Public Comments Sought on Class VI UIC Injection Well Carbon Storage Draft Permits

Carbon TerraVault LLC, Class VI UIC Injection wells

R9UIC-CA6-FY22-1.1 Revised, R9UIC-CA6-FY22-1.2 Revised,

R9UIC-CA6-FY22-1.3 Revised, R9UIC-CA6-FY22-1.4 Revised

July 2024

The U.S. Environmental Protection Agency (EPA) is accepting comments from July 12, 2024, to August 12, 2024, on revisions to four Class VI Underground Injection Control (UIC) permits that the EPA has proposed issuing to Carbon TerraVault JV Storage Company Sub 1, LLC (CTV).

The EPA previously accepted public comments from December 20, 2023 through March 20, 2023, on its intent to issue four Class VI UIC permits to CTV to inject and store carbon dioxide underground at its four proposed injection wells in the Elk Hills oil field in Kern County, CA. The process of injecting carbon dioxide into the subsurface for long-term underground storage is called "geologic sequestration" or "carbon sequestration." Carbon sequestration is one method of reducing emissions of carbon dioxide into the atmosphere.

In a letter dated June 17, 2024, CTV notified the EPA of changes in the initial carbon dioxide sources for the proposed permits, and the EPA has made changes to the proposed permits. With this notice, the EPA is providing an opportunity for the public to comment on its revisions to the proposed permits. EPA requests public comment only on the revised portions of the draft UIC permits. The changes are limited to the removal of all references to the proposed carbon dioxide sources – Avnos Direct Air Capture Facility and Lone Cypress Hydrogen Facility. EPA will accept comments in writing through the end of the comment period on August 12, 2024.

CTV plans to inject 1.46 million metric tons of carbon dioxide annually into the four proposed wells over a 26-year injection period. CTV plans to source carbon dioxide initially from Elk Hills pre-combustion gas treatment facility. CTV would capture the carbon dioxide from the generating facility, transport it via pipeline within the Elk Hills field to the injection wells, pressurize the gas into a liquid-like state, and inject the carbon dioxide stream deep into the ground through the wells.

CTV selected the locations of the proposed wells based on its research and using site-specific data to ensure that the carbon dioxide would be safely stored in the proposed injection formation. The proposed injection formation is the Monterey Formation, which is about 6,000 feet below ground. Above the injection formation is the Reef Ridge Shale Formation, an approximately 1,000-foot-thick rock layer that would ensure the injection fluid does not migrate outside of the injection formation. CTV would monitor the wells during the 26-year injection period, and at least 50 years after injection ceases, or until a demonstration of non-endangerment to underground sources of drinking water has been approved by EPA.

comments, please refer to Carbon TerraVault JV Storage Company Sub 1, LLC , Permit Nos. R9UIC-CA6-FY22-1.1 Revised, R9UIC-CA6-FY22-1.2 Revised, R9UIC-CA6-FY22-1.3 Revised, and/or R9UIC-CA6-FY22-1.4 Revised.

How did EPA make its tentative decision?

In reviewing CTV's permit application, EPA evaluated technical information and project-specific data, such as:

- Advanced computational modeling to determine the maximum extent of the carbon dioxide plume and pressure front defining the proposed project area;
- A detailed study of the geology and the rock layers through which the proposed injection wells would be drilled to confirm that the carbon dioxide will stay where it is injected;
- The location of drinking water resources near the project and how they will be protected.
- The proposed construction design for the injection wells;
- The characteristics of the carbon dioxide to be injected;
- The proposed approach and technologies CTV would use to operate and monitor the project during and after injection;
- The financial resources CTV will have available to responsibly operate, monitor, and close the project; and
- CTV's approach to ensure that the project will protect underground sources of drinking water, public health, and the environment.

What happens next in the permit process?

After the close of the public comment period, EPA will review all comments before making a final decision on whether to grant the permits. The Agency will respond to all significant comments on the draft permits when EPA makes a final permit decision.

Information Repository

The draft permits, fact sheet, and public notice are available on the web at www.regulations.gov under docket number EPA-R09-OW-2023-0623.

Administrative Record

The full administrative record, including all data submitted by Carbon TerraVault in support of its permit application, is available for public review at EPA's regional office. The office is open 8:30 a.m. – 4:30 p.m., weekdays. To review the administrative record or for additional information please contact Elise Nord at 415-972-3079 or Nord.Elise@epa.gov.

On the Web

For more information about the Carbon TerraVault 26R project and draft Class VI UIC Permits: https://www.epa.gov/uic/uic-permits-epas-pacific-southwest-region-9

Legal Notice

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

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

Technical background and details of CTV's carbon storage project

EPA's review of CTV's permit application determined that the proposed injection would comply with the UIC regulations under the Safe Drinking Water Act. Therefore, EPA proposes to issue permits for the four proposed injection wells. Title 40 of the Code of Federal Regulations (CFR), Parts 144 and 146, requires EPA permits for carbon dioxide storage, known as Class VI UIC permits, to specify conditions for the construction, operation, monitoring, reporting, plugging, post-injection site care, and site closure of Class VI injection wells. These conditions are designed to prevent the movement of fluids into any underground source of drinking water, or USDW. Refer to 40 CFR Parts 144 and 146 for the general provisions of underground injection permits. In accordance with 40 CFR 124.8, information on the permitted activity and permit conditions for the proposed wells is provided below.

Area of Review and Corrective Action: In accordance with 40 CFR 146.84, the Area of Review, or AoR, is the region surrounding the geologic sequestration project where USDWs may be endangered by the injection activity (e.g., if there are any improperly sealed, completed, or abandoned wells that penetrate the confining zone that could provide a conduit for fluid migration). The AoR for the four proposed wells is 3.7 square miles and was delineated pursuant to 40 CFR 146.84(c)(1) using a model that predicts the movement of the carbon dioxide plume and pressure front based on available information about planned injection operations and the subsurface rock formations. Refer to Figure 1 below.

Based on CTV's search of well records, there are 157 wellbores within the AoR that require plugging because the wellbores penetrate the injection zone or confining layer and will not be used for injection or monitoring for the proposed injection project. EPA will review the plugging and abandonment plans for the 157 wells and will require CTV to properly plug and abandon the wells before authorizing injection.

As required by 40 CFR 146.84(e), CTV would re-evaluate the AoR by assessing monitoring and operational data every five years over the duration of the project to verify that the carbon dioxide plume and pressure front are moving as predicted. If there are any significant changes from the modeled predictions, CTV must revise the project-specific plans described here, and EPA will modify the permit per 40 CFR 144.39.

Underground Sources of Drinking Water: USDWs are defined by federal regulations as aquifers or portions thereof which contain less than 10,000 milligrams per liter of total dissolved solids and are being used, or could be used, as a source of drinking water. The lowest geologic unit in the Area of Review that has the potential to be a USDW is the Upper Tulare formation, with an average depth of 502 feet below ground surface. Although preliminary data submitted by CTV suggest that the Upper Tulare in the AoR is not a USDW because it is unsaturated and does not contain water, the terms and conditions of the proposed permits are written to protect this formation as a USDW. Moreover, the permits would require CTV to confirm whether the Upper Tulare formation contains a USDW during pre-injection testing, so that its status could be documented and any identified USDW would be protected.

Injection and Confining Zone: Injection for geologic sequestration is limited by the draft permits to the Monterey Formation between approximately 4,800 and 7,800 feet below ground. This zone is separated from the lowest formation that could be a USDW on average by approximately 5,000 feet of rock, including an impermeable 1,000-foot-thick confining zone of shale that would act as a barrier to fluid movement. EPA has reviewed information provided by the permittee, including maps, well logs, cores, and the results of seismic surveys and determined that the regional and local geologic features at the site would allow the Monterey Formation to receive the amounts proposed to be injected without fracturing and that the confining zone would provide a suitable trap so that the carbon dioxide would remain in place and not endanger USDWs, as required under 40 CFR 146.83.

Construction Requirements: The proposed construction of the injection wells, which includes drilling three new wells and converting one existing Class II UIC well, meets the regulatory criteria at 40 CFR 146.86. All Class VI wells must be constructed with materials and cements that can withstand exposure to carbon dioxide and carbon dioxide/water mixtures over the life of the project. Class VI wells must also be cased and cemented to prevent the movement of fluids into or between USDWs. These wells would 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. CTV may not commence construction, including drilling, of any new well until a final permit has been issued and is effective.

Injection Fluid: The injected fluid would be at least 99.2% pure carbon dioxide. The proposed initial emission source of carbon dioxide for the project is pre-combustion gas treatment from the Elk Hills oilfield. The initial expected amount of carbon dioxide to be injected from this source is 200,000 tons per year. CTV may propose for EPA review additional sources of carbon dioxide for injection, as outlined in the draft permit, up to the maximum proposed permit limit of 1.46 million tons per year for 26 years. EPA will review whether the chemical and physical

characteristics of the carbon dioxide stream from any additional proposed source meet the permit requirements. EPA will also review whether injecting carbon dioxide from the additional source would alter the project or permit requirements and result in the need for a major permit modification. The public will be notified within 30 days of EPA receiving a request for analysis of an additional source. The public will also be notified at least 30 days before CTV injects carbon dioxide from an EPA-approved additional source.

Maximum Injection Pressure: Consistent with 40 CFR 146.88(a), to ensure that the pressure during injection does not initiate fractures in the injection or confining zones, the maximum allowable downhole injection pressure would be limited to 3,847–4,294 pounds per square inch (psi). In turn, this ensures that the injection pressure would not cause the movement of injection or formation fluids into a USDW, as prohibited by 40 CFR 146.86(a).

Monitoring and Reporting Requirements: In accordance with 40 CFR 146.90, CTV would implement an EPA-approved Testing and Monitoring Plan. The permittee would analyze the carbon dioxide stream quarterly to provide information about its chemical and physical characteristics. CTV would also be required to demonstrate well integrity before injection begins and throughout injection operations. CTV would be required to conduct and pass a two-part mechanical integrity test, in accordance with 40 CFR 146.8 and 146.89, before EPA would authorize CTV to start injecting.

After injection begins, CTV would continuously observe and record injection pressure, flow rate and volume, and the pressure on the annulus (the space between casing and tubing) to detect leaks in the casing, tubing, or packer. In addition, CTV would annually demonstrate external mechanical integrity using a temperature or noise log or another approved method to detect any fluid movement behind the casing. CTV would test the injection wells for signs of corrosion every quarter to provide early indication of any well material corrosion due to contact with carbon dioxide in the presence of water that could compromise the well. CTV would also monitor the environment near the wells to verify that the project and the injected carbon dioxide plume are behaving as predicted and that carbon dioxide is not migrating outside the injection formation. CTV would perform groundwater quality monitoring in shallow and deep wells quarterly to detect geochemical changes that may be a result of injection—such as leaching or mobilization of heavy metals and organic compounds or fluid displacement that could impact USDWs. Pressure fall-off testing would be performed at least every five years to verify that the injection zone is responding to injection as predicted. CTV would also track the movement of the carbon dioxide plume and pressure front using direct methods such as fluid monitoring of the injection zone and USDWs and pressure monitoring of the injection zone, and indirect methods such as seismicity monitoring and pulse neutron logging of well bores to verify that the carbon dioxide plume and pressure front are moving as predicted or to provide early indication if they are not. In accordance with 40 CFR 144.54 and 146.91, CTV would submit results of this monitoring to EPA semiannually or within 30 days of the completion of a mechanical integrity test or other required testing. CTV would be required to continuously monitor surface air quality including broad aerial monitoring and targeted monitoring at wells. CTV would also be required to monitor and maintain equipment at the wells that can detect leakage of carbon dioxide.

CTV would be required to develop and maintain a publicly accessible website that will include a summary section that describes the data being presented, semi-annual reports, real-time monitoring data collected for surface air monitoring and leak detection, and notification of any permit non-compliance, including the steps taken to resolve the non-compliance, and any actions taken to prevent a re-occurrence of the non-compliance.

Emergency and Remedial Response: In accordance with 40 CFR 146.94, CTV developed a site-specific Emergency and Remedial Response Plan (ERRP) that identifies key resources, including Elk Hills oil and gas production resources not associated with the CTV I Elk Hills 26R Project, the Upper Tulare formation overlying the carbon dioxide plume, and the nearest census designated area of Valley Acres, located 3.6 miles from the AoR boundary. The ERRP, an enforceable part of the permit, describes the responses that would be taken to address adverse events, and identifies the staff, equipment, and other resources available to support emergency and remedial response events. The emergency and remedial response provisions of the permit would facilitate expeditious responses and prevent or mitigate harm to public health and the environment, including USDWs.

Financial Responsibility: In accordance with 40 CFR 146.85, CTV has demonstrated, and would maintain, adequate financial responsibility to perform all needed corrective action on wells in the AoR, to plug the injection wells, to perform all required post-injection site care, to close the site, and to conduct any needed emergency and remedial response measures. The total initial cost estimates for these activities to be covered by the approved financial assurance mechanisms is $33,672,785. CTV will use a letter of credit and a third-party insurance policy to cover costs and demonstrate financial responsibility. The permits require cost estimates for the covered activities to be updated annually. These provisions ensure that resources are

available to perform these USDW-protective activities without using public funds.

Plugging and Abandonment: In accordance with 40 CFR 146.92, the draft permits include an Injection Well Plugging Plan for environmentally protective well plugging at the cessation of injection operations. The wells would be plugged using approved materials that are compatible with carbon dioxide/water mixtures to ensure that the wells would not serve as a conduit for fluid movement into USDWs.

Post-Injection Site Care and Site Closure: In accordance with 40 CFR 146.93, CTV would be required to implement an EPA-approved Post-Injection Site Care and Site Closure Plan. Following the cessation of injection, CTV would be required to continue to monitor groundwater quality and track the position of the carbon dioxide plume and pressure front in a similar manner to what is described under "Monitoring and Reporting Requirements" above. This monitoring would help confirm predictions about the behavior of the carbon dioxide plume and pressure front (e.g., that pressures are subsiding after injection ceases) and provide early indication of any potential USDW endangerment. CTV would continue this post-injection monitoring for at least 50 years and until it demonstrates USDW non-endangerment based on monitoring and other site data. At the end of the 50-year period, if site data support it, EPA may authorize CTV to close the site. Following authorization to proceed with site-closure activities, CTV would plug all monitoring wells with carbon dioxide-compatible materials to ensure they cannot serve as conduits for fluid movement and would restore the site to its original condition.

Consideration of Environmental Justice: EPA is committed to incorporating environmental justice considerations into the Agency's core mission, which is to protect human health and the environment. Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, directs federal agencies, to the greatest extent practical and permitted by law, to identify and address, as appropriate, disproportionate and adverse human health or environmental impacts on people of color and low-income populations. See Exec. Order No. 12898, 59 Fed. Reg. 7629 (Feb. 11, 1994). Recently, Executive Order 14096, Revitalizing Our Nation's Commitment to Environmental Justice for All, supplemented this direction and included, among other things, consideration of "effects (including risks) and hazards… related to climate change and cumulative impacts of environmental and other burdens on communities with environmental justice concerns." See Exec. Order No. 14096, 88 Fed. Reg. 25251 (Apr. 21, 2023). It is against this backdrop that EPA has integrated environmental justice into the UIC Class VI permitting program.

As part of the decision-making process for these permits, EPA considered the above-referenced executive orders and EPA's Environmental Justice Guidance for UIC Class VI Permitting and Primacy (Aug. 17, 2023), which includes, among other things:

- Identifying communities potentially adversely and disproportionately affected by human health, environmental, climate-related, and/or other cumulative harms or risks – that is, affected communities with potential environmental justice concerns; and
- Ensuring fairness and transparency in the decision-making process – that is, allowing for meaningful involvement by communities.

EPA and CTV conducted separate environmental justice screenings to identify possible adverse impacts to communities with environmental justice concerns and opportunities for increased meaningful involvement. EPA's "EJScreen" analysis for the proposed CTV I 26R project used an 8-mile buffer beyond the AoR to incorporate census population data from the communities closest to the project, since there are no communities within the 3.7-square mile AoR. The EJScreen results from this expanded geographic analysis showed seven environmental justice indices above the 80th percentile for the United States, which highlights the potential vulnerability of nearby communities located outside the AoR and the importance of protective permit requirements and a robust outreach and public comment process. For this proposed permit, EPA is providing an extended public comment period of 90 days and multiple opportunities for public engagement through public workshops in advance of the public hearing.

The permit has several safeguards in place to prevent any adverse impacts to public health and the environment, including USDWs, from all injection-related activities throughout the lifetime of the project. For example, the permit requires CTV to run an EJScreen analysis when there is an update to the AoR, provide analysis of proposed additional carbon dioxide sources and their impact to the communities in the area they are located, notify the public of any proposed new carbon dioxide source, notify the public at least 30 days before injecting carbon dioxide from an additional source, create a public website containing monitoring data, and gather real-time monitoring data of carbon dioxide levels in the air within the AoR. Furthermore, if the gas stream of a new carbon dioxide source meets certain criteria, the permit provides that the EPA could require that its injection be subject to the "major"

modification requirements of 40 CFR 124, which would trigger public notice and comment provisions.

In addition to EPA's environmental justice efforts thus far, the permit applicant has also conducted community outreach and engagement, which is documented in the CTV I Community Engagement Summary, dated October 20, 2023. EPA's EJScreen analysis and the CTV I Community Engagement Summary are included in the permit application materials and can be found on regulations.gov under docket number EPA-R09-OW-2024-0623.

Compliance with other Federal Statutes: As part of the permit process, pursuant to 40 CFR 144.4, 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 EPA to ensure that any action it authorizes does not jeopardize the continued existence of any endangered or threatened (i.e., listed) species or adversely affect their critical habitat. After reviewing the best available science, EPA determined that CTV's proposed project may affect, but is not likely to adversely affect, four listed species that could occur in areas potentially impacted by the project. EPA is informally consulting with the U.S. Fish and Wildlife Service on this determination.

National Historic Preservation Act

The NHPA and its implementing regulations require EPA to consider the effects of its undertakings on historic properties. Because issuance of a UIC permit is a federal undertaking, EPA is consulting with the California State Historic Preservation Office (SHPO). As part of that effort, EPA provided the SHPO with a description of the project, the area of potential effect, and the steps taken to identify historic properties. EPA proposed to the SHPO a finding that no historic properties would 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 are received that requested a change in the draft permits. However, if EPA receives public comments and decides to issue final permits, then the permits would become effective 45 days after the date of issuance unless the permits are appealed. 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, 144.40, and 144.41. The permits would expire in one year if CTV does not commence construction unless EPA approves a written request for an extension of this one-year period. Authorization to inject under the permits may be granted following well construction and compliance with additional requirements as outlined in the permits and regulations at 40 CFR 146.82, 146.86, 146.87, and 146.89.