

**OPERATIONS PERMIT  
LIMITED SCALE AQUIFER STORAGE AND RECOVERY PILOT PROJECT**

**City of Ada  
231 S. Townsend Street,  
Ada, Oklahoma 74820**

**Permit Number: LSASR-NH-62001-OP  
Effective Date: June ??, 2022  
Expiration Date: June ??, 2022**

Having complied with the requirements of the law as stated below, City of Ada is hereby granted permission to operate, maintain and monitor a Limited Scale Aquifer Storage and Recovery (LSASR) Pilot Project Facility with appurtenances described in the Permit Application. The facility is located in the SE1/4 of the NW1/4 of Section 4, Township 1 North, Range 6 East, Pontotoc County, Oklahoma. The LSASR Pilot Project includes injection of a tracer into a natural recharge feature (sinkhole) which is positioned at the following latitude and longitude (Geodetic Coordinates):

Sinkhole Site: latitude: 34 degrees, 35 minutes, 11.3 seconds, North  
longitude: 96 degrees, 40 minutes, 47.1 seconds, West

The injection zone is defined as, and limited to, the strata of the Arbuckle-Simpson Aquifer (ASA) or its geological equivalents. Since the injection will occur at the surface there is no upper confining layer and the uppermost aquifer will be protected by requiring the tracer components to meet water quality standards.

The Department of Environmental Quality (DEQ) is authorized to issue permits for limited-scale aquifer storage and recovery pilot projects pursuant to its authority under, the Oklahoma Environmental Quality Act (27A O.S. §1-1-101 et seq), the Oklahoma Environmental Quality Code (27A O.S. §§ 2-1-101 et seq. and 2-6-110), the federal Safe Drinking Water Act (42 U.S.C. §§ 300f-300j-26), and rules promulgated thereunder at 40 Code of Federal Regulations (C.F.R.) §§ 144, 145 and 146, and Oklahoma Administrative Code (OAC) Title 252, Chapters 4, 652, and 653. DEQ incorporates by reference the federal requirements for its underground injection control program at OAC 252:652-1-3, and all rules applicable to Aquifer Storage and Recovery projects shall apply. DEQ has determined pilot project criteria that include any conditions DEQ deems necessary or appropriate for protection of the aquifer quality, and is issuing this permit following the Tier II process.

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**The permittee is authorized to operate in conformity with this permit, its conditions, and the application incorporated by reference. Commencing operations under this permit constitutes acceptance of, and consent to, the conditions contained herein.**

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Hillary Young, P.E.,  
Chief Engineer  
Land Protection Division

Date

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Kelly Dixon,  
Division DEQ  
Land Protection Division

Date

## PREAMBLE

The Permittee shall operate the facility in compliance with the terms and conditions of this permit, the provisions of the Oklahoma Environmental Quality Act (27A O.S. §1-1-101 et seq.), the Oklahoma Environmental Quality Code (27A O.S. § 2-1-101 et seq.), the federal Safe Drinking Water Act (42 U.S.C. §§ 300f-300j-26), and rules promulgated thereunder at 40 Code of Federal Regulations (C.F.R.) §§ 144, 145 and 146, the Oklahoma Administrative Code (OAC) Title 252, Chapters 4, 652, and 653, and with the approved permit application hereby incorporated by reference. DEQ incorporates by reference the federal requirements for its underground injection control program at OAC 252:652-1-3, and all rules applicable to Aquifer Storage and Recovery projects shall apply. The provisions herein are severable. If any provision of this permit or its application to a given circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected.

### INCORPORATION BY REFERENCE:

The April 2022 Application submitted to DEQ on May 16, 2022, by the City of Ada is hereby incorporated by reference.

#### A. Conditions Specific to this Facility:

1. **Injection Location:** The injection shall take place with pumping 5,000-gallon slugs of tracer from two 2,500-gallon tanks into a natural recharge feature (sinkhole) located in the SE1/4 NW1/4 of Section 4-T1N-R6E, in Pontotoc County, Oklahoma, at a latitude and longitude of:

latitude: 34 degrees, 35 minutes, 11.3 seconds, North  
longitude: 96 degrees, 40 minutes, 47.1 seconds, West

2. **Injection Rate:** Injection rate shall be limited to 250 gallons per minute (gpm).
3. **Source Water:** The source of the injection water in which tracer components shall be mixed is from Byrd's Mill Springs (BMS), a spring located about 1 mile northeast of the LSASR site that emits from the Arbuckle Simpson Aquifer (ASA), and is the main source of drinking water for the City of Ada. It shall be collected prior to any treatment and transported to the LSASR Pilot project site for storage in two (2) 2,500-gallon tanks. It is the same as ASA groundwater at the site. Chemical characteristics are provided in the application.
4. **Tracer Tests:** LSASR sub-test 1 has been completed. Sub-tests 2 - 4 will be conducted as detailed in 4(b-c) below. Objectives include determination of aquifer properties; groundwater flow rates and pathways; solute and particle pathways (lateral and vertical) and attenuation rates; and travel times within the "Area of Hydrologic Effect" associated with the BMS.

- a) Sub-test 1: This tracer test was previously approved by DEQ and has been completed. It was composed of 5,000 gallons of ASA-sourced, unprocessed potable water acquired from natural flow at BMS; transported to the LSASR Pilot project site; and stored in two 2,500-gallon tanks. The BMS water at elevated temperature compared to groundwater at the site (i.e., thermally distinct) was pumped at 250 gallons per minute (gpm) into the sinkhole to evaluate the system's operational components and determine if the conveyance rate of the slug delivery system could be accommodated by the sinkhole for the duration of the tracer release. Sub-test 1 showed that operational components are functional and determined that the conveyance rate

of the slug delivery system, at 250 gpm, could be accommodated by the natural recharge feature for the length of the tracer release.

- b) Sub-test 2: A slug deployment of 5,000 gallons into the sinkhole of a non-reactive saline chemical tracer, sodium chloride (NaCl), and thermally distinct BMS water. The NaCl tracer shall not exceed a chloride concentration of 250 mg/L. The thermally distinct NaCl tracer will be pumped at the permitted rate (250 gpm) into the sinkhole and short-term groundwater monitoring will proceed. The frequency and duration of the monitoring will be variable and depend on location. Real time ERI data will also be collected for short durations after tracer deployment.
  - c) Sub-test 3: Sub-test 3 will be implemented after groundwater monitoring shows all traces of Sub-test 2 have returned to ASA background levels. Sub-test 3 shall use a tracer of the same composition as Sub-test 2; but shall contain an addition of no more than 22 pounds of groundwater tracing particles (GTPs). The GTPs shall be artificial sand-sized particles of degradable low toxicity risk mixture of sodium alginate reacted with calcium chloride dihydrate (to produce a food grade gel carrier medium); a common fluorescent groundwater tracer (uranine dye); borosilicate glass bubbles (to provide neutral buoyancy); and powdered magnetite (to allow magnetic capture of particles). The thermally distinct NaCl tracer with GTPs shall be pumped at the permitted rate (250 gpm) into the sinkhole and short-term groundwater monitoring will proceed. The frequency, duration, and methods of monitoring shall be variable and depend on location and sample results. Real time ERI data shall also be collected for short durations after tracer deployment.
  - d) Sub-test 4: Same as sub-test 3. A second 5,000-gallon slug of GTPs, nonreactive chemical tracer, and thermally distinct BMS water will be deployed into the sinkhole at the permitted rate (250 gpm) from the two on-site storage tanks, followed by short-term monitoring. Sub-test 4 will not begin until all traces of Sub-test 3 have dissipated in the nearest monitor wells to near ASA background levels. The frequency, duration, and methods of the monitoring will be variable and depend on location and sample results. Real time ERI data will also be collected for short durations after tracer deployment.
- 5. Groundwater Monitoring:** Short-term monitoring of the sub-tests (6 months), and for 6 months following the final sub-test. Groundwater monitoring shall consist of data collection from continuous groundwater logging devices, groundwater sampling, and data analyses for tracers in monitoring wells, and at BMS. Groundwater monitoring will be conducted in the monitoring wells that have been installed at the time of the tracer tests. There are 5 shallow monitoring locations; three (3) intermediate depth monitor wells; and three (3) deep monitor wells. The objective is to provide aquifer characterization and groundwater hydrogeologic data (vertically and horizontally) for the full-scale ASR application of Phase 2, such as: solute/particle flow paths, hydrogeologic gradients, groundwater velocities/fluxes, and identify solute/particle travel times.

Monitoring in all subtests shall provide continuous monitoring data from in-situ pressure, temperature, and conductivity loggers. Data from loggers shall be collected weekly to monthly depending on location and subtest activity. Monitoring wells shall be sampled for chemical tracers (Sub-tests 2 and 3) and for fluorescent/magnetic particles (Sub-tests 3 and 4). The frequency of groundwater sampling for chemical and fluorescence monitoring shall range from daily for 2 weeks following subtests in near wells, to monthly during short- and long-term monitoring at far wells, and at BMS. As tracer is observed in any of the monitoring wells, the sampling frequency will be increased until tracer breakthrough can be defined adequately to support hydrogeologic analysis.

Electrical Resistivity Imaging (ERI) shall be used in Subtests 2 and 3. ERI data collection shall be real time and shall occur for short durations, up to days immediately after the release of the tracer material in Sub-tests 2 and 3.

Sub-test 4 shall consist of modified protocols to better capture breakthrough based upon previous findings. Aspects of the deployment and subsequent monitoring shall be limited to the sampling frequency, sampling locations, and varying the proportions of tracer slug components, within the permit conditions. Any other changes shall be submitted to DEQ in a request for permit modification.

6. **Notifications:** The permittee shall notify DEQ at least two (2) weeks prior to initiating each sub-test.
7. **Reports:** The permittee shall submit progress reports following each tracer sub-test containing a summary of field activities; and a final LSASR Pilot Project Report at the conclusion of the Limited-Scale Aquifer Storage and Recovery (LSASR) Pilot Project, containing the following:
  - a. A summary of each tracer sub-test(s);
  - b. The results of groundwater monitoring;
  - c. The results of calculated aquifer properties / characteristics (groundwater gradients, flow paths, velocities, preferential flow paths, travel times and area of hydrologic effect);
  - d. The laboratory analysis of physical, chemical and other relevant characteristics of the groundwater samples;
  - e. The results of any aquifer testing;
  - f. The results of any geophysical testing; and
  - g. Any other supporting information, test data, logs (where available), and expert interpretation of any tests thereof.
8. **Retention of Records:** If the permittee elects not to retain records concerning the nature and composition of all injected fluids after the required three-year retention period, the permittee shall transfer them to DEQ.
9. **Financial Assurance:** If corrective action is required, the permittee shall undertake a corrective action program pursuant to OAC 252:653-9-12, calculate cost estimates, and establish and maintain appropriate financial assurance pursuant to applicable portions of OAC 252:653 Subpart 11.
10. **Plugging and Abandonment of Monitoring Wells:** All monitoring wells that are plugged and abandoned shall be plugged in accordance with OWRB well plugging requirements in OAC 785:35.
11. **Prohibition of Injection above Water Quality Standards:** The permittee is prohibited from injecting any material that would exceed Oklahoma Water Quality Standards.
12. **Duration of Permit:** This permit shall remain in effect for 3 years.
13. **Legal Ownership of Land:** City of Ada has demonstrated sufficient legal rights for the land associated with the LSASR Pilot Project, including warranty deeds of property ownership, in the NW/4 and NE/4 of Section 4-1N-R6E; SE/4 of Section 33-T2N-R6E; and SW/4 of Section 34-T2N-R6E, of Pontotoc County, Oklahoma.

## B. Conditions Common to All UIC Permits

As required by 40 C.F.R § 144.51 and adopted by OAC 252:652-1-3, the following conditions apply to all UIC permits.

1. **Duty to comply:** The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Safe Drinking Water Act and the Oklahoma Environmental Quality Code and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application; except that the permittee need not comply with the provisions of this permit to the extent and for the duration such noncompliance is authorized in an emergency permit under 40 C.F.R Sec. 144.34.
2. **Duty to reapply:** If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit.
3. **Need to halt or reduce activity not a defense.** It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
4. **Duty to mitigate:** The permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit.
5. **Proper operation and maintenance:** The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes, but is not limited to, effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit.
6. **Permit actions:** This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.
7. **Property rights:** This permit does not convey any property rights of any sort or any exclusive privilege.
8. **Duty to provide information:** The permittee shall furnish to DEQ, within a time specified, any information which DEQ may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to DEQ, upon request, copies of records required to be kept by this permit.
9. **Inspection and entry:** The permittee shall allow DEQ, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:
  - a. Enter upon the permittee's premises at reasonable times where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
  - b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
  - c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

- d. Sample or monitor, at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the SDWA, any substances or parameters at any location.

**10. Monitoring and records:**

- a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.
- b. The permittee shall retain records of all monitoring information, including the following:
  - i. Calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report, or application. This period may be extended by request of DEQ at any time; and
  - ii. The nature and composition of all injected fluids until three years after the completion of any plugging and abandonment procedures specified under 40 C.F.R. § 144.52(a)(6), or under 40 C.F.R. part 146 subpart G as appropriate. DEQ may require the owner or operator to deliver the records to DEQ at the conclusion of the retention period.
- c. Records of monitoring information shall include:
  - i. The date, exact place, and time of sampling or measurements;
  - ii. The individual(s) who performed the sampling or measurements;
  - iii. The date(s) analyses were performed;
  - iv. The individual(s) who performed the analyses;
  - v. The analytical techniques or methods used; and
  - vi. The results of such analyses.

**11. Signatory requirement:** All applications, reports, or information submitted to DEQ shall be signed and certified.

**12. Reporting requirements:**

- a. Planned changes. The permittee shall give notice to DEQ as soon as possible of any planned physical alterations or additions to the permitted facility.
- b. Anticipated noncompliance. The permittee shall give advance notice to DEQ of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.
- c. Transfers. This permit is not transferable to any person except after notice to DEQ. DEQ may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the Safe Drinking Water Act. (See 40 C.F.R. § 144.38; in some cases, modification or revocation and reissuance is mandatory.)
- d. Monitoring reports. Monitoring results shall be reported at the intervals specified elsewhere in this permit.
- e. Compliance schedules. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 30 days following each schedule date.
- f. Twenty-four hour reporting. The permittee shall report any noncompliance which may endanger human health or the environment, including:
  - i. Any monitoring or other information which indicates that any contaminant may cause an endangerment to a USDW; or
  - ii. Any noncompliance with a permit condition or malfunction of the injection system which may cause non-compliant fluid migration into or between USDWs.
  - iii. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission

shall contain a description of the noncompliance and its cause, the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

- g. Other noncompliance. The permittee shall report all instances of noncompliance not reported under paragraphs (12) (d), (e), and (f) of this section, at the time monitoring reports are submitted. The reports shall contain the information listed in paragraph (12)(f) of this section.
- h. Other information. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to DEQ, it shall promptly submit such facts or information.

**13. Duty to notify:** The permittee shall notify DEQ at such times as the permit requires before closure of the project.

DRAFT

**AN AUTHORIZED OFFICER OF THE CITY OF ADA MUST SIGN THIS PERMIT.**

By signing this Acknowledgement, the City of Ada (Ada) acknowledges that it has read Permit #LSASR-NH-62001-OP and understands the terms and conditions of the permit. Ada agrees to comply with the Oklahoma Environmental Quality Code (27A O.S. § 2-1-101), specifically § 2-6-105 (Pollution of state air, land or waters - Order to cease), § 2-6-701 (Underground injection of hazardous and non-hazardous liquids - Permit required - Water wells and holes to be constructed or sealed to avoid pollution), § 2-7-120 (Fee for disposal of liquid waste other than hazardous waste in underground injection wells) and understands that it is subject to the enforcement provisions of the Code, 27A O.S. §§ 2-3-501 through 506, inclusive (General Regulation and Enforcement) and § 2-6-901 (Penalties, Misdemeanors, Injunctions, Assessment of Civil Penalties) and rules promulgated pursuant thereto (OAC 252:652). City of Ada further agrees to comply with the Underground Injection Control program of the federal Safe Drinking Water Act (42 U.S.C. 300f-300j-26) and applicable federal rules promulgated thereunder (40 C.F.R. §§ 144, 145, and 146) and adopted by reference in OAC 252:652.

\_\_\_\_\_  
Signature. Title \_\_\_\_\_

\_\_\_\_\_  
Name of authorized signatory (Please print or type) Date \_\_\_\_\_

STATE OF OKLAHOMA )  
) ss:  
COUNTY of \_\_\_\_\_ )

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 2022.

\_\_\_\_\_  
Notary Public

My Commission Expires: \_\_\_\_\_