**Class VI Injection Well: Quality Assurance and Surveillance Plan**

INSERT DATE

**INSERT PROJECT NAME**

|  |
| --- |
| **INSTRUCTIONS**  This template provides a suggested outline and recommendations for a Quality Assurance and Surveillance Plan for a Class VI well. Permit applicants are not required to use this template. This document does not substitute for promulgated provisions or regulations, nor is it a regulation itself, and it does not impose legally-binding requirements on the U.S. Environmental Protection Agency (EPA), states, or the regulated community.  In this template, instructions or suggestions appear in ***blue text***. These are provided to assist with site- and project-specific plan development. These are recommendations and are not required elements of the federal Class VI Rule.  Please delete the ***blue text*** and replace the yellow highlighted text before submitting your document. Similarly, please adjust the example text and tables throughout as necessary (e.g., by adding or removing rows or columns). Appropriate figures, references, etc. should also be included to support the text of the plan.  For more information, see EPA’s Class VI guidance documents at <https://www.epa.gov/uic/class-vi-guidance-documents>. It is the responsibility of the owner or operator to maintain records of previous revisions to this plan. |

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# Title and Approval Sheet

This Quality Assurance and Surveillance Plan (QASP) is approved for use and implementation at INSERT FACILITY. The signatures below denote the approval of this document and intent to abide by the procedures outlined within it.

*[Add lines as needed to include all appropriate staff.]*

|  |  |  |
| --- | --- | --- |
| Signature  INSERT TYPED NAME  INSERT TITLE |  | Date |
| Signature  INSERT TYPED NAME  INSERT TITLE |  | Date |
| Signature  INSERT TYPED NAME  INSERT TITLE |  | Date |

# Distribution List

The following project participants will receive the completed Quality Assurance and Surveillance Plan (QASP) and all future updates for the duration of the project.

*[Include names, titles, business addresses, and telephone numbers for all appropriate staff.]*

# A. Project Management

## A.1. Project/Task Organization

### A.1.a/b. Key Individuals and Responsibilities

### A.1.c. Independence from Project QA Manager and Data Gathering

### A.1.d. QA Project Plan Responsibility

### A.1.e. Organizational Chart for Key Project Personnel

## A.2. Problem Definition/Background

### A.2.a. Reasoning

### A.2.b. Reasons for Initiating the Project

### A.2.c. Regulatory Information, Applicable Criteria, Action Limits

## A.3. Project/Task Description

### A.3.a/b. Summary of Work to be Performed

*[Refer to Table INSERT NUMBER X, Summary of Testing and Monitoring, for a high-level list of planned activities.*

*To avoid the need to update the QASP if minor changes to the project’s Testing and Monitoring Plan are made (e.g., increasing monitoring frequency), refer to the Testing and Monitoring Plan for the monitoring schedule instead of including the schedule here.]*

Table Insert Number X. Summary of Testing and Monitoring.

| **Activity** | **Location(s)** | **Method** | **Analytical Technique** | **Lab/Custody** | **Purpose** |
| --- | --- | --- | --- | --- | --- |
| Carbon dioxide stream analysis |  |  |  |  |  |
| Injection rate and volume |  |  |  |  |  |
| Injection pressure |  |  |  |  |  |
| Annular pressure |  |  |  |  |  |
| Downhole pressure/ temperature |  |  |  |  |  |
| Corrosion monitoring |  |  |  |  |  |
| Mechanical integrity |  |  |  |  |  |
| Insert Other activity |  |  |  |  |  |
| Insert Other activity |  |  |  |  |  |
| Insert Other activity |  |  |  |  |  |

*[Add separate summary tables for specific activities (e.g., ground water monitoring), if necessary.]*

Table Insert Number X. Instrumentation Summary.

| **Monitoring Location** | **Instrument Type** | **Monitoring Target (Formation or Other)** | **Data Collection Location(s)** | **Explanation** |
| --- | --- | --- | --- | --- |
| CO2 Facility | Insert Instrument 1 |  |  |  |
| Insert Instrument 2 |  |  |  |
| Monitoring Well Insert #1 | Insert Instrument 1 |  |  |  |
| Insert Instrument 2 |  |  |  |
| Monitoring Well Insert #2 | Insert Instrument 1 |  |  |  |
| Insert Instrument 2 |  |  |  |
| Insert Other location | Insert Instrument 1 |  |  |  |
| Insert Instrument 2 |  |  |  |

*[Add separate summary tables for specific activities (e.g., geophysical surveys), if necessary.]*

### A.3.c. Geographic Locations

### A.3.d. Resource and Time Constraints

## A.4.Quality Objectives and Criteria

### A.4.a. Performance/Measurement Criteria

*[Refer to the tables below for specific analytical parameters and testing/monitoring outputs.]*

Table Insert Number X. Summary of Analytical and Field Parameters for Fluid Samples in INSERT FORMATION NAME.

*[The table below includes some example parameters; include additional parameters (or delete parameters) as appropriate.]*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameters | Analytical Methods(1) | Detection Limit/Range | Typical Precisions | QC Requirements |
| Cations:  List specific cations |  |  |  |  |
| Anions:  List specific anions |  |  |  |  |
| Dissolved CO2 |  |  |  |  |
| Total dissolved solids |  |  |  |  |
| Alkalinity |  |  |  |  |
| pH (field) |  |  |  |  |
| Specific conductance (field) |  |  |  |  |
| Temperature (field) |  |  |  |  |
| Insert Other parameter |  |  |  |  |
| Insert Other parameter |  |  |  |  |
| Insert Other parameter |  |  |  |  |

Note 1: An equivalent method may be employed with the prior approval of the UIC Program Director.

Table Insert Number X. Summary of Analytical Parameters for CO2 Stream.

*[The table below includes some example parameters; include additional parameters (or delete parameters) as appropriate.]*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameters | Analytical Methods(1) | Detection Limit/Range | Typical Precisions | QC Requirements |
| Oxygen |  |  |  |  |
| Nitrogen |  |  |  |  |
| Carbon monoxide |  |  |  |  |
| Oxides of nitrogen |  |  |  |  |
| Total hydrocarbons |  |  |  |  |
| Methane |  |  |  |  |
| Acetaldehyde |  |  |  |  |
| Sulfur dioxide |  |  |  |  |
| Hydrogen sulfide |  |  |  |  |
| Ethanol |  |  |  |  |
| CO2 purity |  |  |  |  |
| Insert Other parameter |  |  |  |  |
| Insert Other parameter |  |  |  |  |
| Insert Other parameter |  |  |  |  |

Note 1: An equivalent method may be employed with the prior approval of the UIC Program Director.

Table Insert Number X. Summary of Analytical Parameters for Corrosion Coupons.

*[Add or delete parameters as needed.]*

| **Parameters** | **Analytical Methods** | **Detection Limit/Range** | **Typical Precisions** | **QC Requirements** |
| --- | --- | --- | --- | --- |
| Mass |  |  |  |  |
| Thickness |  |  |  |  |
| Insert Other parameter |  |  |  |  |
| Insert Other parameter |  |  |  |  |
| Insert Other parameter |  |  |  |  |

Table Insert Number X. Summary of Measurement Parameters for Field Gauges.

*[Add or delete parameters as needed.]*

| Parameters | Methods | Detection Limit/Range | Typical Precisions | QC Requirements |
| --- | --- | --- | --- | --- |
| Booster pump discharge pressure |  |  |  |  |
| Injection tubing temperature |  |  |  |  |
| Annulus pressure |  |  |  |  |
| Injection tubing pressure |  |  |  |  |
| Wellhead pressure |  |  |  |  |
| Downhole temperature |  |  |  |  |
| Injection mass flow rate |  |  |  |  |
| Insert Other parameter |  |  |  |  |
| Insert Other parameter |  |  |  |  |
| Insert Other parameter |  |  |  |  |

Table Insert Number X. Actionable Testing and Monitoring Outputs.

*[Add or delete outputs as needed. Ensure entries are consistent with the Emergency and Remedial Response Plan, where appropriate.]*

| Activity or Parameter | **Project Action Limit** | **Detection Limit** | **Anticipated Reading** |
| --- | --- | --- | --- |
| External mechanical integrity (Insert test type) |  |  |  |
| Internal mechanical integrity (Insert measurement type) |  |  |  |
| Surface pressure |  |  |  |
| Downhole pressure |  |  |  |
| Water quality (Insert formation) |  |  |  |
| Above-confining-zone pressure (Insert formation) |  |  |  |
| Insert Other parameter |  |  |  |
| Insert Other parameter |  |  |  |
| Insert Other parameter |  |  |  |

*[For Sections A.4.b through A.4.g, refer to the tables below as needed. These tables are provided as examples; add or remove tables (or rows/columns within the tables) as needed based on instruments or methods to be used.]*

### A.4.b. Precision

### A.4.c. Bias

### A.4.d. Representativeness

### A.4.e. Completeness

### A.4.f. Comparability

### A.4.g. Method Sensitivity

Table Insert Number X. Pressure and Temperature—Downhole Gauge Specifications.

|  |  |
| --- | --- |
| Parameter | Value |
| Calibrated working pressure range |  |
| Initial pressure accuracy |  |
| Pressure resolution |  |
| Pressure drift stability |  |
| Calibrated working temperature range |  |
| Initial temperature accuracy |  |
| Temperature resolution |  |
| Temperature drift stability |  |
| Max temperature |  |
| Instrument calibration frequency |  |

Table Insert Number X. Representative Logging Tool Specifications.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | **Insert Tool #1** | **Insert Tool #2** | **Insert Tool #3** | **Insert Tool #4** |
| Logging speed |  |  |  |  |
| Vertical resolution |  |  |  |  |
| Investigation |  |  |  |  |
| Temperature rating |  |  |  |  |
| Pressure rating |  |  |  |  |

Table Insert Number X. Pressure Field Gauge.

|  |  |
| --- | --- |
| Parameter | Value |
| Calibrated working pressure range |  |
| Initial pressure accuracy |  |
| Pressure resolution |  |
| Pressure drift stability |  |

Table Insert Number X. Pressure Field Gauge—Injection Tubing Pressure.

| Parameter | Value |
| --- | --- |
| Calibrated working pressure range |  |
| Initial pressure accuracy |  |
| Pressure resolution |  |
| Pressure drift stability |  |

Table Insert Number X. Pressure Field Gauge—Annulus Pressure.

|  |  |
| --- | --- |
| Parameter | Value |
| Calibrated working pressure range |  |
| Initial pressure accuracy |  |
| Pressure resolution |  |
| Pressure drift stability |  |

Table Insert Number X. Temperature Field Gauge—Injection Tubing Temperature.

|  |  |
| --- | --- |
| Parameter | Value |
| Calibrated working temperature range |  |
| Initial temperature accuracy |  |
| Temperature resolution |  |
| Temperature drift stability |  |

Table Insert Number X. Mass Flow Rate Field Gauge—CO2 Mass Flow Rate.

|  |  |
| --- | --- |
| Parameter | Value |
| Calibrated working flow rate range |  |
| Initial mass flow rate accuracy |  |
| Mass flow rate resolution |  |
| Mass flow rate drift stability |  |

## A.5. Special Training/Certifications

### A.5.a. Specialized Training and Certifications

### A.5.b/c. Training Provider and Responsibility

## A.6. Documentation and Records

### A.6.a. Report Format and Package Information

### A.6.b. Other Project Documents, Records, and Electronic Files

### A.6.c/d. Data Storage and Duration

### A.6.e. QASP Distribution Responsibility

# B. Data Generation and Acquisition

## B.1. Sampling Process Design

### B.1.a. Design Strategy

#### CO2 Stream Monitoring Strategy

#### Corrosion Monitoring Strategy

#### Shallow Groundwater Monitoring Strategy

#### Deep Groundwater Monitoring Strategy

*[Add subsections to Section B.1.a if additional types of monitoring are planned.]*

### B.1.b. Type and Number of Samples/Test Runs

### B.1.c. Site/Sampling Locations

### B.1.d. Sampling Site Contingency

### B.1.e. Activity Schedule

### B.1.f. Critical/Informational Data

### B.1.g. Sources of Variability

## B.2. Sampling Methods

### B.2.a/b. Sampling SOPs

*[Refer to the table below for stabilization criteria during well purging.]*

Table Insert Number X. Stabilization Criteria of Water Quality Parameters During Shallow Well Purging.

*[Add/delete parameters as needed.]*

|  |  |
| --- | --- |
| **Field Parameter** | **Stabilization Criteria** |
| pH |  |
| Temperature |  |
| Specific conductance |  |
| Dissolved oxygen |  |
| Turbidity |  |

### B.2.c. In-situ Monitoring

### B.2.d. Continuous Monitoring

### B.2.e. Sample Homogenization, Composition, Filtration

### B.2.f. Sample Containers and Volumes

*[Refer to the tables below as needed for sample container, preservation, and holding time information.]*

### B.2.g. Sample Preservation

*[Refer to the tables below as needed for sample container, preservation, and holding time information.]*

### B.2.h. Cleaning/Decontamination of Sampling Equipment

### B.2.i. Support Facilities

### B.2.j. Corrective Action, Personnel, and Documentation

## B.3. Sample Handling and Custody

### B.3.a. Maximum Hold Time/Time Before Retrieval

*[Refer to the tables below as needed for sample container, preservation, and holding time information.]*

### B.3.b. Sample Transportation

### B.3.c. Sampling Documentation

### B.3.d. Sample Identification

Table Insert Number X. Summary of Sample Containers, Preservation Treatments, and Holding Times for CO2 Gas Stream Analysis.

*[Add or delete rows as needed.]*

|  |  |  |  |
| --- | --- | --- | --- |
| **Sample** | **Volume/Container Material** | **Preservation Technique** | **Sample Holding time (max)** |
| CO2 gas stream |  |  |  |

Table Insert Number X. Summary of Anticipated Sample Containers, Preservation Treatments, and Holding Times for Ground Water Samples.

*[The table below includes some example parameters; include additional parameters (or delete parameters) as appropriate.]*

|  |  |  |  |
| --- | --- | --- | --- |
| Target Parameters | **Volume/Container Material** | **Preservation Technique** | **Sample Holding Time** |
| Cations:  List specific cations |  |  |  |
| Anions:  List specific anions |  |  |  |
| Dissolved CO2 |  |  |  |
| Isotopes:  List specific isotopes |  |  |  |
| Alkalinity |  |  |  |
| Field Confirmation:  List specific parameters |  |  |  |
| Insert Other parameter |  |  |  |
| Insert Other parameter |  |  |  |
| Insert Other parameter |  |  |  |

### B.3.e. Sample Chain-of-Custody

## B.4. Analytical Methods

### B.4.a. Analytical SOPs

### B.4.b. Equipment/Instrumentation Needed

### B.4.c. Method Performance Criteria

### B.4.d. Analytical Failure

### B.4.e. Sample Disposal

### B.4.f. Laboratory Turnaround

### B.4.g. Method Validation for Nonstandard Methods

## B.5. Quality Control

### B.5.a. QC activities

#### Blanks

#### Duplicates

### B.5.b. Exceeding Control Limits

### B.5.c. Calculating Applicable QC Statistics

#### Charge Balance

#### Mass Balance

#### Outliers

## B.6. Instrument/Equipment Testing, Inspection, and Maintenance

## B.7. Instrument/Equipment Calibration and Frequency

### B.7.a. Calibration and Frequency of Calibration

### B.7.b. Calibration Methodology

### B.7.c. Calibration Resolution and Documentation

## B.8. Inspection/Acceptance for Supplies and Consumables

### B.8.a/b. Supplies, Consumables, and Responsibilities

## B.9. Nondirect Measurements

### B.9.a. Data Sources

### B.9.b. Relevance to Project

### B.9.c. Acceptance Criteria

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## B.10. Data Management

### B.10.a. Data Management Scheme

### B.10.b. Recordkeeping and Tracking Practices

### B.10.c. Data Handling Equipment/Procedures

### B.10.d. Responsibility

### B.10.e. Data Archival and Retrieval

### B.10.f. Hardware and Software Configurations

### B.10.g. Checklists and Forms

# C. Assessment and Oversight

## C.1. Assessments and Response Actions

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### C.1.b. Responsibility for Conducting Assessments

### C.1.c. Assessment Reporting

### C.1.d. Corrective Action

## C.2. Reports to Management

### C.2.a/b. QA status Reports

# D. Data Validation and Usability

## D.1. Data Review, Verification, and Validation

### D.1.a. Criteria for Accepting, Rejecting, or Qualifying Data

## D.2. Verification and Validation Methods

### D.2.a. Data Verification and Validation Processes

### D.2.b. Data Verification and Validation Responsibility

### D.2.c. Issue Resolution Process and Responsibility

### D.2.d. Checklist, Forms, and Calculations

## D.3. Reconciliation with User Requirements

### D.3.a. Evaluation of Data Uncertainty

### D.3.b. Data Limitations Reporting

# References

# Appendices

*[Include, as needed, additional information that supports the QASP. Examples may include detailed proceures, sampling, or calibration information; materials from equipment manufacurers; information provided by subcontractors who will perform certain testing and monitoring activities; or sample worksheets to document testing and monitoring results. To support consistency with other permit documents (e.g., the Testing and Mointoring Plan, the PISC and Site Closure Plan, and the Emergency and Remedial Response Plan), consider what information is best included in those documents vs. in this QASP.]*