TITAN
CARBON SEQUESTRATION

Underground Injection Control – Class VI Permit Application for

Cronos No. 1 and Rhea No. 1

Jefferson County, Texas

SECTION 7 – POST-INJECTION SITE CARE AND SITE CLOSURE PLAN

February 2024

LONQUIST
SEQUESTRATION LLC

SECTION 7 – POST-INJECTION SITE CARE AND SITE CLOSURE PLAN

TABLE OF CONTENTS

Figures

Tables

7.1 Introduction

The Post-Injection Site Care (PISC) and Site Closure Plan for the Titan Project injection wells, Cronos No. 1 and Rhea No. 1, was prepared in accordance with the requirements of Title 16, Texas Administrative Code (16 TAC) **§5.203(m)** [Title 40, U.S. Code of Federal Regulations (40 CFR) **§146.93**]. This plan describes the various activities that will occur once injection has ceased and during the site closure. This plan will be implemented once Titan demonstrates that no additional monitoring is needed to ensure that this project poses no further endangerment to Underground Sources of Drinking Water (USDWs).

7.2 Pre- and Post-Injection Pressure Differentials

To meet the requirements of 16 TAC **§5.203(m)(2)** [40 CFR **§146.93(a)(2)(i)**], the following table shows the expected pressure differential between pre- and post-injection pressures in the injection zone, as determined by the plume model described in *Section 2 – Plume Model*. As discussed there and in *Section 4 – Engineering Design and Operating Strategy*, both Titan injection wells will inject into sequentially shallower intervals over the life of the project, resulting in separate pressure profiles for each interval. [redacted] Once injection ceases in each stage, the pressure drops down to near in situ pressures. Table 7-1 shows the maximum pressure differential at the wellbore predicted in each year modeled.

Table 7-1 – Maximum Pressure Differential by Year

Year	Max Pressure Differential (psi) Cronos No. 1	Max Pressure Differential (psi) Rhea No. 1
[redacted]		

Year	Max Pressure Differential (psi) Cronos No. 1	Max Pressure Differential (psi) Rhea No. 1
[redacted]		

Figures 7-1 and 7-2 present graphical representations of the data in Table 7-1, showing the pressure differential over the life of both injection wells. The solid dark-green line represents the buildup from in situ pressure due to injection, and the solid light-green line represents the maximum pressure gradient exhibited in each stage of injection. The dashed light-green line shows the 90% fracture-pressure gradient constraint. The light green line does not exceed the

dashed light-green line, indicating that the model does not surpass the 90% fracture-pressure gradient constraint .

Figure 7-1 – Maximum Pressure Differential Over Time for Cronos No. 1

Figure 7-2 – Maximum Pressure Differential Over Time for Rhea No. 1

7.3 CO_2 Plume Position and Pressure Front at End of Closure

The area of review (AOR) consists of both the CO_2 plume and critical pressure maximum extent. Figure 7-3 shows the AOR and its subcomponents. The CO_2 plumes are indicated by the black polygons, based on the maximum extent of all the differing plume layers in the model, extracted at 50 years post-injection. The CO_2 plumes and pressure front AOR consider both Cronos No. 1 and Rhea No. 1. Once injection has ceased, the pressure in the injection interval will quickly revert to near reservoir pressure, as was shown in Table 7-1.

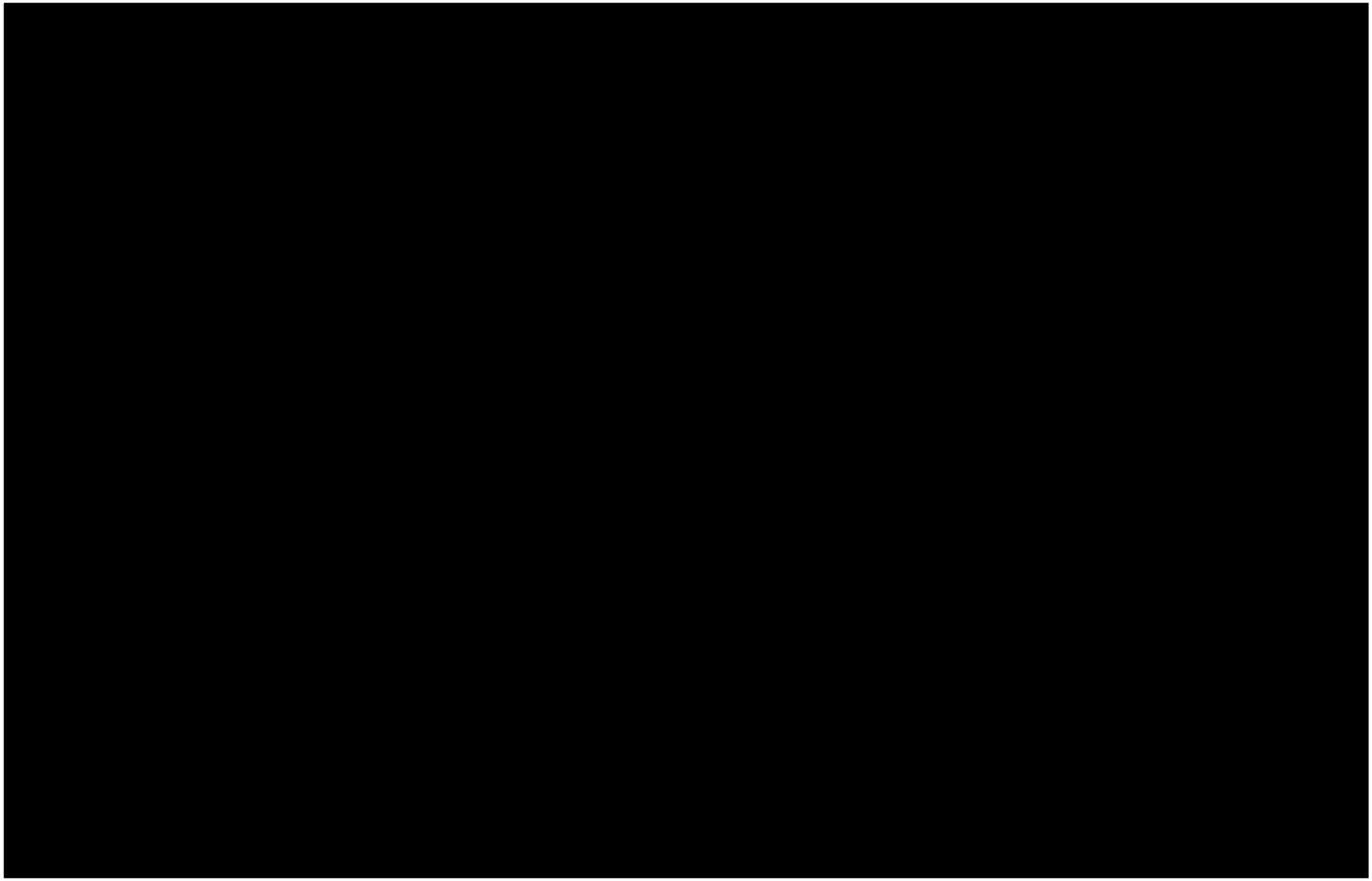

Figure 7-3 – 50-Year Maximum Combined Plume

7.4 Post-Injection Monitoring Plan

As required by 16 TAC **§5.206(k)(2)** [40 CFR **§146.93(b)**], Titan will continue to monitor the site for 50 years or until the UIC director determines that the project no longer poses an endangerment to the USDW, as described in *Section 7.6*. The reservoir model will continue to be updated throughout the project using monitoring observations. Upon cessation of injection, an amended PISC—if needed per the updated model—will be submitted to the Underground Injection Control (UIC) Program director (UIC Director).

Two above-zone monitoring wells and two USDW monitoring wells are proposed, as discussed in *Section 5 – Testing and Monitoring Plan*. The location of these wells is displayed in Figure 7-4.

Figure 7-4 – Monitoring Well Location Map

7.5 Post-Injection Monitoring Activities

During the monitoring period, the testing and monitoring activities, as described in *Section 5 – Testing and Monitoring Plan,* will be performed and reported at the frequency shown in Table 7-2.

Table 7-2 – Post-Injection Monitoring and Reporting Frequency

Testing/Monitoring Activity	Frequency	Reporting Schedule	Comment
USDW monitoring well fluid sampling and analysis	Every 5 years	Within 30 days after data collection and analysis	
Above-zone monitoring well fluid sampling and analysis	Only if required	Within 30 days after data collection and analysis	
Above-zone monitoring well pressure measurements	Continuously	Annually	
Injection-well wellhead pressure monitoring (tubing and annulus)	Continuously	Annually	
Injection well in-zone pressure/temperature (P/T) monitoring	Continuously, using P/T gauges in individual injection stages	Annually	Based on the reservoir model, the pressure quickly decays back towards pre-injection pressure.
Indirect plume monitoring (vertical seismic profile)	Every 5 years	Within 30 days after time-lapse seismic processing has finished	Until plume stabilization is verified.
Direct plume calculations based on P/T data	Annually	Annually	

All testing and monitoring activities listed will be performed and analyzed as discussed in *Section 5*, including quality assurance/quality control (QA/QC) measures.

7.6 Demonstration of Non-Endangerment of USDW

The primary mechanism through which the USDWs are protected is the upper confining zone (UCZ), which is comprised of the *Amphistegina B* (Amph B) shale that ranges from [redacted]

[redacted] The monitoring data that will be collected after injection ceases verifies that the UCZ is functioning as expected and that the USDW is not endangered.

The monitoring data will also be used to calibrate the simulation model and further improve its ability to accurately predict the movement of CO_2. These calibrated predictions from the simulation model are used to identify any UCZ-penetrating features with which the CO_2 plume may interact prior to final stabilization. Examples of these features of concern are legacy wellbores and fault planes. However, for the Titan Project, no known wellbore paths have been identified. Therefore, the calibration effort ensures that (1) legacy wellbores, if any were found to exist in the AOR, do not compromise the integrity of the UCZ, and (2) the USDW is not endangered. The calibrated simulation-model predictions are also used to verify that the CO_2 does not reach fault planes cutting through the UCZ.

Prior to the approval of the site-closure authorization, as required by 16 TAC **§5.203(m)(1)** [40 CFR **§146.93(c)**], Titan will provide documentation that the USDW is not at risk of further endangerment from the CO_2 plume. While the PISC duration is 50 years, it may be possible to demonstrate USDW non-endangerment earlier. [redacted] Titan will submit a report to the UIC Director demonstrating the non-endangerment of the USDW, including site-specific conditions, updated plume model, predicted pressure decline within the injection zone, and any updates to the underlying geological assumptions used in the original model. The UIC Director will ultimately determine and approve an alternative timeline for closure.

7.7 Site Closure Plan

To meet the requirements of 16 TAC **§5.206(k)(5)** [40 CFR **§146.93(e)**], the following site-closure activities will be performed: plugging of all wells, site closure, and submittal of final site-closure reports.

7.7.1 Pre-closure

To meet the requirements of 16 TAC **§5.206(k)(4)** [40 CFR **§146.93(d)**], notice of the intent to close the site will be submitted to the UIC Director at least 120 days prior to the commencement of closure operations. If any changes are made to the original PISC and Site Closure Plan, a revised plan will also be submitted. Relevant notifications and applications, such as plugging requests, will be submitted and approved by the appropriate agency prior to commencing such activities.

7.7.2 Plugging Activities

The Titan Project injection wells (Cronos No. 1 and Rhea No. 1), AZM wells (Atlas No. 1 and Andes No. 1) and both USDW monitoring wells (TCS WM No. 1 and TCS WM No. 2) will be plugged as discussed in *Section 6 – Plugging Plan*. The plugging and abandonment procedures for the injectors are designed to prevent CO_2 or formation fluids in the injection interval from migrating to the USDW. Prior to plugging the injection and above-zone wells, the mechanical integrity of those wells will be verified. Plugging schematics and procedures are provided in *Appendix H*.

7.7.3 Site Restoration

Once the injection and monitoring wells are plugged and capped below grade, all surface equipment will be decommissioned and removed.

7.7.4 Documentation of Site Closure

Within 90 days of site closure, a final report will be submitted to the UIC Director, per the requirements of 16 TAC **§5.206(k)(6)** [40 CFR **§146.93(f)**], and include the following:

- Documentation of appropriate injection and monitoring well plugging, including a copy of the survey plats
- Documentation of well-plugging report to the Texas Railroad Commission (TRRC)
- Records of the nature, composition, and volume of the CO_2 stream over the injection period

A record of notation in the facility property deed will be added to provide, in perpetuity, any potential purchaser of the property the following information:

- The fact that the land was used to sequester CO_2
- The name of the state agency (TRRC) with which the survey plat was filed, and the address of the office of the EPA, Region 6, and the state agency to which it was submitted
- The total volume of fluid injected, the injection zones into which it was injected, and the period over which injection occurred

Titan will retain all records collected during the PISC period for 10 years following site closure. At the end of the retention period, Titan will deliver all records to the UIC Director for retention at a location designated by the UIC Director for that purpose.