CLASS VI PERMIT
INJECTION WELL PLUGGING PLAN

40 CFR §146.82(a)(16) and §146.92(b)

Caliche Beaumont Sequestration Project
Beaumont, Jefferson County, Texas

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1.0 FACILITY INFORMATION AND INTRODUCTION

Facility/Project Name:	Caliche Beaumont Sequestration Project
Facility/Project Contact:	W. Graham Payne, Director of Energy Transition CDP II CO2 Sequestration, LLC ("Caliche") 919 Milam Street, Suite 2425 Houston TX, 77002 (832) 500-7590 / Claimed as PBI
Well Locations:	Beaumont, Jefferson County, Texas Injection Well Nos. 1, 2, and 3
SIC Code(s):	4923
Entity Type:	Private
Indian Lands:	No

Well ID	Latitude	Longitude
Injection Well 1	Claimed as PBI	[redacted]
Injection Well 2	Claimed as PBI	[redacted]
Injection Well 3	Claimed as PBI	[redacted]

This Injection Well Plugging Plan has been designed to meet the requirements of 40 CFR §146.92 (USEPA, 2016) and the requirements of the Carbon Capture and Sequestration Protocol under the Low-Carbon Fuel Standard (LCFS) (CARB, 2018, Subsection C.5.1). Proper plugging and abandonment procedures for injection well(s) are essential to ensuring that that an abandoned well maintains integrity so that no future conduits exist for fluid or CO_2 leakage out of the target reservoir that might endanger overlying USDWs (USEPA, 2016, Section 2; CARB, 2018, Section 5).

2.0 INJECTION TERMINATION

As discussed in Modules A and B, Caliche plans to simultaneously inject CO_2(sc) into three injection wells for approximately Claimed as PBI Although plugging activities may begin immediately upon cessation of injection, it is not a requirement (USEPA, 2016, p. 4). However, per California Air Resources Board (CARB) Low-Carbon Fuel Standard (LCFS) Requirements (CARB, 2018, Subsection C.5.1(d)), Caliche will undertake commercially reasonable efforts to plug and abandon all three injection wells within 2 years of cessation of injection. At this time, Caliche does not plan to transition the injection wells into observation or monitoring wells, but it may choose to do so in the future.

3.0 INJECTION WELL PLUGGING PLAN

Caliche has provided the required financial assurance information for Site Closure and Post-Injection Site Care (PISC) in Section 11 of this Class VI permit application. Well plugging and abandonment procedures and related PISC plans are detailed below.

In compliance with 40 CFR §146.92(c), Caliche will notify the UIC Program Director in writing of intent to plug at least 60 days prior to plugging the injection wells (at least 30 days for CARB LCFS (CARB, 2018, Subsection C.5.1(h)), during which time the final well plugging procedures will be finalized, as needed, and confirmed with the UIC Program Director (and CARB LCFS Executive Officer). A final plugging report will be filed with the UIC Program Director within 60 days after the completion of plugging operations, as required by 40 CFR §146.92(d) and CARB LCFS Subsection C.5.1(k).

3.1 Planned Tests or Measures to Determine Bottom-Hole Reservoir Pressure

A bottom-hole pressure falloff test will then be conducted to measure the target reservoir transmissivity and pressure (40 CFR §146.92(b)(1)) to determine the appropriate density of plugging fluids to achieve static equilibrium prior to plug placement (USEPA, 2016, p. 6; CARB, 2018, p. 99). Testing procedures will follow the methodology detailed in *"USEPA Region 6 UIC Pressure Falloff Testing Guideline-Third Revision"* (USEPA, 2002). Bottom-hole pressure measurements will target near the perforations, and a surface pressure gauge may be used as a monitoring tool for tracking the test progress. Falloff test results will be compared to predicted values. Additional details regarding the bottom-hole pressure falloff test procedures are provided in the Testing and Monitoring Plan to this Class VI permit application.

3.2 Planned External Mechanical Integrity Test(s)

Prior to injection well plugging and abandonment, Caliche will flush each well with a sufficient quantity of brine buffer fluid injectate to displace the CO_2 from the immediate wellbore area. This volume of fluid will be determined by the operator prior to initiating site closure activities using data on the volume of CO_2 injected during the lifetime of the well and the results of previous well formation pressure testing.

As specified in 40 CFR §146.92(b)(2) and CARB LCFS Subsection C.4.2, external mechanical integrity tests (MIT) will be conducted at each injection well to demonstrate that the long-string casing and cement left behind will maintain their integrity over time. The MITs will consist of an annulus pressure test, a temperature or radioactive tracer survey to determine the integrity of the bottom-hole cement, and pulsed neutron log to verify the mechanical integrity of the near-well area behind the casing (see **Table E.3.1** below). Additional details regarding the MIT procedures are provided in the Testing and Monitoring Plan to this Class VI permit application.

Table E.3.1. Mechanical Integrity Testing – Injection Well Nos. 1, 2, and 3

MIT Description	Location
Annulus Pressure Test	Injection Wells 1, 2, and 3
Temperature Survey **OR** Radioactive Tracer Survey	Injection Wells 1, 2, and 3
Pulsed Neutron Log	Injection Wells 1, 2, and 3

3.3 Information on Plugs

Caliche will use the materials and methods noted in **Table E.3.2** below to plug Injection Well Nos. 1, 2, and 3. A proposed schematic of the plugged and abandoned Injection Well Nos. 1, 2, and 3 is presented on **Figures E.2.1 through E.2.3**, respectively. The volume and depth of the plug or plugs will depend on the final geology and downhole conditions at each well as assessed during construction. The cement(s) formulated for plugging will be compatible with the CO_2 stream. The

cement formulation and required certification documents will be submitted to the agency with the final Injection Well Plugging Plan. The owner or operator will report the wet density and will retain duplicate samples of the cement used for each plug.

Table E.3.1. Plugging Details – Injection Well Nos. 1, 2, and 3.

Claimed as PBI

3.4 Plugging and Abandonment Procedures

3.4.1 Notifications, Permits, and Inspections

Per 40 CFR §146.92(c), Caliche will notify the UIC Program Director at least 60 days before plugging the injection wells and provide an updated Injection Well Plugging Plan, if applicable.

3.4.2 Plugging and Abandonment Procedures

Upon abandonment, Caliche will conduct the following well plugging and abandonment procedures at all injection wells. A proposed schematic of each plugged and abandoned injection well is presented on **Figures E.2.1, E.2.2, and E.2.3** for Injection Well Nos. 1, 2, and 3, respectively.

1. Move in and rig up a workover rig on well.

2. Flush tubing with a minimum of two wellbore volumes of brine, sufficiently weighted to overbalance formation pressures (may require mud to overcome pressure differential).

3. Remove wellhead and rig up blowout preventer on well.

4. Claimed as PBI

5. Claimed as PBI [redacted]

6. Claimed as PBI [redacted]

7. Run casing inspection and cement bond logs to determine integrity of casing and cement bond. Note: If logs indicate potential for inter-formational fluid migration, modify closure plan to prevent it.

8. Claimed as PBI [redacted]

9. Claimed as PBI [redacted]

10. Shut well in and monitor pressure.

11. After waiting a sufficient amount of time for the cement to harden, locate the top of the cement plug, and load and/or pressure test the cement plug to ensure its competency.

12. Claimed as PBI [redacted]

13. Claimed as PBI [redacted]

14. Claimed as PBI [redacted]

15. Remove wellhead, cut off all casings five feet below ground surface, and weld steel plate on top.

16. Erect a permanent marker on the well with the permit number, date of plugging, and company name identified on the marker.

The elements of this Injection Well Plugging Plan may be modified at a later date based on information generated during the operational phase of the project (USEPA, 2016, p. 5; CARB, 2018, p. 38). Any modifications to this Injection Well Plugging Plan will be submitted to the USEPA UIC Program Director and CARB LCFS Executive Director for approval.

4.0 CITED REFERENCES

USEPA, 2002, UIC Pressure Falloff Testing Guidance, Third Revision, U.S. Environmental Protection Agency, 8 August 2002.

USEPA, 2016, Geologic Sequestration of Carbon Dioxide Underground Injection Control (UIC) Program Class VI Well Plugging, Post-Injection Site Care, and Site Closure Guidance, U.S. Environmental Protection Agency Office of Water, USEPA 816-R-16-006, December 2016.

FIGURES

Claimed as PBI

Claimed as PBI

Claimed as PBI