data-e-services/missouri-gateway-environmental-management-mogem. See https://dnr.mo.gov/data-e-services/water/electronic-permitting-epermitting for more information.

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

7. All construction must adhere to applicable 10 CSR 20-8 (Chapter 8) requirements listed below.

- Flood protection shall apply to new construction and to existing facilities undergoing major modification. The wastewater facility structures, electrical equipment, and mechanical equipment shall be protected from physical damage by not less than the 100-year flood elevation. 10 CSR 20-8.140(2)(B)

- Unless another distance is determined by the Missouri Geological Survey or by the department's Public Drinking Water Branch, the minimum distance between wastewater treatment facilities and all potable water sources shall be at least 300 feet. 10 CSR 20-8.140(2)(C)1.

- Facilities shall be readily accessible by authorized personnel from a public right–of-way at all times. 10 CSR 20-8.140(2)(D)

- All wastewater treatment facilities shall be provided with an alternate source of electric power or pumping capability to allow continuity of operation during power failures. 10 CSR 20-8.140(7)(A)1.

- Electrical systems and components in raw wastewater or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors that are normally present, shall comply with the NFPA 70 *National Electric Code (NEC)* (2017 Edition), as approved and published August 24, 2016, requirements for Class I, Division 1, Group D locations. 10 CSR 20-8.140(7)(B)

- An audiovisual alarm or a more advanced alert system, with a self-contained power supply, capable of monitoring the condition of equipment whose failure could result in a violation of the operating permit, shall be provided for all wastewater treatment facilities. 10 CSR 20-8.140(7)(C)

- No piping or other connections shall exist in any part of the wastewater treatment facility that might cause the contamination of a potable water supply. 10 CSR 20-8.140(7)(D)1.

- Where a potable water supply is to be used for any purpose in a wastewater treatment facility other than direct connections, a break tank, pressure pump, and pressure tank or a reduced pressure backflow preventer consistent with the department's Public Drinking Water Branch shall be provided. 10 CSR 20-8.140(7)(D)3.A.

- For indirect connections, a sign shall be permanently posted at every hose bib, faucet, hydrant, or sill cock located on the water system beyond the break tank or backflow preventer to indicate that the water is not safe for drinking. 10 CSR 20-8.140(7)(D)3.B.

- Where a separate non-potable water supply is to be provided, a break tank will not be necessary, but all system outlets shall be posted with a permanent sign indicating the water is not safe for drinking. 10 CSR 20-8.140(7)(D)4.

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

- Isolate all wastewater treatment components installed in a building where other equipment or offices are located from the rest of the building by an air-tight partition, provide separate outside entrances, and provide separate and independent fresh air supply. 10 CSR 20-8.140(7)(G)

- Adequate provisions shall be made to effectively protect facility personnel and visitors from hazards. The following shall be provided to fulfill the particular needs of each wastewater treatment facility:
    - Fencing. Enclose the facility site with a fence designed to discourage the entrance of unauthorized persons and animals; 10 CSR 20-8.140 (8) (A)
    - Gratings over appropriate areas of treatment units where access for maintenance is necessary; 10 CSR 20-8.140(8)(B)
    - First aid equipment; 10 CSR 20-8.140(8)(C)
    - Posted "No Smoking" signs in hazardous areas; 10 CSR 20-8.140(8)(D)
    - Appropriate personal protective equipment (PPE); 10 CSR 20-8.140(8)(E)
    - Portable blower and hose sufficient to ventilate accessed confined spaces; 10 CSR 20-8.140(8)(F)
    - 10 CSR 20-8.140(8)(G) Portable lighting equipment complying with NEC requirements. See subsection (7)(B) of this rule;
    - 10 CSR 20-8.140(8)(H) Gas detectors listed and labeled for use in NEC Class I, Division 1, Group D locations. See subsection (7)(B) of this rule;
    - Appropriately-placed warning signs for slippery areas, non-potable water fixtures (see subparagraph (7)(D)3.B. of this rule), low head clearance areas, open service manholes, hazardous chemical storage areas, flammable fuel storage areas, high noise areas, etc.; 10 CSR 20-8.140(8)(I)
    - Ventilation shall include the following:
        - Isolate all pumping stations and wastewater treatment components installed in a building where other equipment or offices are located from the rest of the building by an air-tight partition, provide separate outside entrances, and provide separate and independent fresh air supply; 10 CSR 20-8.140(8)(J)1.
        - Force fresh air into enclosed screening device areas or open pits more than four feet (4') deep. 10 CSR 20-8.140(8)(J)2.
        - Dampers are not to be used on exhaust or fresh air ducts. Avoid the use of fine screens or other obstructions on exhaust or fresh air ducts to prevent clogging; 10 CSR 20-8.140(8)(J)3.
        - Where continuous ventilation is needed (e.g., housed facilities), provide at least 12 complete air changes per hour. Where continuous ventilation would cause excessive heat loss, provide intermittent ventilation of at least thirty (30) complete air changes per hour when facility personnel enter the area. Base air change demands on 100% fresh air; 10 CSR 20-8.140(8)(J)4.
        - Electrical controls. Mark and conveniently locate switches for operation of ventilation equipment outside of the wet well or building. Interconnect all intermittently operated ventilation equipment with the respective wet well, dry well, or building lighting system. The manual lighting/ventilation switch is expected to override the automatic controls. For a two speed ventilation system with automatic switch over where gas detection equipment is installed, increase the ventilation rate automatically in response to the detection of hazardous concentrations of gases or vapors; 10 CSR 20-8.140(8)(J)5.

        - Fabricate the fan wheel from non-sparking material. Provide automatic heating and dehumidification equipment in all dry wells and buildings. 10 CSR 20-8.140(8)(J)6.
    - Explosion-proof electrical equipment, non-sparking tools, gas detectors, and similar devices, in work areas where hazardous conditions may exist, such as digester vaults and other locations where potentially explosive atmospheres of flammable gas or vapor with air may accumulate. 10 CSR 20-8.140(8)(K)
    - Provisions for local lockout/tagout on stop motor controls and other devices; 10 CSR 20-8.140(8)(L)
    - Provisions for an arc flash hazard analysis and determination of the flash protection boundary distance and type of PPE to reduce exposure to major electrical hazards shall be in accordance with NFPA 70E *Standard for Electrical Safety in the Workplace* (2018 Edition), as approved and published August 21, 2017. 10 CSR 20-8.140(8)(M)

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

- Overflow weirs shall be readily adjustable over the life of the structure to correct for differential settlement of the tank. 10 CSR 20-8.160(3)(C)1.

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

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

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

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

- Electrical fixtures, equipment, and controls. Electrical fixtures, equipment, and controls shall comply with the National Electrical Manufacturers Association (NEMA) 4X enclosure rating where necessary; *NEMA Standard 250-2014*, published December 15, 2014. This standard shall hereby be incorporated by reference into this rule, as published by National Electrical Manufacturers Association, 1300 North 17th Street, Arlington, VA 22209. This rule does not incorporate any subsequent amendments or additions. Electrical equipment, fixtures, and controls, in places enclosing and adjacent to anaerobic digestive appurtenances where hazardous gases are included. 10 CSR 20-8.170(4)(C)3.

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

8. Upon completion of construction:

   A. The City of Ashland 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; and

   C. Submit the Statement of Work Completed form to the department in accordance with 10 CSR 20-6.010(5)(N) (https://dnr.mo.gov/document-search/wastewater-construction-statement-work-completed-mo-780-2155) and request the operating permit modification public noticed on July 11, 2025 be issued.

IV. REVIEW SUMMARY

1. CONSTRUCTION PURPOSE

The City of Ashland is a growing community and Ashland WWTF is currently operating near its treatment capacity. Upgrading the WWTF is necessary to keep up with the current and future wastewater flows.

2. FACILITY DESCRIPTION

The project includes constructing a new 1.0 million gallon per day (MGD) Aero-Mod SEQUOX biological nutrient removal (BNR) activated sludge treatment system, adding a fermentation tank to the existing 0.6 MGD Aero-Mod SEQUEOX system to enhance phosphorous biological removal, constructing an influent control flow structure, installing a new flow equalization pump station, and adding three in-plant magnetic flow meters. The new 1.0 MGD treatment system and the existing 0.6 MGD treatment will operate in parallel. The project increases the design capacity of Ashland WWTF to 1.6 MGD.

The Ashland WWTF is located at 850 Richardson Drive, Ashland, in Boone County, Missouri. The new facility will have a design average flow of 1.6 MGD and serves a hydraulic population equivalent of approximately 16,000 people.

3. COMPLIANCE PARAMETERS

The proposed project is required to meet final effluent limits established in the Antidegradation review dated February 22, 2023.

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

Parameter	Units	Monthly Average Limit
Biochemical Oxygen Demand$_5$	mg/L	10
Total Suspended Solids	mg/L	10
Ammonia as N- October to March	mg/L	0.9
Ammonia as N- April to September	mg/L	0.5
pH	SU	6.5-9.0*
Oil and Grease	mg/L	10
E. coli	#/100mL	206
Total Nitrogen (Oct – Mar)	mg/L	15.9
Total Nitrogen (Apr – Sep)	mg/L	16.3
Total Phosphorus	mg/L	1.0
Dissolved Oxygen	mg/L	7.0**

* pH limit is between 6.5 – 9.0;
**D.O. limit is Monthly Average Minimum.

4. ANTIDEGRADATION

The department has reviewed the antidegradation report for this facility and issued the Water Quality and Antidegradation Review dated February 22, 2023, due to the WWTF's expanded design average flow. See **APPENDIX – ANTIDEGRADATION**.

5. REVIEW of MAJOR TREATMENT DESIGN CRITERIA

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

- Headworks system – The existing headworks consists of an influent trash rack, auger pump station, fine screen, manual bar screen, grit collector, and a flow splitter. This system will remain largely unmodified other than converting the existing flow splitter into an open channel pass through structure that diverts flow to the new proportional flow splitter. The pump station is capable of handling 1.8 million gallons per day (MGD). Flows over 1.8 MGD are passively diverted to the equalization basin. The mechanical fine screen has a maximum capacity of 1.2 MGD. The manual fine screen is for flows over 1.2 MGD or for maintenance of the mechanical fine screen. The mechanical grit collection has a maximum capacity of four MGD. The influent screening system is to be upgraded when the influent average flow approaches 1.2 MGD.

- Flow Equalization Basin – The existing flow equalization basin has a storage capacity of approximately four million gallons which has approximately 2.5 days of storage at the design average flow of 1.6 MGD.

- Aero-Mod SEQUOX Treatment System – The existing Aero-Mod system has a design capacity of 0.6 MGD and consists of an aerobic selector basin, two aeration basins, two clarifiers, and two aerobic digesters. A new fermentation tank will be installed before the anaerobic basin for phosphorus removal.

- UV Disinfection System – The existing system is capable of treating a peak flow of 2.4 MGD. Flows through the UV system will be controlled at 2.4 MGD. The UV system will be upgraded to 6.4 MGD in the next phase of the WWTF improvements project.

- Reaeration System – The existing reaeration system consists of two 7.5 horsepower (hp) blowers capable of providing an air supply of 101 cubic feet per minute (CFM) through 56 diffusers at the bottom of the 25,245-gallon basin.

- Belt Press Dewatering System – The existing belt press system is designed for a hydraulic throughput of 50 to 200 gallons per minute (gpm) depending on the feed percent solids between 1 to 4%.

Construction will cover the following items:

- Components are designed for a Population Equivalent of 16,000 based on hydraulic loading to the system.

- Influent Flow Control Structure – Construction of an influent flow control structure to allow for passive and manual flow control to the existing equalization basin.

- Equalization Basin Pumping Station – Construction of a new equalization basin pump station to increase pumping capacity and to automize pumping operations. The triplex equalization basin pump station with each 15 HP submersible pump capable of operating at 2190 gpm at 11 feet of TDH. The pumps will be equipped with variable frequency drives (VFDs).

- Flow Measurement – Installation of accurate flow measurement devices will give the treatment facility a means of improved data analysis.
  - Electromagnetic Meters – Three electromagnetic flow meters, one 8-inch and two 14-inch meters, shall measure the in-plant flows to allow for automation and maximization of throughput flow between average and peak flow events.

- Fermentation Tank – Addition of a fermentation tank to the existing Aero-Mod system for biological phosphorus removal. The tank will be installed prior to the anaerobic selector basin and will be 24 feet by 12 feet by 18 feet height with 16 feet water depth to provide a volume of approximately 34,468 gallons. Six stainless steel coarse bubble diffusers are provided for intermittently mixing. The existing aeration system will be upgraded to accommodate the addition of this tank.

- New Activated Sludge Treatment Plant – Installation of one Aeromod SEQUOX BNR plant capable of treating a design average flow of 1.0 MGD. The plant will be installed in parallel to the existing 0.6 MGD Aeromod to provide a total treatment capacity of the WWTF of 1.6 MGD. The following components are integrated into the one MGD cast-in-place plant:
  - Fermentation Tank – A fermentation tank with a volume of 110,704 gallons will be provided. 16 stainless steel coarse bubble diffusers will be installed in the tank. The aeration basin blowers will supply air to the diffusers.
  - Anaerobic Selector Tank – An anaerobic selector tank with a volume of 166,056 gallons will be provided. 20 stainless steel coarse bubble diffusers will be installed in the tank. The aeration basin blowers will supply air to the diffusers.
  - Aeration Basin – A 1,070,478-gallon two-stage aeration basin with each stage 133.5 ft by 33.5 ft by 16 feet sidewater depth will be provided. Aeration by means of three (3) 125 hp blowers capable of supplying 2161 scfm to 288 fine bubble membrane diffusers in the first stage and 160 stainless steel coarse bubble diffusers in the second stage. The aeration is designed for an average daily loading of 2,335 lbs BOD_5. Transfer pipes with inlet coarse screens and elbows allow wastewater from the second aeration chamber to move by gravity to the clarifiers.
  - Final Clarifiers – Two final clarifiers will have a total settling volume of 421,101 gallons and a detention time of nine hours with a settling rate of 316 gpd/ft^2. An air lift surface skimmer is provided to remove grease and floatables and return to the selector basin. An effluent box with adjustable low- and high-level weirs and a submerged orifice for surge control will be provided. The clarified effluent will flow by gravity to the disinfection system. Air lift pumps will be provided to move settled sludge from the hopper bottoms to the aerobic digester or return to the aeration basin as return activated sludge.
  - Aerobic Digester Tank – The digester will have a volume of 421,101 gallons. The aeration basin blowers will supply air to the 112 stainless steel coarse bubble diffusers. Supernatant will be decanted by means of a fixed level weir with baffle to the selector basin. Sludge removal shall be by contract hauler.
  - Waste Activated Sludge (WAS) Pump Station – Construction of a duplex WAS pump station and associated valves to transport aged sludge from the aerobic digester to the existing belt filter press for sludge dewatering. The WAS pump will be capable of pumping 225 gpm at 33.5 ft of TDH with a 5.5 HP motor.

- Emergency Power – Two 700 kW standby diesel generators and an automatic transfer switch will be provided to operate the treatment facility in event of power failure.

6. OPERATING PERMIT

Operating permit MO-0106844 expired on May 31, 2024. A renewal application was received by the department on December 6, 2023. The renewal must be issued before the modified operating permit is implemented. The operating permit modification to reflect the construction activities was incorporated into the renewal that was public noticed July 11, 2025, through August 11, 2025. Upon department receipt of the statement of work completed form and approval, the operating permit modification associated with this construction permit will become effective.

V. NOTICE OF RIGHT TO APPEAL

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

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

Sieu T. Dang, P.E.
Engineering Section
sieu.dang@dnr.mo.gov

APPENDICES

- **Process Flow Diagrams**
- **Antidegradation**
- **Cost Analysis for Compliance**

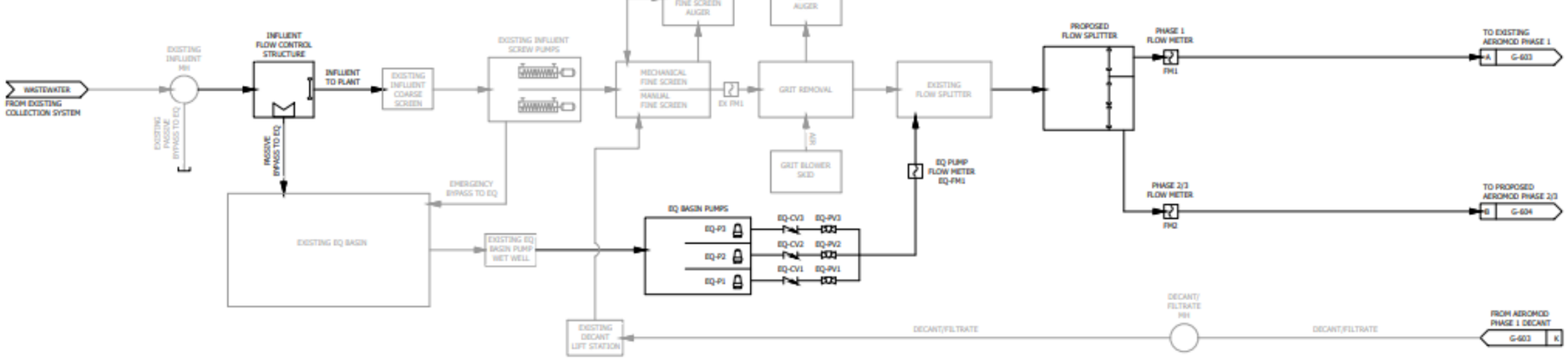
BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

GENERAL NOTES

1. PIPE, FITTINGS, VALVES, EQUIPMENT, ETC., TAGS AND LABELS ARE PROVIDED AS A COURTESY FOR THE CONTRACTOR. IT IS NOT THE INTENT OF THESE CALLOUTS, LABELS, AND TAGS TO BE A BILL OF MATERIALS LIST. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ITEMS EITHER CALLED OUT OF SHOWN IN THE DRAWINGS AND/OR SPECIFICATIONS.

LEGEND:

- PRIMARY LINE SEGMENT
- SECONDARY LINE SEGMENT
- PRIMARY LINE SEGMENT - FUTURE
- PRIMARY LINE SEGMENT - EXISTING
- EQUIPMENT
- EQUIPMENT - EXISTING
- EQUIPMENT - FUTURE
- EQUIPMENT BOUNDARY



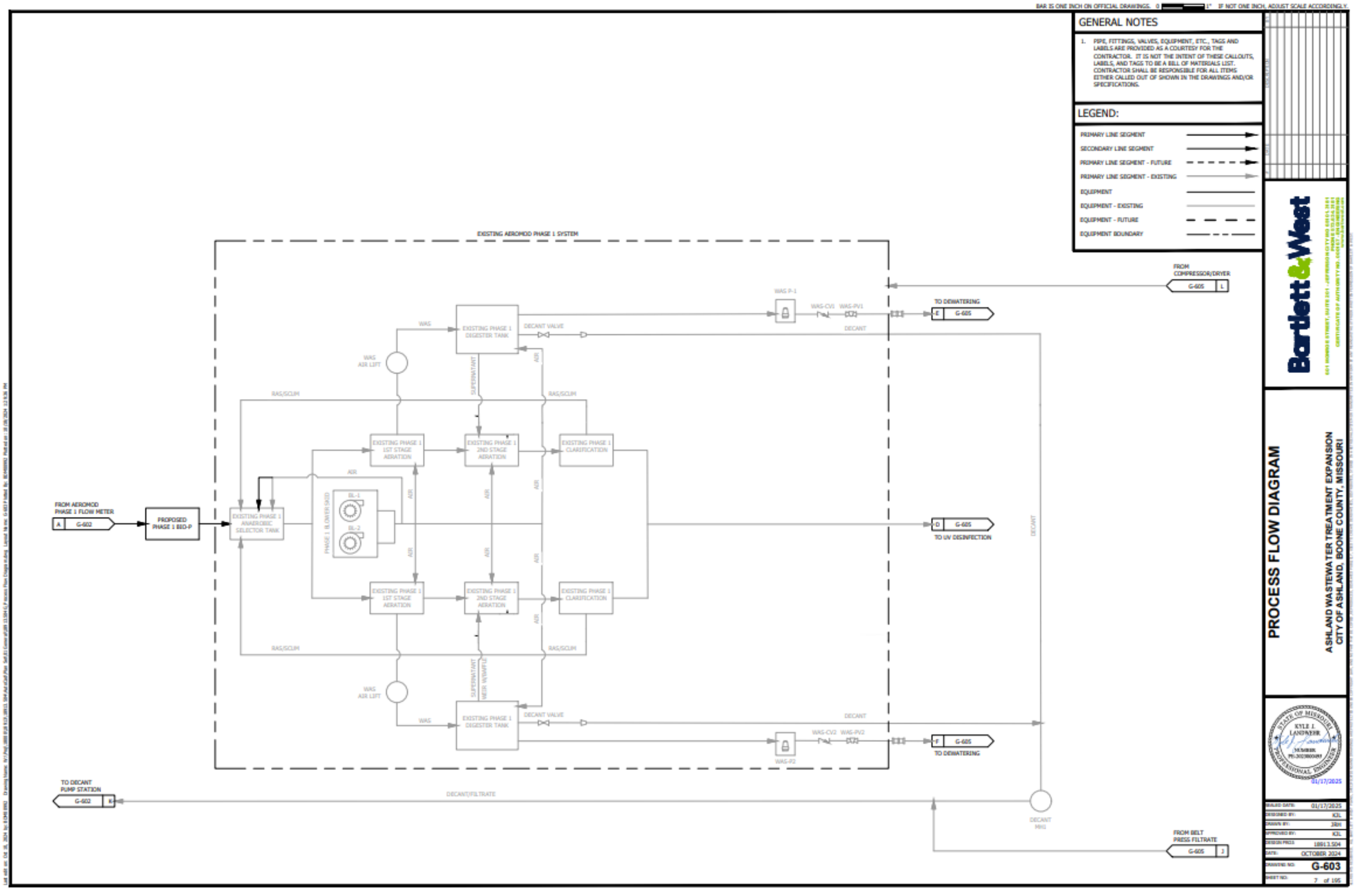
Bartlett & West

PROCESS FLOW DIAGRAM

ASHLAND WASTEWATER TREATMENT EXPANSION
CITY OF ASHLAND, BOONE COUNTY, MISSOURI

STATE OF MISSOURI
KYLE J. LANDWEHR
NUMBER PE-2010000989
PROFESSIONAL ENGINEER
01/17/2025

ISSUED DATE:	01/17/2025
DESIGNED BY:	KJL
DRAWN BY:	JRH
APPROVED BY:	KJL
DESIGN PROJ:	1891.1.504
DATE:	OCTOBER 2024
DRAWING NO:	G-602
SHEET NO:	6 of 195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EQUIPMENT - EXISTING
EQUIPMENT - FUTURE
EQUIPMENT BOUNDARY
EXISTING AEROMOD PHASE 1 SYSTEM
FROM COMPRESSOR/DRYER
G-605 L
TO DEWATERING
E G-605
WAS P-1
WAS-CV1 WAS-PV1
DECANT
WAS
EXISTING PHASE 1 DIGESTER TANK
DECANT VALVE
WAS AIR LIFT
SUPERNATANT
AIR
RAS/SCUM
EXISTING PHASE 1 1ST STAGE AERATION
EXISTING PHASE 1 2ND STAGE AERATION
EXISTING PHASE 1 CLARIFICATION
FROM AEROMOD PHASE 1 FLOW METER
A G-602
PROPOSED PHASE 1 BIO-P
EXISTING PHASE 1 ANAEROBIC SELECTOR TANK
PHASE 1 BLOWER SKID
BL-1
BL-2
D G-605
TO UV DISINFECTION
SUPERNATANT WEIR W/BAFFLE
WAS-CV2 WAS-PV2
F G-605
TO DEWATERING
WAS-P2
TO DECANT PUMP STATION
G-602 K
DECANT/FILTRATE
DECANT MH1
FROM BELT PRESS FILTRATE
G-605 J
Bartlett & West
PROCESS FLOW DIAGRAM
ASHLAND WASTEWATER TREATMENT EXPANSION
CITY OF ASHLAND, BOONE COUNTY, MISSOURI
STATE OF MISSOURI
KYLE J. LANDWEHR
PE-2023000091
PROFESSIONAL ENGINEER
01/17/2025
ISSUED DATE: 01/17/2025
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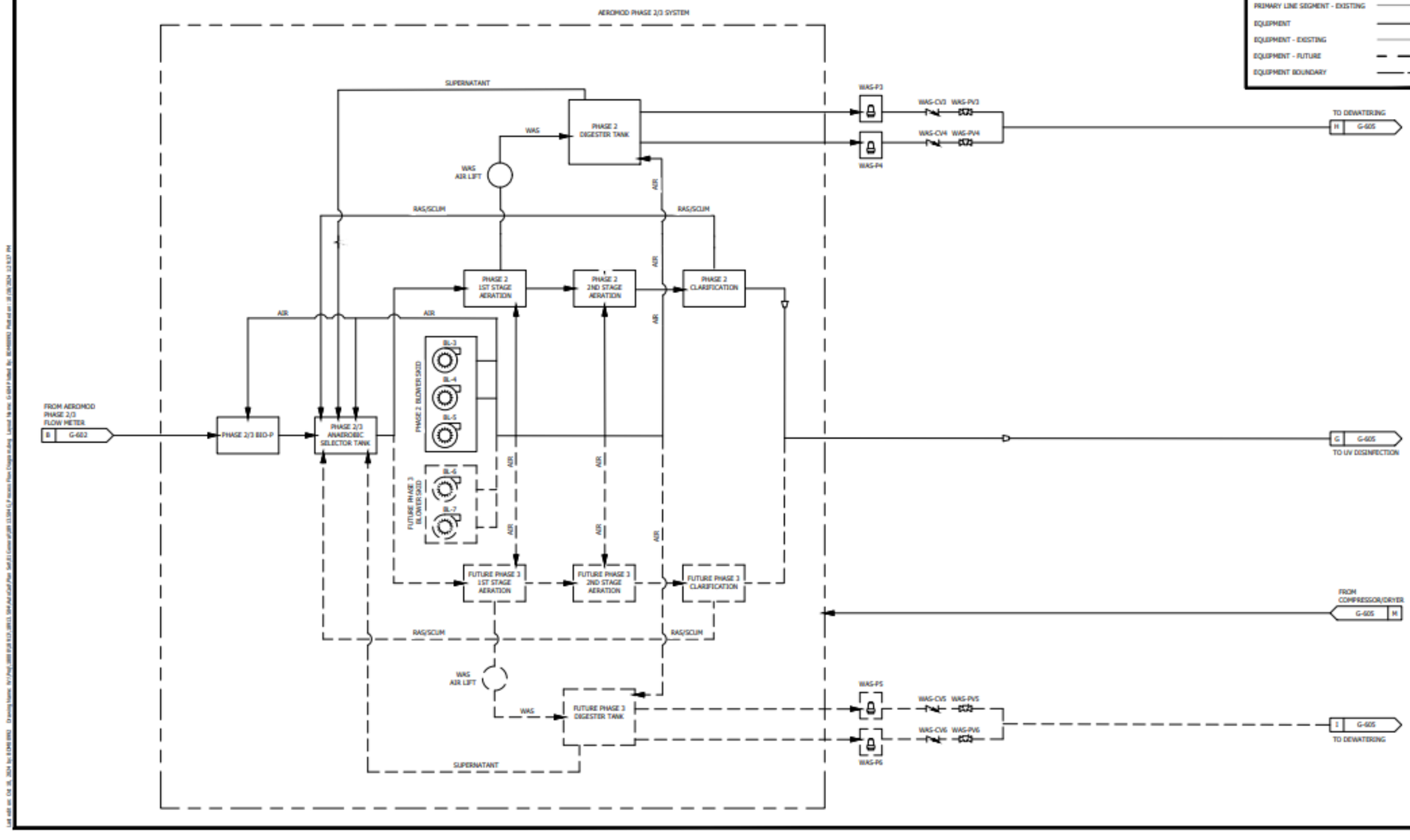

PROCESS FLOW DIAGRAM

ASHLAND WASTEWATER TREATMENT EXPANSION
CITY OF ASHLAND, BOONE COUNTY, MISSOURI

STATE OF MISSOURI
KYLE J. LANDWEER
NUMBER PE-2023800089
PROFESSIONAL ENGINEER
01/17/2025

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DESIGN PROJ:	1891.3.504
DATE:	OCTOBER 2024
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Missouri Department of Natural Resources
Water Protection Program
Water Pollution Control Branch
Engineering Section

Water Quality and Antidegradation Review

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

Tributary to Foster Creek
By

Ashland WWTF
Currently permitted as Ashland Lagoon

February, 2023

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1. PERMIT LIMITS AND MONITORING INFORMATION

Proposed Monitoring Parameters and Effluent Limits

PARAMETER	Unit	Basis for Limits	Daily Maximum	Weekly Average	Monthly Average	Previous Permit Limit	Sampling Frequency	Sample Type ****
Flow	MGD	1	*		*	*/*	1/weekday	T
BOD_5	mg/L	12		15	10	30/20	1/month	C
TSS	mg/L	12		15	10	30/20	1/month	C
*Escherichia coli***	#/100mL	1,3		1,030	206	1030/206	1/week	G
Ammonia as N								
(January)			1.8		0.9	7.5/2.1	1/month	C
(February)			1.8		0.9	7.5/2.1	1/month	C
(March)			1.8		0.9	7.5/2.1	1/month	C
(April)			1.0		0.5	3.6/1.0	1/month	C
(May)			1.0		0.5	3.6/1.0	1/month	C
(June)	mg/L	12	1.0		0.5	3.6/1.0	1/month	C
(July)			1.0		0.5	3.6/1.0	1/month	C
(August)			1.0		0.5	3.6/1.0	1/month	C
(September)			1.0		0.5	3.6/1.0	1/month	C
(October)			1.8		0.9	7.5/2.1	1/month	C
(November)			1.8		0.9	7.5/2.1	1/month	C
(December)			1.8		0.9	7.5/2.1	1/month	C
Oil & Grease	mg/L	1, 3	15		10	15/10	1/month	G
Chloride	mg/L	3	*		*	***	1/month	C
Total Phosphorus	mg/L	12	*		1.0	*/*	1/month	C
Total Nitrogen (summer)	mg/L	12	*		15.9	*/*	1/month	C
Total Nitrogen (winter)	mg/L	12	*		16.3	*/*	1/month	C
Total Kjeldahl Nitrogen	mg/L	1	*		*	*/*	1/month	C
Nitrite + Nitrate	mg/L	1	*		*	*/*	1/month	C

PARAMETER	Unit	Basis for Limits	Minimum		Maximum	Previous Permit Limit	Sampling Frequency	Sample Type
pH	SU	1	6.5		9.0	6.5-9.0	1/month	G

PARAMETER	Unit	Basis for Limits	Daily Minimum		Monthly Avg. Min	Previous Permit Limit	Sampling Frequency	Sample Type
Dissolved Oxygen (DO)	mg/L	12	*		7.0	*/*	1/month	G
BOD_5 Percent Removal	%	1			85	85	1/month	M
TSS Percent Removal	%	1			85	85	1/month	M

* - Monitoring requirement only

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

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

**** C = 24-hour composite
G = Grab
T = 24 hr. Total
E = 24 hr. estimate
M = Measured/calculated

Basis for Limitations Codes:

1. State or Federal Regulation/Law
2. Water Quality Standard (includes RPA)
3. Water Quality Based Effluent Limits
4. Antidegradation Review
5. Antidegradation Policy
6. Water Quality Model
7. Best Professional Judgment
8. TMDL or Permit in lieu of TMDL
9. WET Test Policy
10. Multiple Discharger Variance
11. Nutrient Criteria Implementation Plan
12. Water Quality Model Limits

INFLUENT MONITORING PERMITTED FEATURE:

PARAMETER	Unit	Basis for Limits	Daily Maximum	Weekly Average	Monthly Average	Previous Permit Limit	Sampling Frequency	Reporting Frequency	Sample Type **
BOD_5	mg/L	1			*	*	1/month	monthly	C
TSS	mg/L	1			*	*	1/month	monthly	C
Ammonia as N	mg/L	1	*		*	*/*	1/month	monthly	C
Total Phosphorus	mg/L	1	*		*	*/*	1/month	monthly	C
Total Kjeldahl Nitrogen	mg/L	1	*		*	*/*	1/month	monthly	C
Nitrite + Nitrate	mg/L	1	*		*	*/*	1/month	monthly	C

* - Monitoring requirement only. ** - C = Composite

Basis for Limitations Codes:
1. State or Federal Regulation/Law

2. PURPOSE OF ANTIDEGRADATION REVIEW REPORT

The existing facility has a design flow of 600,000 gpd and consists of an extended aeration Aero-Mod SEQUOX activated sludge process with ultraviolet disinfection, aerobic sludge digestion, and sludge dewatering. The existing system is labeled as Phase 1 of numerous wastewater system expansion phases.

This Water Quality and Antidegradation Review (WQAR) will evaluate the expansion from the current Phase 1 facility (Design Flow of 0.6 MGD), to the Phase 2 expansion (Design Flow of 1.6 MGD). Future expansions will be evaluated on future Antidegradation Reviews when they occur. The preferred alternative is identified as an Extended Aeration Aero-Mod SEQUOX activated sludge process with ultraviolet disinfection, aerobic sludge digestion, and sludge dewatering.

Bartlett & West, Inc. prepared the Wastewater System Improvements Antidegradation Report for the City of Ashland, Missouri sealed on October 5, 2022.

Tier 1 water quality model effluent limits were developed for the facility in order to address the impaired segment of Foster Branch Tributary. An alternatives analysis was presented by the applicant to support a Tier 2 review in accordance with the Antidegradation Implementation Procedure (AIP). Preferred alternative effluent limits were not considered since all pollutants of concern were either Tier 1 or Tier 2 pollutants included as operating permit limits.

3. FACILITY INFORMATION

Facility Name:	Ashland WWTF, currently permitted as Ashland Lagoon
Address:	0.18 mi S of 408 East Liberty Lane, Ashland, MO 65010
Permit #:	MO-0106844
County:	Boone
Facility Type:	POTW
Owner:	City of Ashland
Continuing Authority:	Same as Owner
UTM Coordinates:	X = 564694 ; Y = 4290768

Legal Description:	Sec. 15, T46N, R12W
Ecological Drainage Unit:	Ozark/Moreau/Loutre

4. FACILITY HISTORY

The existing facility has a design flow of 600,000 gpd and consists of an extended aeration Aero-Mod SEQUOX activated sludge process with ultraviolet disinfection, aerobic sludge digestion, and sludge dewatering. The existing system is labeled as Phase 1 of numerous wastewater system expansion phases.

A. FACILITY PERFORMANCE HISTORY:

A review of the past 5 years of Discharge Monitoring Report data show exceedances in the following parameters: BOD_5 (11/30/21, 9/30/21, 7/31/21, 6/30/21, 8/31/19, 7/31/19, 11/30/18, 8/31/18, 6/30/18, 5/31/18, 2/28/18, 1/31/18, 12/31/17), BOD_5 % Removal (11/30/21, 5/31/21, 8/31/19, 7/31/19, 11/30/18, 8/31/18, 6/30/18, 5/31/18, 3/31/18), TSS (1/31/22, 7/31/21, 5/31/21), TSS % Removal (3/31/18, 2/28/18, 5/31/21), *E. coli* (7/31/21, 6/30/21, 5/31/21, 4/30/21), ammonia (6/30/21, 5/31/21, 11/30/19, 8/31/19), pH (10/31/21, 8/31/21).

It should also be noted that monthly average minimum dissolved oxygen was measured below the water quality standard of 5 mg/L on 3/31/18, 5/31/18, 6/30/18, 7/31/18, 8/31/18, 9/30/18, 10/31/18, 11/30/18, 12/31/18, 1/31/19, 2/28/19, 3/31/19, 4/30/19, 5/31/19, 6/30/19, 7/31/19, 8/31/19, 9/30/19, 10/31/19, 11/30/19, 12/31/19, and 4/30/21.

B. RECEIVING WATERBODY INFORMATION

OUTFALL(S) TABLE:

OUTFALL	DESIGN FLOW (CFS)	TREATMENT LEVEL	EFFLUENT TYPE
001	2.48	Secondary	Domestic

RECEIVING STREAM(S) TABLE:

WATER-BODY NAME	CLASS	WBID	DESIGNATED USES*	12-DIGIT HUC	DISTANCE TO CLASSIFIED SEGMENT (MI)
Foster Branch tributary, 303(d) List	C	3943	AQL, WBC-B, SCR, HHP, IRR, LWW	10300102-1004	0.0
Foster Branch	C	3942	AQL, WBC-B, SCR, HHP, IRR, LWW	10300102-1004	1.4

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

RECEIVING STREAM(S) LOW-FLOW VALUES:

RECEIVING STREAM	LOW-FLOW VALUES (CFS)		
	1Q10	7Q10	30Q10
Foster Branch tributary, 303(d) List	0.0	0.0	0.0

Receiving Water Body Segment Outfall #1:		
Upper end segment* UTM coordinates:	X = 564694 ; Y = 4290768	outfall
Lower end segment* UTM coordinates:	X = 565889; Y = 4289034	downstream confluence

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

A Geohydrologic Evaluation was not submitted with the request and the receiving stream is gaining for discharge purposes.

C. EXISTING WATER QUALITY

The applicant submitted a Tier 2 Antidegradation Review request. No existing water quality data was submitted.

D. MIXING CONSIDERATIONS

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

5. RECEIVING WATER MONITORING REQUIREMENTS

No receiving water monitoring requirements recommended at this time.

6. ANTIDEGRADATION REVIEW INFORMATION

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

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

The following is a review of the *Antidegradation Report* dated October, 2022.

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

Tier 1 protection is applied to a waterbody on a pollutant by pollutant basis for pollutants may cause or contribute to the impairment of a beneficial use or violation of Water Quality Criteria (WQC); and prohibit further degradation of Existing Water Quality (EWQ) where additional pollutants of concern (POCs) would result in the water being included on the 303(d) List.

Tier 2 level protection is assigned to the waterbody on a pollutant by pollutant basis that prohibits the degradation of water quality of a surface water unless a review of reasonable alternatives and social and economic considerations justifies the degradation in accordance with the methods presented in the AIP.

Tier 3 protection prohibits any degradation of water quality of Outstanding National Resource Waters and Outstanding State Resource Waters as identified in Tables D and E of the Water Quality Standards

(WQS). Temporary degradation of water receiving Tier 3 protection may be allowed by the Department on a case-by-case basis as explained in Section VI of the AIP.

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

Pollutants of Concern and Tier Determination

Pollutants of Concern	Tier	Degradation	Comment
Biological Oxygen Demand (BOD_5)/DO	1	Significant	Water Quality Model Limits
Total Suspended Solids (TSS)	1	Significant	Water Quality Model Limits
Ammonia as N	1	Significant	Water Quality Model Limits
Escherichia coli (E. coli)	2*	Significant	Permit Limits Applied
Phosphorus, Total	1	Significant	Water Quality Model Limits
Nitrogen, Total	1	Significant	Water Quality Model Limits
pH	***	Significant	Permit Limits Applied
Oil and 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.

Tier 1 Review
The receiving stream, Foster Branch tributary, is the on the 2020 and 2022 303(d) list for dissolved oxygen with no TMDL developed. The facility does discharge to a TMDL watershed for the Missouri River with a TMDL for Chlordane & PCBs.

According to the AIP, the waters may receive the POCs that are causing impairments if 1) the discharge would not cause or contribute to a violation of the WQS, 2) all other conditions of the state permitting requirements are met (i.e., no discharge options are explored and technology based requirements (including ELGs) are met); and 3) the permit is issued with the highest statutory and regulatory requirements.

B. NECESSITY OF DEGRADATION
The AIP specifies that if the proposed activity does result in significant degradation then a demonstration of necessity (i.e., alternatives analysis) and a determination of social and economic importance are required. Part of that analysis as shown below is the evaluation of non-degrading alternatives, such as regionalization or no discharge systems.

The applicant has the option of assuming discharge will be significant and proceeding directly to the alternatives analysis, thereby avoiding the determination of the assimilative capacity of the receiving water. The applicant has elected this option.

i. Regionalization
The wastewater treatment facility in Ashland is already the regional treatment facility for this area. No other treatment facilities exist in the immediate vicinity with adequate capacity. The proposed expansion will accommodate the population growth of the region.

ii. No Discharge Evaluation
A Land Application alternative was presented as impracticable. A storage basin would be needed since land application would not be feasible year round. For an application rate of 24 in/year, about 500 acres of land would be required which would cost about $2.5 million. Upgrades to increase the

level of treatment at the existing facility would be far less costly than decommissioning the existing facility and constructing a new land application system based on the construction costs of the land application system.

iii. Alternatives to No discharge

Alternative 1: Do Nothing

Alternative 1 was presented as a Do Nothing alternative. This alternative is not ideal since the facility will need to increase capacity and treatment capability for growing populations and more stringent effluent limits to address the 303(d) listing of the receiving water. The do nothing approach would likely lead to future treatment deficiencies as flows increase due to new residential and commercial developments.

Alternative 2: Extended Aeration Aero-Mod SEQUOX – Base Case

Alternative 2 is presented as the base case and preferred alternative of an Aero-Mod SEQUOX system with ultraviolet disinfection, aerobic sludge digestion, and sludge dewatering. The system also includes an equalization basin, a belt press for sludge dewatering, ultraviolet disinfection, and a reaeration chamber prior to discharge. This alternative would consist of an expansion of the existing Aero-Mod SEQUOX activated sludge treatment process to expand the system to a total average daily flow capacity of 1.6 MGD and would facilitate improved treatment for BOD_5, TSS, ammonia, and total phosphorus. In order to treat for total phosphorus, the existing SEQUOX basin would also need to be retrofitted with a fermentation tank and chemical feed system to facilitate phosphorus removal. The total expected construction cost for the proposed expansion including contingencies and the cost of all equipment and structures is $6,100,002. The total present worth cost associated with this alternative is $9,432,448.

Alternative 3: Membrane Bio Reactor

Alternative 3 is a Membrane Bio Reactor system with aeration and mixing providing suspended growth to serve as primary treatment with solids removal via filtration to serve as final polishing prior to discharge. An Ovivo ecoBLOX SiC MBR system was evaluated for Ashland's expansion. The total present worth cost for the MBR alternative including equipment, construction, and all non-construction costs is $22,668,250. This alternative is practicable and not preferred due to the total present worth cost 140% above the base case alternative.

Alternative 4: Extended Aeration Aero-Mod SEQUOX with Disk Filters

Alternative 4 is an Aero-Mod SEQUOX system as described in Alternative 2 but adds ferric chloride feed and disk filtration between the Aero-Mod and UV-disinfection basins. Disk filtration and ferric feed system would be housed in a new structure and provide additional removal of BOD, TSS, and phosphorus. The total present worth cost associated with this alternative is $11,452,596. This alternative is considered practicable and not preferred due to the total present worth costs 21% above the base case alternative.

iv. Preferred Alternative

Alternative 2, Aero-Mod SEQUOX system was selected as the preferred alternative due to the treatment capability and cost-effectiveness.

Alternatives Analysis Comparison

Pollutant	Alternative 2 (Base Case) Extended Aeration Aero-Mod SEQUOX	Alternative 3 Membrane Bio Reactor	Alternative 4 Extended Aeration Aero-Mod SEQUOX with Disk Filters
BOD_5	≤ 10 mg/l	≤ 0.9 mg/l	≤ 5 mg/l
TSS	≤ 10 mg/l	≤ 0.2 mg/l	≤ 5 mg/l
Ammonia as N	≤ 0.5 mg/l	≤ 0.5 mg/l	≤ 0.5 mg/l
Phosphorus, Total	≤ 1.0 mg/l	≤ 0.4 mg/l	≤ 0.5 mg/l
Nitrogen, Total	8.0	9.6	8.0
Total Present Worth	$9,432,448	$22,668,250	$11,452,596
Ratio	100%	240%	121%

C. LOSING STREAM ALTERNATIVE DISCHARGE LOCATION

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

A losing stream alternative discharge location was not presented since the receiving stream is gaining for discharge purposes.

D. SOCIAL AND ECONOMIC IMPORTANCE

The affected community is identified as the City of Ashland as well as the citizens in the surrounding communities. The proposed expansion will allow the facility to meet proposed effluent limitations on a consistent basis. The expansion project will improve the reliability of the treatment system and improve the health and safety of the public. The design flow increase will increase the service population and treatment capacity which in turn will enable commercial growth and expansion of the City of Ashland. This commercial growth will increase the tax base, enable additional residential developments, add jobs, and facilitate economic growth. The facility serves the environmental and economic interests of both the State of Missouri and the local communities.

E. NATURAL HERITAGE REVIEW

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

- Manage construction to minimize sedimentation and run-off to nearby streams.
- At stream and drainage crossings, avoid erosion, silt introduction, petroleum or chemical pollution, and disruption or realignment of stream banks and beds.
- If any trees need to be removed for the project, contact the U.S. Fish and Wildlife Service for coordination under the Endangered Species Act.

7. DERIVATION AND DISCUSSION OF PARAMETERS AND LIMITS

Wasteload allocations and limits were calculated using two methods:

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

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

Where C = downstream concentration
C_s = upstream concentration
Q_s = upstream flow

C_e = effluent concentration
Q_e = effluent flow

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

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

B. **Alternative Analysis-based –** Using the preferred alternative's treatment capacity for conventional pollutants such as 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).

Note: Significantly-degrading effluent limits have been based on the authority included in Section I.A. of the AIP. Also under 40 CFR 133.105, permitting authorities shall require more stringent limitations than equivalent to secondary treatment limitations for 1) existing facilities if the permitting authority determines that the 30-day average and 7-day average 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.

C. **Water Quality Model -based –** 303(d) listed waters are considered Tier 1 for the POCs attributed to use impairment. Prior to allowing any new or expanded discharges of the POC, the department must conduct a Tier 1 review and demonstrate that the discharge would not violate the water quality criteria for the POC. Tier 1 protection prohibits degradation that may cause or contribute to the impairment of a beneficial use or violation of water quality criteria and prohibits further degradation of existing water quality where additional pollutants of concern would result in the water being included on the 303(d) list. Using water quality model results, effluent limits and waste load allocations are developed to protect designated uses. These limits would be included in an Antidegradation review as Total Maximum Daily Load Limits or Water Quality Model Limits.

Outfall #001 – Main Facility Outfall

- **Flow.** Though not limited itself, the volume of effluent discharged from each outfall is needed to assure compliance with permitted effluent limitations [40 CFR Part 122.44(i)(1)(ii)]. If the permittee is unable to obtain effluent flow, then it is the responsibility of the permittee to inform the department, which may require the submittal of an operating permit modification. Influent monitoring has been and will be required for this facility in its Missouri State Operating Permit.

- **Biochemical Oxygen Demand (BOD_5).** Effluent limits of 10 mg/L average monthly and 15 mg/L average weekly maximum were established as Water Quality Modeling Limits. These limits are at least as stringent as the minimum effluent regulations established in 10 CSR 20-7.015(8)(A)1.

- **Dissolved Oxygen.** Antidegradation Review establishes Water Quality Model Limits of 7 mg/L as a monthly average minimum and daily minimum monitoring. Due to the DO impairment downstream of Ashland WWTF, the TMDL and Modeling Unit completed QUAL2K modeling for Foster Branch tributary in the vicinity of Ashland WWTF.

  Staff considers the BOD_5 effluent limitations of 15 mg/L as the average weekly and 10 mg/L as the monthly average protective of aquatic life.

- **Total Suspended Solids (TSS).** Effluent limits of 10 mg/L average monthly and 15 mg/L weekly average were established as Water Quality Monitoring Effluent Limits. These limits are at least as stringent as the minimum effluent regulations established in 10 CSR 20-7.015(8)(A)1.

- ***Escherichia coli (E. coli)***. Monthly Average of 206 per 100 mL as a geometric mean and Weekly Average of 1,030 per 100 mL as a geometric mean during the recreational season (April 1 – October 31), for discharges within two miles upstream of segments or lakes with Whole Body Contact Recreation (B) designated use of the receiving stream, as per 10 CSR 20-7.015(9)(B). An effluent limit for both monthly average and weekly average is required by 40 CFR 122.45(d). The Geometric Mean is calculated by multiplying all of the data points and then taking the nth root of this product, where n = # of samples collected. For example: Five *E. coli* samples were collected with results of 1, 4, 6, 10, and 5 (#/100mL). Geometric Mean = 5th root of (1)(4)(6)(10)(5) = 5th root of 1,200 = 4.1 #/100mL.

- **Total Ammonia Nitrogen.** Total Ammonia Nitrogen (TAN) effluent limits for the expanded facility are presented below. The selected limits will be implemented as Water Quality Model Limits.

TAN Water Quality Model Effluent Limits for the Expanded Ashland WWTF at the Design Flow of 1.6 MGD

Month	Daily Maximum Limit mg/L	Monthly Average Limit mg/L	Basis of Effluent Limit
January	1.8	0.9	WQML
February	1.8	0.9	WQML
March	1.8	0.9	WQML
April	1.0	0.5	WQML
May	1.0	0.5	WQML
June	1.0	0.5	WQML
July	1.0	0.5	WQML
August	1.0	0.5	WQML
September	1.0	0.5	WQML
October	1.8	0.9	WQML
November	1.8	0.9	WQML
December	1.8	0.9	WQML

WQML – Water Quality Model Limits

Comparison of Total Ammonia as Nitrogen Water Quality Based Effluent Limits and Water Quality Model Limits for the Expanded WWTF at a Design Flow of 1.6 MGD

Month	MDNR WQBEL		MDNR WQML	
	MDL mg/L	AML mg/L	MDL mg/L	AML mg/L
January	12.1	3.1	1.8	0.9
February	10.1	2.7	1.8	0.9
March	10.1	2.7	1.8	0.9
April	10.1	2.3	1.0	0.5
May	12.1	1.9	1.0	0.5
June	12.1	1.5	1.0	0.5
July	10.1	1.1	1.0	0.5
August	12.1	1.3	1.0	0.5
September	12.1	1.7	1.0	0.5
October	12.1	2.6	1.8	0.9
November	12.1	3.1	1.8	0.9
December	10.1	2.7	1.8	0.9

Total Ammonia as Nitrogen – Water Quality Based Effluent Limits
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

Month	Temp (°C)*	pH (SU)*	Total Ammonia Nitrogen CCC (mg N/L)	Total Ammonia Nitrogen CMC (mg N/L)
January	2.8	7.8	3.1	12.1
February	4.0	7.9	2.7	10.1
March	10.6	7.9	2.7	10.1
April	17.0	7.9	2.3	10.1
May	22.0	7.8	1.9	12.1
June	26.0	7.8	1.5	12.1
July	28.9	7.9	1.1	10.1
August	28.0	7.8	1.3	12.1
September	24.1	7.8	1.7	12.1
October	17.5	7.8	2.6	12.1
November	11.6	7.8	3.1	12.1
December	4.9	7.9	2.7	10.1

* Ecoregion Data (Central Irregular Plains)

WBQEL equation

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

January AML = 3.1 mg/L MDL = 12.1 mg/L	**February** AML = 2.7 mg/L MDL = 10.1 mg/L	**March** AML = 2.7 mg/L MDL = 10.1 mg/L
April AML = 2.3 mg/L MDL = 10.1 mg/L	**May** AML = 1.9 mg/L MDL = 12.1 mg/L	**June** AML = 1.5 mg/L MDL = 12.1 mg/L
July AML = 1.1 mg/L MDL = 10.1 mg/L	**August** AML = 1.3 mg/L MDL = 12.1 mg/L	**September** AML = 1.7 mg/L MDL = 12.1 mg/L
October AML = 2.6 mg/L MDL = 12.1 mg/L	**November** AML = 3.1 mg/L MDL = 12.1 mg/L	**December** AML = 2.7 mg/L MDL = 10.1 mg/L

- **Oil & Grease.** Conventional pollutant, effluent limitation for protection of aquatic life; 10 mg/L monthly average, 15 mg/L daily maximum. According to 10 CSR 20-7.031(4)(B), waters shall be free from oil, scum, and floating debris in sufficient amounts to be unsightly or prevent full maintenance of designated uses.

- **Chloride.** Monthly monitoring is included in order to determine reasonable potential to exceed water quality criteria.

- **Total Kjeldahl Nitrogen, & Nitrate + Nitrite.** Effluent monitoring for Total Kjeldahl Nitrogen, and Nitrate + Nitrite are required per 10 CSR 20-7.015(9)(D)8. Quarterly monitoring required for facilities with design capacities greater than 100,000 gpd and less than 1,000,000 gpd for a period up to five years. Monthly monitoring required for facilities with design capacities greater than 1,000,000 gpd for a period up to five years.

- **pH**. 6.5-9.0 SU. pH limitations of 6.0-9.0 SU [10 CSR 20-7.015] are not protective of the in-stream Water Quality Standard, which states that water contaminants shall not cause pH to be outside the range of 6.5-9.0 SU.

- **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) 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 TSS.

- **Total Phosphorus.** Monthly Average effluent limits of 1.0 mg/L and daily maximum monitoring will be implemented as Water Quality Model Limits. The December 29, 2022 Memorandum Ashland Wastewater Treatment Facility QUAL2K Model Results for Antidegradation Review, describing the Recommended Effluent Limits for the Proposed 1.6 Million Gallons per Day Ashland Wastewater Treatment Facility has determined that the Ashland WWTF has reasonable potential to cause or contribute to the dissolved oxygen impairment of Foster Branch Tributary. Modeling results indicate that limiting Total Phosphorus discharges from Ashland to no greater than a monthly average of 1.0 mg/L Total Phosphorus will promote the attainment of water quality in Foster Branch tributary and Fowler Creek.

  A proposed rule amendment is being developed for Missouri's Nutrient Loss Reduction Strategy, Nutrient Trading Program, and Total Phosphorus Implementation Guidance. Facilities subject to the proposed 10 CSR 7.015(9)(B)2. will choose one of the following options for compliance with Total Phosphorus Implementation regulations.
  1. Concentration-based: 1.0 mg/L as a 12 month annual average;
  2. Mass-based: 1.0 mg/L at design flow as a 12-month (annual) total;
  3. An overall reduction of TP discharged by 80% based on a one-time calculation of two years of representative monitoring for process influent and effluent data; or
  4. An overall reduction of annual load of TP discharged by 80% based on a one-time calculation of adequately representative data.

  Since this Antidegradation Review lists Total Phosphorus as a Tier 1 pollutant, the Water Quality Model Limits would supersede the proposed total phosphorus rule. The applicant and operating permit writer should coordinate the preferred path forward depending on the modifications to the rule amendment. For more information, refer to the established website for the Total Phosphorus Rule Amendment at https://dnr.mo.gov/water/what-were-doing/water-planning/nutrient-loss-reduction-strategy.

8. GENERAL ASSUMPTIONS OF THE WATER QUALITY AND ANTIDEGRADATION REVIEW

A. A Water Quality and Antidegradation Review (WQAR) assumes that [10 CSR 20-6.010(2) Continuing Authorities and 10 CSR 20-6.010(4)(A)5.B., consideration for no discharge] has been or will be addressed in a Missouri State Operating Permit or Construction Permit Application.
B. A WQAR does not indicate approval or disapproval of alternative analysis as per [10 CSR 20-7.015(4) Losing Streams], and/or any section of the effluent regulations.
C. Changes to Federal and State Regulations (FSR) made after the drafting of this WQAR may alter Water Quality Based Effluent Limits (WQBEL).
D. Effluent limitations derived from FSR may be WQBEL or Effluent Limit Guidelines (ELG).
E. WQBEL supersede ELG only when they are more stringent. Mass limits derived from technology based limits are still appropriate.
F. A WQAR does not allow discharges to waters of the State, and shall not be construed as a National Pollution Discharge Elimination System (NPDES) or Missouri State Operating Permit to discharge or a permit to construct, modify, or upgrade.
G. Limitations and other requirements in a WQAR may change as Water Quality Standards (WQS), Methodology, and Implementation procedures change.
H. Nothing in this WQAR removes any obligations to comply with county or other local ordinances or restrictions.
I. The operating permit may contain additional requirements to evaluate the effectiveness of the technology once the facility is in operation. This Antidegradation Review is based on the information provided by the facility and is not a comprehensive review of the proposed treatment technology. If the review engineer determines the proposed technology will not consistently meet proposed effluent limits, the permittee will be required to revise their Antidegradation Report.

9. ANTIDEGRADATION REVIEW PRELIMINARY DETERMINATION

The proposed expanded facility discharge will result in significant degradation of Foster branch tributary. The Extended Aeration Aero-Mod SEQUOX was determined to be the Base Case Alternative (lowest cost alternative that meets technology and water quality based effluent limitations). The Preferred Alternative of Extended Aeration Aero-Mod SEQUOX was selected due to the cost effectiveness and treatment capability. The other technologies evaluated, Extended Aeration Aero-Mod SEQUOX with Disk Filters or the Membrane Bioreactor, were not considered cost effective and were not selected.

It has also been determined that the other treatment options presented (Extended Aeration Aero-Mod SEQUOX and Membrane Bio-reactor) 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: Steve Hamm, P.E.
Date: February 2023
Unit Chief: Jill Wade, P.E.

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

Ashland WWTP, Permit Renewal/Upgrade
City of Ashland
Missouri State Operating Permit #MO-0106844

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

New Permit Requirements
The permit requires compliance with new effluent limitations for Biochemical Oxygen Demand$_5$ (BOD_5), Total Suspended Solids (TSS), Ammonia, Total Phosphorus, Total Nitrogen, and Dissolved Oxygen (DO), which requires the design, construction, and operation of a different treatment technology. The cost assumptions in this analysis anticipate and upgrade to the existing treatment facility. For this analysis, the facility has selected the mechanical treatment technology that is the most practical solution to meet the new requirements for their community.

The permit also requires compliance with new effluent monitoring requirements for Total Flow, Total Nitrogen, Acute WET test, and Chronic WET test, and an increase in effluent sampling frequencies for Flow, BOD_5, TSS, Ammonia, DO, Total Kjeldahl Nitrogen, Nitrate + Nitrite, Total Nitrogen, and Total Phosphorus.

The permit also requires compliance with an increase in influent sampling frequencies for Ammonia, Total Kjeldahl Nitrogen, Nitrate + Nitrite, and Total Phosphorus.

Flow and Connections
The size of the facility evaluated for upgrades was chosen based on the revised design flow provided by the facility. The number of connections was reported by the permittee on the Financial Questionnaire.

Flow Evaluated: 1.6 million gallons per day	
Connection Type	**Number**
Residential	1,972
Commercial	134
Industrial	0
Total	**2,106**

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. If certain data was not provided by the permittee to the department and the data is not obtainable through readily available sources, this analysis will state that the information is "unknown".

The cost for upgrades to the existing treatment plant were provided by the permittee.

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 Ashland	
Current Monthly User Rates per 5,000 gallons*	$56.50
Municipal Bond Rating (if applicable)	unknown
Bonding Capacity**	$21,647,198
Median Household Income (MHI) [1]	$93,301
Current Annual Operating Costs (excludes depreciation)	$1,684,066
Current Outstanding Debt for the Facility	$5,556,300
Amount within the Current User Rate Used toward Payments on Outstanding Debt Related to the Current Wastewater Infrastructure	$24.78

* User Rates were reported by the permittee on the Financial Questionnaire.
** General Obligation Bond capacity allowed by constitution: Cities = up to 20% of taxable tangible property.

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

The cost estimates located within this document are for the upgrade to the existing system.

The following table outlines 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 - Influent	Monthly	$26 x 12	$312
Total Kjeldahl Nitrogen - Influent	Monthly	$35 x 12	$420
Nitrate + Nitrite - Influent	Monthly	$44 x 12	$528
Ammonia - Influent	Monthly	$22 x 12	$264
BOD_5 - Effluent	Weekly β	$44 x 40	$1,760
TSS - Effluent	Weekly β	$17 x 40	$680
Ammonia - Effluent	Weekly β	$22 x 40	$880
Total Phosphorus - Effluent	Monthly £	$26 x 8	$208
Total Kjeldahl Nitrogen - Effluent	Monthly £	$35 x 8	$280
Nitrate + Nitrite - Effluent	Monthly £	$44 x 8	$352
Chloride	Monthly	$22 * 12	$264
Oil & Grease	Monthly £	$43 x 8	$344
Acute WET test	Once per year	$840	$840
Chronic WET test	Once per permit cycle	$2,040 ÷ 5	$408
Total Estimated Annual Cost of New Sampling and Permit Requirements			$7,540

£ - previous permit required quarterly frequency
β – previous permit required monthly frequency

Mechanical Plant Pollution Control Option Cost Estimates:
For the mechanical plant option, the facility has provided estimated costs for the upgraded wastewater treatment plant. Sludge handling and sludge treatment are included in the capital, operations, maintenance, and present worth cost estimations. New sampling costs are also included in the following cost estimations.

Criterion 2B Table. Estimated Costs for Mechanical Plant Pollution Control Option		
(1)	Estimated Total Present Worth	$25,842,500
	Estimated Capital Cost	$22,800,000
	Estimated Annual Cost of Operation and Maintenance	$1,400,000
	Estimated Monthly Cost Per User	$100.00
	Estimated Monthly Cost of New Sampling and Permit Requirements Per User	$0.30
(2)	Current Monthly Debt Retirement Amount Per User	$24.78
(3)	Total Monthly User Cost*	$100.30
	Total Monthly User Cost as a Percent of MHI [2]	1.3%

* Estimated User Rate (after construction) + Estimated Monthly Costs of New Sampling and Permit Requirements (after construction)

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

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

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

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

kidney damage. The effluent limits for nitrogen and phosphorus have been added to the permit to protect the health of the receiving stream's aquatic life. A healthy ecosystem is beneficial as it provides reduced impacts on human and aquatic health as well as recreational opportunities.

Whole Effluent Toxicity (WET) test – Monitoring
The WET Test is a quantifiable method of determining if discharge from a facility may be causing toxicity to aquatic life by itself or in combination with receiving stream water. WET tests are required under 10 CSR 20-6.010(8)(A)4 to be performed by specialists properly trained in conducting the test according to 40 CFR 136. This test will help ensure that the existing permit limits are providing adequate protection for aquatic life.

The WET Test monitoring requirement has been added to the permit to provide data regarding the health of the receiving stream's aquatic life. A healthy ecosystem is beneficial as it provides reduced impacts on human and aquatic health as well as recreational opportunities.

Chlorides Monitoring
The major sources of chloride in surface waters are deicing salt, urban and agricultural runoff, and discharges from municipal wastewater plants, industrial plants, and the drilling of oil and gas wells. Chloride compounds are highly soluble; however, chloride ions do not degrade in the environment and tend to stay in solution once dissolved. High concentrations of chlorides can harm the osmoregulation of aquatic organisms; however, low levels can still negatively impact fish, aquatic bugs, and amphibians.

The monitoring requirements for chloride have been added to the permit to protect the health of the receiving stream's aquatic life. A healthy ecosystem is beneficial as it provides reduced impacts on human and aquatic health as well as recreational opportunities.

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

The community reported that their outstanding debt for their current wastewater collection and treatment systems is $5,556,300. The community reported that each user pays $56.50 monthly, of which, $24.78 is used toward payments on the current outstanding debt.

As shown in Criterion 2, the projected monthly user rate is $100.00 for the mechanical treatment option.

(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.

- A schedule of compliance will be provided based on the results of this cost analysis. The schedule of compliance is provided to ensure that the entity has time to reasonably plan for compliance with the new permit requirements. The time provided ensures the entity has time to hire an engineer, develop facility plans, hold community meetings, seek an appropriate funding source, and construct the facility. If it is determined by the permittee that a longer schedule of compliance is necessary due to financial reasons, please contact the department and request modification of the compliance schedule.
- An integrated plan may be an appropriate option if the community needs to meet other environmental obligations as well as the new requirements within this permit. The integrated plan needs to be well thought out with specific timeframes built into the management plan in which the municipality can reasonably commit. The plan should be designed to allow the municipality to meet Clean Water Act obligations by maximizing infrastructure improvement dollars through the appropriate sequencing of work. For further information on how to develop an integrated plan, please see the department publication, "Missouri Integrated Planning Framework," at https://dnr.mo.gov/document-search/missouri-integrated-planning-framework-pub2684/pub2684.

- If the permittee can demonstrate that the proposed pollution controls result in substantial and widespread economic and social impact, they may use Factor 6 of the Use Attainability Analysis (UAA) 40 CFR 131.10(g)(6) in the form of a variance. This process is completed by determining the treatment type with the highest attainable effluent quality that would not result in a socio-economic hardship. For more information on variance requests, please visit the department's water quality standards webpage at https://dnr.mo.gov/water/what-were-doing/water-planning/quality-standards-impaired-waters-total-maximum-daily-loads/standards/variances.

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

- The permittee may apply for State Revolving Fund (SRF) financial support in order to help fund a capital improvements plan. Other loans and grants also exist for which the facility may be eligible. More information can be found on the department's FAC website at https://dnr.mo.gov/water/business-industry-other-entities/financial-opportunities/financial-assistance-center/wastewater.

The 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, 3-7] for the City of Ashland

No.	Administrative Unit	Ashland City	Missouri State
1	Population (2023)	4,811	6,168,181
2	Percent Change in Population (2000-2023)	157.4%	10.2%
3	2023 Median Household Income (in 2024 Dollars)	$93,301	$70,567
4	Percent Change in Median Household Income (2000-2023)	42.6%	-1.2%
5	Median Age (2023)	37.8	38.9
6	Change in Median Age in Years (2000-2023)	5.1	2.8
7	Unemployment Rate (2023)	1.2%	4.1%
8	Percent of Population Below Poverty Level (2023)	3.0%	12.6%
9	Percent of Household Received Food Stamps (2023)	5.2%	9.9%
10	(Primary) County Where the Community Is Located	Boone County	

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

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

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

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

Criterion 7A Table. Financial Capability Indicator

Indicators	Strong (3 points)	Mid-Range (2 points)	Weak (1 point)	Score
Bond Rating Indicator	Above BBB or Baa	BBB or Baa	Below BBB or Baa	unknown
Overall Net Debt as a % of Full Market Property Value	Below 2%	2% - 5%	Above 5%	1
Unemployment Rate (2023)	Beyond 1% below Missouri average of 4.1%	± 1% of Missouri average of 4.1%	Beyond 1% above Missouri average of 4.1%	3
2023 Median Household Income (in 2024 Dollars)	Beyond 25% above Missouri MHI ($70,567)	± 25% of Missouri MHI ($70,567)	Beyond 25% below Missouri MHI ($70,567)	3
Percent of Population Below Poverty Level (2023)	Beyond 10% below Missouri average of 12.6%	± 10% of Missouri average of 12.6%	Beyond 10% above Missouri average of 12.6%	2
Percent of Household Received Food Stamps (2023)	Beyond 5% below Missouri average of 9.9%	± 5% of Missouri average of 9.9%	Beyond 5% above Missouri average of 9.9%	2
Property Tax Revenues as a % of Full Market Property Value	Below 2%	2% - 4%	Above 4%	3
Property Tax Collection Rate	Above 98%	94% - 98%	Below 94%	2
Total Average Score (Financial Capability Indicator)	--	--	--	2.3

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

- Financial Capability Indicator (from Criterion 7): 2.3
- Mechanical Plant Residential Indicator (from Criterion 2): 1.3

Criterion 7B Table. Financial Capability Matrix

Financial Capability Indicator	Residential Indicator (User Rate as a % of MHI)		
	Low (Below 1%)	Mid-Range (1.0% to 2.0%)	High (Above 2.0%)
Weak (Below 1.5)	Medium Burden	High Burden	High Burden
Mid-Range (1.5 – 2.5)	Low Burden	Medium Burden	High Burden
Strong (Above 2.5)	Low Burden	Medium Burden	High Burden

- Resulting Financial Burden for Mechanical Plant: Medium Burden

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

The City reported that given the City's design flow increase to greater than 1 MGD, new effluent limitations for total phosphorus and nitrogen will be implemented. This project places a significant burden on rate payers. More stringent limits in the future will place even higher burden on rate payers.

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 Ashland has been determined to be a category 5 community. This means that the City of Ashland 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 will require the permittee to upgrade the facility and construct new control technologies and to increase monitoring. The department has considered the eight (8) criteria presented in subsection 644.145 RSMo to evaluate the cost associated with the new permit requirements.

The City of Ashland determined that an upgrade to the existing wastewater treatment plant is the most practical and affordable option for the City. The construction and operation of the upgrade to the existing wastewater treatment plant will ensure that the individuals within the community will not be required to make unreasonable sacrifices in their essential lifestyle or spending patterns or undergo hardships in order to make the projected monthly payments for sewer connections.

Because each community is unique, the department wants to make sure that each community has the opportunity to consider all options and tailor solutions to best meet their needs. The department understands the economic challenges associated with achieving compliance and is committed to using all available tools to make an accurate and practical finding of affordability for Missouri communities. If the community is interested in the funding options available to them, please contact the Financial Assistance Center for more information. https://dnr.mo.gov/water/business-industry-other-entities/financial-opportunities/financial-assistance-center/wastewater.

The City's facility plan that was submitted as a part of the construction permit process includes a discussion of community details, what the community can afford, existing obligations, future growth potential, an evaluation of options available to the community with cost information, and a discussion on no-discharge alternatives. The cost information provided through the facility plan process, which is developed by the community and their engineer, is more comprehensive of the community's individual factors in relation to selected treatment technology and costing information.

References

1. (A) 2023 MHI in 2023 Dollar: United States Census Bureau. 2019-2023 American Community Survey 5-Year Estimates, Table B19013: Median Household Income in the Past 12 Months (in 2023 Inflation-Adjusted Dollars). https://data.census.gov/cedsci/table?q=B19013&tid=ACSDT5Y2023.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) 2024 CPI and 1999 CPI: U.S. Department of Labor Bureau of Labor Statistics (2024) Consumer Price Index - All Urban Consumers, U.S. City Average. All Items. 1982-84=100 (unadjusted) - CUUR0000SAO. https://data.bls.gov/cgi-bin/surveymost?bls.
   (D) 2023 MHI in 2024 Dollar = 2023 MHI in 2023 Dollar x 2024 CPI /2024 CPI; 2000 MHI in 2024 Dollar = 2000 MHI in 1999 Dollar x 2024 CPI /1999 CPI.
   (E) Percent Change in Median Household Income (2000-2023) = (2023 MHI in 2024 Dollar - 2000 MHI in 2024 Dollar) / (2000 MHI in 2024 Dollar).
2. ($100.30/($93,301/12))100% = 1.3% (mechanical + sampling)
3. (A) Total Population in 2023: United States Census Bureau. 2019-2023 American Community Survey 5-Year Estimates, Table B01003: Total Population - Universe: Total Population. https://data.census.gov/cedsci/table?q=B01003&tid=ACSDT5Y2023.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 (2000-2023) = (Total Population in 2023 - Total Population in 2000) / (Total Population in 2000).
4. Median Age in 2023: United States Census Bureau. 2019-2023 American Community Survey 5-Year Estimates, Table B01002: Median Age by Sex - Universe: Total population. https://data.census.gov/cedsci/table?q=B01002&tid=ACSDT5Y2023.B01002.
   (B) For United States, United States Census Bureau (2002) 2000 Census of Population and Housing, Summary Social, Economic, and Housing Characteristics, PHC-1-1 Part 1. United States Summary, Table 1. Age and Sex: 2000, Washington, DC., Page 2. https://www.census.gov/content/dam/Census/library/publications/2003/dec/phc-2-1-pt1.pdf.
   (2) For Missouri State, United States Census Bureau (2002) 2000 Census of Population and Housing, Summary Population and Housing Characteristics, PHC-1-27, Missouri, Table 2. Age and Sex: 2000, Washington, DC., Pages 64-92. https://www2.census.gov/library/publications/2003/dec/phc-2-1-pt2.pdf.
   (C) Change in Median Age in Years (2000-2023) = (Median Age in 2023 - Median Age in 2000).
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