STATE OF MISSOURI

DEPARTMENT OF NATURAL RESOURCES

MISSOURI CLEAN WATER COMMISSION

CONSTRUCTION PERMIT

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

Village of Silex
P.O. Box 191
Silex, MO 63377

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.

March 25, 2025
Effective Date

March 24, 2027
Expiration Date

John Hoke, Director, Water Protection Program

CONSTRUCTION PERMIT

I. CONSTRUCTION DESCRIPTION

Expansion of the existing Silex subsurface drip dispersal system by increasing the working volume of Lagoon Cell 1 and connecting eight additional zones to the drip dispersal system. Construction includes rerouting the lift station influent pipe from Lagoon Cell No. 1 to the existing pipe connecting Lagoon Cell Nos. 1 and 2 (which will lower the low water level of Lagoon Cell No. 1), a new primary filter box with five effluent filters prior to the existing Lift Station No. 7 wet well, two replacement submersible pumps and replacement lift station control panel with SCADA system, four additional disc filters and eight additional automated distribution valves in the filter house, and eight additional drip dispersal zones with a total area of approximately 110,665 ft^2 containing 53,594 lf of 0.5-inch drip dispersal tubing. 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.

Upon completion of construction the Silex wastewater treatment system will be composed of a three-cell lagoon, a primary filter box with five effluent filters, lift station No. 7 which pumps filtered lagoon effluent to the filter house, eight disc filters and 16 distribution valves within the filter house to distribute flows to a sixteen zone subsurface drip distribution field. The drip distribution field has a total area of approximately 194,609 ft^2, dosed at 0.20 gpd/ft^2 with a design application rate of 36,088 gpd. The drip distribution zones are located along Cuivre Street in Silex, MO. Lagoon Cell No. 3 connects to Outfall 001, which is only intended to be used in the event that the lagoon has no additional storage and conditions are unsuitable for subsurface dispersal.

II. COST ANALYSIS FOR COMPLIANCE

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

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

III. CONSTRUCTION PERMIT CONDITIONS

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

1. This construction permit does not authorize discharge.

2. All construction shall be consistent with plans and specifications signed and sealed by Rebecca Howley, P.E. with George Butler Associates 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 Saint Louis 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. The completed project shall be field tested to verify actual pumped volume of each dose. The timer controls shall be set to ensure a dosing rate not to exceed the allowable rate of 0.20 gallons per square foot per day.

7. 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.

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

- Imported Soils. When a facility is importing soils for the subsurface soil dispersal systems, the following shall be specified:
  - Physical characteristics that are uniform in texture, structure, and pore space; 10 CSR 20-8.110(7)(C)1.
  - Transportation methods that ensures uniformity and consistency of the physical characteristics as close as possible to the original state upon delivery; 10 CSR 20-8.110(7)(C)2.
  - A sandy to loamy material, with less than 10 percent clay and less than 15 percent organic debris present; 10 CSR 20-8.110(7)(C)3.
  - Methods for removal of the organic layer; 10 CSR 20-8.110(7)(C)4.
  - No compaction of imported soil; 10 CSR 20-8.110(7)(C)5.
  - Placement in small "lift" increments of four to six inches instead of one thick layer; and 10 CSR 20-8.110(7)(C)6.
  - Native soil is to be used for the vertical separation for the subsurface soil dispersal systems with the fill for the cap being imported soils. 10 CSR 20-8.110(7)(C)7.

- 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)

- 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.

- Subsurface systems shall—
  - Exclude unstabilized fill and soils that have been highly compacted and/or disturbed, such as old road beds, foundations, or similar things; 10 CSR 20-8.200 (7)(A)1.A.
  - Provide adequate surface drainage where slopes are less than two percent;10 CSR 20-8.200(7)(A)1.B.

- Provide surface and subsurface water diversion where necessary, such as a curtain or perimeter drain; 10 CSR 20-8.200(7)(A)1.C. and
- Have a ten foot (10') buffer from the property line. 10 CSR 20-8.200(7)(A)1.D.

- The vertical separation between the bottom of the drip lines and/or the trench and a limiting layer, including but not limited to, bedrock; restrictive horizon; or seasonal high water table, shall be no less than:

  - Twelve inches for systems dispersing secondary or higher quality effluent; 10 CSR 20-8.200(7)(A)2.B.

- Subsurface systems shall be, at a minimum, preceded by preliminary treatment. 10 CSR 20-8.200(7)(B)

- Loading rates shall not exceed the values assigned by the site and soil evaluation. 10 CSR 20-8.200(7)(C)

- The location and size of the drains and buffers must be factored into the total area required for the drip dispersal system. 10 CSR 20-8.200(9)(A)1.

- The drip dispersal lines shall be placed at a minimum depth of six inches below the surface. 10 CSR 20-8.200(9)(B)1.

- Emitters and drip dispersal lines shall be placed at a minimum on a two foot spacing to achieve even distribution of the wastewater and maximum utilization of the soil. 10 CSR 20-8.200(9)(B)2.

9. Upon completion of construction:

   A. The Village of Silex 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 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 December 20, 2024 be issued. No operating permit fee modification required.

IV. REVIEW SUMMARY

1. CONSTRUCTION PURPOSE

Expansion of the existing subsurface dispersal treatment system to increase the total number of dispersal field zones from eight to sixteen and increase design flow of the subsurface dispersal system to 36,088 gpd to mitigate current issues of over application and wastewater surfacing in the existing dispersal field. The facility is primarily no-discharge, soil absorption, but also contains an existing discharge outfall in lagoon Cell No. 3.

2. FACILITY DESCRIPTION

The lagoon system was constructed in the early to mid-1990's with a design average flow of 30,000 gpd and consists of two lagoon ponds with a total of three cells. The northern pond is Cell No. 1 while the southern pond consists of Cells Nos. 2 and 3, split by a baffle curtain. Cell No. 1 is connected to Cell No. 2 through a valved gravity pipe. In 2018, the facility was modified to disperse lagoon effluent through a drip dispersal system to utilize a no-discharge, soil absorption system with a design average flow of 22,696 gpd as the primary method of treatment. Existing Outfall No. 001, which discharges effluent from Cell No. 3, remains intact and if operated is required to meet effluent limits established in table A-3 of Operating Permit MO-0108243.

Existing Lift Station No. 7 influent line will be rerouted from Cell No. 1 to the gravity pipe between Cell Nos. 1 and 2 (which will lower the low water level of Cell No. 1 by two feet), the new influent line for Lift Station No.7 will also include a new filter box with five primary filters, and the duplex submersible pumps will be replaced. The pumps are controlled by float switches which are connected to a SCADA system.

The filtered lagoon effluent is pumped to the Filter House, where it will pass through eight disc filter units before being dispersed through the 16 valve drip dispersal manifold, with a valve and pressure regulator for each dispersal zone, which is automated to dose each dispersal zone once a day at 0.20 gpd per ft^2.

The Silex WWTF is located at 0.15 miles NE of Duncan Mansion Drive terminus, Silex, MO, in Lincoln County, Missouri. The expanded drip dispersal system will have a design average flow of 36,088 gpd and the facility will have a wet weather design flow of 45,108 gpd when incorporating the storage capacity of the lagoon basins for a total hydraulic population equivalent of approximately 449 people. Outfall 001, which discharges effluent from Lagoon Cell No. 3, is only intended to be used in the event that the lagoon has no additional storage and conditions are unsuitable for subsurface dispersal.

3. COMPLIANCE PARAMETERS

The proposed wastewater treatment facilities will be primarily a no-discharge treatment and soil dispersal/absorption system. Lagoon cell No. 3 is connected to Outfall No. 001, which is only intended to be used in the event that the lagoon has no additional storage and conditions are unsuitable for subsurface dispersal. Periodic removal of waste sludge will be necessary. A Missouri State Operating Permit is required to be maintained. Monitoring of the facility will be required along with keeping records of maintenance activities. Sampling is only required in the event of a discharge from Outfall No. 001.

4. REVIEW of MAJOR TREATMENT DESIGN CRITERIA

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

- Three-Cell Lagoon – Lagoon Cell No. 1 and Lagoon Cell No. 2 are connected by an 8-inch pipe
  - Lagoon Cell No. 1 is non-aerated and has a surface area of 1.59 acres and a wastewater volume of 2.4 million gallons. This cell has approximately 2 ft of freeboard, 3 ft of operating depth, 3 ft of sludge depth, and a clay liner. This provides approximately 46 days of retention at the wet weather design flow of 45,108 gpd.

  - Lagoon Cell Nos. 2 and 3 are baffled by a curtain and are non-aerated. Both cells have a total surface area of 0.55 acres and a wastewater volume of 0.66 million gallons. These two cells have approximately 2 ft of freeboard, 5 ft of operating depth, 0 ft of sludge depth, and a clay liner. The combined volume of both cells provides approximately 12 total days of retention at the wet weather design flow of 45,108 gpd.

    - Lagoon Cell No. 3 also connects to Outfall 001, which is only intended to be used in the event that the lagoon has no additional storage and conditions are unsuitable for subsurface dispersal.

- Lift Station No. 7 – pumps lagoon effluent to the Filter House. The existing wet well and float switches will be retained, modifications listed in the construction section below.

- Filter House – houses a filter rack that contains four 2” Netafim LP Disc-Kleen filter units which filter lagoon effluent prior to subsurface dispersal, as well as the drip dispersal manifold valving and pressure regulators for the eight existing drip dispersal zones. The discs are constructed with 100 µm openings. Each disc filter unit connects to a backwash assembly on the filter rack, which washes the filter units prior to each dosing cycle. Backwash water flows into the City’s gravity collection system.

- Eight Drip Dispersal Field Zones – located along Cuivre Street, the existing zones have a total application area of 83,944 ft^2 and a total of 44,186 lf of 0.5 inch drip dispersal tubing with 2 ft emitter spacing. The design loading rate of these zones is to be lowered

from 0.26 gpd/ft² to 0.20 gpd/ft² with the replacement of the pumps in Lift Station No. 7, for a total design load of 16,788 gpd. Dimensions of the existing zones included in the chart below.

Zone Number	1	2	3	4	5	6	7	8
Zone Size (ft²)	15,990	11,466	12,000	10,150	8,488	8,478	10,686	10,686
Length of Drip Tubing (lf)	8,118	5,824	6,000	5,075	4,244	4,239	5,343	5,343

Construction will cover the following items:

- Primary Filter – five Polylok PL-625 filters housed in a new filter box with an inlet connected to the existing pipe between Lagoon Cell No. 1 and Lagoon Cell No. 2. Filtered lagoon effluent then flows by gravity into the wet well of Lift Station No. 7.
- Lift Station No. 7 replacement valve vault, submersible pumps, and controls.
  - Two Keen KHG7-2303 7.5 HP submersible pumps, each capable of operating at 30 gpm against 160 feet of TDH, controlled by float switches. SCADA system to be connected to the lift station controls.
- Expansion of the existing drip system from 8 to a total of 16 drip field zones. Post construction, the drip system control panel in the Filter House will dose 16 zones on a timed dosing cycle at 0.20 gpd/ft^2, providing each zone one dose per day. Approximately once a week (field adjustable), the system field flush valve opens to flush the disposal system of any solids that have built up. Sequential flushing is done for each zone during subsequent pump cycles. The drip field total area will be 194,609 ft^2 and will contain 97,780 lf of drip dispersal tubing. The subsurface drip dispersal system expansion includes:
  - Drip Distributing Valves – eight Geoflow G-SVLVB-150 automatic 2-inch solenoid type valves for zone selection added to the Filter House. All valves will operate on a timed dispersal cycle and dose each zone once per day, activated when Lift Station No. 7 pumps are in operation.
  - Eight Drip Dispersal Field Zones – Geoflow Drip Tubing WFPC16-2-24 Wasteflow PC 0.5 GPH 2' Emitter Spacing tubing with two combo air/vacuum release valves per zone will be installed. The drip field expansion area is 110,665 ft^2 and contains 53,594 lf of 0.5-inch tubing fitted with emitters every 2 ft. Dimensions of each zone listed in the chart below. Supply manifold piping to be installed at least 20-inches below the final grade for freeze protection.

Zone Number	9	10	11	12	13	14	15	16
Zone Size (ft²)	13,635	13,330	15,300	10,050	10,050	12,300	20,000	16,000
Length of Drip Tubing (lf)	5,805	5,805	7,650	5,092	5,092	6,150	10,000	8,000

    - The soils at the proposed dispersal field zones are rated for 0.2 to 0.25 gpd/sf. The facility decided to use a conservative design loading rate of 0.2 gpd/sf for the entire system. Soil morphology review was conducted during the facility

plan review and on site soils were determined to be acceptable for this system with the addition of import soils above the ground surface to ensure sufficient treatment depth above the seasonal high water table. The soil investigation was completed by Evelyn Mann, Certified Soil Scientist with On-Site Soils, Inc. on October 7, 2022.

- Soils Report. In the soils investigation, there were nine pits dug over the proposed site, seven of which are within or in close proximity to the proposed drip dispersal field zones. All seven dispersal field pits had a surface soil that was described as silt loam with an application rate and depth to seasonal high water table as listed in the chart below. Soils will be imported as described in the next section and placed in a mound above grade to achieve the required twelve inches of separation from the drip tubing and the seasonal high water table depth identified at each soil pit and to provide six inches of cover over the drip tubing.

Soil Pit Number	1	3	4	5	6	8	9
Application Rate (gpd/ft^2)	0.25	0.2	0.25	0.25	0.2*	0.25	0.25
Depth to Seasonal High Water Table (in)	9	7	9	0	10	6	0
Located Within or Near Drip Zone(s)	11	9	10	13 & 12	14	15	16

*Pit 6 identified a platy structure in the top 10 inches of soil, which will be tilled to ensure the soils in drip zone 14 can accept a hydraulic loading of 0.2 gpd/ft^2

- Imported Soil - The facility will have to import approximately 4,700 cubic yards of soils from off site, which must be approved by the engineer before placement, and shall be sandy loam, silt loam, loam, or loamy sand containing less than 10 percent clay as described by the USDA.

- Curtain Drain – 16-inch deep curtain drain to be installed minimum 1 ft from toe of field slope for each drip dispersal zone.

5. OPERATING PERMIT

Operating permit MO-0108243 will require a modification to reflect the construction activities. The modified Silex WWTF, MO-0108243, was successfully public noticed from December 20, 2024, to January 21, 2025 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.

Operating permit MO-0108243 will be expiring on December 31, 2027. A renewal application must be filed before July 4, 2027, regardless of the status of these construction activities. If you have questions on completing the renewal application, please contact the NPDES permitting section at 573-522-4502.

This facility does not meet the requirements of the MOGD issued on July 1, 2024, or MOG823 issued on August 25, 2022 for the following reasons: design flow, publicly owned, combined subsurface dispersal and discharging system.

V. NOTICE OF RIGHT TO APPEAL

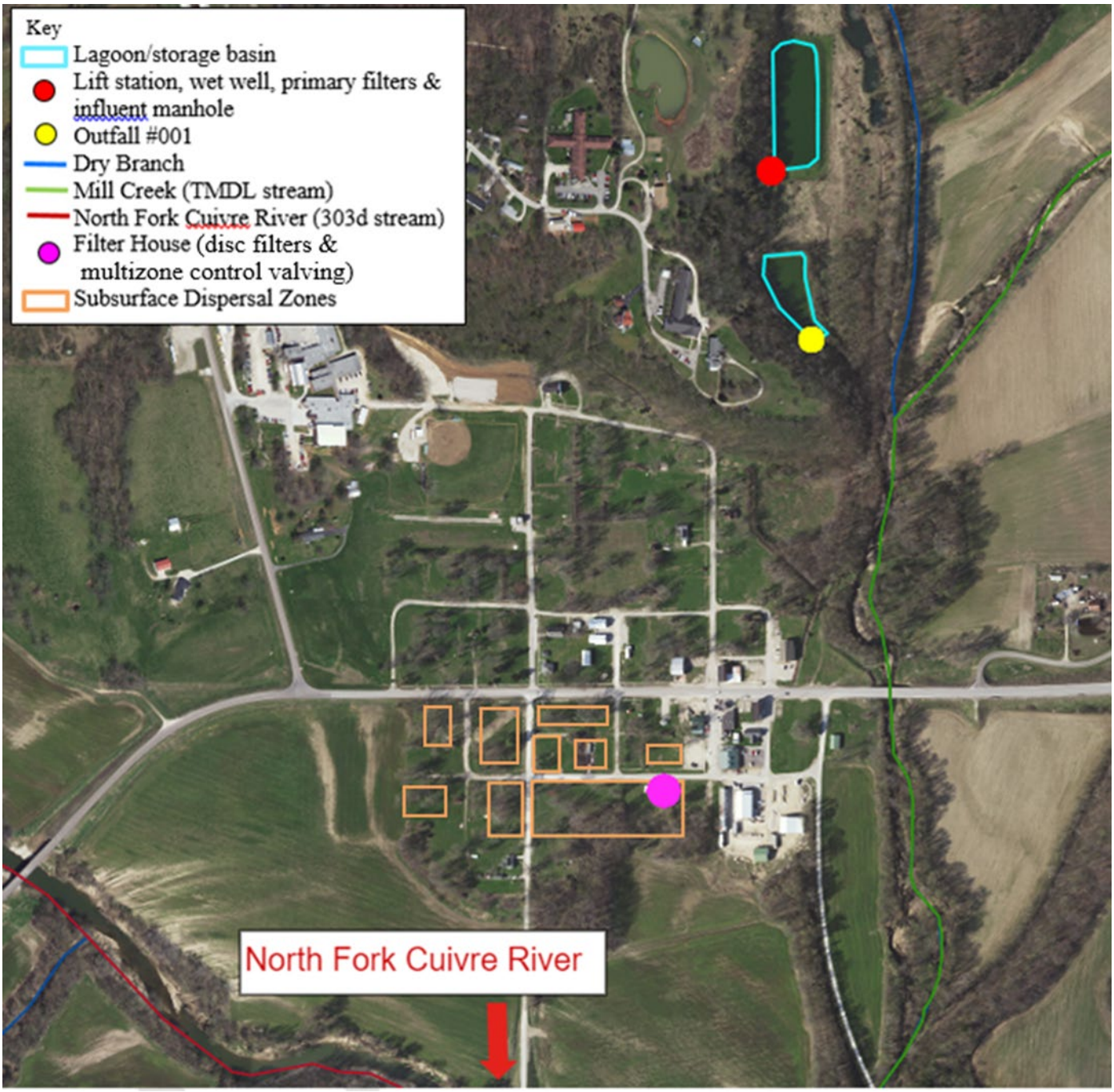
If you were adversely affected by this decision, you may be entitled to an appeal before the Administrative Hearing Commission (AHC) pursuant to Section 621.250 RSMo. To appeal, you must file a petition with the AHC within 30 days after the date this decision was mailed or the date it was delivered, 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

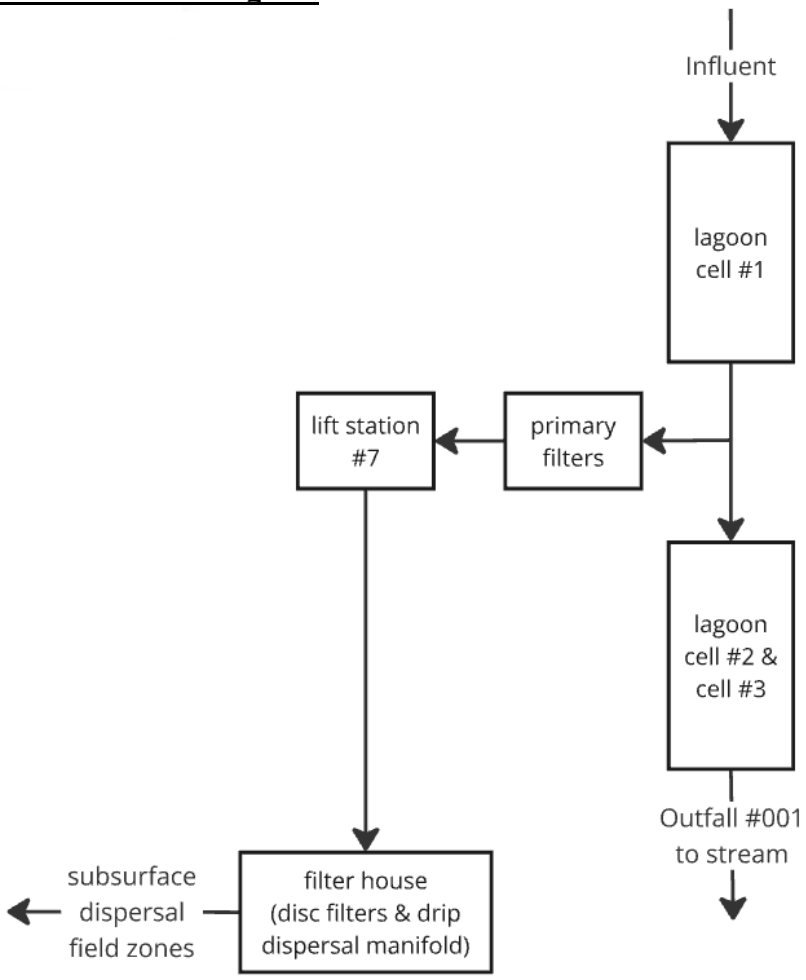
Katrice Williams, E.I.
Engineering Section
katrice.williams@dnr.mo.gov

Chia-Wei Young, P.E.
Engineering Section
chia-wei.young@dnr.mo.gov

APPENDIX A – Site Map



APPENDIX B – Process Flow Diagram



APPENDIX C – Drip Dispersal Zones Layout