

July 14, 2021

William Bates, P.G.
Branch Chief
Office of Ground Water & Drinking Water: Prevention Branch
U.S. Environmental Protection Agency
Washington, D.C.

Dear Mr. Bates:

The undersigned entities representing Carbon180, ClearPath, Energy and Environmental Research Center at the University of North Dakota, Environmental Defense Fund, Gulf Coast Sequestration, Illinois State Geological Survey, Minnkota Power Cooperative, and Southern Company submit the below “Recommendations to the EPA on the Underground Injection Control Class VI Program” for your consideration.

Background

As part of the Appropriations Act of 2021, Congress has directed the EPA to submit a report on recommendations to improve the Underground Injection Control (UIC) Class VI permitting procedures for commercial and research carbon sequestration projects and to draft the report in consultation with the Department of Energy, relevant State agencies, previous permit applicants, and nongovernmental stakeholders. Only two of the six Class VI wells that have ever been permitted are in use for injection, and the permit application processing time was six years for both of these projects. Such a timeline would be a significant barrier to develop additional storage capacity at the rate needed to capture carbon dioxide as well as for projects trying to take advantage of the incentives provided by the IRS Section 45Q tax credit.

Due to the incentives offered by the section 45Q tax credit and the recent two-year extension of the time to qualify for the credit, a large influx of sequestration projects is anticipated in the development pipeline, and a growing number of states will be seeking to obtain primacy for the Class VI program. The Class VI permit and primacy approval process must become more efficient to enable growth of carbon capture and sequestration projects while also protecting drinking water resources, and we commend the Agency for working to remove obstacles from the deployment of carbon capture and sequestration projects while at the same time making sure storage is safe and secure.

The undersigned entities represent a diverse range of previous, current, and prospective permit applicants and nonprofit organizations engaged on environmental and clean energy policy. The objective of convening this group was to put forward a list of high priority, nonpartisan recommendations, that if implemented, would facilitate the timely scale-up of carbon capture and sequestration projects. The section below offers recommendations, in rough order of suggested priority, on how to improve and streamline the Class VI permitting program while balancing the need to protect environmental integrity.

Recommendations to the EPA on the Underground Injection Control Class VI Program

- 1. Develop a Staffing and Resource Plan to Target State Primacy, Permitting Timelines, and Periodic Review**

The EPA should prioritize resourcing and staffing the Agency to ensure adequate support for permitting and the state primacy process as two key areas needed to meet the timelines proposed below. With the increased interest in carbon capture as essential to achieving climate change mitigation policy and the large number of carbon capture, removal, and storage projects in the development pipeline, the EPA's needs for fulfilling permitting requests exceed what has been historically allocated to the program. Additional resources will help EPA issue timely permits, prevent a backlog of applications from both state governments and project developers, and ensure safe geologic storage.

We recommend that EPA complete an analysis detailing the level of staffing, resources, and training needed to enable EPA and the states to be successful with timely reviews of both state primacy and project developer applications. In addition to the analysis, we recommend that EPA prioritize increases in funding for Class VI implementation and explicitly provide details of proposed spending on Class VI implementation in their annual budget requests to Congress.

a. Permitting Timelines

The Class VI permitting timeline, if unduly long or uncertain, can pose a major obstacle for carbon capture and storage project developers, which could serve as a barrier to meeting public and private sector emission reduction goals. Project costs often exceed hundreds of millions of dollars, and unpredictable permitting processes pose significant project risk because of the uncertainty in the timing of receiving project approval. Establishing a clearer permitting process and timeline will facilitate project development and reduce overall carbon emissions. The Consolidated Appropriations Act of 2021 provided a much-needed extension of the time to qualify for the 45Q tax credit, but many carbon management projects will be delayed, or may not even be possible, unless there is an efficient, orderly, and responsible process that is completed in an expeditious manner.

As of the time of this report writing, EPA has only issued six Class VI well permits (Permits to Drill) and only two wells have been constructed and operated (both located at the Archer Daniel Midland's ethanol plant located in Illinois). The time for the full permitting and authorization to inject process to be completed for the ADM wells was six years for both of the permits, and 18 months for the four moribund permits for the FutureGen Project.¹ A high degree of irregularity in how long the timing will be between submission of a complete application and issuance of an Authorization to Inject would pose significant project risk.

We recommend that the EPA establish target timelines for issuing a Permit to Drill as well as the Authorization to Inject to provide certainty to project developers. We recommend EPA target issuing a Permit to Drill within twelve months of receiving a complete application. Upon receipt of a Well Completion Report, the EPA should review, make any necessary modifications, and target issuing an Authorization to Inject within three months of receiving the Well Completion Report. If further information is needed to determine whether permit modifications are required based on results of the report, the EPA should notify the project developer as soon as possible after receipt and review of the report.

b. Prioritize State Primacy Application Process

As acknowledged by EPA in the Class VI rulemaking and subsequent April 2015 Memorandum titled *Key Principles in EPA's Underground Injection Control Program Class VI Rule Related to Transition of*

¹ National Petroleum Council. (2019). Meeting the Dual Challenge: A Roadmap to At-Scale Deployment of Carbon Capture, Use, and Storage. <https://dualchallenge.npc.org/>.

Class II Enhanced Oil or Gas Recovery Wells to Class VI, “The best implementation approach is for states to administer both the Class II and the Class VI UIC programs.” States are encouraged to pursue primacy for the Class VI program. They have the best knowledge of regional geology and areas in need of special protection, along with necessary pre-existing relationships with the regulated community. At the time of this report writing, only North Dakota and Wyoming have received primacy over Class VI wells, but multiple states have either applied or signaled their intent to apply.

We recommend that EPA keep as a priority the expeditious approval of state primacy applications, target approval within twelve to eighteen months of having a complete application, and provide training and resources as needed to support state regulators through the process.

c. Undertake the Planned Periodic Review of the Class VI Regulation

As noted in the preamble to the Class VI regulation, EPA stated that an adaptive approach would enable the Agency to make changes to the program as necessary to incorporate new research, data, and information about geologic sequestration and associated technologies. EPA announced in the preamble that the EPA intended to review the rulemaking and data on sequestration projects every six years to determine if modifications are needed to the program. The rule was finalized in 2010 and the EPA has not yet performed a periodic review.

We recommend that EPA commit to performing the review and immediately establish a plan and framework for performing this review. We recommend EPA establish a set of criteria for what would be considered a substantive data pool for considering the review complete (e.g., timeline, number of projects reviewed, etc.) as well as a process for capturing lessons learned continuously throughout the review process. EPA should target commencing rulemaking by the end of 2025 in order to incorporate lessons learned and experience from previous permit reviews, fulfilling the appropriations request, and permit applications for new projects from now until the start of rulemaking.

2. Alignment of Requirements and Guidance with Purpose of Underground Injection Control Program

The purpose of the UIC program is to protect underground sources of drinking water (USDW). Below are key issues we recommend EPA should prioritize in implementation of the Class VI program and in future rulemaking.

a. Risk-based Approach to Financial Responsibility Requirements

The financial responsibility demonstration required by the Class VI regulation must cover all corrective action, injection well plugging, post-injection site care and site closure, and emergency and remedial response. Five project plans must be submitted to EPA as part of the application and “must be based on site-specific information,” which detail the above items.² The regulation also notes that the demonstration must “be sufficient to address endangerment of underground sources of drinking water.”

Project applicants have reported that EPA has imposed prescriptive requirements for estimating costs, particularly for estimates for remediating a USDW, regardless of project size.³ We recommend that EPA

² U.S. Environmental Protection Agency. (2012). Underground Injection Control (UIC) Program Class VI Well Project Plan Development Guidance.

³ Van Voorhees, B. (2019). UIC Class VI Permit Refinements. Ground Water Protection Council Annual Forum. https://www.gwpc.org/sites/gwpc/uploads/documents/2019_Annual_Forum/UIC_Class_VI_Permit_Refinements__GWPC_Presentation_September_16_2019.pdf

allow a risk assessment and risk management approach to determining financial responsibility cost estimates, and clarify what information would be needed from an applicant to support that the demonstration is sufficient to address endangerment of USDWs. This will allow financial responsibility to be scaled to the size of the project and take into account site-specific factors, which are already supposed to be included in the project submittal as noted above.

b. Modify Post-Injection Site Care Based on Actual Site Conditions

The default post-injection site care (PISC) period established in the regulation is for 50 years, which is overly conservative in many cases and can present a challenge to project financing.

The existing regulation allows the Director to approve an alternative timeframe if the applicant can demonstrate the project no longer poses a risk of endangerment to USDWs. Within the existing regulatory framework, we recommend that EPA should encourage and allow project developers to leverage the flexibility provided by the regulation for making a demonstration to shorten the PISC period. If the rule is amended, we recommend that EPA remove the 50-year default time period and establish that applicants can propose a PISC timeframe during the application process or at any time during the operation or closure of the site instead of providing a default PISC timeframe. The PISC period should be based on the specific characteristics and operating history of the project and be established on a case-by-case basis, as the variety of site conditions will affect the PISC timeframe.

Additionally, clarification should be provided for what is required for closure of a site. Some EPA guidance documents suggest that closing a storage site requires demonstrating the plume is stable, while the regulation itself states that the site can be closed when the project “no longer poses an endangerment to USDWs.”⁴ The guidance documents suggest the plume must be immobile while the regulation itself suggests as long as the plume does not pose a risk to USDWs, it would not need to remain stagnant. This is the same approach already reflected in the Subpart RR regulations [40 CFR § 98.441(b)(ii) (“show that the injected CO₂ stream is not expected to migrate in the future in a manner likely to result in surface leakage”)]. EPA’s supporting documents should be updated in alignment with the regulatory language.

c. Flexible Requirements Based on Risks to Underground Sources of Drinking Water

The Class VI regulation requires testing and monitoring the extent of the CO₂ plume and absence/presence of elevated pressure by using direct methods in the injection zone(s) and indirect methods. We recommend that monitoring and testing programs and requirements should be based on site-specific conditions and be proportionate with the risk to USDWs from the project. There are many different monitoring methods and tools that can be used, but not every method or any particular method should be imposed on a project, especially if the requirement would impose significant costs without an actual nexus to assessing endangerment of USDWs. For example, surface or soil gas monitoring should not be required as part of a monitoring plan or a permit requirement. This type of monitoring is meant to detect CO₂ leakage at the surface, which is extremely unlikely for a properly permitted project, and would introduce substantial costs to a project.⁵

⁴ Van Voorhees, B. (2019). UIC Class VI Permit Refinements. Ground Water Protection Council Annual Forum. https://www.gwpc.org/sites/gwpc/uploads/documents/2019_Annual_Forum/UIC_Class_VI_Permit_Refinements___GWPC_Presentation_September_16_2019.pdf

⁵ Van Voorhees, B., S. Greenberg, and S. Whittaker. (2021). Observations on Class VI permitting: Lessons learned and guidance available: Illinois State Geological Survey, Special Report 9, 23 p.

Additionally, monitoring of the injected CO₂ plume should be to demonstrate that the plume will remain contained and will not pose an endangerment risk to USDWs, rather than determining the exact location. The requirement for direct monitoring of the injection zone should not be interpreted as requiring monitoring wells into the injection zone in every case. This would result in unnecessary penetrations of the injection zone, which could create leakage pathways. We recommend that EPA allow flexibility for applicants to use monitoring methods appropriate for the risks of the project and not routinely require the use of monitoring wells into the injection zone. We also recommend that the monitoring program be developed to demonstrate containment of the CO₂ rather than to determine the precise location of the CO₂ plume. Indirect and above zone monitoring often can sufficiently demonstrate containment of the plume.

EPA should also be forward looking and provide flexibility in the requirements to allow for new technology and new techniques to be used as they are developed.

d. Adaptive Computational Modeling Requirements

Computational modeling is a significant part of the permitting process as it is used to delineate the area of review and to make post injection site closure demonstrations. EPA allows the use of proprietary models for the application process. However, prior permit applicants have reported that EPA or its contractors have tried to replicate the modeling and sometimes have required applicants to redo modeling using EPA's preferred model, which has caused unexpected additional resource expenditures and delays.⁶ It is unclear whether these EPA requirements have resulted in any environmental benefit.

We recommend that EPA clarify and align with project applicants prior to conducting modeling on what the modeling expectations and requirements are, such as the model to be used, so that unnecessary replication of the modeling can be avoided. The regulation does not require that EPA replicate the modeling, though the guidance documents suggest that the UIC Program Director may choose to replicate the model.⁷

e. Revise the Area of Review Framework

The Area of Review (AoR) is the region around the project where USDWs may be endangered by the injection activity.⁸ The lateral and vertical migration of the CO₂ plume and formation fluids is to be predicted using site characterization, data, and modeling. The AoR is significant for establishing the expanse of a project's environmental assessment and associated operating costs, as it is the area required to be evaluated for corrective action, emergency and remedial response, and monitoring. Project applicants are to consider endangerment to USDWs by both the movement of the CO₂ plume and the movement of the elevated pressure front, where fluid pressures are sufficient to force fluids into a USDW.⁹

We recommend that the AoR be established through risk-based approach requirements based on the site-specific characteristics. EPA guidance provides that a risk-based approach to AoR delineation may be

⁶ Van Voorhees, B. (2019). UIC Class VI Permit Refinements. Ground Water Protection Council Annual Forum. https://www.gwpc.org/sites/gwpc/uploads/documents/2019_Annual_Forum/UIC_Class_VI_Permit_Refinements___GWPC_Presentation_September_16_2019.pdf

⁷ U.S. Environmental Protection Agency. (2013). Underground Injection Control (UIC) Program Class VI Well Area of Review Evaluation and Corrective Action Guidance.

⁸ Underground Injection Control Program: Criteria and Standards, 40 C.F.R. § 146.81(d) (2010).

⁹ U.S. Environmental Protection Agency. (2013). Underground Injection Control (UIC) Program Class VI Well Area of Review Evaluation and Corrective Action Guidance.

pursued.¹⁰ The risk-based AoR approach accounts for the operating reality that the area of the free-phase CO₂ plume around an injection well is typically much smaller than the area of the elevated pressure front capable of endangering a USDW. An important distinction between EPA Methods 1 and 2, which both calculate a critical pressure threshold, and the risk-based AoR approach is that the risk-based approach (1) calculates and maps the potential incremental flow of formation fluids from the storage reservoir to the USDW that could occur, and then (2) delineates the areal extent beyond which no significant leakage would occur. Therefore, the region beyond which no significant leakage would occur does not present an endangerment to the USDW leaving the region inside of this areal extent as the risk-based AoR. Establishing an AoR through a risk-based approach would allow for appropriate, fit-for-purpose standards to be applied depending on the risk. Complete details of the risk-based AOR model are found in Burton-Kelly et al.¹¹

f. Restore the Definition of USDW

The UIC regulations allow an aquifer or portion of an aquifer that otherwise meets the definition of “underground source of drinking water” to be designated as an “exempted aquifer” if it has no real potential to be used as a drinking water source and meets certain criteria. Geologic sequestration primarily occurs in saline formations, which generally would not be fit for drinking water. However, the UIC regulations do not allow new aquifer exemption designations for Class VI injection wells.¹² This has already prevented the permitting of at least one carbon capture and storage research project.¹³ Categorically restricting the geologic formations into which CO₂ can be injected will slow down widespread deployment of carbon capture and storage technologies without yielding a significant environmental benefit. We recommend EPA revise the regulations to apply the established criteria to Class VI wells for identifying aquifers that are not USDWs to be designated as “exempt” notwithstanding having total dissolved solids (TDS) levels below 10,000 parts per million (ppm).

3. Reduce Administrative Burden on the Agency and Project Developers

a. Allow Comprehensive Project Application Submittals and Permitting

The Class VI regulation does not allow area permits for Class VI wells. EPA has taken the approach that individual well permits are essential to ensure that every well is constructed, operated, monitored, plugged, and abandoned in a manner that protects USDWs. While the handful of projects that have submitted Class VI applications to EPA have only been for a small number of wells, some projects will require tens if not hundreds of wells to enable the wide scale deployment of carbon capture and storage (such as at a storage hub). A mature carbon capture industry may grow from regional hotspots, where there is favorable geology and highly concentrated sources of carbon dioxide to support its capital-intensive infrastructure. Some prospective applicants have expressed concern that this requirement will be both burdensome and inefficient for themselves and the EPA with the amount of paperwork that will need to be generated and the time it will take to review all of the separate documents. In addition, many projects start out with a few injection wells and have plans to expand based on demand for storage. The

¹⁰ U.S. Environmental Protection Agency. (2013). Underground Injection Control (UIC) Program Class VI Well Area of Review Evaluation and Corrective Action Guidance.

¹¹ Burton-Kelly, M.E., Azzolina, N.A., Connors, K.C., Peck, W.D., Nakles, D.V., and Jiang, T. (2021). Risk-based area of review (AOR) estimation in overpressured reservoirs to support injection well storage facility permit requirements for CO₂ storage projects. <https://onlinelibrary.wiley.com/doi/10.1002/ghg.2098>.

¹² Underground Injection Control Program: Identification of Underground Sources of Drinking Water and Exempted Aquifers, 40 CFR § 144.7(a) (2010).

¹³ National Petroleum Council. (2019). Meeting the Dual Challenge: A Roadmap to At-Scale Deployment of Carbon Capture, Use, and Storage. <https://dualchallenge.npc.org/>.

injection wells and CO₂ plume do not behave in isolation, so moving to a project-wide approach is more appropriate to ensure protection of USDWs. For classes for which area permits are allowed (all classes other than I and VI), the UIC regulations already require that “[t]he cumulative effects of drilling and operation of additional injection wells [be] considered by the Director during evaluation of the area permit application and are acceptable to the Director.”¹⁴

Within the existing regulatory framework, while continuing to ensure proper review of all elements of each project, EPA should identify opportunities for consolidating well applications and encourage project-wide plans for a single project to streamline the permitting process. EPA should also amend the regulation to allow the use of area permits.

b. Review and Update Guidance Documents

EPA currently has 14 final guidance documents on its Class VI website that are designed to assist with program directors implementing the program and well owners or operators in complying with the regulations. Although these guidance documents are intended to show how to comply with the Class VI rule, inconsistencies have been found between the regulations and guidance.¹⁵

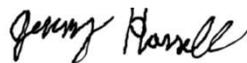
We recommend EPA complete a review of the guidance documents to ensure they reflect the latest information and are consistent with the regulation. EPA should also consider consolidating the number and volume of the documents to make them more user-friendly for applicants.

Thank you for the opportunity to submit these recommendations to address our joint concerns with the existing regulations. Please contact us with any questions.

Respectfully submitted,



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¹⁴ Underground Injection Control Program: Authorization by Permit, 40 C.F.R. § 144.33(c)(3) (2010).

¹⁵ Van Voorhees, B., S. Greenberg, and S. Whittaker, 2021, Observations on Class VI permitting: Lessons learned and guidance available: Illinois State Geological Survey, Special Report 9, 23 p.



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