Options for Participating in the Permitting Process and Procedures for Reaching a Final Decision (40 CFR 124.8(b)(6))

The comment period begins September 11, 2025, and ends at 11:59 p.m. Eastern Standard Time (EST) on October 16, 2025. You may submit a public comment on the draft permits to the electronic public docket at https://www.regulations.gov under docket number EPA-R06-OW-2025-0882 or via the following direct link: https://www.regulations.gov/docket/EPA-R06-OW-2025-0882. Comments may also be submitted via email to Noel Bonilla at Bonilla.Noel@epa.gov.

All unique public comments, whether submitted electronically or in paper form, will be made available for public viewing in the docket at Regulations.gov as the EPA receives and processes them. Comments will be made available without change unless the comment contains copyrighted material, confidential business information (CBI), or other information whose disclosure is restricted by statute.

The EPA will hold a virtual public hearing to accept oral comments on the draft permits on:

Tuesday, October 14, 2025

The virtual Public Hearing will start at 6:00 p.m. Central Standard Time (CST) and will last until no later than 9:00 p.m. CST.

The Public Hearing may close before 9:00 p.m. CST if there are no further interested parties wishing to provide comments.

Pre-registration information for the virtual hearing can be found at: https://www.epa.gov/tx/uic-class-vi-permit-intent-issue-orchard-storage-company-llc.

The EPA will record or accept both oral and written comments. However, the EPA will not answer questions or respond to comments during the formal public hearing.

You must either participate in the public hearing or send in written comments on the draft permit decision by the end of the comment period to preserve your right to appeal a final permitting decision.

Please contact Noel Bonilla at Bonilla.Noel@epa.gov or 214-665-7271 for additional information (pursuant to 40 CFR 124.8(b)(7)) or if you are unable to submit written comments via the electronic docket or email.

Fact Sheet for Class VI Underground Injection Control (UIC) Injection Well Carbon Storage Draft Permits and Public Comment Opportunity

Permit Applicant/Facility Information

Orchard Storage Company LLC UIC Class VI Injection wells

Gaines County, Texas (Permit Nos. R6-TX-165-C6-0001, R6-TX-165-C6-0002, R6-TX-165-C6-0003, R6-TX-165-C6-0004, R6-TX-165-C6-0005, R6-TX-165-C6-0006, and R6-TX-165-C6-0007)

Draft Permit/Fact Sheet Date

September 11, 2025

Part I: General Overview

Introduction

The U.S. Environmental Protection Agency (the EPA) is accepting comments from the public on its intent to issue permits for Orchard Storage Company LLC (Orchard) to inject carbon dioxide (CO_2) underground at its proposed injection project in Gaines County, Texas. This injection would be part of a process that is often called “geologic sequestration” or “carbon sequestration.” Carbon sequestration is a means of reducing emissions of carbon dioxide (CO_2) to the atmosphere.

https://www.regulations.gov/docket/EPA-R06-OW-2025-0882 In issuing a permit for a geologic sequestration project, the EPA has authority to protect underground drinking water sources. Other federal, state, and local agencies have authority relevant to surface activities such as carbon capture and transportation, and to address protection of other resources such as surface water and air quality.

Orchard Storage Company LLC proposes to construct seven injection wells in Gaines County, Texas, for the purpose of injecting previously captured CO_2 at a depth of 5,051 to 6,597 feet below ground surface (BGS) underground for long-term storage. Each of the seven wells will be covered by a separate Class VI permit; however, since the construction and operation of the wells are similar, this fact sheet describes all seven draft permits. The proposed project would have eight monitoring wells, including two that will monitor above the confining zone, one deep well that will monitor within the injection zone, and five wells that will monitor USDWs. Orchard Storage Company LLC will be permitted to inject up to 2.319 million metric tons (MMT) of CO_2 per year into these wells over the injection period of 12 years, for a total permitted injection volume of 27.828 MMT of CO_2 for the project.

The EPA reviewed Orchard Storage Company, LLC's information on the geologic, hydrogeologic, and other characteristics of the proposed well locations. The EPA also reviewed well construction and operational plans to determine if they were developed appropriately based on site-specific information. This preparation stage helps ensure, as determined by the EPA, that the wells are placed in a site where the geology is suitable, the CO_2 can be securely stored underground, and the wells will operate safely. The upper boundary of the San Andres Formation where the CO_2 will be stored is about 5,051 to 6,597 feet BGS feet below ground, and studies of the site show that there is over 2,000 feet of low-permeability carbonate rock (dolomite and evaporite) between the deepest underground source of drinking water (USDW) in the area and the proposed CO_2 storage below. It is important to note that the EPA's permitting decision must be based on the underlying geology and protection of USDWs.

Pursuant to the draft permit, Orchard Storage Company, LLC would need to test and monitor the condition of the wells, the injection pressure, and the location and size of the injected CO_2 plume during the 12 years of proposed CO_2 injection and for 50 years after injection is finished, known as the post-injection site care (PISC) period. This requirement is to make sure that the injection wells work properly during injection, to determine if any changes in operation are needed to protect USDWs, to observe how the movement of the CO_2 compares to simulated outcomes (both during and after injection), and to confirm that it is safe to close the project site at the end of the PISC period.

How did the EPA make its tentative decision?

To reach a tentative decision and prepare the draft permit, the EPA reviewed the project-specific technical, scientific, and financial information submitted by Orchard Storage Company LLC in their permit application materials. Where needed, the EPA also consulted other information sources to conduct a rigorous evaluation of the application materials and the suitability of the project site. The goal of the EPA's review and tentative determination is to ensure that the project will be protective of USDWs. The full administrative record for the draft permit, including all data submitted by Orchard Storage Company LLC regarding its permit applications and all other information considered by the EPA, is available for public review at https://www.regulations.gov/docket/EPA-R06-OW-2025-0882. To review the administrative record or for additional information please contact Noel Bonilla at Bonilla.Noel@epa.gov or 214-665-7271.

A non-exhaustive general overview of the types of data and information reviewed is described briefly below. This information is also available at https://www.regulations.gov/docket/EPA-R06-OW-2025-

0882. The second part of this fact sheet presents the more technical project-specific details on each of these topics.

- Information about the regional geology (rock layers and structures) and the applicant's detailed study of the geology at the project site. This is to confirm that the CO_2 will remain in the injection formation after it is injected, that there are no faults, fractures, or other pathways that could allow for CO_2 to move out of the injection zone, and that there is also a thick, dense, impermeable formation above the injection formation that will serve as a "confining zone," preventing upward movement of the CO_2 out of the injection formation. Additional information is available in Orchard Storage Company LLC's Site Characterization narrative (Section 1 of the permit application, dated July 2025); the EPA's requests for additional information (RAIs), including RAI #1 (dated February 23, 2024) and RAI #2 (dated June 13, 2024); and Orchard Storage Company LLC's responses to the RAIs (RAI #1 Responses dated April 8, 2024; RAI #2 Responses dated August 9, 2024; RAI #3 Responses dated April 22, 2025; RAI #4 Responses dated April 22, 2025; RAI #5 Responses, dated July 29, 2025).
- The locations of drinking water resources near the project and how the applicant will ensure that the project does not endanger them. See Orchard Storage Company LLC's Site Characterization narrative (Section 1 of the permit application, dated July 2025); RAI #1 and RAI #4 (dated November 14, 2024); and Orchard Storage Company LLC's responses to the RAIs.
- The Area of Review (AoR) is the region surrounding the geologic sequestration project where USDWs may be endangered by the injection activity. See Orchard Storage Company LLC's AoR and Corrective Action Plan (Section 3 of the permit application, dated July 2025); EPA's RAI #1, RAI #2, RAI #4, and RAI #5 (dated July 7, 2025); and Orchard Storage Company LLC's responses to the RAIs.
- The corrective action plan, which identifies existing penetrations (i.e., other wells) that extend into the confining rock layer in the AoR; whether they would pose a risk for CO_2 to migrate out of the injection formation; whether they need remediation (e.g., plugging); and, if so, how that corrective action will be performed. See Orchard Storage Company LLC's AoR and Corrective Action Plan (Section 3 of the permit application, dated July 2025); EPA's RAI #1 and RAI #2; and Orchard Storage Company LLC's responses to the RAIs.
- The proposed well construction design and plans for eventual well plugging after injection. See Orchard Storage Company LLC's Engineering Design and Operating Strategy (Section 4 of the permit application, dated July 2025); EPA's RAI #1, RAI #2, RAI #3 (dated October 29, 2024), and RAI #5; and Orchard Storage Company LLC's responses to the RAIs.
- The physical (e.g., temperature) and chemical characteristics of the CO_2 to be injected. See Orchard Storage Company LLC's Engineering Design and Operating Strategy (Section 4 of the permit application, dated July 2025); EPA's RAI #1; and Orchard Storage Company LLC's responses to the RAI.
- The data that Orchard Storage Company LLC will collect during well construction but before they are authorized to inject. This information will supplement the data that was available when the application was initially prepared. See Orchard Storage Company LLC's Engineering Design and Operating Strategy (Section 4 of the permit application, dated July 2025); EPA's RAI #1, RAI #2, RAI #3, and RAI #5; and Orchard Storage Company LLC's responses to the RAIs.

- The proposed operating technologies and parameters (injection rate and pressure) and how they would allow for safe operation. See Orchard Storage Company LLC's Engineering Design and Operating Strategy (Section 4 of the permit application, dated July 2025); EPA's RAI #1; and Orchard Storage Company LLC's responses to the RAI.
- The proposed approach for monitoring the project during and after injection. This monitoring includes the physical condition of the wells, the location and size of the injected CO_2, the changing pressure in the subsurface, water quality in formations above the injection formation, and seismicity (including events too small to be felt at the surface). See Orchard Storage Company LLC's Testing and Monitoring Plan (Section 5 of the permit application, dated July 2025); PISC and Site Closure Plan (Section 7 of the permit application, dated July 2025); Quality Assurance and Surveillance Plan (Appendix E-2 to the permit application); EPA's RAI #1, RAI #3, and RAI #5; and Orchard Storage Company LLC's responses to the RAIs.
- The proposed Emergency and Remedial Response Plan, which establishes requirements for the operator to respond to potential injection-related compliance issues that could endanger USDWs should they arise. See Orchard Storage Company LLC's Emergency and Remedial Response Plan (Section 8 of the permit application, dated July 2025); EPA's RAI #2, RAI #3, and RAI #5; and Orchard Storage Company LLC's responses to the RAIs.
- The financial resources Orchard Storage Company LLC is required to have available to responsibly perform corrective action; plug the injection wells; responsibly operate, monitor, and close the project; and respond to emergency events. See Orchard Storage Company LLC's Financial Assurance Plan (Section 9 of the permit application, dated July 2025); EPA's RAI #2, RAI #3, and RAI #5; and Orchard Storage Company LLC's responses to the RAIs.

The technical details below provide discussion about these data and the EPA's review and analysis of this information that led to this draft permitting decision. The administrative record located at https://www.regulations.gov/docket/EPA-R06-OW-2025-0882 gives the public an opportunity to review the data and better understand the EPA's comprehensive analysis.

What happens next in the permit process?

The EPA will review all public comments received during the public comment period before making a final decision on whether to issue the permits. The EPA will respond to all significant comments on the draft permits. This is the public's only opportunity to provide comments on the draft permits. If the EPA decides to issue final permits, there will not be an additional opportunity to comment on the final permit, although the final permits may be appealed by any person who commented on the draft permits or participated in the public hearing.

If the EPA's final decision is to issue final permits, Orchard Storage Company LLC would be authorized to construct the wells. However, Orchard Storage Company LLC would not be authorized to inject until it has complied with specific permit requirements, including the requirements for pre-operational testing under Section J of the permits and the requirements for testing described in Attachment 4 (Construction Details) and Attachment 6 (Testing and Monitoring Plan), which may include but are not limited to, pre-injection logging, sampling, testing, and coring to verify injection and confining zone characteristics and confirm well integrity. The EPA will review the data related to Orchard's compliance

with these requirements before issuing written authorization to inject. However, there will be no additional public process prior to an authorization to inject.

Additional Information and Right to Appeal

The full administrative record, including all data submitted by Orchard Storage Company LLC in support of its permit application, is available for public review at regulations.gov under Docket# EPA-R06-OW-2025-0882, available at https://www.regulations.gov/docket/EPA-R06-OW-2025-0882. To review the administrative record in person or for additional information, please contact Noel Bonilla at Bonilla.Noel@epa.gov or 214-665-7271.

Additional Project Details

For more information about Orchard Storage Company LLC's project: https://www.epa.gov/tx/uic-class-vi-permit-intent-issue-orchard-storage-company-llc.

Legal Notice for Final Permit Decision Appeal

To preserve your right to appeal any final permit decision, you must either participate in the public hearing or send in written comments on the draft permit decision by the end of the comment period.

The first appeal must be made to the EAB; only after all agency review procedures have been exhausted may you file an action in the appropriate Circuit Court of Appeals.

Part 2: Technical Background, Orchard Project Information, and Permit Conditions

The EPA conducted a thorough review of Orchard Storage Company LLC's permit application and other relevant information during its evaluation of this permitting decision. The data and information are publicly available as part of the administrative record for the draft permit. Title 40 of the Code of Federal Regulations (CFR) Parts 144 and 146 require permits for CO_2 storage, known as UIC Class VI permits, to specify conditions for the siting, construction, operation, monitoring, reporting, plugging, post-injection site care and site closure of Class VI injection wells to prevent the movement of fluids into any USDWs. See 40 CFR Parts 144 and 146 for the general provisions of underground injection permits.

This part of the draft permit fact sheet provides (1) references to the primary applicable statutory or regulatory provisions for each portion of the permit, (2) a brief summary of the draft permit conditions, and (3) a brief summary of the basis for the conditions, including the technical background and information on the Orchard Storage Company LLC project and appropriate supporting references to the administrative record, to help the public better understand how the EPA reached the tentative permitting decision (40 CFR 124.8(b)(4)). Within these sections the principal facts and the significant factual, legal, methodological, and policy questions considered in preparing the draft permit are discussed as appropriate (40 CFR 124.8(a)).

The EPA's review of Orchard Storage Company LLC's permit applications and other information in the record indicates that a permit with appropriate conditions will prevent endangerment of USDWs. In accordance with the UIC permit fact sheet requirements at 40 CFR 124.8, information and related permit conditions for the proposed wells are presented below.

Site Geology, Hydrogeology, and Water Resources

Federal Requirements under the Class VI Rule

Applicants must submit extensive geologic, hydrogeologic, and hydrologic information, which is described at 40 CFR 146.82. Requirements under 40 CFR 146.83 define the minimum geologic siting criteria for a Class VI injection well, including an injection zone that will receive the CO_2 stream and a confining zone that will contain the injected CO_2. Some of the specific types of information required to be submitted by the applicant and considered by the permitting authority include the geologic structure at the project site, the integrity of the confining zone, and data on the site hydrogeologic and geomechanical properties. Siting also considers an estimate of storage capacity of the injection formation, the seismic history of the area, and water resources (e.g., springs, mines, water wells) (40 CFR 146.82(a)).

Draft Permit Conditions

Injection for geologic sequestration is limited by the draft permits to the San Andres Formation (the injection zone) at a depth of approximately 5,051 to 6,597 feet BGS. The Upper San Andres and overlying Grayburg Formations comprise the upper confining zone, and the Glorieta and Upper Leonard Formations will serve as the lower confining zone. The primary upper confining zone is separated vertically from the lowermost USDW by over 2,000 feet.

Application Review and Decision Process

The EPA reviewed Orchard Storage Company LLC's information and data related to the site geology, hydrogeology, geomechanical properties, water resources, and other relevant information to ensure it complies with all regulatory requirements.

The EPA reviewed information provided by the permittee, including geologic maps, cross sections, and well logs; analyses of cores, which Orchard used to determine average porosity, permeability, and gross thickness; and other properties for injection zone and upper and lower confining zones at the injection site. Additional information includes site-specific 2D seismic data, literature review from regional studies, and oil and gas field injectivity and productivity data.

Based on this review, the EPA has determined that the regional and local geologic features at the site support a determination of site suitability per 40 CFR 146.83, specifically that the injection zone can receive the total volume of carbon dioxide that Orchard proposes to inject without fracturing, and that it is separated from USDWs by a competent confining zone, and with no transmissive faults or fractures. This is based on information Orchard submitted about the lithological, petrophysical, geomechanical, and geochemical properties of the injection zone.

Additionally, the EPA determined that the confining zone would provide a suitable trap to prevent carbon dioxide from moving upward, thereby protecting USDWs from endangerment, as required under 40 CFR 146.83. This is based on information regarding the lithological, petrophysical, geomechanical, and geochemical properties of the upper and lower confining zones, as well as a review of seismic history and seismic risk. The EPA also reviewed water chemistry and data on the solids in the injection zone to determine whether geochemical reactions during injection could alter the ability to inject and the storage capacity (i.e., through changes in porosity and permeability) or cause the release of trace elements.

To evaluate seismic risk, the EPA reviewed information about seismic history in the project area, including data from the U.S. Geological Survey and the TexNet Seismic Monitoring and Center for Integrated Seismicity research group. This data shows that no seismic activity has been detected within the proposed project area, with the closest event approximately 30 miles northeast of the project area. This distance from the site and lack of activity within the project area indicates a low seismic probability and risk for induced seismicity. The only faults identified within the project AoR are deep faults that do not extend upward into the lower confining zone. These six faults are considered to be minor faults with minimal displacement that do not affect the injection and confining zones and therefore would not be affected by injection activities.

The EPA asked questions of Orchard Storage Company LLC about the injection and confining zone properties, available core data, porosity and permeability, geochemistry, thickness, and fracture pressure to ensure that site-specific information is accounted for in predicting plume behavior. The EPA determined that Orchard's responses to its questions and updated Site Characterization document addressed all concerns to the EPA's satisfaction. Before the EPA authorizes injection, Orchard will also conduct pre-operational testing (as per 40 CFR 146.87) to provide additional data on the injection and confining zones, thereby verifying the information on which the permit application narrative is based.

Based on the review of the information provided by Orchard Storage Company LLC and additional information, the EPA determined the permit application meets the requirements for the injection and confining zones, thereby protecting USDWs from endangerment, as required under 40 CFR 146.83. See the relevant permit application documents and other supporting materials as part of the administrative record: Orchard Storage Company LLC's Site Characterization narrative (Section 1 of the permit application); RAI #1 and RAI #2; and Orchard Storage Company LLC's responses to the RAIs.

Geochemical Characterization and Compatibility

Federal Requirements under the Class VI Rule

Geochemical and mineralogic data required in the Class VI Rule encompasses fluid chemistry and information on the solids (i.e., bulk chemistry and mineralogy) of the formation rocks. 40 CFR 146.82(a)(6) requires baseline geochemical information on subsurface formations including all USDWs in the AoR. Information on water chemistry indicates which formations qualify as USDWs and confirms that the proposed injection formation is not a USDW (see section below on Underground Sources of Drinking Water). Also, at 40 CFR 146.82(a)(3)(iii), owners or operators are required to submit information on the mineralogy of the injection formation and confining zone. The combined water chemistry and data on the solids is used to determine whether geochemical reactions during injection will cause changes in the ability to inject and the storage capacity (i.e., through changes in porosity and permeability) or cause the release of trace elements. This assessment of the compatibility of the injectate with the formation fluids and solids is required at 40 CFR 146.82(c)(3) and is typically done using geochemical modeling software.

Draft Permit Conditions

Prior to commencing injection, Orchard must perform pre-operational testing (including logging, core analyses, and fluid sampling and analysis) to characterize the chemistry and mineralogy of the injection zone. In addition, Orchard must perform monitoring during injection operations to demonstrate that the injected carbon dioxide is behaving in the subsurface as predicted by modeling. For additional details on relevant permit conditions related to geochemical characterization and compatibility analysis, see Sections J (Pre-Injection Testing) and M (Testing and Monitoring) and Attachments 4 (Construction Details) and 6 (Testing and Monitoring Plan) of the permits.

Application Review and Decision Process

The EPA has reviewed information in the record. This includes the collection of geochemical and mineralogic data and the permittee's geochemical modeling. Interpretation of fluid chemistry for USDW identification is discussed below in the section on Underground Sources of Drinking Water. The EPA's evaluation of the geochemical modeling considered the inputs used, how simulations were run, the results, and any other information needed to evaluate the modeling approach and interpretation of the results.

The EPA reviewed laboratory analytical results from produced water in oil and gas fields near the project to characterize fluid geochemistry of the injection zone. The EPA also reviewed data on the minerology of the injection and confining zones based on X-ray diffraction analysis of core samples.

The EPA asked clarifying questions about planned geochemical testing in RAI #1 and determined based on Orchard Storage Company LLC's responses that Orchard will collect a sufficient amount of data during pre-operational testing to fully characterize injection zone geochemistry to identify potential chemical reactions that could affect plume and pressure front movement.

Based on the review of the information provided by Orchard Storage Company LLC and additional information, the EPA determined the permit application meets the requirements at 40 CFR 146.82(a)(6), 40 CFR 146.82(a)(3)(iii), and 40 CFR 146.82(c)(3) for geochemical characterization and compatibility analysis. See the relevant permit application documents and other supporting materials as part of the administrative record: Orchard Storage Company LLC's Site Characterization narrative (Section 1 of the permit application); EPA's RAI #1; and Orchard Storage Company LLC's responses to the RAI.

Area of Review Determination

Federal Requirements under the Class VI Rule

The Class VI Rule under 40 CFR 146.82 and 40 CFR 146.84(a, b, and c) defines the requirements for delineating and reevaluating the project's AoR. The project's AoR is the maximum extent of the subsurface area that may be affected by injection. For Class VI wells, the AoR is determined using advanced computational modeling to predict the projected lateral and vertical migration of the injected CO_2 and the area of elevated pressure underground. The injected fluid is sometimes referred to as the CO_2 plume once it is underground.

The applicant must conduct computational modeling that accounts for the physical and chemical properties of all phases of the injected CO_2 stream and is based on available site characterization, monitoring, and operational data. The modeling is used to predict the lateral and vertical migration of the injected CO_2 underground and to predict pressure increase in the injection zone. Determination of the AoR is a key aspect of a Class VI project, and the numerical modeling is expected to be robust and well-documented.

As required at 40 CFR 146.84(e), Orchard Storage Company LLC must also periodically re-evaluate the AoR. This is done by evaluating monitoring and operational data every five years over the duration of the project, or when monitoring and operational conditions warrant, and by updating the computational modeling based on new information. The re-evaluation will verify whether the CO_2 plume and pressure front are moving as predicted. If there are any significant changes from modeled predictions, Orchard Storage Company LLC must revise the project-specific plans described here, and the EPA may need to modify the permit per 40 CFR 144.39.

Draft Permit Conditions

The specifics regarding the AoR for the Orchard Storage Company LLC Project are in the Area of Review and Corrective Action Plan, found in Section G (Area of Review and Corrective Action) of the permits and Attachment 2 (Area of Review and Corrective Action Plan). AoR revaluation and any needed updates to the Area of Review and Corrective Action Plan will be done every five years or when

anomalous events (e.g., plume and pressure front behavior that varies from modeled predictions, potential loss of mechanical integrity, detected changes to the CO_2, or seismic events).

Application Review and Decision Process

The EPA has reviewed information in the record. This includes the development of the numerical model, the inputs used, how simulations were run, the results, and any other information needed to evaluate the modeling approach and interpret the results.

The EPA reviewed Orchard's AoR and Corrective Action Plan to ensure that it complies with all requirements. Specifically, the EPA examined Orchard's computational modeling approach to verify that it meets the needs for complex AoR delineations. The EPA also evaluated the modeling inputs, including porosity and permeability, geomechanical properties, fluid chemistry, etc. of the injection and confining zones to verify that they accurately reflect the site-specific geologic conditions as described in the permit application.

The EPA asked clarifying questions about the model design, processes modeled, and how inputs and assumptions reflect site-specific geologic and geochemical data in RAI #1, RAI #2, RAI #4, and RAI #5 and Orchard's responses to the EPA's questions, and determined that the modeling approach accurately predicts, to the extent possible, the extent of the plume and pressure front.

Based on the review of the information provided by Orchard Storage Company LLC and additional information, the EPA determined the permit application meets the requirements at 40 CFR 146.84 for AoR determination. See the relevant permit application documents and other supporting materials as part of the administrative record: Orchard Storage Company LLC's Area of Review and Corrective Action Plan (Section 3 of the permit application); EPA's RAI #1, RAI #2, RAI #4, and RAI #5; and Orchard Storage Company LLC's responses to the RAIs.

Corrective Action on Wells Within the Area of Review

Federal Requirements under the Class VI Rule

Requirements under 40 CFR 146.82(a)(2)&(4) and 40 CFR 146.84(b,c,d,e), specify that the applicant must identify all wells in the area of review. This includes injection and producing wells, abandoned wells, plugged wells or dry holes, and deep stratigraphic boreholes. The applicant must identify which wells penetrate the injection or confining zone(s) and which abandoned wells in the AoR have been plugged in a manner that prevents the movement of CO_2 or other fluids that may endanger USDWs. Owners or operators of Class VI wells must perform corrective action on all wells in the AoR that the EPA has determined to need corrective action.

Draft Permit Conditions

The permit conditions regarding corrective action for the Orchard Project are in Section G.2 of the permits and the Area of Review and Corrective Action Plan (Attachment 2 to the permits). Twelve wellbores within the AoR will be plugged or reworked (repaired), because they penetrate the injection zone or confining layer and will not be used for injection or monitoring purposes within the storage

project. Orchard must properly plug and abandon or rework these wells before the EPA will authorize the permittee to begin carbon dioxide injection.

Any updates to corrective action will be included in the AoR and Corrective Action Plan updates, performed every five years or when any conditions that would trigger an AoR reevaluation occur (as described under "Area of Review Determination").

The specifics regarding corrective action for the Orchard Project are in the Area of Review and Corrective Action Plan found in Section G (Area of Review and Corrective Action) of the permits and Attachment 2 (Area of Review and Corrective Action Plan).

Application Review and Decision Process

The EPA reviewed the material related to corrective action in Orchard Storage Company LLC's Area of Review and Corrective Action Plan and other relevant information to ensure that the plan complies with all requirements.

The EPA reviewed Orchard's analysis of wells in the AoR, which included searches of state databases. For the wells within the AoR that require plugging because they penetrate the confining zone, the EPA evaluated Orchard's proposed approach to plugging and determined that it was sufficient to ensure that these wells will not allow fluid movement that could endanger USDWs.

The EPA asked clarifying questions about the ability of wells in the AoR to withstand pressures associated with the injection activity and determined that Orchard's responses to the EPA's questions and updated application submittals demonstrated that corrective action meets the requirements.

Based on the review of the information provided by Orchard Storage Company LLC and additional information, the EPA determined the permit application meets the requirements for corrective action. See the relevant permit application documents and other supporting materials as part of the administrative record: Orchard Storage Company LLC's Area of Review and Corrective Action Plan (Section 3 of the permit application); EPA's RAI #1 and RAI #2; and Orchard Storage Company LLC's responses to the RAIs.

Underground Sources of Drinking Water (USDWs)

Federal Requirements under the Class VI Rule

Class VI permit applicants are required to submit maps and cross sections showing all USDWs (as well as water wells and springs) within the AoR and where they are situated relative to the injection zone(s) and the direction of water movement, where known (40 CFR 146.82(a)(5)). Applicants must also submit baseline water chemistry data on all subsurface formations, including USDWs, within the AoR (40 CFR 146.82(a)(6)). This information is important to understand where the injection formation is located in relation to USDWs.

The UIC program protects current and future sources of drinking water by defining a USDW broadly. USDWs, by definition under 40 CFR 144.3 and 40 CFR 146.3, include aquifers that currently supply public water supply systems or contain enough groundwater to do so and either 1) currently supply

drinking water (e.g., private wells) or 2) contain fewer than 10,000 milligrams per liter (mg/L) of total dissolved solids (TDS). The concentration of TDS is an indicator of whether an aquifer has the potential to be used for drinking water even if it is not currently being used. Typically, potable water generally contains less than 500 mg/L of TDS. However, an aquifer (or portion of an aquifer) that contains up to 10,000 mg/L of TDS is still considered a potential drinking water source and is therefore protected under the UIC program even if it is not in use. In this way, the broad definition of USDWs protects both groundwater sources that are currently used for drinking water and those that could be used in the future.

Draft Permit Conditions

At the Orchard site, the Ogallala aquifer, the Edwards-Trinity aquifer, and the Dockum aquifer have been determined to be USDWs. The lowermost USDW is the Dockum aquifer. It is separated vertically from the top of the primary confining layer by over 2,000 feet of rock.

Protection of USDWs is the stated goal of the UIC program; protection of the USDWs at the Orchard site is supported by all aspects of the permit, from siting (based on numerous geologic, hydrogeologic, seismic, geochemical, and geomechanical considerations) to AoR determination, corrective action, well construction requirements, testing and monitoring, safe operational parameters (maximum injection rate and pressure), emergency and remedial response, plugging and abandonment, post-injection site care, and financial responsibility. Collectively, the permit conditions maintain protective measures for USDWs in the AoR.

Application Review and Decision Process

The EPA reviewed the permit application and other relevant information regarding USDWs in the AoR, including information from literature reviews. The underlying Dockum aquifer is the oldest aquifer in the area and is considered to be the lowermost USDW at the Orchard project site. It has a TDS content of 5,000 to 10,000 mg/L, and the base occurs at depths of approximately 1,850 to 2,000 ft below the ground surface.

The EPA reviewed the information submitted in the Site Characterization document regarding the depth to and quality of the lowermost USDW, which is included as part of the administrative record for the Permits.

The EPA asked clarifying questions to understand the depth and thickness of the lowermost USDW and determined that Orchard's responses to the EPA's questions and updated application submittals demonstrated that the wells will be constructed to protects USDWs.

Based on the review of the information provided by Orchard Storage Company LLC and additional information, the EPA determined the permit application meets the requirements for describing USDWs in the AoR. See the relevant permit application documents and other supporting materials as part of the administrative record: Orchard Storage Company LLC's Site Characterization narrative (Section 1 of the permit application); RAI #1 and RAI #4; and Orchard Storage Company LLC's responses to the RAIs.

Well Construction Requirements

Federal Requirements under the Class VI Rule

The regulatory criteria for Class VI well construction are provided at 40 CFR 146.86. All Class VI wells must be constructed with materials (e.g., steel casings and cement) that are compatible with the fluids they will come in contact with. Materials expected to be exposed to CO_2 and a mixture of CO_2 and water need to be corrosion resistant.

Class VI wells must be cased and cemented to prevent the movement of fluids into or between USDWs or into any unauthorized zones. Requirements include a surface casing (outermost pipe) that extends down through the base of the lowermost USDW and a long-string casing (inner pipe) that extends down into the injection zone. Casings must be cemented in place with the cement extending the full length of the casing all the way to the surface.

Draft Permit Conditions

The draft permit specifies that the seven injection wells will be completed to inject into the San Andres Formation at depths of 5,051 to 6,597 feet BGS. The well construction will include three casing strings composed of J-55, L-80, and 22CR/25CR steel; acid-resistant cement; and a packer set within the confining zone to isolate the injection formation.

The draft permit specifies that three monitoring wells will be constructed at the project site. These include: MW1, an above-confining zone well (4,899 feet deep), located in the center of the injection wells; Orchard MW #2, an existing wellbore (7,200 feet deep) that will be utilized as an in-zone monitoring well (located south of the injection wells); and Orchard MW #3 (4,622 feet), located between two injection wells on the eastern side of the project, which will also serve as an above-confining zone monitoring well. The monitoring wells will be constructed with J-55 steel casing. Five additional monitoring wells will be installed for the purpose of solely monitoring the USDW.

Once a final permit has been issued and is effective, Orchard Storage Company LLC may commence well construction. Orchard Storage Company LLC is not authorized to inject until they have complied with specific permit requirements in Section R, including performing all required well and formation testing and demonstrating mechanical integrity of the injection wells. The EPA will review submitted materials to confirm that these conditions have been met and will issue a written authorization to inject.

For details on permit conditions related to injection well construction, see Section I (Well Construction Requirements) of the permits and Attachment 4 (Construction Details).

Application Review and Decision Process

The EPA reviewed information in the permit application, including well construction procedures, schematics, and information about the proposed casings, tubing, types and amount of cement, packer, and equipment and other relevant information regarding the proposed injection well construction to determine if the proposed Class VI well construction meets requirements.

The EPA reviewed the permit application to determine if the submitted Class VI wells' construction meets these requirements. Specifically, the EPA evaluated information on Orchard's construction procedures, casings and cements (including the corrosion-resistance of the materials used), well

schematics, mechanical integrity testing procedures, continuous monitoring, and emergency shut-off procedures to determine that they are suitable for carbon dioxide injection at the planned operating conditions and that all casings are set and cemented at depths appropriate to relevant formations (e.g., the lowermost USDW and the injection and confining zones).

The EPA asked clarifying questions about well construction, e.g., about the well depths, how the wells will resist corrosion and anticipated stress, and the well schematics. The EPA determined that Orchard's responses to the EPA's questions and updated application submittals demonstrated that the wells will be constructed to meet the Class VI requirements.

Based on the review of the information provided by Orchard Storage Company LLC and additional information, the EPA determined the permit application meets the requirements for well construction at 40 CFR 146.86. See the relevant permit application documents and other supporting materials as part of the administrative record: Orchard Storage Company LLC's Engineering Design and Operating Strategy (Section 4 of the permit application); EPA's RAI #1, RAI #2, RAI #3, and RAI #5; and Orchard Storage Company LLC's responses to the RAIs.

Characteristics of the CO_2 Stream

Federal Requirements under the Class VI Rule

The Class VI Rule at 40 CFR 146.82(a)(7)(iii, iv) requires the applicant to submit information on the source(s) of the CO_2 stream and an analysis of the chemical and physical characteristics of the CO_2 stream. The Class VI Rule defines CO_2 stream as "carbon dioxide that has been captured from an emission source (e.g., a power plant), plus incidental associated substances derived from the source materials and the capture process, and any substances added to the stream to enable or improve the injection process" (40 CFR 146.81(d)). It cannot include anything that meets the RCRA definition of a hazardous waste under the Resource Conservation and Recovery Act.

At 40 CFR 146.86(c)(3)(ii), the permit applicant must submit information on the characteristics of the CO_2 stream (chemical content, corrosiveness, temperature, and density) so that the Director can determine and specify requirements for the injection tubing and packer.

Draft Permit Conditions

The CO_2 to be injected will be captured from industrial activities and power plants and transported via an existing Kinder Morgan CO_2 pipeline to the injection site. The composition of the CO_2 stream is anticipated to be at least 95 percent CO_2, up to 4 percent nitrogen (N_2), and additional components that will comprise less than 1 percent of the mass of the CO_2. It will be sampled prior to commencing injection and analyzed quarterly during injection operations.

For details on permit conditions related to the sources and physical and chemical characteristics of the CO_2 stream, see Section K.4 of the permits (Additional Injection Limitations) and Attachment 1 (Summary of Operating Requirements).

Application Review and Decision Process

The EPA reviewed information in the permit application including the minimum requirements for the composition of the CO_2 stream. The permit also requires periodic testing of the CO_2 stream to ensure that the CO_2 stream remains within permitted specifications. The EPA reviewed the CO_2 stream specifications in the context of potential geochemical reactions with subsurface fluids and rock formations (to inform the AoR delineation modeling) and the materials and cements to be used in constructing the injection and monitoring wells (to identify potential corrosion concerns). Based on this, the EPA determined that injection of the proposed CO_2 stream will not pose endangerment to USDWs.

The EPA requested information about the CO_2 source and determined that Orchard's responses to the EPA's questions and updated application submittals demonstrated that the responses meet the requirements.

Based on the review of the information provided by Orchard Storage Company LLC and additional information, the EPA determined the permit application meets the requirements for characterization of the injection fluid as per 40 CFR 146.82 and 40 CFR 146.86. See the relevant permit application documents and other supporting materials as part of the administrative record: Section 0 (Introduction) of Orchard Storage Company LLC's permit application); EPA's RAI #1; and Orchard Storage Company LLC's responses to the RAI.

Injection Fluid Volume and Injection Rates

Federal Requirements under the Class VI Rule

The Class VI Rule at 40 CFR 146.83(a)(1) requires an injection zone(s) of sufficient areal extent, thickness, porosity, and permeability to receive the total anticipated volume of the CO_2 stream. Thus, the proposed volume of CO_2 to be injected must be consistent with the storage capacity of the injection zone.

The Class VI Rule at 40 CFR 146.82(a)(7)(i) requires the applicant to submit information on the CO_2 injection rate and volume and the total amount of CO_2 that will be injected over the lifetime of the project.

Draft Permit Conditions

Orchard Storage Company LLC will inject a maximum of approximately 27.8 MMT of CO_2 over a 12-year period into the San Andres Formation, which is the injection zone formation capable of receiving that amount of CO_2. The annual amount expected to be injected is approximately 2.319 million metric tons per year.

For details on permit conditions related to injection fluid volume and injection rates, see Section K (Injection Well Operation) and Attachment 1 (Operating Conditions) of the permits.

Application Review and Decision Process

To determine whether the proposed injection volumes and rates are appropriate, the EPA reviewed information on the storage capacity of the San Andres Formation injection zone, including the amount of pore space available and the results of modeling. Based on this, the EPA determined that the San Andres Formation has sufficient capacity to receive the total volume Orchard plans to inject each year over the 12-year injection duration.

The EPA asked clarifying questions about the planned injection rates in each well and determined that Orchard's responses to the EPA's questions and updated application submittals were sufficient.

Based on the review of the information provided by Orchard Storage Company LLC and additional information, the EPA determined that the injection zone is of sufficient areal extent, thickness, porosity, and permeability to receive the total anticipated volume of the CO_2 stream as per 40 CFR 146.83(a)(1). The EPA has also determined that the proposed CO_2 injection rate and volume are acceptable and will not endanger USDWs (e.g., by initiating fractures in the injection or confining zones as further described below).

See the relevant permit application documents with proposed operating information as part of the administrative record: Orchard Storage Company LLC's Engineering Design and Operating Strategy (Section 4 of the permit application); EPA's RAI #1; and Orchard Storage Company LLC's responses to the RAI.

Maximum Injection Pressure

Federal Requirements under the Class VI Rule

The pressure during injection must not initiate fractures in the injection or confining zones, as required under 40 CFR 146.88(a) and 40 CFR 146.83(a)(2). Such fractures, especially those in the confining zone, could become conduits for the movement of injection or formation fluids into a USDW, which is prohibited by 40 CFR 146.88(a), 40 CFR 146.83(a)(2), and 40 CFR 144.12.

To maintain safe injection, wells must be equipped with continuous recording devices to monitor the injection pressure; the rate, volume and/or mass, and temperature of the CO_2 being injected; the pressure on the annulus (space) between the tubing and the long string casing and the volume of fluid in the annulus, as required by 40 CFR 146.88(e)(1).

Injection wells must also be equipped with an automatic surface shut-off system that would shut off the well if any permitted operating parameters—such as injection pressure—diverge from permit limitations, as required by 40 CFR 146.88(e)(2).

Draft Permit Conditions

Injection pressure limits are in Section K.2 of the permits and are summarized for each injection well in the table below:

Parameter	Orchard No. 1	Orchard No. 2	Orchard No. 3	Orchard No. 4	Orchard No. 5	Orchard No. 6	Orchard No. 7

Maximum Bottomhole Pressure (psi)	2,816	2,806	2,736	2,683	2,659	2,448	2,725
Maximum Surface Injection Pressure (psi)	933	955	934	899	936	845	860
Expected Surface Injection Pressure (psi)	868	888	934	850	873	830	830

Application Review and Decision Process

The EPA reviewed information in the permit application and other relevant information regarding the maximum injection pressure and proposed injection well operations to determine if they meet Class VI requirements.

The EPA reviewed Orchard's proposed maximum injection pressures and injection rates and determined that the maximum injection pressures will not exceed 90% of the fracture pressure of the injection zone. This is based on an assumed fracture pressure derived from the calculated fracture gradient at each injection well. The actual fracture gradient and maximum injection pressure limits will be updated based on testing conducted during well construction.

The EPA reviewed the proposed maximum injection pressures and found them to be appropriate to the site-specific geomechanical properties of the injection and confining zones and congruent with a required safety factor below that of the calculated site fracture pressure. This information is also incorporated into the computational modeling described under "AoR and Corrective Action." As a result, the EPA has determined that the maximum surface injection pressures and bottomhole pressures in the table above, and in Section K of the permits, will allow Orchard to inject the total volume of CO_2 over the project lifetime and ensure that the pressures during injection do not initiate fractures in the injection or confining zones, under 40 CFR 146.88(a). These limits are contained in Section K and Attachment 1 (Summary of Operating Requirements) to the permits.

The EPA also reviewed Orchard's plans for well stimulation and determined that the planned procedures and stimulation fluids are appropriate to ensure that any well stimulation would not adversely affect the integrity of the injection or confining zone.

Prior to commencing injection, Orchard must perform a step rate test to measure fracture gradient and validate assumptions about formation fracture pressure. Initial bottomhole and temperature measurements will also be taken.

The EPA asked clarifying questions about Orchard's planned operations and stimulation plan and determined that Orchard's responses to the EPA's questions and updated application submittals met the requirements.

Based on the submitted preliminary data, the EPA has determined that the maximum proposed injection pressures will ensure that the pressures during injection will not initiate fractures in the

injection or confining zones. Pursuant to 40 CFR 146.88(a) as part of pre-operational testing additional data will be collected and reviewed to ensure the injection pressure will not initiate fractures. See the relevant permit application documents with information related to the maximum injection pressures as part of the administrative record: Orchard Storage Company LLC's Engineering Design and Operating Strategy (Section 4 of the permit application); EPA's RAI #1, RAI #3, and RAI #5; and Orchard Storage Company LLC's responses to the RAIs.

Testing and Monitoring Requirements

Federal Requirements under the Class VI Rule

The Class VI Rule at 40 CFR 146.90 requires multiple types of testing and monitoring during CO_2 injection and through to site closure. The proposed testing and monitoring procedures are described in a required Testing and Monitoring (T&M) Plan, which is part of the permit application. It must include certain elements specified by regulation, and it will be incorporated as an enforceable attachment to the permits, if issued. The Class VI Rule also requires owners and operators to submit a quality assurance and surveillance plan (QASP) for all testing and monitoring requirements (40 CFR 146.90(k)). The draft permits require that the T&M plan will be periodically updated during the injection period (reviewed at least once every five years). The required monitoring types are:

1. Analysis of the CO_2 stream with sufficient frequency to yield data representative of its chemical and physical characteristics is required at 40 CFR 146.90(a).
2. The Class VI Rule at 40 CFR 146.90(b) requires continuous monitoring of the injection pressure, rate, and volume, and pressure on the annulus (space) between the tubing and long string casing, and the volume of annulus fluid added in order to detect the development of any leaks in the casing, tubing, or packer.
3. Requirements for quarterly monitoring of well materials for corrosion are outlined at 40 CFR 146.90(c),
4. Monitoring groundwater quality above the confining zone(s) to check for changes that could be due to migration of CO_2. This is done through sampling from deep monitoring wells. This will indicate any changes in water quality, such as changes in pH, major ions, or mobilization of metals or organic compounds that could be caused by injection. This is in accordance with 40 CFR 146.90(d).
5. The Class VI Rule requires testing of the physical condition of the injection wells and whether there are leaks in the casing that would allow movement of fluid along the outside of the well ("external mechanical integrity testing"). Testing must be done at least once per year until the well is plugged. The initial baseline test is done prior to injection, as required at 40 CFR 146.90(e). The Class VI Rule specifies the types of tests that are allowed.
6. Testing for changes in the hydrogeologic properties of the injection formation ("pressure fall-off testing") at least once every five years to determine how the formation is responding to injection as required at 40 CFR 146.90(f).
7. Tracking the plume of injected CO_2 and the changes in pressure in the injection formation to verify that the CO_2 plume and pressure are developing as predicted. This is done through a combination of direct measurements (e.g., pressure measurements) and indirect measurements (e.g., using

methods such as seismic surveys) to determine the extent of the CO_2 plume as required at 40 CFR 146.90(g)(1,2).

8. The UIC Program Director may require surface air and soil gas monitoring to detect CO_2 movement pursuant to 40 CFR 146.90(h) if such monitoring is based on potential risks to USDWs.
9. Under 40 CFR 146.90(i), the UIC program Director may require any additional monitoring necessary to support, upgrade, and improve computational modeling of the area of review evaluation and to determine compliance with the prohibition of movement of fluid into USDWs.

Most testing and monitoring results are required to be submitted in semi-annual reports under 40 CFR 146.91(a). Mechanical integrity test results must be submitted within 30 days as required by 40 CFR 146.91(b). Events where the injected CO_2 or pressure could cause endangerment to a USDW, such as triggering of a shut-off device, a mechanical integrity failure, possible fluid movement into USDWs, or evidence of a surface leak, must be reported within 24 hours as required by 40 CFR 146.91(c).

Draft Permit Conditions

The Testing and Monitoring Plan and the draft permits specify the following:

1. Section M.2 of the draft permits requires Orchard Storage Company, LLC to analyze the CO_2 quarterly for its chemical and physical characteristics.
2. Section M.3 of the draft permits requires Orchard Storage Company LLC to conduct continuous monitoring for injection pressure, rate, and volume; pressure on the annulus (space) between the tubing and long string casing; and the volume of annulus fluid added as per Class VI requirements at 40 CFR 146.90.
3. Section M.4 of the draft permits requires Orchard Storage Company LLC to perform quarterly corrosion monitoring using coupons.
4. Section M.5 of the draft permits requires Orchard Storage Company LLC to monitor groundwater quality above the confining zone(s) in two monitoring wells (MW No. 1 and MW No. 3) screened in the Queen Formation at depth. Samples will be taken quarterly and analyzed for total dissolved solids (TDS); pH; specific conductivity; temperature; density; and other parameters including major anions and cations, trace metals, hydrocarbons, and volatile organic compounds.
5. Section M.6 of the draft permits requires Orchard Storage Company LLC to test external mechanical integrity annually via a temperature log and an oxygen activation log.
6. Section M.7 of the draft permits requires Orchard Storage Company LLC to perform casing inspection logs with the initial installation of the tubing and packer, every 5 years, and any time the tubing must be removed.
7. Section M.8 of the draft permits requires Orchard Storage Company LLC to perform fall-off testing at least once every five years.
8. Section M.9 of the draft permits requires Orchard Storage Company LLC to track the movement of the CO_2 plume and pressure front using direct methods (i.e., continuously monitoring pressures and temperatures, pressure falloff testing, and fluid sampling of the injection zone) and indirect methods (i.e., using seismic surveys such as vertical seismic profiling).
9. Section M.10 of the draft permits requires Orchard Storage Company LLC to perform seismic monitoring and soil gas monitoring.

In accordance with 40 CFR 144.54 and 40 CFR 146.91 and as required by Section N.2 of the draft permits, Orchard Storage Company LLC will submit the results of this monitoring to the EPA semiannually or within 30 days of the completion of a mechanical integrity test or other required testing. Section N.3 of the permits requires reporting to the EPA within 24 hours of events where the injected CO_2 or pressure could cause endangerment to a USDW, such as triggering of a shut-off device, a mechanical integrity failure, possible fluid movement into an unauthorized zone, or evidence of a surface leak.

Application Review and Decision Process

Orchard Storage Company LLC submitted a Testing and Monitoring Plan and Quality Assurance Surveillance Plan as part of their permit application. Based on the review, the EPA has determined that the Testing and Monitoring Plan meets all requirements. The EPA reviewed information in the permit application and other relevant information regarding Orchard's testing and monitoring plan to determine whether they meet Class VI requirements. For example, the EPA reviewed the placement of above confining zone monitoring wells to ensure that they will collect data to detect leakage of carbon dioxide or brines above the confining zone. The EPA also reviewed plume and pressure front tracking methods to ensure that they will provide information on the evolution of the CO_2 plume and pressure front. Orchard will also use this data to inform AoR reevaluations, as described in Section G. AoR and Corrective Action. The EPA also verified that planned well testing (including the use of corrosion coupons, continuous operational monitoring, and mechanical integrity testing) are appropriate to ensure that the wells will maintain integrity throughout the injection operation.

The EPA reviewed the Testing and Monitoring Plan and requested clarifying information about planned corrosion monitoring, injectate monitoring, groundwater monitoring, plume and pressure front tracking, mechanical integrity tests, soil gas monitoring, and seismic monitoring. The EPA reviewed Orchard's responses, and an updated Testing and Monitoring Plan was submitted, which was found to meet federal requirements. The EPA also reviewed the Quality Assurance and Surveillance Plan and determined that it addresses all testing and monitoring activities to ensure that all testing and monitoring will produce reliable results.

Based on the above information, the EPA has concluded that Orchard Storage Company LLC's Testing and Monitoring Plan, as reflected in Attachment 6 of the draft permits, meets the requirements at 40 CFR 146.90. (Monitoring after injection has ended, i.e., as part of "post injection site care," is discussed in a separate section further below.) See the relevant permit application documents with information related to testing and monitoring as part of the administrative record: Orchard Storage Company LLC's Testing and Monitoring Plan (Section 5 of the permit application); Quality Assurance and Surveillance Plan (Appendix to Permit Attachment 6); EPA's RAI #1, RAI #3, and RAI #5; and Orchard Storage Company LLC's responses to the RAIs.

Emergency and Remedial Response

Federal Requirements under the Class VI Rule

Requirements for the Emergency and Remedial Response plan (40 CFR 146.94) specify that the plan must describe what the owner or operator will do in the unanticipated circumstance where unintended movement of the CO_2 or formation fluids occurs and may cause an endangerment to a USDW during the construction, operation, or PISC periods. The Emergency and Remedial Response plan (40 CFR 146.94(b)(1-4)) is an enforceable part of the permit that describes the responses that the permit applicant must take to address adverse events related to the unanticipated movement of fluids that may endanger a USDW.

If there is an indication that the injected CO_2 and associated pressure may endanger a USDW, the owner or operator must stop injection, identify and characterize any release, notify the UIC Director within 24 hours, and implement the approved emergency and remedial response plan (40 CFR 146.94(b)). The plan identifies the staff and equipment available to support emergency and remedial response events. The emergency and remedial response provisions of the permit will facilitate expedient responses and prevent or mitigate harm to USDWs.

Draft Permit Conditions

Section P and Attachment 9 (Emergency and Remedial Response Plan) of the permits describe the responses to be taken in the event of adverse events and identifies the staff and equipment available to support emergency and remedial response events. The emergency and remedial response provisions of the permits will facilitate expedient responses and prevent or mitigate harm to the environment, including USDWs.

Section N.3 (Reporting and Recordkeeping) of the permits requires reporting to the EPA within 24 hours of events where the injected carbon dioxide or pressure could cause endangerment to a USDW, such as triggering of a shut-off device, a mechanical integrity failure, possible fluid movement into an unauthorized zone, or evidence of a surface leak.

Application Review and Decision Process

The EPA reviewed Orchard Storage Company LLC's Emergency and Remedial Response Plan that identifies key resources in the project AoR, which is located in a rural area and includes agricultural infrastructure and one residence.

It also identifies potential emergency scenarios (such as water quality contamination, release of CO_2 to the surface, a well blowout, surface spill, loss of mechanical integrity, induced seismic event, or accidents or unplanned events), and the actions that Orchard would use to respond to the emergency event, including the personnel and equipment it would deploy.

The Emergency and Remedial Response Plan also provides contact information for emergency personnel, including project staff and relevant local/state authorities; procedures for emergency notification to the public; and procedures/timelines for periodic review of the Emergency and Remedial Response Plan.

The EPA asked clarifying questions about Orchard's Emergency and Remedial Response Plan and reviewed their revised Emergency and Remedial Response Plan and determined it satisfactorily addressed the EPA's questions and meets the requirements at 40 CFR 146.94.

Based on the review, the EPA has determined that the Emergency and Remedial Response Plan meets all applicable Class VI Rule requirements. See the relevant permit application documents with information related to emergency and remedial response as part of the administrative record: Orchard Storage Company LLC's Emergency and Remedial Response Plan (Section 8 of the permit application); EPA's RAI #2, RAI #3, and RAI #5; and Orchard Storage Company LLC's responses to the RAIs.

Financial Responsibility

Federal Requirements under the Class VI Rule

Owners and operators are required to demonstrate and maintain financial responsibility for their Class VI projects as per 40 CFR 146.85. This is to ensure that the private costs of the project are not passed along to the public, including possible costs after CO_2 injection ends and the well is plugged, through site closure. The financial coverage must be sufficient to address endangerment of USDWs. It must cover the cost of corrective action, injection well plugging, post injection site care and site closure, and emergency and remedial response. The Class VI Rule provides a list of financial instruments as the required conditions of coverage, *see* 40 CFR 146.85(a)(1); 40 CFR 146.85((a)(4)(i).

During the injection period of the geologic sequestration project, the owner or operator must adjust the cost estimate for inflation annually and provide this adjustment to the Director. 40 CFR 146.85(c)(2). The owner or operator must also provide to the Director adjustments to the cost estimate after any amendments to the AoR and Corrective Action Plan (40 CFR 146.84), the Injection Well Plugging Plan (40 CFR 146.92), the PISC and Site Closure Plan (40 CFR 146.93), and the Emergency and Remedial Response Plan (40 CFR 146.94). The Director must approve any decrease or increase to the cost estimate. Whenever the cost estimate increases beyond the face amount of a financial instrument currently in use, the owner or operator must either increase the amount of the financial instrument to equal the current cost estimate or obtain other financial responsibility instruments to cover the increase. 40 CFR 146.85(c)(4).

Draft Permit Conditions

Orchard Storage Company LLC has secured financial coverage of a total of $22,842,826 via a bond that will cover corrective action, well plugging and post-injection site care, site closure, and third-party insurance that will cover emergency response.

For details on permit conditions related to financial responsibility, see Section H (Financial Responsibility) and Attachment 3 (Financial Responsibility Demonstration) of the permits.

Application Review and Decision Process

The EPA reviewed information in the permit application and other relevant information regarding Orchard Storage Company LLC's financial responsibility demonstration to determine if they meet Class VI requirements.

The EPA reviewed whether Orchard's proposed cost estimates were adequate to cover the activities as described in the AoR and Corrective Action Plan, Testing and Monitoring Plan, Well Plugging Plan, PISC, Site Closure Plan, and Emergency and Remedial Response Plan.

The EPA also evaluated the language in Orchard's financial instruments to determine that they included the required conditions (e.g., for continuation, renewal, and cancellation) and are financially secure. The EPA asked clarifying questions and reviewed the applicant's responses, after which Orchard updated its financial information accordingly. Based on the review, the EPA has determined that Orchard meets all requirements for demonstrating and maintaining financial responsibility.

Orchard will utilize a bond and third-party insurance to cover costs and demonstrate its financial responsibility for corrective action, well plugging, post-injection site care, site closure, and emergency response. The cost estimates for the covered activities must be updated for inflation within 60 days prior to the anniversary date of the financial instruments' establishment. If there are other updates to the financial responsibility instruments, this information must be submitted on an annual basis. These provisions ensure that resources are available to perform these USDW-protective activities without using public or taxpayer money.

The EPA asked clarifying questions about Orchard's proposed financial instruments and determined that Orchard's financial responsibility demonstration meets the requirements at 40 CFR 146.85.

Based on the above information, the EPA has concluded that Orchard Storage Company LLC's demonstration of financial responsibility meets the requirements at 40 CFR 146.85. See the relevant permit application documents with information related to financial responsibility as part of the administrative record: Orchard Storage Company LLC's Financial Assurance Plan (Section 9 of the permit application); EPA's RAI #2, RAI #3, and RAI #5; and Orchard Storage Company LLC's responses to the RAIs.

Plugging and Abandonment

Federal Requirements under the Class VI Rule

The requirements for an Injection Well Plugging and Abandonment Plan are found at 40 CFR 146.92. This plan is a required permit application component reviewed by the EPA. It must include certain elements required by regulation and will be incorporated as an enforceable attachment to the permit, if issued. The plan must include the measurement of pressure in the injection formation and mechanical integrity testing (40 CFR 146.92(b)(1-5)). The description of the plugging procedures must include the numbers and types of plugs that will be used and where in the well they will be placed, the type of material that will be used, and the method that will be used to place the plugs.

Draft Permit Conditions

The draft permits specify that the injection wells will be plugged using five plugs across the confining zone, the lowermost USDW, the base of usable quality water, and a surface plug. The plugs will be emplaced by wireline or circulation and be made of acid-resistant cement and Type 1 cement. Prior to

plugging, determination of bottomhole pressure in the injection formation and external mechanical integrity will be verified via a temperature log.

For details on permit conditions related to plugging and abandonment, see Section O (Well Plugging, Post-Injection Site Care, and Site Closure) of the permits and Attachment 7 (Well Plugging Plan).

Application Review and Decision Process

The EPA reviewed information in the permit application and other relevant information regarding Orchard's well plugging and abandonment plan to determine if they meet Class VI requirements.

The EPA's review of the Injection Well Plugging Plan for each injection well included an evaluation of Orchard's proposed pre-plugging testing procedures and the cements and plugs to be used (including their resistance to corrosion and their location relative to the lowermost USDW and the injection and confining zones) to demonstrate that Orchard met the Class VI requirements. The EPA asked clarifying questions about Orchard's proposed injection and monitoring well plugging materials and procedures and testing and determined that Orchard's responses to the EPA's questions and updated application submittals demonstrated that the wells will be plugged in a USDW-protective manner.

Based on the review, the EPA has determined that the Plugging and Abandonment Plan meets all applicable Class VI Rule requirements. See the relevant permit application documents with information related to the Plugging and Abandonment Plan as part of the administrative record: Orchard Storage Company LLC's Plugging and Abandonment Plan (Section 6 of the permit application); EPA's RAI #3 and RAI #5; and Orchard Storage Company LLC's responses to the RAIs.

Post-Injection Site Care (PISC) and Site Closure

Federal Requirements under the Class VI Rule

Following the cessation of injection, Orchard Storage Company LLC will continue using the injection wells, along with the USDW, above-confining zone, and in-zone monitoring wells, to monitor the site. At the end of the PISC period, all wells will be plugged according to their approved Plugging and Abandonment Plans. Activities during PISC are done according to the project's PISC and Site Closure Plan, which is approved by the UIC Director. The plan must include certain elements required by regulation, and it is incorporated as an enforceable attachment to the permit, if issued.

The requirements for the PISC and Site Closure Plan are found at 40 CFR 146.93. It must include, among other information, predictions about the maximum extent of the increased pressure front in the AoR underground, where the CO_2 plume is expected to be, and how the site will be monitored after injection and for how long. Monitoring during PISC is needed to demonstrate that the migration of the CO_2 plume has plateaued and that pressure is decreasing such that it will return to the native formation pressure prior to site closure. The types of monitoring during PISC will be similar to monitoring during injection under the T&M plan and will involve monitoring groundwater quality and tracking the CO_2 plume and pressure in the injection zone. This will enable confirmation of predictions about plume migration and decreasing pressure after injection.

At the end of the PISC period, the owner or operator must demonstrate to the UIC Director that the site will not endanger USDWs to receive authorization to close the site. The owner or operator must plug monitoring wells, submit a notice of intent for site closure, and, upon closure, restore the site.

Draft Permit Conditions

The draft permit specifies a PISC period of 50 years. During PISC, monitoring will continue according to ongoing monitoring plans. These include groundwater geochemical analysis every 5 years; annual soil gas monitoring; continuous seismic monitoring; continuous pressure and temperature monitoring (in the injection wells and monitoring wells); vertical seismic profiles every 5 years to indirectly track the plume and pressure front; and annual evaluation of pressure and temperature data to calculate the plume location.

At the end of the PISC period, when it has been demonstrated that the site no longer poses a risk to USDWs, the monitoring wells will be plugged by emplacing plugs by wireline or circulation; the plugs will be made of Class H and corrosion-resistant cement. Orchard will then decommission and remove all surface equipment from the site to complete site closure. The permit requires Orchard to obtain EPA approval for site closure.

For details on permit conditions related to the PISC and Site Closure Plan, see Section O (Well Plugging, Post-Injection Site Care, and Site Closure) of the permits and Attachment 8 (PISC and Site Closure Plan).

Application Review and Decision Process

The EPA reviewed information in the permit application and other relevant information regarding Orchard's PISC and Site Closure Plan to determine if it meets Class VI requirements.

The EPA's review of the PISC and Site Closure Plan included verifying that information about the pre- and post-injection pressure differential and the predicted position of the carbon dioxide plume and associated pressure front at site closure are consistent with the AoR delineation modeling results; that the planned post-injection monitoring is appropriate to provide early warning of USDW endangerment and is consistent with injection-phase monitoring; and that Orchard will plug all monitoring wells and restore the site to its pre-operational condition.

The EPA asked clarifying questions related to predictions of pressure decline and determined that Orchard's responses and Orchard's updated PISC and Site Closure Plan addressed the Agency's concerns. Based on the review, the EPA has determined that Orchard's PISC and Site Closure Plan meets all requirements.

Based on the review, the EPA has determined that the PISC and Site Closure Plan meets all the Class VI requirements. See the relevant permit application documents with information related to PISC and site closure as part of the administrative record: Orchard Storage Company LLC's Post-Injection Site Care and Site Closure Plan (Section 7 of the permit application); EPA's RAI #1; and Orchard Storage Company LLC's responses to the RAI.

Other Permit Information

As part of the permit process, pursuant to 40 CFR 144.4, the EPA is required to consider other Federal laws, including Section 7 of the Endangered Species Act (ESA) and Section 106 of the National Historic Preservation Act (NHPA).

Endangered Species Act

The ESA and its implementing regulations require the EPA to ensure that any action it authorizes does not jeopardize the continued existence of any endangered or threatened species (i.e., listed) or adversely affect critical habitat. After reviewing information provided to the EPA by the applicant's biological consultant and the information provided by the U.S. Fish and Wildlife Service (Service) in the Information for Planning and Consultation (IPaC) report, the EPA determined that Orchard Storage Company LLC's proposed project may affect, but is not likely to adversely affect and will not jeopardize one species proposed for listing that could occur in areas potentially impacted by the project. The EPA notified the Service of this determination, which indicated that no consultation is necessary for the proposed listed species. The Service also acknowledged that two listed species did not need to be considered for this project.

National Historic Preservation Act

The NHPA and its implementing regulations require the EPA to consider the effects of its undertakings on historic properties. Because issuance of a UIC permit is a federal undertaking, the EPA will complete Section 106 consultation with the Texas State Historic Preservation Office (SHPO) and interested tribal governments prior to issuance of a final permit. The EPA is working with the applicant and its consultant to provide additional information, however, based on the preliminary NHPA information provided to-date, the EPA does not expect that any historic properties will be affected by this undertaking.

Issuance and Effective Date of Permits

In accordance with 40 CFR 124.15, the permits would become effective immediately upon issuance if no public comments were received that requested a change in the draft permits. However, in the event that public comments are received requesting changes, and the EPA decides to issue final permits, then the permits would become effective 30 days after the date of issuance unless a different effective date is specified in the decision or the permits are appealed.

Duration of Permits

In accordance with 40 CFR 144.36(a), the permits would be in effect for the duration of the project unless they are otherwise modified, revoked and reissued, or terminated as provided at 40 CFR 144.39, 40 CFR 144.40, and 40 CFR 144.41.

Modification, Revocation and Reissuance, and Termination

Section B of the permits states some conditions that may warrant modification, revocation and reissuance, or termination of the permit. The EPA may modify, revoke and reissue, or terminate this permit in accordance with 40 CFR 124.5, 40 CFR 144.12, 40 CFR 144.39, and 40 CFR 144.40 and any other applicable law. The permits are also subject to minor modifications as specified in 40 CFR 144.41.

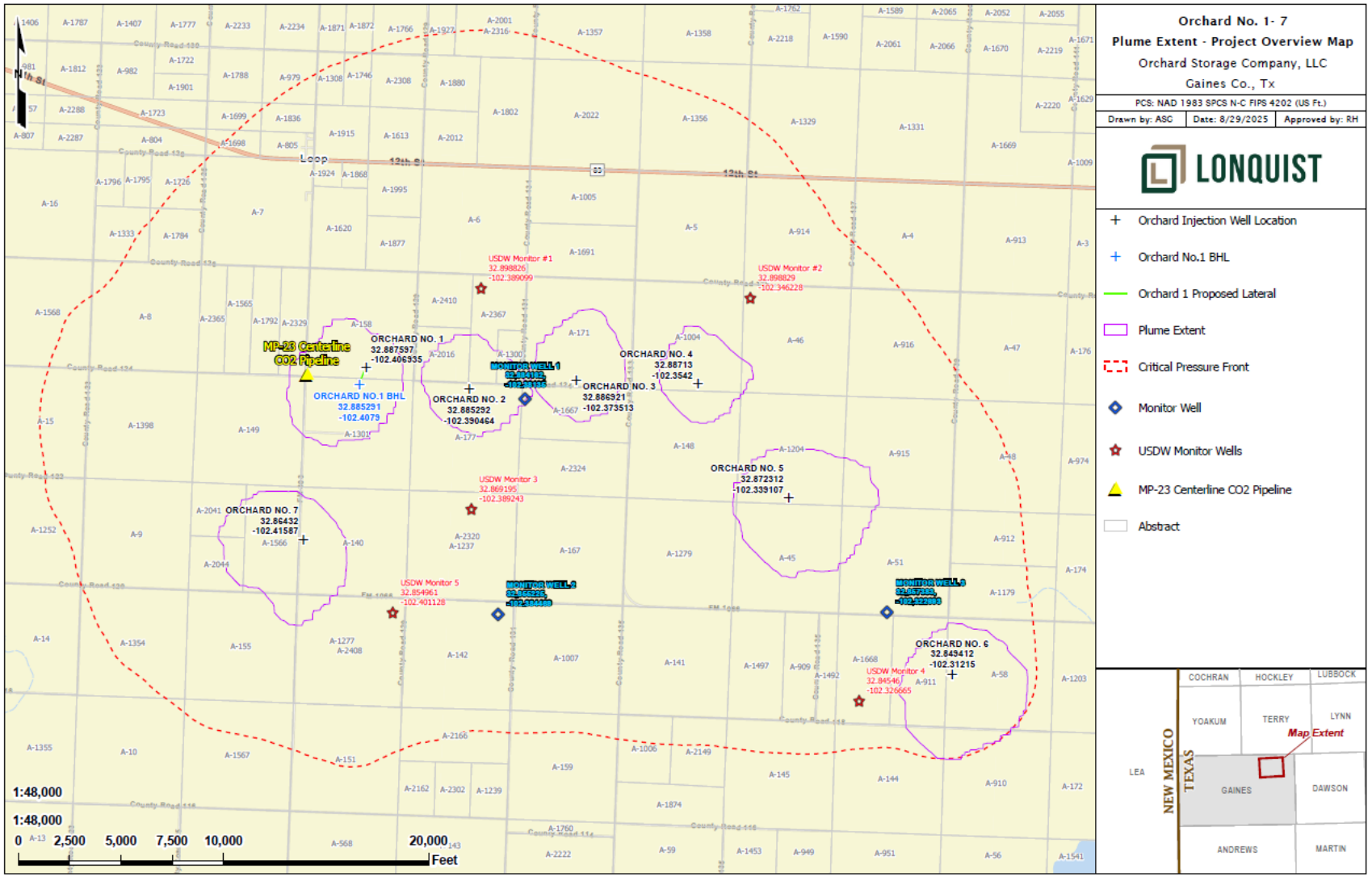
Expiration upon Failure to Construct

The permits would expire in two years if Orchard Storage Company LLC does not commence construction unless a written request for an extension of this two-year period has been approved by the EPA.

Authorization to Inject

Orchard Storage Company LLC is prohibited from commencing injection without authorization. The EPA may grant authorization to inject under the permits following well construction and compliance with additional requirements as outlined in the permits and regulations at 40 CFR 146.82, 40 CFR 146.86, 40 CFR 146.87, and 40 CFR 146.89. No additional public notice and comment is required prior to the EPA granting authorization to inject.

Figure 1. Area of Review (AoR)



Acronyms

AoR	Area of Review
CO_2	Carbon dioxide
CFR	Code of Federal Regulations
EAB	Environmental Appeals Board
EPA	Environmental Protection Agency
ESA	Endangered Species Act
MMT	Million metric tons
NHPA	National Historic Preservation Act
ORC	Office of Regional Counsel
PISC	Post-injection site care
QASP	Quality assurance and surveillance plan
RAI	Request for additional information
SHPO	State Historic Preservation Office
TDS	Total dissolved solids
TVD	Total vertical depth
UIC	Underground Injection Control
USDW	Underground Source of Drinking Water