

Plan revision number: 0
Plan revision date: June 2024

TESTING AND MONITORING PLAN
40 CFR 146.90
Bayou Bend East SL20220050

PBI CROSSWALK FOR BAYOU BEND EAST CLASS VI APPLICATION

Plan Number	Plan Document Title	Contains PBI
07	Testing and Monitoring Plan	Yes
	Appendix 7-1: Quality Assurance and Surveillance Plan	Yes
	Appendix 7-2: Testing and Monitoring Plan Figures	Yes

TABLE OF CONTENTS

PBI Crosswalk for Bayou Bend East Class VI Application i

TABLE OF CONTENTS i

LIST OF TABLES iii

List of Figures..... iv

List of Appendicies..... iv

7 TESTING AND MONITORING PLAN 40 CFR 146.90..... 1

7.1 Facility Information 1

7.2 Introduction..... 1

7.3 Overall Strategy and Approach for Testing and Monitoring 1

7.3.1 Testing and Monitoring Plan Objectives 1

7.3.2 Testing and Monitoring Plan Focus Areas 2

7.3.3 Monitoring Network Design and Strategy 4

7.3.4 Quality assurance procedures 7

7.3.5 Reporting procedures..... 7

Plan revision number: 0

Plan revision date: June 2024

7.4	Carbon Dioxide Stream Analysis [40 CFR 146.90(a)]	7
7.4.1	Sampling location and frequency.....	7
7.4.2	Analytical parameters.....	7
7.4.3	Sampling methods	8
7.4.4	Laboratory to be used/chain of custody and analysis procedures	8
7.5	Continuous Recording of Operational Parameters [40 CFR 146.88I(1), 146.89(b) and 146.90(b)]	8
7.5.1	Monitoring location and frequency.....	8
7.5.2	Monitoring details.....	10
7.6	Corrosion Monitoring	11
7.6.1	Monitoring location and frequency.....	11
7.6.2	Sample description.....	11
7.6.3	Monitoring details.....	11
7.7	Above Confining Zone Monitoring	12
7.7.1	Monitoring location and frequency.....	12
7.7.2	Analytical parameters.....	14
7.7.3	Sampling methods	17
7.7.4	Laboratory to be used/chain of custody procedures	17
7.8	External Mechanical Integrity Testing.....	17
7.8.1	Testing location and frequency.....	17
7.8.2	Testing & Monitoring details.....	18
7.8.3	External MIT via logging.....	18
7.9	Pressure Fall-Off Testing	19
7.9.1	Testing location and frequency.....	19
7.9.2	Testing details	19
7.10	Carbon Dioxide Saturation Front and Pressure Front Tracking.....	19
7.10.1	Saturation front monitoring location and frequency.....	19
7.10.2	Saturation front monitoring details.....	22

Plan revision number: 0
Plan revision date: June 2024

7.10.3	Pressure-front monitoring location and frequency.....	24
7.10.4	Pressure-front monitoring details.....	24
7.11	Appendix: Quality Assurance and Surveillance Plan	24
7.12	Additional Information	25
7.12.1	Acronyms.....	25
7.12.2	References	26

LIST OF TABLES

Claimed as PBI	2
Table 7-2: Summary of monitoring methodologies and monitoring frequencies for baseline and injection phases.	6
Claimed as PBI	7
Claimed as PBI	9
Claimed as PBI	11
Claimed as PBI	13
Table 7-7. Summary of analytical and field parameters for groundwater samples.....	15
Claimed as PBI	18
Table 7-9. Saturation front monitoring activities.....	22
Table 7-10. Summary of analytical and field parameters for fluid sampling in the injection zone.	23
Table 7-11. Pressure-front monitoring activities.	24

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Claimed as PBI

Plan revision number: 0
Plan revision date: June 2024

7 TESTING AND MONITORING PLAN

40 CFR 146.90

Bayou Bend East SL20220050

7.1 Facility Information

Facility Name: BAYOU BEND EAST SL20220050 – PHASE 1 (BBE-P1)
SL20220050 W1, SL20220050 W2, SL20220050 W3, SL20220050 W4,
SL20220050 W5, SL20220050 W6

Facility Contact: Claimed as PBI
1500 LOUISIANA STREET, 11TH FLOOR
HOUSTON, TEXAS 77002

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Site Location: GULF OF MEXICO, TEXAS STATE WATERS
HIGH ISLAND BLOCK
JEFFERSON COUNTY, TEXAS
Claimed as PBI

7.2 Introduction

This Testing and Monitoring Plan describes how Bayou Bend CCS LLC (Operator) will monitor the Bayou Bend East SL20220050 – Phase 1 (BBE-P1) site, Claimed as PBI, pursuant to 40 CFR 146.90. In addition to demonstrating that the wells are operating as planned and the CO₂ saturation and pressure front are moving as predicted, the monitoring data will be used to validate and adjust the reservoir simulation models used to predict the distribution of the CO₂ within the injection zone to support Area of Review (AOR) reevaluations and a non-endangerment demonstration.

Results of the testing and monitoring activities described below may trigger action according to the Emergency and Remedial Response Plan (ERRP).

7.3 Overall Strategy and Approach for Testing and Monitoring

7.3.1 Testing and Monitoring Plan Objectives

The Operator has developed a comprehensive Testing and Monitoring Plan to assess Claimed as PBI

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Plan revision number: 0
Plan revision date: June 2024

The direct and indirect testing and monitoring tracking proposed methods to be used at BBE-P1 and required per 40 CFR 146.90(g)(1) and (2) are provided in **Table 7-1**. These methods are discussed in the following sections.

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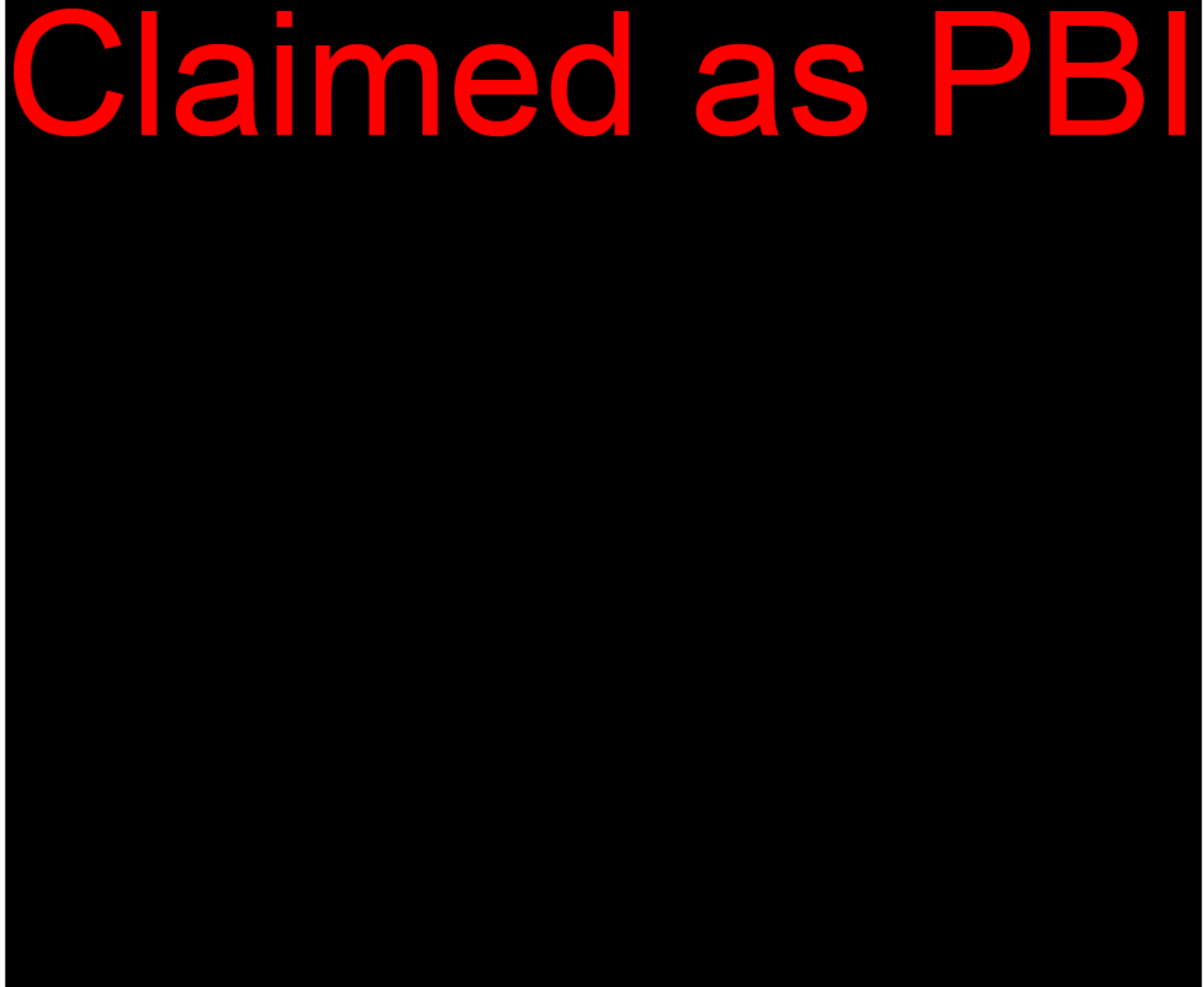
7.3.2 Testing and Monitoring Plan Focus Areas

Claimed as PBI

Plan revision number: 0
Plan revision date: June 2024

Claimed as PBI





7.3.3 Monitoring Network Design and Strategy

Figure 7-2 below is a schematic diagram illustrating the monitoring plan that the Operator will deploy at



Table 7-2 provides a list of monitoring techniques and their frequency during the different stages of the project. The following sections provide additional details on each methodology.

Plan revision number: 0
Plan revision date: June 2024

Claimed as PBI



Plan revision number: 0
Plan revision date: June 2024

Table 7-2: Summary of monitoring methodologies and monitoring frequencies for baseline and injection phases.

Monitoring Category	Monitoring Method		Baseline Frequency (1 year)	Injection Phase Frequency (20 years)*
Monitoring Plan Update	Reviewed every 5 years; Updated as required		N/A	As required
CO ₂ Injection Stream Analysis	Monitoring of injection stream chemical composition		N/A	Quarterly
CO ₂ Injection Process Monitoring	Continuous monitoring of injection process (e.g., injection rate, pressure, and temperature; annulus pressure)		N/A	Continuous
Hydrogeologic Testing	Injection well pressure fall-off testing		1 after well completion	1 per every 5 years
Injection Well Mechanical Integrity Testing	Internal**	Continuous annulus pressure monitoring of pressurized annulus	1 after well completion	Continuous
	External**	Claimed as PBI	1 after well completion	Annual
Corrosion Monitoring	Corrosion coupons (well and pipeline materials)		N/A	Quarterly

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*Monitoring technologies and reporting frequencies provided in this permit may change, pursuant to UIC Program Director approval based on monitoring data, technology, well/equipment failures, and/or regulatory changes.

**Internal integrity tests refer to annular space and pressure monitoring. External integrity tests refer to casing and temperature logging.

Plan revision number: 0
Plan revision date: June 2024

7.3.4 Quality assurance procedures

A quality assurance and surveillance plan (QASP) for testing and monitoring activities, required pursuant to 40 CFR 146.90(k), is provided in **Appendix 7-1**.

7.3.5 Reporting procedures

The Operator will provide testing and monitoring results to the UIC Program Director in compliance with the requirements under 40 CFR 146.91.

7.4 Carbon Dioxide Stream Analysis [40 CFR 146.90(a)]

The CO₂ stream will be analyzed during the operation phase to yield data representative of its chemical and physical characteristics and to meet the requirements of 40 CFR 146.90(a).

7.4.1 Sampling location and frequency

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Claimed as PBI No other equipment will affect the CO₂ stream at this point, so the analyzer will be exposed to the same CO₂ stream as the wellhead, any downhole equipment, and formation solids and fluids. Physical samples of the gas will also periodically be taken and sent to a qualified laboratory.

Baseline data will be collected quarterly during the first year of injection. No significant changes are anticipated in the CO₂ stream throughout the injection period. However, if significant changes are detected by monitoring equipment, the Operator will make the appropriate operational actions, including but not limited to, collecting laboratory samples, and temporarily shutting in the facility. The operating Central Gathering Facility procedures will outline a plan to identify the cause of the change, assess the impact on the project, and implement corrective actions.

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7.4.2 Analytical parameters

The Operator will analyze the CO₂ for the constituents identified in **Table 7-3** using the methods listed.

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7.4.3 Sampling methods

Samples of the CO₂ stream will be collected downstream of the process equipment, at the beginning of the pipeline to the wellhead. This will ensure that the samples are the same CO₂ composition and pressures that will be injected. Samples will be collected in gas cylinders, or equivalent.

7.4.4 Laboratory to be used/chain of custody and analysis procedures

CO₂ stream samples will be collected in gas cylinders, or equivalent, and sent to a qualified laboratory for analysis of the parameters (**Appendix 7-1**). A standardized chain-of-custody form will be used to track the samples from collection to disposal. A copy of the form will be provided to the person or qualified laboratory receiving the samples as well as the person or qualified laboratory transferring the samples. These forms will allow for easy tracking of sample status and will be archived. Detailed instructions on sampling processes, including sample collection, handling, transportation, analysis, and disposal are provided in the QASP (**Appendix 7-1**).

7.5 Continuous Recording of Operational Parameters [40 CFR 146.88I(1), 146.89(b) and 146.90(b)]

The Operator will install and use on each injector continuous recording devices to monitor injection pressure, rate, and volume; the pressure on the annulus between the tubing and the long string casing; the annulus fluid volume added; and the temperature of the CO₂ stream, as required at 40 CFR 146.88I(1), 146.89(b), and 146.90(b).

7.5.1 Monitoring location and frequency

The Operator will perform the activities identified in **Claimed as PBI** on each injector well to monitor operational parameters and verify internal mechanical integrity of the injection well. Monitoring will take place at the locations and frequencies shown in the table.

If an anomaly occurs within one of the operating parameters below, available data will be interrogated to determine the most plausible cause of the anomaly and inform any next steps to be taken by the Operator.

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Plan revision number: 0
Plan revision date: June 2024

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Plan revision number: 0
Plan revision date: June 2024

7.5.2 Monitoring details

Continuous Recording of Wellhead Injection Pressure and Temperature

The CO₂ injection pressure and temperature will be monitored on a continuous basis at each wellhead to ensure that injection pressures do not exceed the calculated maximum allowable injection pressure (MAIP) [Narrative, Table 7-1], determined, in part, by using 90% of the fracture pressure of the injection zone per 40 CFR146.88 (a).

Continuous Recording of Injection Rate

The rate of CO₂ injection into the wells will be monitored by flowmeters located on the injection piping at each injector wellhead, upstream of the choke. The flowmeters will be connected to the Supervisory Control and Data Acquisition (SCADA) system for continuous monitoring and control of the CO₂ injection rate into each well.

Injection Volume

The injection volume into the reservoir will be calculated on a continuous basis based on the injection mass. The pressure and temperature conditions will be accounted for at the measurement. The volume calculated will be used in the computational models to determine storage capacity, flow within the reservoir, and volumes sequestered.

Continuous Recording of Annular Pressure

As described in the Pre-Operational Testing Plan [Section 6.5], the annular pressure will be tested prior to operation by conducting an internal mechanical integrity test. During operations, the pressure on the annulus between the injection tubing and the long-string casing will be measured continuously by an electronic pressure gauge mounted on wellhead. The gauge will be connected to the well control system and the SCADA system to monitor the annular pressure.

Recording of Annulus Fluid Volume

The volume of the annulus fluid between the injection tubing and the long-string casing will be calculated and confirmed during well construction. The annular pressure is expected to fluctuate as atmospheric and injection stream temperatures change during startup, injection, and shutdown operations. The fluid will be added to or removed from the annulus to maintain the pressure higher than the CO₂ injection surface injection pressures. If fluid volumes must be added or removed to maintain annular pressure during injection, those volumes will be recorded and submitted to the Underground Injection Control (UIC) Program Director.

Continuous Recording of CO₂ Stream Temperature

The temperature of the CO₂ injection stream will be continuously measured using an electronic temperature gauge. The gauge will be mounted to the injection piping at each wellhead and will be electronically connected to the SCADA system. The gauge will be calibrated prior to the start of injection operations and

Plan revision number: 0
Plan revision date: June 2024

1 calibrated annually. The thermocouple for measuring surface injection temperature will be recalibrated
2 annually or it will be replaced with a calibrated thermocouple.

3 **7.6 Corrosion Monitoring**

4 To meet the requirements of 40 CFR 146.90(c), the Operator will monitor well materials during the
5 operation phase for loss of mass, thickness, cracking, pitting, and other signs of corrosion to ensure that the
6 well components meet the minimum standards for material strength and performance.

7 The Operator will monitor corrosion using corrosion coupons. Collection and analysis of samples will be
8 done according to the description below.

9 **7.6.1 Monitoring location and frequency**

10 Corrosion coupons composed of the same material as the well components be placed in discharge piping
11 of the Central Gathering Facility that will go into the injection pipeline. The coupons will be exposed to the
12 same fluid that will be injected into the well. The coupons will be checked on a quarterly basis for signs of
13 corrosion for the first year after injection; sampling beyond that will be determined from initial results
14 and/or industry preferences. Coupons could be checked more frequently if there are operational concerns
15 or other factors that change during injection.

16 Coupons will be checked for loss of mass, thickness, cracking, pitting, and other signs of corrosion that
17 may be indicative of future potential integrity issues. If signs of corrosion are identified in the coupons, this
18 will trigger further well integrity testing.

19 **7.6.2 Sample description**

20 **Table 7-5** below is the list of well construction components and material of construction. There will be a
21 corrosion coupon for each unique material.

22 **Claimed as PBI**

23 **7.6.3 Monitoring details**

24 The corrosion monitoring system will be located downstream of the injection pumps onshore, at the
25 beginning of the pipeline to the wellhead. Each material sample will be attached to a separate holder and

Plan revision number: 0

Plan revision date: June 2024

1 inserted into a flow-through pipe arrangement continuously during operation. This will ensure that the
2 samples are exposed to the same CO₂ composition that will be seen at the wellhead and injection tubing;
3 temperatures and pressures will be comparable to those at the wellhead. The holders and location of the
4 system will be included in the Central Gathering Facility design and will allow for continued injection
5 during sample removal.

6 At the frequency outlined in Section 7.6.1, each coupon will be carefully examined and measured to assess
7 the extent of corrosion, following a standardized procedure. Each coupon will be photographed, visually
8 inspected, dimensionally measured to within 0.0001 inches, and weighed to within 0.0001 grams, following
9 the American Society for Testing and Materials (ASTM) G1-03 Standard Practice for Preparing, Cleaning,
10 and Evaluating Corrosion Test Specimens (Re-approved 2017).

11 7.7 Above Confining Zone Monitoring

The Operator will monitor ground water quality and geochemical changes above the confining zone during the operation phase to meet the requirements of 40 CFR 146.90(d).

12 7.7.1 Monitoring location and frequency

13 Table 7-6 shows the planned monitoring methods, locations, and frequencies for ground water quality and
14 geochemical monitoring above the confining zone.

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Plan revision number: 0
Plan revision date: June 2024

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20 Claimed as PBI

7.7.2 Analytical parameters

Table 7-7 identifies the parameters to be monitored and the analytical methods Operator will use.

An extensive suite of groundwater parameters will be analyzed quarterly for up to one year prior to the start of injection to capture natural seasonal variability. This suite includes natural intrinsic tracers such as ions, dissolved gases, and isotopes that can be used to determine whether a foreign brine or gas has invaded the groundwater.

After the start of injection, a shorter suite of groundwater parameters will be analyzed once every two years or as needed. An evaluation of the results from the baseline data collection will be used to inform which parameters will be included in this shorter suite. However, the shorter suite will likely include the parameters listed in the “During and Post-injection” section of **Table 7-7**.

The range of concentrations measured during the baseline period will be used to evaluate geochemical changes in the groundwater once injection begins. Geochemical measurements are influenced by a variety of factors including natural and offset industry-induced fluctuations in the groundwater as variability due to sampling and laboratory procedures. For these reasons, multiple sources of evidence are needed to evaluate whether a change has occurred.

Mercury will be analyzed during baseline, but low detections should be considered suspect due to potential contamination from the well casing or during sampling. Zinc will also be analyzed during baseline as it is commonly found in tubing and pipe dope, and there is potential for sample contamination.

Once the project has established baseline conditions, monitoring may be reduced to a subset of analytes that are most likely to change due to interactions with CO₂. Any modification to the parameter list in **Table 7-7** will be made in consultation with the UIC Program Director.

Plan revision number: 0

Plan revision date: June 2024

Table 7-7. Summary of analytical and field parameters for groundwater samples.

Parameters	Analytical Methods*
Claimed as PBI	
Cations: Al, Ba, Mn, As, Cd, Cr, Cu, Pb, Sb, Se, Sr, Tl, Zn, Ca, Fe, K, Mg, Na, Si, B	ICP-MS, EPA Method 6020B, ICP, EPA Method 6010D
Anions: Br, Cl, F, NO₃, NO₂ and SO₄	Ion chromatography, EPA Method 300.0
Alkalinity (total and bicarbonate)	SM 2320B
Total dissolved solids	SM 2540C
Water density (lab)	
Water density (field)	hydrometer
pH (lab)	SM 4500 H+B
pH (field)	Standard Method 4500-H+ B-2000
Specific conductance (lab)	
Specific conductance (field)	Standard Method 2510 B-1997
Temperature (field)	Thermistor, Standard Method 2550 B-2000
Turbidity (lab)	
Turbidity (field)	Nephelometric – Optical, 90° Scatter
Oxidation-Reduction Potential (field)	Platinum Button; Ag/AgCl Reference
Dissolved Oxygen (field)	ASTM Method D888-09 I
Dissolved Inorganic Carbon (DIC)	SM 5310B
²²⁸Ra/²²⁶Ra	EPA Method 901.1
⁸⁷Sr/⁸⁶Sr	ICP-MS
δ¹⁸O and δ²H of H₂O	Analyzed via CRDS
δ¹³C of DIC	IRMS
¹⁴C of DIC**	AMS
Dissolved CO₂, N₂, Ar, O₂, He, C1-C6+, by headspace	Isotech/Stratum SOP, similar to RSK-175
δ¹³C of CO₂	Isotech/Stratum
δ¹³C and δ²H of Methane, Ethane, Propane	High precision (offline) analysis via Dual Inlet IRMS
Sulfide	SM4500
Dissolved Noble Gasses (He, Ne, Ar, Kr, Xe)	Noble Gas Mass Spectrometry
Total Petroleum Hydrocarbons	EPA 8015B with silica gel cleanup
Ammonium	EPA 350.1
Mercury	EPA 245.1, 245.2

Plan revision number: 0

Plan revision date: June 2024

Parameters	Analytical Methods*
Acetate	
Propionate	
Butyrate	
Claimed as PBI	
pH (lab)	
pH (field)	Standard Method 4500-H+ B-2000
Specific conductance (lab)	
Specific conductance (field)	Standard Method 2510 B-1997
Temperature (field)	Thermistor, Standard Method 2550 B-2000
Alkalinity (total and bicarbonate)	SM 2320B
Oxidation-Reduction Potential (field)	Platinum Button; Ag/AgCl Reference
Total dissolved solids	SM 2540C
Cations: Al, Ba, Mn, As, Cr, Pb, Se, Sr, Tl, Zn, Ca, Fe, K, Mg, Na, Si, B	ICP-MS, EPA Method 6020B, ICP, EPA Method 6010D
Anions: Br, Cl, F, and SO ₄	Ion chromatography, EPA Method 300.0
Alkalinity (total and bicarbonate)	SM 2320B
Dissolved Inorganic Carbon (DIC)	SM 5310B
$\delta^{13}\text{C}$ of DIC	IRMS
Water density (lab)	
Water density (field)	hydrometer
Turbidity (lab)	
Turbidity (field)	Nephelometric – Optical, 90° Scatter
Sulfide (lab)	
* Analytical methods subject to change with approval from UIC Program Director **Specialized analysis we may collect less than frequently depending on results ***Analyte list may change depending on results from baseline assessment	

Plan revision number: 0
Plan revision date: June 2024

7.7.3 Sampling methods

Sampling will be performed in accordance with the QASP (**Appendix 7-1**). Claimed as PBI

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Field measurements for pH, temperature, conductance, and dissolved oxygen will be monitored and recorded. Samples will be preserved and sent to the qualified laboratory via the chain of custody procedures (**Appendix 7-1**).

7.7.4 Laboratory to be used/chain of custody procedures

The geochemical analyses and the isotopic analyses will be performed by qualified laboratories that meet the standards and guidelines set forth in the QASP (**Appendix 7-1**). Samples will be tracked using appropriately formatted chain-of-custody forms.

7.8 External Mechanical Integrity Testing

The Operator will conduct at least one of the tests presented in **Table 7-8** periodically during the injection phase to verify external mechanical integrity as required at 40 CFR146.89(c) and 146.90(e). In combination with the robust well and barrier design (Ref: Narrative 5.2.2 Well Design), MITs will verify no significant fluid movement is observed through channels adjacent to the injection well bore.

7.8.1 Testing location and frequency

Claimed as PBI

1 **Claimed as PBI**

2 The mechanical integrity testing frequency reduction time will be proposed to the UIC Program Director
3 after baseline and historical data demonstrate a satisfactory trend.

4 **7.8.2 Testing & Monitoring details**

5 **Claimed as PBI**
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8 Regarding additional well data, injector well testing and evaluation will, at a minimum, be capable of
9 monitoring surface tubing and annular pressures and temperatures to identify any anomalies or possible
10 leaks (**Table 7-3**).

11 **7.8.3 External MIT via logging**

12 The preliminary testing procedures for the wireline well logs in **Table 7-8** will follow Operator and industry
13 standards. The procedures will be approved by the UIC Program Director prior to commencing MIT
14 operations.

15 The following procedure will be used for logging:

- 16 1. If necessary, shut in well to allow for wellbore stabilization.
- 17 2. Move in and rig up wireline unit and pressure control equipment.
- 18 3. Run the log by lowering the tool from surface to the injection zone at a rate meeting the logging
19 tool performance specifications.
- 20 4. Pull the logging tool from the injection interval to surface to take readings at defined locations or
21 full wellbore in agreement with the UIC Program Director.
- 22 5. Perform repeat passes, as necessary, to provide wellbore coverage.
- 23 6. Rig down and move out wireline unit.
- 24 7. Log results will be interpreted and submitted to the UIC Program Director.

Plan revision number: 0
Plan revision date: June 2024

7.9 Pressure Fall-Off Testing

The Operator will perform pressure fall-off tests during the injection phase as described below to meet the requirements of 40 CFR 146.90(f).

7.9.1 Testing location and frequency

A pressure fall-off test is planned for, at a minimum, once every five (5) years on each operational injection well and at the end of the injection period. Results of the pressure fall-off tests will be submitted to the UIC Program Director electronically within 30 days of the test. The pressure fall-off testing procedure is described below.

7.9.2 Testing details

Operator will perform pressure fall-off testing with the procedure below.

1. Hold injection rate constant while maintaining as stable operating conditions as possible prior to the fall-off test shut in period. Do not exceed the maximum operating pressure.
2. Shut in well at the wellhead, or as near to the wellhead as feasible. For offset injectors in **Claimed as PBI** maintain a constant injection rate and continuously record injection rates for the duration of the test.
3. Continuously measure pressure using downhole pressure gauges for the duration of the test. Conduct the test over a sufficient time period in which pressure is no longer influenced by wellbore storage or skin.

7.10 Carbon Dioxide Saturation Front and Pressure Front Tracking

The Operator will employ direct and indirect methods to track the extent of the CO₂ saturation front and the presence or absence of elevated pressure during the operation phase to meet the requirements of 40 CFR 146.90(g) (Table 7-1).

7.10.1 Saturation front monitoring location and frequency

Table 7-9 presents the methods that the Operator will use to monitor the position of the CO₂ saturation front, including the activities, locations, and frequencies. The parameters to be analyzed as part of fluid sampling in the injection zone and associated analytical methods are presented in Table 7-10. Quality assurance procedures for these methods are presented in the QASP (Appendix 7-1).

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Due to the shallow water depths, the Operator has determined **Claimed as PBI**
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Plan revision number: 0
Plan revision date: June 2024

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Claimed as PBI

Plan revision number: 0
Plan revision date: June 2024

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7.10.2 Saturation front monitoring details

Claimed as PBI it is expected to interact with the formation and its fluids, resulting in changes in geochemistry. To baseline these fluids and model potential changes, Claimed as PBI

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will be delivered in the form of laboratory reports. Table 7-10 identifies the parameters to be monitored and the analytical methods Operator will use. Additional fluid sampling details can be found in the QASP (Appendix 7-1).

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Table 7-9. Saturation front monitoring activities.

Target Formation	Monitoring Activity	Monitoring Location(s)	Spatial Coverage	Frequency
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Claimed as PBI

Plan revision number: 0
Plan revision date: June 2024

Table 7-10. Summary of analytical and field parameters for fluid sampling in the injection zone.

Parameters	Analytical Methods
Claimed as PBI	
Total Alkalinity	SM 2320B
Organic Acids (Acetate, Propionate, Butyrate)	APHA SM 5560B
Dissolved sulfide	SM4500
lab pH (25°C)	SM 4500 H+B
Total Dissolved Solids	SM 2540C
Water Density	Density Meter (ASTM D4052/D5002)
Conductivity	U.S. EPA Method 120.1 (Same as APHA SM 2510B and ASTM D1125-95(A)).
Turbidity (lab)	U.S. EPA Method 180.1 (Same as APHA SM 2130B)
Temperature (field)	Field instrument
Dissolved Inorganic Carbon (DIC)*	Standard Method 5310B
d ¹³ C Dissolved Inorganic Carbon	Gas Bench/CF-IRMS
dD & d ¹⁸ O H ₂ O	Analyzed via CRDS
Hydrogen sulfide	ASTM D5623
Cations: Al, Ba, Mn, As, Cd, Cr, Cu, Pb, Sb, Se, Sr, Tl, Zn, Ca, Fe, K, Mg, Na, Si, B, S	ICP-MS, EPA Method 6020B, ICP, EPA Method 6010D
Anions: Br, Cl, F, NO ₃ , NO ₂ , SO ₄ and PO ₄	Ion chromatography, EPA Method 300.0
δ ¹³ C of dissolved Methane, Ethane, Propane, and CO ₂ , δ ² H of Methane	High precision (offline) analysis via Dual Inlet IRMS
Dissolved CO ₂ , N ₂ , Ar, He, O ₂ , C1 – C6+ by headspace	Lab in-house SOP, similar to RSK-175

Plan revision number: 0
Plan revision date: June 2024

7.10.3 Pressure-front monitoring location and frequency

Table 7-11 presents the methods that Operator will use to monitor the position of the pressure front, including the activities, locations, and frequencies Operator will employ (Appendix 7-1)

The pressure front will be monitored

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7.10.4 Pressure-front monitoring details

Claimed as PBI

Table 7-11. Pressure-front monitoring activities.

Target Formation	Monitoring Activity	Monitoring Location(s)	Spatial Coverage	Frequency
DIRECT PRESSURE-FRONT MONITORING				

Claimed as PBI

7.11 Appendix: Quality Assurance and Surveillance Plan

The Quality Assurance and Surveillance Plan for the Testing and Monitoring Plan is provided in Appendix 7-1.

Plan revision number: 0
Plan revision date: June 2024

7.12 Additional Information

7.12.1 Acronyms

Claimed as PBI

AOR	Area of Review
ASTM	American Society for Testing and Materials
BBE-P1	Bayou Bend East SL20220050 – Phase 1
CCS	carbon transport and sequestration
CO ₂	carbon dioxide

Claimed as PBI

ERRP	Emergency and Remedial Response Plan
ft	feet
FWI	full waveform inversion

Claimed as PBI

MAIP	Maximum allowable injection pressure
MIT	mechanical integrity testing
OBS	ocean bottom sensors
PDHG	permanent downhole gauges

Claimed as PBI

QASP	quality assurance and surveillance plan
SCADA	Supervisory Control and Data Acquisition
TL	time-lapse
TVD	true vertical depth
UIC	Underground Injection Control

Claimed as PBI

Plan revision number: 0
Plan revision date: June 2024

7.12.2 References

American Society for Testing and Materials (ASTM), 2017. G1-03 Standard Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens. <https://www.astm.org/g0001-03r17e01.html>. Referenced April 2024. 7.8.3

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