REGION 6
DALLAS, TX 75270

Olivia Johnson
Lab Accreditation and Quality Assurance (QA) Manager
Arkansas Department of Energy and Environment
5301 Northshore Drive
North Little Rock, Arkansas 72118

Dear Ms. Johnson:

We have completed our review of the latest Quality Assurance Project Plan (QAPP) for the Arkansas Department of Energy and Environment (ADEE) Underground Injection Control (UIC) program. The grant number associated with this UIC QAPP is #G-006221-27. I am pleased to inform you that this QAPP is approved. This ADEE UIC QAPP expires in three years, on August 17th, 2029.

Enclosed is one QAPP signature page for your records. In any future correspondence relating to this QAPP, please reference Q-track #26-329. If you have any questions, please contact me at (214) 665-7313.

Sincerely,

Mike Vaughan /s/

Mike Vaughan, Project Officer
Community Infrastructure Section

Enclosure

QUALITY ASSURANCE PROJECT PLAN

UIC PROGRAM

Prepared by:

Arkansas Department of Energy and Environment

5301 Northshore Drive

North Little Rock, Arkansas 72118

Prepared for:

United State Environmental Protection Agency Region 6

1201 Elm Street, Suite 500

Dallas, Texas 75270

Prepared August 2025, Revised August 2026

Group A. Project Management and Information/Data Quality Objectives

A1. Title Page

Quality Assurance Project Plan
UIC Program
Cooperative Agreement No. G00622126

Prepared by:
Arkansas Department of Energy and Environment
5301 Northshore Drive
North Little Rock, Arkansas 72118

Prepared for:
United State Environmental Protection Agency Region 6
1201 Elm Street, Suite 500
Dallas, Texas 75270

Period of Applicability: Federal Fiscal Year (FFY) 2025 through FFY 2028
October 1, 2025 - September 30, 2028
Prepared - August 2025
Revision One - February 2026
Revision Two - August 2026

A2. Approval Page

Quality Assurance Project Plan
UIC Program

Arkansas Department of Environmental Quality
Division of Environmental Quality, Office of Water Quality
Quality Management Plan EPA QTRACK # 25-075

L. Hanson — August 5, 2026
DEQ-OWQ Professional Geologist — Date
Linda Hanson

A. Paige Heigle — August 5, 2026
DEQ-OWQ Laboratory Program Supervisor — Date
A. Paige Heigle

Olivia Johnson — August 5, 2026
E&E Quality Assurance Manager — Date
Olivia Johnson

Michael P. Vaughan — 8/18/2026
EPA Region 6 Clean Water Infrastructure Project Officer — Date
Michael Vaughan

WaKisha Marshall — 08/18/2026
EPA Region 6 Environmental Scientist — Date
WaKisha Marshall

QAPP Revision History

Revision No.	Description	Author	Date
0	Original version submitted August 7, 2025	Linda Hanson A. Paige Heigle	8/7/2025
1	Original version revised to reflect the updated standard (CIO 2105-S-02.1) and guidance received from EPA on December 8, 2025	Linda Hanson A. Paige Heigle	4/16/2026
2	Revision 1 revised to reflect responses to EPA comments received 7/20/2026	Linda Hanson A. Paige Heigle	8/4/2026

A3. Table of Contents

List of Tables

List of Appendices

Abbreviations

ADH	Arkansas Department of Health
COC	Chain-of-Custody
DEQ	Division of Environmental Quality
E&E	Arkansas Department of Energy and Environment
EI	Environmental Information
EIO	Environmental Information Operations
EPA	United States Environmental Protection Agency
FFY	Federal Fiscal Year
HAZWOPER	Hazardous Waste Operations and Emergency Response
ICP	Inductively Coupled Plasma
IT	Information Technology
LIMS	Laboratory Information Management System
LPS	Laboratory Program Supervisor
MS	Mass Spectrometry
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NELAC	National Environmental Laboratory Accreditation Conference
O&GC	Oil and Gas Commission
OES	Optical Emission Spectrometry
OSHA	Occupational Safety and Health Administration
OWQ	Office of Water Quality
PC&EC	Pollution Control and Ecology Commission
PM/C	Project Manager/Coordinator
PT	Proficiency Test(ing)
QA	Quality Assurance
QAM	Quality Assurance Manager
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
QMP	Quality Management Plan
SOP	Standard Operating Procedures
UIC	Underground Injection Control
VOC	Volatile Organic Compound
WQX	Water Quality Exchange, the US EPA data storage system

A4. Project Purpose, Problem Definition, and Background

Since receiving primacy from the Environmental Protection Agency (EPA), Arkansas Division of Environmental Quality (DEQ) effectively implemented the delegated Underground Injection Control (UIC) program and assured compliance with the Safe Drinking Water Act (SDWA). EPA delegated the UIC program to the state of Arkansas in 1982, and DEQ has permitting and enforcement authority for Classes I, III, IV, and V (excluding spent brine disposal and small capacity cesspool) injection wells. DEQ enforces the Code of Arkansas Regulations Title 8 Code of Arkansas Rules (CAR), Chapter I, Subchapter C, Part 26, (formerly PC&EC Rule 17), and by reference, 40 C.F.R. §§ 144 through 148, inclusive. In the state of Arkansas, UIC primacy is shared by DEQ, the Arkansas Oil and Gas Commission (O&GC), the Arkansas Department of Health (ADH), and EPA Region 6. O&GC has authority over Class II and Class V (spent brine disposal) injection wells. ADH has authority over single family residential cesspools and non-residential cesspools which receive solely sanitary waste and have the capacity to serve fewer than 20 people a day. These agencies cooperate in the administration of the state UIC Program through a negotiated Memorandum of Understanding with the EPA Region 6 dated September 1983 and amended in 1996. EPA retains permitting authority for Class VI (carbon sequestration) UIC wells.

In FFY1994 a Class V UIC spent brine injection well sampling procedure was established. At that time the feed brine, spent brine, and leachate samples were collected from open ponds. Subsequently the ponds were replaced by tanks. Feed brine has not been sampled in recent years. On January 21, 2011, the Dow Chemical Company's Class I hazardous waste disposal UIC well (Permit no. 0017-UR-2) began injecting the wastewater and leachate from the Albemarle West Plant. Since the leachate was no longer being disposed of in Class V UIC spent brine disposal wells, sampling of leachate at these locations was discontinued effective spring of 2011.

As per the Memorandum of Agreement between DEQ and the O&GC dated June 24, 1994, DEQ personnel will sample tail brine disposed of in Class V (bromine-related) spent brine injection wells permitted by the O&GC. In 2025, the Oil and Gas Commission determined that debrominated brine samples would be collected and analyzed in the Office of Water Quality (OWQ) Water Laboratory for metals content only. Since the processes at the chemical manufacturing facilities have remained consistent for years, the analytical results have shown no statistically significant changes. The metals content would be compared to previous sampled spent brine analyses to determine if metals content was similar to concentrations in previously collected samples. If information becomes available that sampling for additional parameters such as volatile organic compounds (VOCs) and semi-volatile organic compounds is warranted, DEQ will collect additional samples following previously EPA-approved sampling and analysis procedures and will send the samples to be analyzed for additional analytes at a DEQ-accredited laboratory. All analytical results of the tail brine sampling will be sent to the O&GC and to the permittees. Relevant planning documents pertinent to this UIC QAPP are summarized in **Table 1** below.

Table 1. Quality Assurance Planning Documents

Title of Document	Date of Document	Pertinence to this QAPP
E&E Quality Management Plan (QMP)	Effective 12/29/2024 through 4/30/2026 *QTRACK # 25-075*	This QAPP was developed in accordance with the organization's QMP.
UIC Grant Application and Work Plan for FFY 2026	Effective 10/1/2025 through 9/30/2026	This Work Plan describes the activities and tasks to be completed under the UIC Program.

Brine samples will be collected at the last point before injection by a DEQ UIC Program geologist or other qualified personnel along with duplicate samples, as necessary, field blanks, and trip blanks. Guidance for sample collection is listed in Section 3.0 of Chapter 1 and in Chapters 10 and 11 (including the documents hyperlinked in Chapter 11) of the Environmental Protection Agency's publication *Test Methods for Evaluating Solid Waste*, SW-846, available online at https://www.epa.gov/hw-sw846 and *Standard Methods for the Examination of Water and Wastewater* https://www.standardmethods.org/ (as approved in 40 C.F.R. Part 136 https://www.ecfr.gov/current/title-40/chapter-I/subchapter-D/part-136).

The specific purpose of this UIC Quality Assurance Project Plan (QAPP) is to protect underground sources of drinking water and provide quality chemical data concerning the chemical composition of the spent brine that is injected into the Class V UIC brine-disposal wells.

If it is determined that water quality violations may have occurred because of underground injection or that an underground source of drinking water is threatened, a sampling program relating to those concerns would be developed.

This QAPP is based on the 8 CAR Part 26, the 40 C.F.R. Parts 146–148, the Safe Drinking Water Act, 40 C.F.R. regulations concerning environmental measurements, and the June 24, 1994, Memorandum of Understanding between the DEQ and the O&GC. The sampling and analytical procedures are adequate for use in enforcement.

A5. Project Task Description

Tasks to be completed under the UIC Program are summarized in **Table 2** below.

Table 2. Tasks, Schedules, and Products

Task	Schedule for Accomplishment	Description of Work	Products Produced
1. Core Program Activities	Ongoing/annual sampling and analyses	Ongoing sampling and analyses of Class V depleted brine disposal well injectate	Annual analytical result reports to the O&GC and to each permittee
2. Management Assistance Activities	Ongoing/annual reporting	Ongoing review and reporting of analytical data	Annual analytical result reports to the O&GC and to each permittee

This QAPP, prepared in accordance with the EPA Quality Assurance Project Plan Standard (*CIO 2105-S-02.1*), was developed to outline the procedures followed during Environmental Information Operation (EIO) supported and/or required by EPA. The QAPP defines the necessary quality assurance (QA), quality control (QC), and other technical activities that will be implemented to ensure the results of all work performed by DEQ will satisfy EPA's performance criteria.

Task 1: Core Program Activities

The Project Manager/Coordinator (PM/C) will conduct research, review existing information, and perform or provide oversight of field activities including sampling with laboratory analysis. All laboratory analyses will be conducted by the OWQ Water Laboratory or another DEQ-accredited laboratory.

Each year, five (5) spent brine samples are collected at five (5) bromine plants operated by LANXESS Corporation and Albemarle Corporation. At each site, at the last sampling point before the spent brine enters the pipeline to the Class V UIC spent brine disposal wells. For each sample for total metals in the wastewater a 125 mL plastic bottle with 3 mL of nitric acid is partially filled. Duplicate samples are collected in a 250 mL plastic bottle with 6 mL of nitric acid. No field blanks or trip blanks for metals are required. The samples are then submitted to an accredited laboratory with the Chain-of-Custody (COC) form. A typical sample labeling procedure and COC form are in Appendices B and C.

If representative metals analyses indicate changes in concentrations above background levels for spent brine, then the DEQ and the O&GC staff will proceed with further investigation into the wastewaters that are being injected into the Class V UIC spent brine disposal wells. If additional sampling is warranted, in addition to the samples for metals, samples for volatile organic compounds and semi-volatile organic compounds may be collected. For the volatile organic

compounds, two 40-mL glass vials with septa will be filled without headspace for volatile organic analyses and a 1-liter amber glass jar will be filled for semi-volatile organic analyses, and a 125-mL plastic bottle will be partially filled for metal analyses. A trip blank (a 40-mL glass vial with septa) for the volatiles accompanies the containers. A duplicate set of samples is collected at one sampling location each day in three 40-mL glass vials with septa, a 1-liter amber glass jar for semi-volatile organic analyses, and containers as described above for metal analyses. Two field blanks (40-mL glass vials with septa) are collected at every sampling point. The brine stream contains small air bubbles and is very hot, so the sample bottles are cooled slightly in ambient air before placing them on ice to prevent breakage of the glass sample containers. The volatile and semi-volatile organic compound samples will be sent to an accredited laboratory for analysis.

Task 2: Management Assistance Activities

Under Task 2, Managers and/or Supervisors will assign a PM/C to serve as the main point of contact between DEQ and the assigned EPA Project Officer and to oversee QC measures for the project. The PM/C may be a Geologist, Engineer, or Chemist. Managers and/or Supervisors will assign other members of the project technical team if necessary. The PM/C will review the analytical results and calculations prior to forwarding a copy of the results to the O&GC.

In the event evidence indicates that existing treatment systems are being bypassed or unauthorized constituents are included in the waste stream, the DEQ and O&GC will proceed with joint enforcement action against the operator.

A6. Information/Data Quality Objectives and Performance/Acceptance Criteria

EI collected at the Class V UIC spent brine facilities will be used to meet some or all the following goals:

A. Determine compliance with EPA and O&GC rules and regulations.
B. Identify potential threats to public health or the environment.
C. Provide data in compliance with EPA analytical criteria for environmental measurements.

The objectives of this QAPP are to provide data that is complete as possible with the precision and accuracy necessary to support proper interpretation and decision making regarding regulatory compliance. The data must also be representative of the media and conditions being measured and must be calculated and reported in units which allow comparison of data. The data is evaluated by statistical techniques for trends and is compared to water quality standards and criteria. Compliance data is compared to the permit limits to verify compliance. The quality of the data should be sufficient to support regulatory actions. All data will be reviewed and evaluated to ensure the data meets the appropriate quality standards. Goals for achieving our data quality objectives for sampling and analysis are precision, accuracy, and completeness.

Representativeness

The representativeness of the data will be assured by the proper selection of sampling sites and sampling methods. For example, a representative point to sample the injection fluid is at the wellhead.

Comparability

To assure comparability among data from different sites or dates of collection, all values will be reported in milligrams per kilogram or milligrams per liter unless extremes of data render these units cumbersome.

Precision

Sampling precision will be determined by collecting and analyzing field duplicate samples. OWQ staff will duplicate sampling conditions and sampling methods when collecting duplicate samples.

Precision of analytical data will be assessed using either method specific or laboratory established control limits. Duplicate sample results will be utilized to calculate the Relative Percent Difference (RPD) this RPD will be evaluated against laboratory established control limits.

The overall precision of measurement is a mixture of sampling and analytical factors. Analytical precision is easier to control and quantify than sampling precision.

Accuracy

The accuracy of the laboratory analyses will be determined by calculating the percentage of recoveries of the analytes in Laboratory Control Samples (LCS). Percent recoveries will be evaluated against either method specified or laboratory-established upper and lower control limits.

Completeness

Completeness is defined as the percentage of measurements made which are judged to be valid. The completeness goal is that enough valid data be generated. For this plan, it is believed that a completeness level of 100% should be achieved. Five (5) spent brine samples are collected each year at a time to be determined by the OWQ. Since plant compliance depends on contaminant level results and due to the small number of samples, 100% completeness is necessary and obtainable. If any samples fail laboratory QC limits, a replacement sample would be collected.

Sensitivity

Sensitivity is the capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest. The term "detection limit" is

closely related to sensitivity and is often used synonymously. Detection limits are specific to the method and instrument. Detection limits are listed in laboratory Standard Operating Procedures (SOPs).

A7. Distribution List

These individuals (or successors) listed in **Table 3** will receive a copy and subsequent revisions of, or have access to, this QAPP. A complete copy of the original version and all revisions of this QAPP will be maintained in the department-wide computer system under the E&E Public Network Drive at the following file path: *G:Quality AssuranceTeam\OWQ\UIC QAPPs*. This QAPP will be made available to approval authorities upon request.

Table 3. Distribution List

Name	Organization	Role
Michael Vaughan	EPA Region 6	US EPA Project Officer, Clean Water Infrastructure Section
Denise Hamilton	EPA Region 6	Supervisor, Clean Water Infrastructure Section
Lauren Ballard	E&E	Chief of Staff (Senior Manager)
Stacie R. Wassell	E&E-DEQ	Deputy Director, Office of Water Quality
Jessica Sears	E&E-DEQ	Managing Engineer, Office of Water Quality
Terry Liu	E&E-DEQ	Engineer Supervisor, Office of Water Quality
Linda Hanson	E&E-DEQ	Professional Geologist, Office of Water Quality, Project Manager
Michael Young	E&E-DEQ	Inspector Supervisor, Office of Water Quality (or inspector)
Olivia Johnson	E&E-DEQ	E&E Quality Assurance Manager
A. Paige Heigle	E&E-DEQ	Laboratory Program Supervisor, Office of Water Laboratory
Rex Robertson	E&E-O&GC	Permitting and UIC Program Manager, Oil & Gas Commission

A8. Project Organization

The primary personnel responsible for implementation of this QAPP are the PM/C, supervisor, managers, deputy director, and the E&E QAM. The duties of key personnel are briefly outlined in this section.

Senior Manager: Office of the Secretary, Arkansas Department of Energy & Environment

- Senior Manager with executive leadership authority for E&E.

Deputy Director: Office of Water Quality, Division of Environmental Quality, Arkansas Department of Energy & Environment

- Has executive leadership authority for the Office of Water Quality.

Managing Engineer: Permits Branch, Office of Water Quality, Division of Environmental Quality, Arkansas Department of Energy & Environment

- Reviews documents for accuracy and completeness.
- Oversees all permitting including the UIC Program.

Engineer Supervisor: No-Discharge Section, Permits Branch, Office of Water Quality, Division of Environmental Quality, Arkansas Department of Energy & Environment

- Assigns a geologist or other qualified personnel to complete sampling and data reporting to O&GC and permittees.
- Ensures that the personnel responsible for participating in the EIO are qualified, trained, and experienced.
- Ensures that any specialized training or certifications needed by personnel is completed.
- Reviews documents for accuracy and completeness.
- Oversees the UIC Program.

Geologist (PM/C): No-Discharge Section, Permits Branch, Office of Water Quality, Division of Environmental Quality, Arkansas Department of Energy & Environment

- Serves as Project Manager/Coordinator and main point of contact between DEQ and O&GC. This role is project Operations Manager.
- Prepares, updates, revises, and ensures implementation of the UIC Program QAPP.
- If EPA promulgates updated procedures for sampling and analysis, will update the QAPP and notify EPA Region 6 as soon as possible to reflect any changes required.
- annual reviews of Program QAPP activities to the QAM.
- Implements field work and coordinates sample analyses and is responsible for oversight of sampling and reporting activities.
- Verifies proper function of all equipment before beginning field activities.
- Ensures the proper number, type, and quantity of sample containers, including preservation methods, are available for field activities.
- Follows standard sampling procedures as defined in this QAPP.
- Records all field data in accordance with this QAPP.
- Follows all applicable QAPP guidelines to ensure samples are collected, preserved, labeled, packaged, and shipped to laboratories in an appropriate manner.
- Reviews analytical results as described in Table 2.
- Performs data validation as required.
- Forwards final copies of laboratory analysis to the O&GC and to the respective permittees.
- Ensures copies of field records and analytical results are kept as electronic files in the UIC Program network files.

E&E Quality Assurance Manager (QAM): Arkansas Department of Energy & Environment

- Provides final approval of the UIC Program QAPP.
- Oversees E&E's QA program.
- Prepares, updates, and revises the agency's QMP.
- If EPA promulgates updated procedures for sampling and analysis, will update the QAPP and notify EPA Region 6 as soon as possible to reflect any changes required.
- Annual reviews of Program QAPP activities to the QAM.
- Conducts internal reviews.
- Serves as the main point of contact between E&E and EPA Region 6 Office of Quality Assurance.

Laboratory Program Supervisor: Water Laboratory, Office of Water Quality, Division of Environmental Quality, Arkansas Department of Energy & Environment.

- Maintains accreditation through the Arkansas DEQ Laboratory Accreditation Program
- Performs the requested analyses using appropriate test methods specified in the OWQ Water Laboratory Quality Assurance Manual (OWQ Laboratory Quality Assurance Manual 2025).
- If EPA promulgates updated procedures for sampling and analysis, will update the QAPP and notify EPA Region 6 as soon as possible to reflect any changes required.
- Submits annual reviews of Program QAPP activities to the QAM.
- Satisfies laboratory Quality Assurance/Quality Control (QA/QC) objectives and activities in accordance with EPA/Standard Methods.
- Prepares laboratory reports for DEQ, including all data and QC reports.
- Communicates any analytical issues or concerns to PM/C in a timely manner
- Initiates corrective action measures when deficiencies in sample collection, preservation, handling, test methods, or documentation are identified.

A9. Project Quality Assurance Manager Independence

The QAM operates independently from the OWQ, the unit generating data for the UIC Program. The QAM has the authority to access and discuss quality-related issues with DEQ's senior manager outside of their direct supervisory chain as necessary.

A10. Project Organization Chart and Communications

Effective communication allows DEQ staff to identify and resolve issues immediately to ensure project goals are met. Methods of communication include in-person conversations and meetings, telephone and video conferencing calls, emails, and written correspondence, with written correspondence being the most official form of communication. All written correspondences are maintained in the project file.

All data collection is performed under this QAPP as approved by DEQ and EPA. Because QA issues often occur in the field and require quick resolutions to keep projects on track, calls or emails are the preferred means of communication. However, all QA/QC issues and resolutions are also documented and must be described in any work products submitted to DEQ. The communication chain of who will receive information pertaining to the sampling and analyses of spent brine is as follows:

Step in communication chain	Agency	Position	Job duties pertaining to sample collection and analyses
1.	E&E – DEQ -OWQ	Geologist, PM/C	Collects samples, reviews sample analyses, forwards sampling reports to AOGC
2.	E&E – DEQ -OWQ	Laboratory Program Manager	Supervises analysis of samples, reviews analytical results, forwards results to PM/C
3.	E&E - AOGC	Permitting and UIC Program Manager	Receives and processes sampling results

See **Appendix A** for the UIC Program EIO Organization Charts.

A11. Personnel Training/Certifications

Supervisors are responsible for outlining specific training requirements for new and existing personnel. Managers or Supervisors assign new employees to apprentice with an employee experienced in the needed skills. New employees are required to read and understand the appropriate QA documents pertaining to their work. Direct supervisors are responsible for documenting personnel training.

DEQ staff are not permitted on a potential or known hazardous substance site without an escort until they have completed forty (40) hours of Hazardous Waste Operations and Emergency Response (HAZWOPER) training as required by applicable OSHA regulations (29 C.F.R. 1910.120). DEQ also requires personnel to obtain eight (8)-hour annual refresher courses, according to OSHA 1910.120, once during each calendar year. UIC personnel must have adequate safety training prior to entering these facilities to avoid exposure to hazardous materials that could result in adverse effects such as impaired health or death. The UIC program does not provide support for emergency response activities. Employees are also offered QA courses from EPA when available.

Additionally, permitted facilities provide onsite training for site-specific health and safety concerns that all visitors are required to complete before they are allowed to enter the facilities.

While DEQ personnel are onsite, they are always accompanied by a facility representative that has completed HAZWOPER training and any required refresher courses.

Analyses will be performed by the Office of Water Quality Water Laboratory. All laboratory analysts must have documented demonstrations of proficiency for each analysis. If it is determined that analysis for constituents other than metals is required, those samples will be sent to an accredited contract laboratory.

Job qualifications for management and technical staff personnel include a baccalaureate degree or higher in a relevant discipline of environmental or earth science, engineering, and/or management. Personnel responsible for grant applications or grant-related duties also participate in the EPA Grants Management Training for Applicants and Recipients.

Managers, Supervisors, the Program Manager, Deputy Director, Associate Director, or a combination of thereof, will assess training effectiveness when reviewing project and personnel performance. Training programs will be developed to correct problems discovered during project and personnel reviews.

A12. Documents and Records

The UIC Program QAPP describes the general QA/QC measures implemented at UIC sites. The UIC Program QAPP will be effective for a period of three (3) years following its approval date unless it is amended, replaced, or rescinded prior to expiration. A secured copy of this QAPP will be maintained in the department-wide computer system under the following file path: G:\Quality Assurance Team\OWQ\UIC QAPPs and on the E&E website at https://www.adeq.state.ar.us/qa. This QAPP will also be provided to all DEQ personnel involved in this project as well as to those listed in the distribution list in Element A7 (**Table 3**).

Work products to be produced for UIC injectate sampling are Laboratory Analytical Reports. Activities at UIC sites will, at a minimum, adhere to this UIC Program QAPP. Signed documentation will be maintained showing the plans have been reviewed and are understood by all personnel.

Field personnel will ensure that pertinent documentation is maintained during all site-related activities. Any deviations from pre-approved plans will be documented. Throughout all site sampling events, personnel will maintain COC forms. Copies of COC forms will be included in final work products.

Sample collection types may include grab samples, split samples, duplicate samples, and control samples. Each sample will be assigned a unique and traceable sample number. The documentation for sampling will consist of sample number and type, time, location, and site operator written

directly on the containers, on labels applied to the outside of the containers, or written directly on the plastic zip top bag containing the containers. This information is repeated on the COC.

The PM/C will forward the results of the laboratory analyses to the O&GC for review and possible enforcement actions if deemed necessary.

The LPS will ensure that analytical data is received by the PM/C, who will, after reviewing, forward data to O&GC and the appropriate DEQ staff. Both the LPS and the PM/C will ensure that it meets all the QA/QC criteria established for each project. The protocol followed will, at a minimum, be consistent with this UIC Program QAPP. The documentation for chemical analyses will consist of the sampler writing the identifying information directly on the sample container with an indelible marker, the COC form (see **Appendix C**), raw data and records pertaining to the final report (reagents and standards preparation, sample preparation, and calibrations), and final reports, which include QA/QC results and corrective action reports.

All work products, including but not limited to QA documents, project reports, bench sheets, QC checks, calibration logs, instruments printouts, and COC forms are stored according to the DEQ Records Retention Policy. The DEQ UIC project manager keeps copies of all UIC-related documents indefinitely in electronic files, either in an online database (for OWQ-permitted facilities) or in the DEQ network of non-permitted facilities. For analytical data and related documentation, the reports are stored in the aforementioned manner, but the data is also stored in the Laboratory Information Management System (LIMS) with its redundant storage mechanisms. Laboratory documents will be kept for a minimum of seven years. However, E&E strives to retain pertinent records in perpetuity if there is space on the department-wide system.

Group B: Implementing Environmental Information Operations

The UIC Program QAPP was developed in accordance with the EPA Quality Assurance Project Plan Standard (*CIO 2105-S-02.1*).

The EIO is collected, analyzed, reviewed and then forwarded to the O&GC and the permittees operating the Class V spent brine disposal wells. The O&GC then reviews the data to determine compliance with the O&GC rules and regulations.

B1. Identification of Project Environmental Information Operations

Table 4 summarizes the EIO conducted under the UIC Program, how these operations satisfy the purpose of the UIC Program, and performance/acceptance criteria used to evaluate EI for usability. These procedures ensure the integrity of the EIO.

Table 4. UIC Program Environmental Information Operations

Environmental Information Operation	Connection to Program Purpose	Performance/Acceptance Criteria
Task 1: Core Program Activities (Sampling & Analyses)		
Collection of quantitative & qualitative EI from the site, including sampling	- Collect samples	- Sampling follows the approved QAPP
Laboratory analyses	- Analyze samples - Provide analytical results	- Data validation package from laboratory - QC checks by PM/C and LPS to ensure data meets quality requirements
Task 2: Management Assistance Activities		
Ongoing review and reporting of analytical data	-Review analytical results -Forward analytical results to O&GC	- QC checks by PM/C to ensure data meets quality requirements

B2. Methods for Environmental Information Acquisition

The following subsections describe methods for obtaining EI in the UIC Program.

Field Activities Environmental Measurements

Spent Brine Samples

Collection and preservation methods are described in the most current DEQ SOP for sampling chemical constituents. If deviations are necessary, the methods used, the reasons for deviation, and the identification of the decision maker are documented. DEQ personnel will perform the field sampling.

Five (5) samples of spent brine (the Smackover brine from which the bromine has been removed and replaced by chlorine) from five (5) facilities (three LANXESS Corporation plants and two Albemarle Corporation plants) are collected each year during sampling events. The sample points are determined by the layout of the manufacturing plants and the disposal wells. The samples will be collected at the last available sample point before the disposal wells, which generally is on or near the plant, before the flowlines to the individual wells. The samples will be analyzed for metals by EPA Methods listed in this plan.

Sampling Methods Requirements

The sampling and the analysis are done by the DEQ for the O&GC, which regulates Class V UIC spent brine disposal wells that return the brine to the Smackover Formation (the source of the

initially produced brine). In addition to the Class V UIC spent brine disposal well samples, there may be unscheduled samples collected from the pipeline leading to the injection well(s) at the last available sampling point before disposal in the Class I UIC wells, if warranted.

All samples will be collected utilizing the guidelines found in Section 3.0 of Chapter 1 and in Chapters 10 and 11 (including the documents hyperlinked in Chapter 11) of the EPA's publication Test Methods for Evaluating Solid Waste, SW-846, available online at https://www.epa.gov/hw-sw846 and Standard Methods for the Examination of Water and Wastewater https://www.standardmethods.org/ (as approved in 40 C.F.R. Part 136) https://www.ecfr.gov/current/title-40/chapter-I/subchapter-D/part-136).

The spent brine samples are taken from the pipeline leading to the injection well(s) at the last available sampling point before disposal in the injection well(s). Sample times and locations will be recorded.

Grab samples for metals will be collected in 125 mL plastic bottles to which nitric acid (HNO3) was added. Sample containers are purchased from vendors that certify a level of cleanliness appropriate to the analytical method used. The containers will be used directly from their cartons with no further cleaning and filled to the levels recommended by the laboratory. The containers will be disposed of properly after one use.

All samples will be received at the laboratory in a time frame that will allow analyses to be completed within holding times of each respective method.

Sampling Handling and Custody Requirements

Samples collected by DEQ personnel are kept secure and within the possession of the sampler until transported and delivered to the laboratory by the sampler. If samples are passed off to another individual for delivery to the laboratory, both individuals must sign and date the COC to document the transaction. The samples will be preserved and held according to the methods in **Table 5**.

Decontamination and Waste Disposal

No decontamination waste will be generated. All waste solvents generated by extraction procedures are collected and recycled by a permitted hazardous waste treatment facility.

Laboratory Analyses

All laboratory analyses for the UIC Program will be performed either by the OWQ Water Laboratory or by another DEQ-accredited laboratory. Laboratory analytical and preservative methods and holding times are listed in **Table 5**.

Table 5. Environmental Information Analytical Testing Methods

Parameter	Analytical Reference Method	Sample Container	Preservative	Holding Time
Total Metals	EPA 200.8, Rev. 5.4 (1994)/EPA 200.7 Rev. 4.4 (1994)	125 mL plastic bottle/250 mL plastic bottle	HNO3	6 Months

B3. Integrity of Environmental Information

Field Activities

Sampling Handling and Custody Requirements

The purpose of the chain of custody procedures is to demonstrate the reliability of evidence by creating an accurate written record of the possession of the sample from collection to final sample disposition. This procedure will also ensure that the samples are collected, transferred, stored, analyzed, and disposed of properly only by authorized personnel.

A sample is in custody if it is in any one of the following states:

A. In actual physical possession.
B. In view, after being in physical possession.
C. In physical possession and locked up.
D. In a secure area, restricted to authorized personnel.

Sample containers are labeled by the sampler onsite at the time of collection and indicate the station number, the date and time of collection, the name of the collector, and any preservative used. The time and location are recorded on the chain of custody form (**Appendix C**). The sample collector is responsible for the care and custody of the samples until they reach the laboratory. The sample collector must provide the proper storage conditions and ensure the delivery of the samples within the permitted holding times. The samples must be in their physical possession, in their view, or always stored in a locked place. Samples must always be accompanied by a COC record form (**Appendix C**) that includes the name of the investigation, the collector's signature, date, time, type of sample, number of containers, preservative used, condition of the samples, and analyses required.

The measures and activities to assure the integrity of environmental information collected during field sampling are outlined in the most recent DEQ SOP. In-situ information collected during sampling activities is recorded on a field sheet. Prior to recording the data on the COC, it is checked

by the sampler for accuracy and completeness. The information on the COC is then validated by the sampler by comparing the information on the field sheet with the data on the COC.

Laboratory Activities

Any laboratory performing work on behalf of DEQ must be accredited as per the requirements set forth in the Arkansas Code Annotated §§ 8-2-201 et seq., State Environmental Laboratory Accreditation Program Act.

All spent brine samples will be analyzed by the DEQ OWQ laboratory or another DEQ-accredited laboratory for metals content. If information becomes available that sampling for additional parameters such as volatile organic compounds (VOCs) and semi-volatile organic compounds is warranted, DEQ will collect additional samples following previously EPA-approved sampling and analysis procedures and will send the samples to be analyzed for additional analytes at a DEQ-accredited laboratory.

Metals Analysis

For total recoverable metals, water samples are analyzed using EPA Method 200.8, Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma (ICP) – Mass Spectrometry (MS), Revision 5.4 (1994), EPA 200.7, Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma – Optical Emission Spectrometry (OES), Revision 4.4, (1994), or a combination of the two methods.

Table 6. DEQ OWQ Laboratory Equipment & Parameters

Equipment	Parameter
Inductively Coupled Plasma instrument with Mass Spectrometer (MS) or Optical Emission Spectrometer (OES) capable of meeting project and method requirements	Metals: Aluminum, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Sodium, Vanadium, Zinc

The metals determined are:

Aluminum - total, mg/L, Inductively Coupled Plasma - Mass Spectrometry, Method 200.8, Rev. 5.4.(1994); OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

Arsenic - total, mg/L, Inductively Coupled Plasma - Mass Spectrometry, Method 200.8, Rev. 5.4 (1994); OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

Barium - total, mg/L, Inductively Coupled Plasma - Mass Spectrometry, Method 200.8, Rev. 5.4 (1994); OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

Beryllium - total, mg/L, Inductively Coupled Plasma - Mass Spectrometry, Method 200.8, Rev. 5.4 (1994); OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

Boron - total, mg/L, Inductively Coupled Plasma - Mass Spectrometry, Method 200.8, Rev. 5.4 (1994); OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

Cadmium- total, mg/L, Inductively Coupled Plasma - Mass Spectrometry, Method 200.8, Rev. 5.4, (1994); OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

Calcium - total, mg/L, Inductively Coupled Plasma – Mass Spectrometry, Method 200.8, Rev. 5.4 (1994); OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

Chromium- total, mg/L, Inductively Coupled Plasma - Mass Spectrometry, Method 200.8, Rev. 5.4 (1994), OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

Cobalt - total, mg/L, Inductively Coupled Plasma - Mass Spectrometry Method 200.8, Rev. 5.4 (1994); OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

Copper - total, mg/L, Inductively Coupled Plasma - Mass Spectrometry, Method 200.8, Rev. 5.4 (1994); OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

Iron - total, mg/L, Inductively Coupled Plasma – Mass Spectrometry, Method 200.8, Rev. 5.4 (1994); OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

Lead - total, mg/L, Inductively Coupled Plasma - Mass Spectrometry, Method 200.8, Rev. 5.4 (1994); OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

Magnesium - total, mg/L, Inductively Coupled Plasma – Mass Spectrometry, Method 200.8, Rev. 5.4 (1994); OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

Manganese - total, mg/L, Inductively Coupled Plasma – Mass Spectrometry, Method 200.8, Rev. 5.4 (1994); OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

Nickel - total, mg/L, Inductively Coupled Plasma - Mass Spectrometry, Method 200.8, Rev. 5.4 (1994); OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

Potassium - total, mg/L, Inductively Coupled Plasma - Mass Spectrometry, Method 200.8, Rev. 5.4 (1994); OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

Selenium- total, mg/L, Inductively Coupled Plasma - Mass Spectrometry, Method 200.8, Rev. 5.4 (1994); OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

Sodium - total, mg/L, Inductively Coupled Plasma – Mass Spectrometry, Method 200.8, Rev. 5.4 (1994); OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

Vanadium - total, mg/L, Inductively Coupled Plasma - Mass Spectrometry, Method 200.8, Rev. 5.4 (1994); OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

Zinc- total, mg/ L, Inductively Coupled Plasma- Mass Spectrometry, Method 200.8, Rev. 5.4 (1994); OR by Inductively Coupled Plasma – OES, Method 200.7, Rev. 4.4 (1994)

B4. Quality Control

Laboratory Performance Checks

The performance of the laboratory will be checked with a scheduled system of duplicate samples, spiked samples, and Laboratory Control Samples (LCS) from an outside source.

A. All chemical analysis possible will be checked for accuracy by the analysis of LCS. A minimum of one (1) LCS will be analyzed by the addition of a known amount of target analyte(s) to an aliquot of de-ionized water, free of target analytes per batch of twenty (20) samples. The results must be entered into the Laboratory Information Management System (LIMS) QC system and verified to be within the control limits.
B. Laboratory Precision and the effect of the matrix on analyte recovery will be determined by preparation and analysis of a minimum of one (1) Matrix Spike/Matrix Spike duplicate (MS/MSD) per batch of twenty (20) samples. MS/MSD are prepared by adding a known

amount of target analyte(s) to an aliquot of the sample, which has a field duplicate. The precision and recoveries of the MS/MSD will be compared to method or lab generated acceptance criteria. The results must be entered into the LIMS QC system and verified to be within the control limits.

C. Proficiency testing samples from a NELAC Institute (TNI) accredited PT providers will be analyzed annually. The analyst will perform the analysis without knowing the expected value.

Table 7. Acceptance Criteria and Corrective Actions for Analytical QC Checks

QC Activity	Acceptance Criteria	Recommended Corrective Action
Initial Instrument Blank	Response < Reporting Limit	Prepare another blank, determine cause
Initial Calibration	COV >0.995	Reanalyze standards, make new standards
QC check standard	Method or lab established control limits	Reanalyze standards, make new standards
Continuing Calibration	Method limits	Recalibrate and reanalyze samples
Sample Duplicates	Precision within Limits	Reanalyze, code results
Matrix Spike	Precision within Limits	Reanalyze, determine cause, code results
Matrix Spike Duplicates	Recoveries within Limits	Reanalyze, determine cause, code results

Field Sampling

Field duplicate samples will be collected at a rate of ten percent (10%) or a minimum of one (1) per sampling event. Each field sampler must collect a field duplicate consisting of an additional 250 mL plastic bottle treated with 6 mL of nitric acid at one (1) site during the sampling event.

Procedures to Assess Data Precision and Accuracy

Assess precision and accuracy of all data immediately after analyses are performed. Data from all duplicate and spiked samples will be checked against the acceptance criteria and qualify violations.

Precision

The precision of the data will be determined from the field duplicate samples and the laboratory spiked replicate samples. The control limits for precision are either method-specified or lab-established.

Field Precision

The field precision will be based on the relative percent differences (RPD) between the sample (S1) and its field duplicate (S2). The control limits will be based on laboratory-established control limits. The RPD will be calculated as follows:

$$RPD = \{S2 - S1\} \div \{(S2 + S1) \div 2\} \text{ X } 100$$

Laboratory Precision

The values from laboratory-spiked (LS1 and LS2) replicate samples will be used to evaluate laboratory precision. The control limits will be based on method control limits or lab established limits. The RPD will be calculated:

$$RPD = \{LS2 - LS1\} \div \{(LS2 + LS1) \div 2\} \text{ X } 100$$

Field Accuracy

Since no field readings are collected at the sampling sites, the accuracy of the sampling is determined from field duplicate samples analyzed in the laboratory.

Laboratory Accuracy

The control limits for accuracy are based on method or lab established limits and will be based upon the percent recovery of the laboratory control samples (LCS).

The percent recovery (P) is defined as:

$$P = 100 \text{ X } \{(\text{Final Concentration} - \text{Initial Concentration}) / \text{Spike added}$$

The analysis will be considered out of control if the recovery of the LCS is outside of the acceptance criteria for that parameter.

Corrective Action

If any problems with the samples are encountered, the issues will be documented on an Incident Report Form or Corrective and Preventative Action report and the LPS, or the Chemist Supervisor will contact the sampler. Corrective actions may include additional training and communicating sampling requirements to individuals charged with sample collection responsibility.

The purpose of corrective action is to document and promptly address major and/or minor problems, and to develop a plan that will eliminate the potential for repetition of the problem.

Corrective actions are taken when:

A. Quality control checks reveal a problem.
B. The QC data are out of control.
C. Deficiencies are cited during an audit.
D. Samples are lost or mishandled.

Representativeness

Determining whether the results from a sample represent the characteristics of the main water mass sampled is controlled by the sampling process. The PM/C, or designee, is responsible for site selection. The PM/C, or designee, is responsible for field staff training and adherence to sampling procedures. The control limits set for each field duplicate parameter are meant to assure proper sampling technique.

Completeness

An annual progress report, incorporating the number of samples collected, is prepared by the PM/C, or designee.

Comparability

The laboratory must use two approaches to ensure that data generated by the laboratory is comparable to data from other sources:

A. Only EPA-approved methods will be used on these projects.
B. The laboratory will participate in two (2) performance evaluation studies annually. These studies indicate the confidence of laboratory results and allow for comparison of all laboratory's results with other laboratories throughout the country.

EIO in this QAPP do not utilize models or involve modeling activities.

B5. Instruments/Equipment Calibration, Testing, Inspection, and Maintenance

Inspections and Acceptance Testing of Instruments

All instruments purchased for this project will meet specific performance criteria before acceptance. The use of calibration standards will be used for these tests. Each instrument will be inspected during its scheduled cleaning and/or per manufacturer recommendations or operating instructions.

Final Acceptance

The final acceptance will be performed by the Chemist Supervisor or the LPS to assure compliance with purchase requirements.

Resolution of Deficiencies

If deficiencies are found during the testing procedure, the vendor will be given every opportunity to correct the problem within the available time allowed by the project and funding mechanisms.

Preventive Maintenance

A. Analytical Balance
    1. All analytical balances must be cleaned weekly and immediately after any chemical spills.
    2. The balance table must be kept neat and cleaned after any spills. Any spill that might interfere with trace analysis, such as mercury compounds, must be immediately and thoroughly cleaned.
    3. All analytical balances must be cleaned and checked by a balance service annually or whenever a problem is found.
    4. Daily Calibration checks are recorded before the balance is used.

B. ICP/MS and ICP/OES
    1. The maintenance schedule should be followed.
    2. The following spare materials should be maintained and available
        i. Pump tubing
        ii. Inline filters
        iii. Nebulizer

C. Di-ionized Water System
    1. Maintenance will be performed on the system by a vendor on a routine and scheduled basis.

Calibration Procedures

Calibration, the process of adjusting a piece of equipment to ensure it gives accurate answers, is one of the most important steps in any analysis. All laboratory equipment must be routinely calibrated. Calibration procedures are used on the following equipment.

A. Laboratory Instrumentation
    1. Metals
        i. ICP/MS as required by the method
        ii. ICP/OES as required by the method

B. Stock Standard Receipt and Traceability
   2. Purchased Standards
   3. Stock standards should be purchased from reputable vendors. They should be National Institute for Standards and Technology traceable and documented in the LIMS. They should be labeled with a lot number and an expiration date. Certificates of analysis should be filed for future reference, as part of the record.

C. Prepared Standards
   1. Standards prepared from pure compounds are documented in the LIMS for traceability. This information should include manufacturer, lot number, expiration date, weights and volumes taken, final concentration and preparer's initials.

D. Intermediate Standards
   2. The preparation of intermediate dilutions, mixed standards and spiking solutions must be recorded in the LIMS. The information recorded must include the lot number of the stock, concentration of the stock used, volume of the stock taken, final volume, final concentration of each component, preparer's initials, and date.

E. Calibration Standards
   1. Calibration standards are prepared from stock or intermediate standards. The preparation of calibration standards is documented in the LIMS. The information recorded must include lot number of stock, concentration of the stock used, volume of stock taken, final volume, final concentration or each component, preparer's initials and date.

B6. Inspection/Acceptance of Supplies and Services

The PM/C, or designee, purchases supplies and consumables. The individual receiving the items inspects them and checks the items received against the packing slip.

All chemicals and reagents are inspected for proper expiration dates. Purchase chemical standards used for calibration from reputable vendors with Certificates of Analysis listing the certified chemical content. The final acceptance will be performed by the LPS to assure compliance with purchase requirements.

B7. Environmental Information Management

Field Data

The data collected in the field is recorded on the COC form (**Appendix C**).

Upon receipt of the sample by a DEQ-accredited lab, the date of sample receipt, time of sampling, and station number is entered into the LIMS and issued a laboratory log number.

Laboratory Data

Automated Methods: Data generated by automated procedures, e.g. ICP-OES, is imported directly to LIMS. All instrument-generated paper is stored according to the DEQ's Records Retention Policy.

Control Mechanisms for Detection/Correcting Errors

The data is checked for errors at several points. The data must pass all precision-and-accuracy-checks for both the field duplicates and the laboratory matrix spike replicates. The data must be within the allowed range. Ranges are method dependent.

Data Handling Equipment and Procedures

Computer hardware and software is acquired according to the DEQ Information Technology (IT) Budget and Expenditure Plan. IT is responsible for the computer and network infrastructure as well as all DEQ software needs. The data center is equipped with a large Uninterruptible Power Supply and generator backup that support both IT and Laboratory Services infrastructure. An off-site disaster recovery site helps maintain a backup and image of data housed at the main campus.

Programs used to process, compile, and analyze the data include the EPA Water Quality Exchange storage system (WQX) and programs developed by DEQ personnel or purchased programs such as Microsoft Office.

In addition, OWQ keeps pdf copies of all sampling records and analytical results in the UIC Program files.

Data Storage

Data are transferred to the DEQ server and backed up daily. Data from all water quality monitoring networks are regularly transferred to the WQX.

Data Use

Data generated are available upon request to LPS. Laboratory staff access data within the LIMS, maintained in-house.

Group C: Assessment, Response Actions, and Oversight

C1. Assessments and Response Actions

Field duties are evaluated by PM/C or designee to assess sampling methodologies, data handling, field quality control procedures, and personnel activities. Annual refresher training courses should be made available to sample collectors on sampling methodologies and quality control procedures.

The E&E QAM or LPS will conduct an annual inspection of the laboratory to review and assess analytical procedures, laboratory personnel, facilities, instrumentation, laboratory quality control, and data handling. The QM/C or designated personnel will also perform annual inspections of field duties to assess sampling methodologies, data handling, field quality control procedures, and personnel.

Laboratory performance will be checked using semi-annual Performance Testing (PT) Provider check samples. A sample for each measurement parameter will be analyzed and the results reviewed by the QM/C and LPS. The QAM or designee may conduct at least one (1) field audit consisting of, but not limited to, sampling techniques, sample preservation, sample labeling, and field data handling techniques during the project period. A report on any deviations from the QAPP will be generated and distributed to the QM/C, LPS, and other applicable personnel.

Corrective actions are taken when:

A. quality control checks reveal a problem,
B. the QC data is out of control,
C. deficiencies are cited during an audit, or
D. data is determined to be questionable by an outlier test.

If for any of the above reasons precision and/or accuracy data fall outside the boundaries of the control or acceptable recovery or bias standards, the analyst will consult his/her supervisor. If it is determined that the analytical system is out of control, the QAM, the LPS of the Office of Water Quality, or the Laboratory Chemist Supervisor will be consulted, and the system is brought back into control. Currently all data sets containing precision or accuracy points that have shown the analysis to be anomalous with past data sets are re-analyzed, if possible.

C2. Oversight and Reports to Management

If applicable, an annual summary QA report may be prepared and submitted to either the PM/C, the LPS, or the QAM. The report should identify any quality assurance issue that resulted in a significant amount of data loss and the corrective measures that were immediately taken, if any, to address the issue. The report may also discuss recommendations to help prevent future QA failures and/or any actions that did occur that may help limit future QA issues. All quality assurance issues, either major (significant loss of data) or minor (meter failure) should be verbally reported to one

of the above individuals as soon as possible. Minor QA issues may or may not be included in the annual report.

One additional report that may be prepared, if requested, is the results of a periodic evaluation of the data produced by the projects associated with this QAPP. The report may include information such as an assessment of the data quality in terms of precision, accuracy, and completeness of the project as described in Element D1, 2, and 3.

As a result of these reports, senior management may or may not instruct senior staff members to establish training or educational opportunities to enhance the quality assurance knowledge of field staff. These opportunities may include training on new sampling and preservation methods, documentation records, corrective action procedures, and other QA related activity. Annual progress reports will be generated by the PM/C and distributed to the EPA and the DEQ OWQ Deputy Director.

Group D: Environmental Information Review and Usability Determination

D1. Environmental Information Review

Data integrity must be validated prior to entry into the database. The LPS is responsible for ensuring all field data are properly reviewed and verified and are in the proper format for submitting storage databases. All data produced must meet data quality objectives outlined in Element A6.

D2. Usability Determination

Data Verification

Verification refers to the process of confirming a process or procedure was followed. Data verification is performed using self-assessments and by a technical review by the LPS, PM/C, or designee. Data to be verified are evaluated against project specifications and are checked for errors in transcriptions, calculations, and data input. Potential outliers are handled by the procedure listed below. Issues that can be resolved will be corrected and documented.

Data Validation

The LPS. PM/C, or designee, are responsible for validating that the verified data are usable and reportable. They are also responsible for re-evaluating the data to determine whether any anomalies are present.

Data integrity will be verified at several points during the collection and reporting process. The two principal check points are laboratory quality control checks and data processing checks made during the data preparation. These checks consist of use of field duplicates, laboratory duplicates,

and spikes to monitor the levels of precision and accuracy of the collection and analytical processes.

The data processing checks are designed to ensure the accurate transfer of the data to the computer system. Water constituent data are verified by a computer program that inspects the data for values out of the permissible or normal range.

Outliers

A. Quality Control Data

1. Outliers from the quality control checks indicate sampling or analytical problems. Re-analyze all samples in these out-of-control situations. If re-analysis is impossible, examine data for obvious causes.

2. If reasons are found for the problem, e.g. dilution error or field duplicate samples are obviously different, the QC data will not be used in the database to calculate new control limits. If the analytical process is found to be on control, based on other control samples in the same analysis set, the data for the samples can be used.

3. If reasons for the problem are not found, test the QC data to see if it is an outlier. If the test results do not justify calling the suspect data point an outlier use the data in the QC database to calculate new control limits.

B. Sample Data

1. When a value in a data set is suspiciously high or low, examine to see if it must be discarded to avoid biasing the data set. The first check should be to see if there is any physical reason, e.g. high flow, low flow, abnormal temperature, reporting error, transcription error, or any other explanation for the abnormal data.

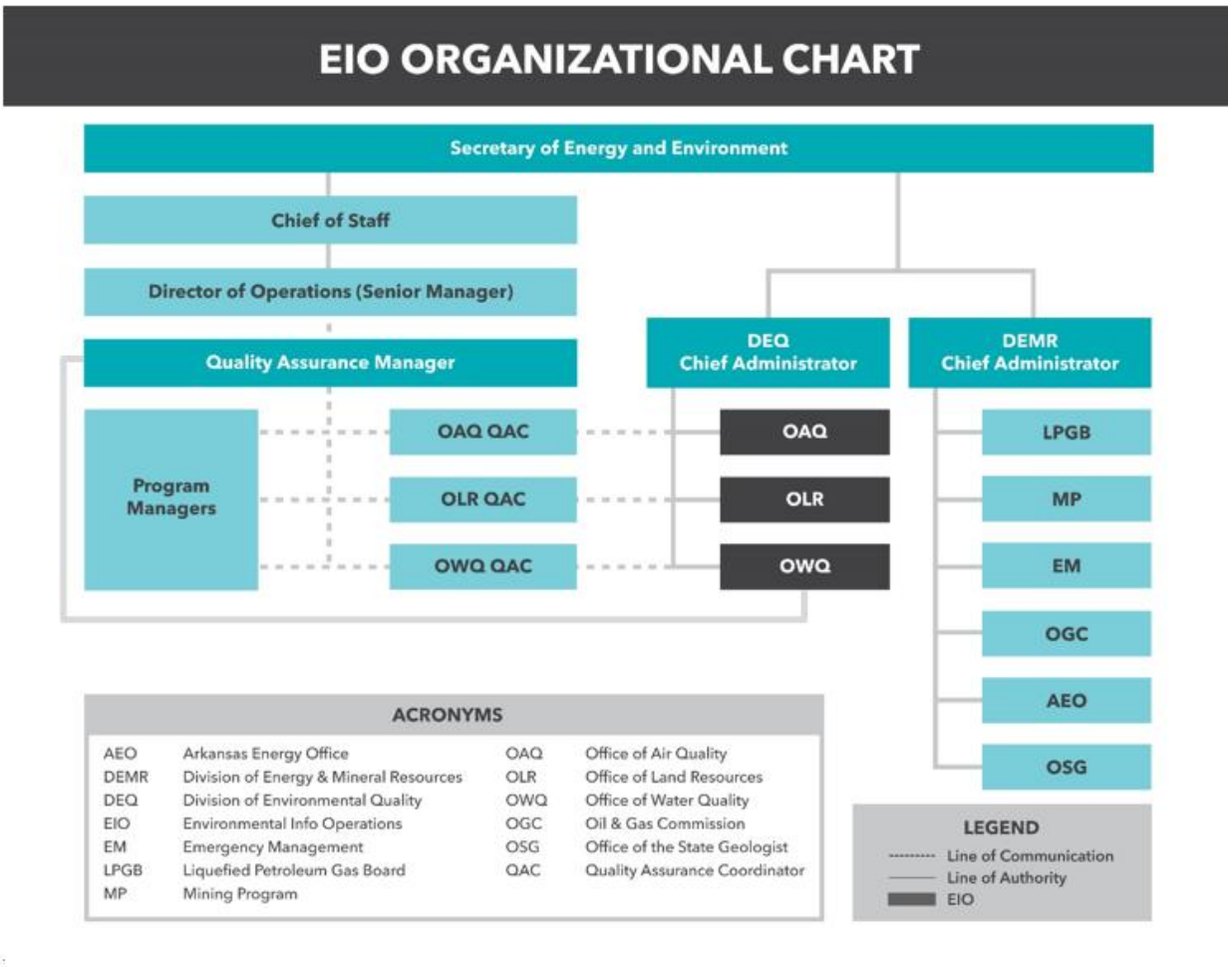
2. If a reason for the suspicious value is not found it must be tested to see if it is statistically judged to be an outlier. The suspect data point and the eleven closest data points in the data set should be used in the test.

Results obtained from projects associated with this QAPP are evaluated periodically and at the end of the project to determine if data quality objectives are being, or have been, obtained. Project completeness will be reconciled with the expected outputs. Data precision and accuracy developed for the project will be reported to the decision makers to establish the limits that should be placed on the data.

Data generated by projects associated with this QAPP that meet the QA/QC requirements set forth by this QAPP may be used to establish trend analyses, background, or baseline levels of spent brine quality criteria.

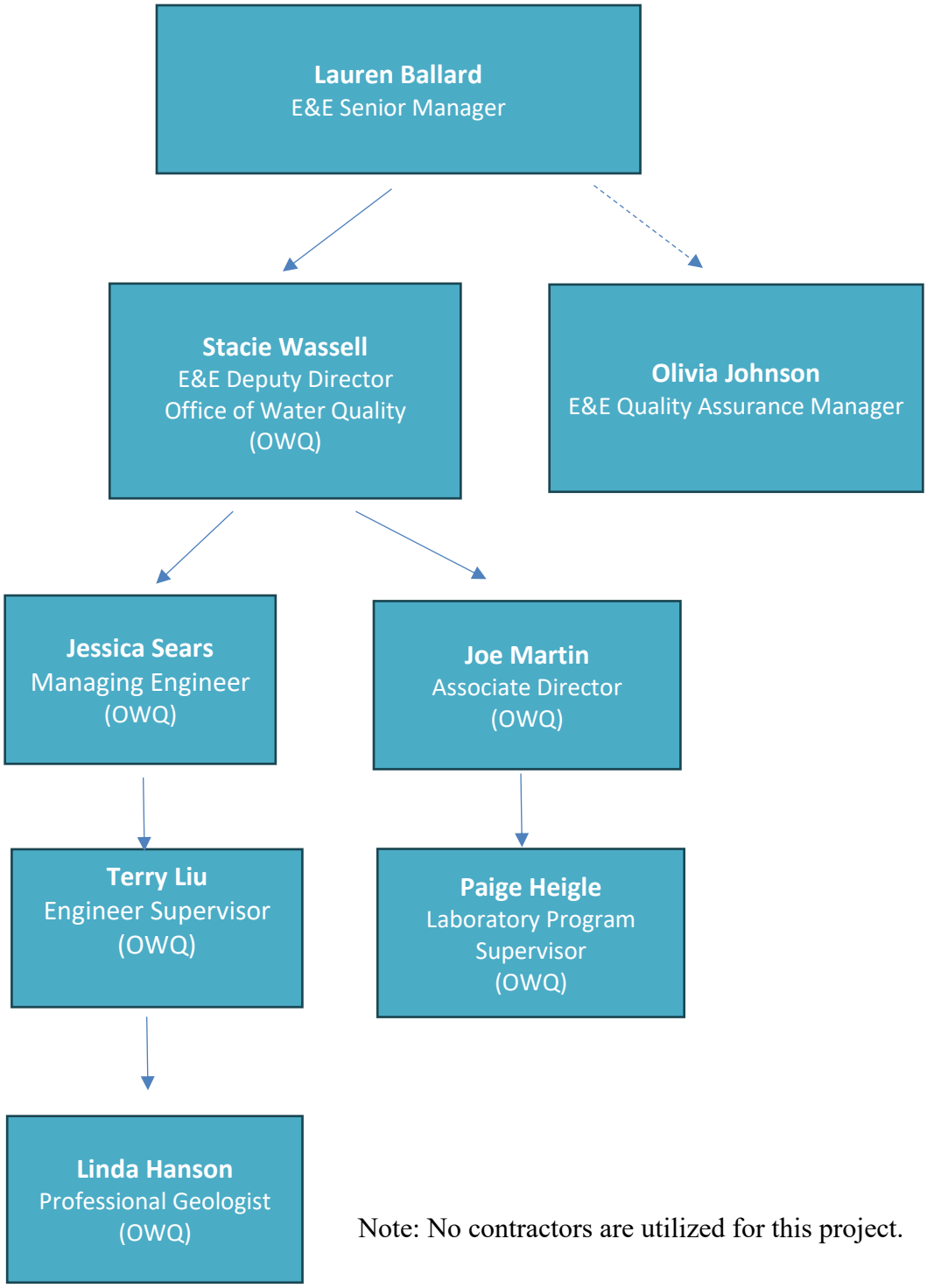
APPENDIX A

PROJECT ORGANIZATIONAL CHARTS



Note: No contractors are utilized for this project.

DEQ, Office of Water Quality
UIC QAPP Organizational Chart



Note: No contractors are utilized for this project.

APPENDIX B

SAMPLE LABELING PROCEDURES & TYPICAL SAMPLE LABELS

Sampling documentation includes the sample number and type, date and time, and the location and facility name. This information is recorded directly on the sample containers with a permanent marker. In the event samples for constituents other than metals are collected, labels will be attached to the containers, or the documentation will be written with a permanent marker directly on the plastic zip-top bag holding the containers. It is also included on the chain of custody form (**Appendix C**).

APPENDIX C

CHAIN OF CUSTODY FORM

Division of Environmental Quality
Office of Water Quality Laboratory
CHAIN OF CUSTODY (COC) RECORD

To be completed in blue or black ink

Rev. 4 Effective Date 04/01/2026

Page _____ of _____

Facility, District, or Project Name	AFIN #/ County

Printed Name of Sampler(s)

Container	P	P	V	P	P	O	O	P	
Presevation	A	C	AB	A	AE	A	A	AB	

Parameters Requested

Lab #	Sample ID	Date Collected (mm/dd/yy)	Time Collected (hh:mm)	GRAB OR COMPOSITE (G) or (C)	MEDIA CODE	Routine Wet Chem*	Metals*, (T), (d)	DOC or TOC	BOD_5 or $CBOD_5$	E. coli or Fecal	Chl a or periphyton	Cyanotoxin	NH_4, TN, TP	Number of Containers

Container Type Code	Media Code	Preservation Code	Parameter Notes*
P = Polyethylene/Plastic	W = water	A = Cool to ≤ 6°C	**Routine Wet Chem:**
G = Glass	L = liquid (not water)	B = Sulfuric Acid	Cl, F, Br, SO4, TSS/TDS
A = Amber Glass	S = soil or solid	C = Nitric Acid	Turb, Cond, NH_4, NO_3+NO_2,
V = Septum top, Glass	E = edible tissue	D = NaOH	Alk, TP, TKN
O = Other	B = other	E = Sodium Thiosulfate	**Metals:** Sb, As, Ba, Be, Cd,
		F = Other (specify)	Cr, Co, Cu, Pb, Ni, Se, Ag,
			Tl, V, Zn, Al, Ca, Fe, Mg, Mn
			K, Na, P, Hardness

Field Measurements

DO (mg/L)	pH (SU)	Temp (°C)	Cond (uS/cm)	Turb† (NTU)	Flow Severity	Latitude (DD)	Longitude (DD)	Secchi (m)	Sample Depth (m)	Lake Depth (m)

In situ meter post field check	Sampled and Relinquished By: Signature	Date/Time	Received By: Signature	Date/Time
DO QC Pass: O Y O N O NA				
pH QC Pass: O Y O N O NA	Printed:		Printed:	
Cond QC Pass: O Y O N O NA	Relinquished By: Signature	Date/Time	Received By: Signature	Date/Time
Turb QC Pass: O Y O N O NA				
	Printed:		Printed:	
SAMPLE CONDITION UPON RECEIPT IN LAB (for completion by lab only)	Relinquished By: Signature	Date/Time	Received By: Signature	Date/Time
1. Containers Correct ___Yes ___No				
2. COC & Labels Agree ___Yes ___No	Printed:		Printed:	
3. Received on Ice ___Yes ___No				
4. Temp (°C) Upon Receipt				

Notes:

*corresponding benchtop measurements recorded in database - field measurements recorded on COC to inform sampling

This page is intentionally left blank.