

Pore Space Primer: Who, What, When, Where, and How Much?

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One of the Biden Administration’s top priorities is “put[ting] the United States on a path to achieve net-zero emissions, economy-wide, by no later than 2050.”² In pursuit of this goal, the U.S. Environmental Protection Agency (“EPA”) has proposed a series of new and revised regulations that aim to aggressively reduce emissions of greenhouse gases from various sectors of U.S. industry. These regulatory requirements, in conjunction with recent significant increases in federal tax credits for permanent geologic sequestration of carbon dioxide (“CO₂”) under Section 45Q of the Internal Revenue Code (“45Q”) and a growing emphasis on environmentally beneficial projects, have resulted in a rapidly increasing demand for carbon capture and storage (“CCS”) projects. These projects involve the collection and injection of CO₂ into underground geologic repositories for permanent storage. When used to sequester CO₂ that would have otherwise been emitted by an industrial facility, the benefits of CCS are tri-fold, resulting in the reduction of the facility’s CO₂ emissions to allow compliance with increasingly stringent EPA regulations, promotion of long-term sustainability, and generation of sizable tax credits.

Because the ingredients that resulted in the growing hunger for CCS came into existence relatively recently, the CCS market is only in its first stages of development. Accordingly, this paper seeks to provide an overview of the important legal and regulatory considerations and recent developments that underlie one important piece of CCS projects: the geologic repository in which the CO₂ is stored, commonly known as “pore space.” In particular, this paper will examine answers to the following questions that project proponents may be asking as they set out to develop a CCS project in Texas:

1. **Who** owns the pore space in Texas?
2. **What** kind of property interest could a CCS project proponent obtain in the pore space?
3. **When** should the pore space for a CCS project be acquired?
4. **Where** should the pore space property interest be located?
5. **How** much pore space is needed for a CCS project?

In answering these questions, this paper seeks to set a project proponent down the right path toward obtaining pore space rights needed for a Texas CCS project and provide general insight into the types of considerations that should underlie the development of CCS projects in other jurisdictions

¹ Any opinions expressed in this paper reflect the general views of the author at the time of the writing of this paper and not necessarily the views of Baker Botts L.L.P. or the author’s opinion with respect to any specific matter. Given the early stage of the CCS market and the unsettled nature of the regulatory framework applicable to CCS, the views in this paper could change overtime as the CCS industry and applicable legal scheme continue to develop.

² “The Biden-Harris Administration Immediate Priorities,” available at <https://www.whitehouse.gov/priorities/#:~:text=President%20Biden%20will%20take%20steps,succeed%20in%20a%20global%20economy.>

as well. It is important, however, to recognize that the CCS industry and associated legal framework is in its early stages and will continue to change and evolve.

I. Background on Pore Space and the CCS Legal Framework

CCS projects are made up of four main pillars: (1) the CO₂ source, (2) transportation of the CO₂ between the source and injection well, currently expected to be primarily via pipeline in the United States, (3) the CO₂ injection well, and (4) the pore space into which the CO₂ is injected and permanently stored. This paper will focus on pillar number 4, and touch on the other pillars as they relate to pore space considerations.

Pore space is the empty space underground, typically between rocks or particles of sand or sediment. The presence of adequate pore space for CO₂ storage is determined by the geologic, geochemical, and geophysical makeup of the subsurface. In addition to pore space that exists by virtue of historic geology in a region, activities such as oil and gas extraction or coal mining can create repositories for storage of CO₂, such as in areas where oil and gas has been depleted leaving empty space underground or in coal seams. Pore space suitable for CO₂ storage can also encompass non-drinkable saline aquifers.

While focused largely on permitting of the injection well, the CCS regulatory framework impacts the considerations that go into answering the pore space questions below. Injection wells for the underground injection and permanent geologic storage of CO₂ are regulated under the Underground Injection Control (“UIC”) program established pursuant to the Safe Drinking Water Act. The UIC program is administered by the EPA or by states, territories, or tribes that have received approval from the EPA for primary permitting and enforcement authority, referred to as primacy, for a specific type of well under the UIC program. Prior to constructing or operating wells for the primary purpose of permanent geologic sequestration, known as Class VI UIC injection wells, a Class VI UIC permit must be obtained for each well.

Currently, North Dakota, Wyoming, and Louisiana³ are the only states that have been granted primacy by the EPA to administer the Class VI UIC program in their respective states, though several other states are at various stages in the process of seeking Class VI program primacy from EPA. In all states other than those three, EPA is the primary permitting authority. Several states have issued their own regulations that apply to CCS projects as well. CCS projects in those states must comply with both the applicable EPA and state regulations.

Texas submitted a preapplication for Class VI primacy on December 12, 2022.⁴ In furtherance of its bid for primacy, the Texas legislature passed House Bill 1284 in 2021, consolidating authority over CCS injection wells with the Railroad Commission of Texas (“RRC”),⁵ and the RRC subsequently amended its rules concerning CCS permitting and

³ On February 20, 2024, three environmental NGOs filed suit in the U.S. Court of Appeals for the Fifth Circuit, challenging EPA’s decision to grant Louisiana primacy over Class VI well permitting. *Deep South Center for Environmental Justice et al. v. United States Env’t Prot. Agency*, No. 24-60084 (5th Cir. Feb. 20, 2024).

⁴ Letter from Governor Greg Abbott (December 12, 2022), available at <https://rrc.texas.gov/media/ux0l1kfkz/texas-class-vi-uic-primacyapplication.zip>

⁵ H.B. 1284, 87th Leg., Reg. Sess. (Tex. 2021).

operational requirements in August 2023 to address feedback from EPA.⁶ Until Texas receives Class VI primacy, CCS injection wells in Texas must also be authorized by the RRC.⁷ Despite these recent developments in Texas CCS law providing more detail and clarity regarding requirements for CCS projects, there still exist gaps in the CCS legal framework that must be filled by legislation or case law. The state and federal statutes, regulations, and case law that impact pore space considerations are described in more detail below.

II. Who owns the pore space in Texas?

The first step toward acquiring pore space for a CCS project is understanding who owns the pore space. Pore space ownership has not been established by statute or regulation in Texas. However, Texas case law overwhelmingly indicates that the owner of the surface also owns the pore space below, unless specifically severed from the surface estate. In 2023, the Texas legislature proposed legislation that sought to codify surface ownership of pore space with House Bill 4484, but the bill was never voted on. Unless and until pore space ownership is addressed by statute, the relevant case law will govern in Texas.

Two theories of pore space ownership have developed over time in the context of mineral extraction: the English Rule and the American Rule. These theories are centered on who owns the geologic structures and earth surrounding the minerals that belong to the mineral interest holder, rather than the concept of pore space as used in the CCS context. The English Rule “maintains that the mineral interest owner has the exclusive right of possession of the whole space and, after all minerals have been extracted, the owner is entitled to the entire and exclusive use of that space for all purposes.”⁸ Accordingly, under the English Rule, the mineral interest owner also owns the pore space, at least to the extent a mineral interest severed from the surface estate was once located within the “pore” in question.⁹ On the other hand, the American Rule provides that the mineral interest is severed from the interest in the surrounding geological formation. Thus, the geological formation remains owned by the surface estate owner.¹⁰ The American Rule is the majority rule in the United States.¹¹

While no case has directly involved pore space ownership for CCS purposes, the majority of Texas case law addressing pore space ownership has been consistent with the American Rule, with only a 1991 case involving storage in salt caverns, *Mapco, Inc. v. Carter*,¹² ruling in line with the English Rule. However, *Mapco*, can be distinguished from and harmonized with the existing case law that supports the American Rule.

⁶ RRC, “Amendments to 16 TAC Chapter 5, relating to Carbon Dioxide (CO₂)” (August 22, 2023), available at <https://www.sos.state.tx.us/texreg/archive/September82023/Adopted%20Rules/16.ECONOMIC%20REGULATION.html#106>.

⁷ Tex. Water Code § 27.043; see also RRC, “How to Become a Class VI Well,” <https://rrc.texas.gov/oil-and-gas/applications-and-permits/injection-storage-permits/co2-storage/>.

⁸ Trae Gray, *A 2015 Analysis and Update on U.S. Pore Space Law – The Necessity of Proceeding Cautiously with Respect to the “Stick” Known as Pore Space*, 1 OIL AND GAS, NAT. RESOURCES AND ENERGY J. 277, 282 (2015).

⁹ *Id.*

¹⁰ *Id.* at 283.

¹¹ *Id.*

¹² 808 S.W.2d 262 (Tex. App. 1991), *rev’d in part on other grounds*, 817 S.W.2d 686 (Tex. 1991).

In *Emeny v. United States*, the Federal Court of Claims, applying Texas law, found that the surface estate retained the “surface of the leased lands and everything in such lands, except the oil and gas deposits covered by the leases” including “the geologic structures beneath the surface” and “any such structure that might be suitable for the underground storage of ‘foreign’ or ‘extraneous’ gas produced elsewhere.”¹³ Similarly, the Texas Supreme Court held in *Humble Oil & Refining Co. v. West*, that a fee simple owner’s dominion “include[d] not only the surface and mineral estates, but also the matrix of the underlying earth, i.e., the reservoir storage space.”¹⁴ These cases have been cited in later cases for the proposition that the surface estate holds an interest in the geologic space supporting minerals, consistent with the American Rule.¹⁵ The Texas Supreme Court took a similar view in *Lightning Oil Co. v. Anadarko E&P Onshore LLC*. In *Lightning Oil Co.*, a mineral lessee brought action against the surface owner for granting permission to a third party to drill through the mineral estate to reach an adjacent tract without consent of the mineral interest holder.¹⁶ The Court held that although “the surface owner retains ownership and control of the subsurface materials, a mineral lessee owns a property interest – a determinable fee – in the oil and gas in place in the subsurface materials,” and stated that the surface owner owns and controls “the mass of earth undergirding the surface.”¹⁷

Mapco v. Carter represents a potential exception to this line of cases. In *Mapco*, the Texas Court of Appeals held that a subsurface gas storage area made of salt was owned by the mineral estate, and the mineral estate was thereby entitled to compensation for use of the storage area.¹⁸ Since the walls were constructed of an underground mineral, the court held that the mineral owners owned the storage rights to the cavern, stating that “a property ownership, right and interest after the underground storage facility – here, a cavern – had been created.”¹⁹ In light of other Texas case law decisions both before and after *Mapco*, though, this case would seemingly only apply when the storage facility was created by a mineral, such as a salt cavern.

However, a more recent Texas Court of Appeals decision issued in 2022 casts doubt on the applicability of *Mapco* even in that context.²⁰ In *Myers-Woodward, LLC v. Underground Services Markham, LLC*, the Texas Court of Appeals held that, despite the fact that an underground cavern was made of salt after the completion of the mineral holder’s salt mining activities, the surface owner owned the salt cavern just like it owned the rest of the subsurface below its lands. In reaching that decision, the court overturned the lower court’s decision to the contrary, which had relied heavily on *Mapco*, stating that *Mapco* contained no citation to any authority for its holding. *Myers* has been appealed to and is currently pending before the Texas Supreme Court. The Texas

¹³ *Emeny v. United States*, 412 F.2d 1320, 1323 (Ct. Cl. 1969).

¹⁴ 508 S.W.2d 812, 815 (Tex. 1974).

¹⁵ See e.g., *Rosenthal v. Railroad Comm’n of Texas*, 2009 WL 2567941 at *8 (Tex. App. Aug. 20, 2009).

¹⁶ *Lightning Oil Company v. Anadarko E&P Onshore, LLC*, 520 S.W.3d 39 (Tex. 2017).

¹⁷ *Id.* at 47; see also *Dunn-McCampbell Royalty Interest, Inc. v. Nat’l Park Serv.*, 630 F.3d 431, 442 (5th Cir. 2011) (holding that the surface owner, not the mineral owner, “owns all non-mineral ‘molecules’ of the land, i.e., the mass that undergirds the surface” estate.).

¹⁸ *Mapco Inc. v. Carter*, 808 S.W.2d 262, 274 (Tex. App. 1991), *rev’d in part on other grounds*, 817 S.W.2d 686 (Tex. 1991).

¹⁹ *Id.* at 274-75.

²⁰ *Myers-Woodward, LLC v. Underground Servs. Markham, LLC*, No. 13-20-00172-CV, 2022 WL 2163857 (Tex. App. 2022).

Supreme Court’s ruling should clarify Texas common law on the ownership of pore space formed from minerals, and potentially could also address pore space ownership more generally.

Legislation was proposed in the 2023 term of the Texas state legislature that would have codified the American Rule for pore space ownership by statute. House Bill 4484, relating to the ownership of pore space and the use of pore space for the geologic storage of carbon dioxide, was filed on March 10, 2023.²¹ This bill was not limited to pore space ownership and addressed three significant issues: (1) surface estate ownership of pore space, (2) transfer of liability associated with stored carbon dioxide and geologic storage facilities to the state, and (3) “forced” integration of pore space interests for the development of proposed geologic storage facilities, which will be discussed in more detail below. If passed, the bill would have provided by statute that ownership of pore space lies with the surface owner unless specifically severed. However, the bill never came to a vote, and the question of pore space ownership in Texas remains grounded in case law rather than statute. It is possible that another attempt to codify surface estate ownership of pore space will be made in a future legislative session.

III. What kind of property interest could a CCS project proponent obtain in the pore space?

Neither federal nor state permitting regulations mandate any specific type of property rights that must be obtained by a CCS project permittee, and the early CCS market has not converged on a consensus approach to securing pore space property interests. However, common approaches rooted in the applicable common law and oil and gas precedent include obtaining pore space deeds, easements, or leases. Regardless of the nature of the property interest obtained, the rights to be acquired should be permanent and either exclusive or carefully coordinated to prevent pathways for CO₂ migration or other adverse impacts in the event of potential competing uses.

EPA’s Class VI regulations do not contain any specific requirements related to the pore space or real property rights to be acquired for a CCS project. However, a required finding for issuance of a state geologic storage facility permit under the RRC rules is that the applicant “has provided a signed statement that the applicant has a good faith claim to the necessary and sufficient property rights for construction and operation of the geologic storage facility for at least the first five years after initiation of injection”²² The RRC rules do not specify what rights are necessary and sufficient.

While there is no mandated form of property interest, the pore space property interest should be grounded in requirements necessary for the owner of the CO₂ capture equipment to qualify for 45Q credits. These credits currently represent the primary financial incentive for CCS projects. The calculation of 45Q credits earned by a CCS project is based on the “amount per metric ton of qualified carbon oxide captured by the taxpayer using carbon capture equipment and permanently isolated from the environment.”²³ Accordingly, to ensure the CCS project qualifies for 45Q credits, the pore space property interest must allow for **permanent** storage of CO₂. Use of a pore space deed or a perpetual easement may be better suited to establish a permanent right,

²¹ The senate companion bill was S.B. 2107.

²² 16 Texas Administrative Code (“TAC”) § 5.206(b)(10).

²³ 86 Fed. Reg. 4728, 4753 (Jan. 15, 2021).

as a lease is more likely to have a defined term and be terminable. However, a lease is what has been traditionally used in the oil and gas context and is one of the vehicles being used by developing CCS projects. For example, in offshore projects in Texas state waters, the Texas General Land Office leases its pore space. In addition, while EPA and the RRC have left open the possibility of overlapping CCS projects, CCS project proponents should consider providing in any lease or easement that the pore space property right is exclusive. This would help avoid potential operational, monitoring, and/or financial assurance issues that may arise due to multiple CCS project's sharing the same pore space. In the absence of exclusivity, there would need to be coordination with any other overlapping project to ensure each project complies with applicable regulations and permits.

In general, the most secure pore space property interest would be a deed conveying fee simple ownership in the surface or severed pore space. However, surface or severed pore space owners may not be willing to sell their pore space, and in certain states (not including Texas), surface owners are barred by statute from severing the pore space interest from the surface right.²⁴ In such situations, acquisition of severed pore space rights would not be an option. Additional property right considerations, which are outside the scope of this paper, include whether to include surface rights within the pore space easement or lease or as a separate agreement, and what types of surface rights to include based on the project design and applicable regulations.

Finally, where the mineral estate has been severed from the surface estate, CCS projects should evaluate whether agreements with mineral interest owners and/or operators may be appropriate. For instance, where ongoing mineral activities are ongoing or anticipated in the vicinity of the proposed facility that potentially could affect the CCS project's storage facilities or operations, an accommodation agreement between the CCS project and mineral interest owner/operator could be put in place. This agreement could address in advance coordination of activities in situations where mineral interest owners/operators might operate or plan to drill wells that intersect with the CO₂ repository to minimize the risk of interference with the CCS project or mineral development activities. In any event, the RRC's rules require geologic storage facility permittees to coordinate with any oil or gas operator planning to drill through the CCS project and "take all reasonable steps necessary to minimize any adverse impact on the operator's ability to drill for and produce oil and gas or geothermal resources from above or below the geologic storage facility."²⁵ This can be accomplished through consents, or accommodation or coordination agreements, which can also address responsibility for any issues that may occur as a result of potentially co-located activities. The RRC has indicated that it also plans to include conditions in oil and gas well drilling permits requiring oil and gas operators that plan to drill within the extent of a CCS project's CO₂ plume to notify and coordinate with the CCS permittee prior to drilling.²⁶

IV. When should the pore space for a CCS project be acquired?

As mentioned above, to receive a Texas state geologic storage facility permit, an applicant must submit to the RRC "a signed statement that the applicant has a good faith claim to the

²⁴ See, e.g., North Dakota Century Code § 47-31-05.

²⁵ 16 TAC § 5.206(o)(2)(G).

²⁶ RRC, "Amendments to 16 TAC Chapter 5, relating to Carbon Dioxide (CO₂)," p. 59 (August 20, 2022), available at <https://www.rrc.texas.gov/media/0tta0c3k/adopt-amend-ch5-hb1284-epa-primacy-sig-08302022.pdf>.

necessary and sufficient property rights for construction and operation of the geologic storage facility for at least the first five years after initiation of injection.”²⁷ The CCS operator must also submit annual reports to the RRC detailing the updated area for which the operator has such a good faith claim.²⁸ EPA’s Class VI rules contain no similar requirement. Accordingly, at the very least, before a draft permit is issued, and ideally before submitting an application for a Texas state geologic storage facility permit, a project proponent should obtain a property interest in sufficient pore space to hold the first five years’ worth of injected CO₂. This is based on the computational modelling of the CCS project’s CO₂ plume movement throughout the life of the project, which is required as part of the CCS permit application. Additional pore space may need to be acquired over time to accommodate changes in the CO₂ plume to satisfy applicable requirements and avoid a potential trespass or nuisance claim (discussed in more detail in Section VI.a.).

CO₂ plume movement may not be so straightforward in reality, however. At the outset of a CCS project, the expected CO₂ plume area is based on modelling that inputs the geology, chemistry, and operational factors for the project. After injection begins, the possibility remains that the CO₂ will travel in unanticipated ways, which could lead to a potential trespass or nuisance claim or a scramble for additional pore space rights. Many CCS project proponents are thus seeking to obtain pore space that can accommodate the CO₂ plume’s expansion over a longer time horizon, rather than the minimum first five years of injection, and potentially a buffer to account for unanticipated plume movement.

V. Where should the pore space property interest be located?

While siting of a CCS project is based largely on the geology of the target CO₂ repository and the location of the CO₂ source(s), there are legal considerations that a CCS project should take into account as well. One such consideration is the potential need to perform corrective action on pre-existing artificial penetrations located within the CCS project’s Area of Review (“AOR”), or the “region surrounding the geologic sequestration project where [underground sources of drinking water] may be endangered by the injection activity.”²⁹ This can be costly and raise questions about how to access wells that have already been plugged and abandoned. Additional considerations include potential challenges to the CO₂ pipeline or the state geologic storage facility permit by interested parties, which can result in project development delays. Taking these considerations into account during CCS site selection can help mitigate the risks of project development issues down the road. Finally, the CCS project should be sited such that it will not interfere with or impact any existing injection wells authorized by the Texas Commission on Environmental Quality (“TCEQ”) or associated waste plumes.

a. Corrective Action

When selecting the location of a CCS project, project proponents should take into consideration the potential need to perform corrective action on pre-existing artificial penetrations within the project’s AOR. This corrective action can include well plugging and/or remedial cementing of a legacy well that has been improperly plugged and abandoned. Such corrective

²⁷ 16 TAC § 5.206(b)(10).

²⁸ 16 TAC § 5.207(a)(2)(D)(iv).

²⁹ 40 Code of Federal Regulations (“CFR”) § 146.81(d).

action, which is required by both RRC and EPA rules, may be costly, and a project proponent may face difficulties obtaining access to all artificial penetrations to perform such corrective action. Accordingly, a CCS project proponent's strategy for pore space site selection should anticipate and mitigate for these potential issues.

Pursuant to the RRC's and EPA's CCS rules, a CCS operator must identify in its permit application all artificial penetrations within the AOR and perform corrective action on any such penetrations that may allow the unwanted movement of CO₂ or other materials.³⁰ RRC and EPA rules also require that a CCS project proponent include in its permit application a corrective action plan describing how corrective action will be carried out, how the plan will be adjusted if there are changes in the AOR, and how site access will be guaranteed for future corrective action.³¹

Evaluation of wells to assess the need for corrective action can require physical reconnaissance and tests on legacy wells. In addition, if corrective action is needed, access to reach the well site, access to enter the well itself, and surface access to conduct the required corrective action will be required. Where possible, access across the surface to perform corrective action activities should be secured by voluntary agreement with the surface estate owner. In addition, while there is currently no law on point in Texas, leading commentators have opined that "it is the near-unanimous rule that surface equipment and casing that is not removed within a reasonable time subsequent to the termination of a lease belongs to the owner of the surface estate."³² In states that follow this rule, a CCS project proponent would need permission from the surface owner to secure access to the well requiring corrective action. While the RRC's rules provide some potential avenues for obtaining such access for corrective action in the absence of owner or operator consent or for legacy wells, which are beyond the scope of this paper, this is largely a novel issue in Texas and thus comes with some degree of regulatory uncertainty and the potential risk of becoming responsible as the operator of the legacy well.

Accordingly, pore space site selection should account for the costs of performing corrective action on artificial penetrations within the AOR, particularly those that reach deep enough to intersect with the planned CO₂ repository or otherwise create pathways for unwanted movement of CO₂ or other subsurface substances. Where artificial penetrations that require corrective action are identified, access to reach and perform corrective action on those artificial penetrations should be evaluated as part of the site selection strategy as well. Even small adjustments to a CCS project's location or planned operations may increase or decrease the number of wells that would trigger corrective action requirements and can impact the risks and costs associated with corrective action.

b. Pipelines

Unless a CCS project will be co-located with the CO₂ source or within a short distance to the injection well site to convey CO₂ by truck, CO₂ likely will need to be transported from the CO₂ source to the injection well site via a CO₂ pipeline. The availability of existing CO₂ pipelines, or

³⁰ 40 CFR § 146.84(c); 16 TAC §§ 5.203(b), (d); *see also* EPA, "Underground Injection Control (UIC) Program Class VI Well Area of Review Evaluation and Corrective Action Guidance (May 2013), available at <https://www.epa.gov/sites/default/files/2015-07/documents/epa816r13005.pdf>.

³¹ 40 CFR § 146.84(b); 16 TAC § 5.203(d)(2)(C).

³² 1 BRUCE M. KRAMER & PATRICK H. MARTIN, *THE LAW OF POOLING AND UNITIZATION* § 18.03[2] (2018).

the viability of new CO₂ pipelines, to transport CO₂ is thus an important consideration when selecting the location for pore space acquisition.

Citing safety and environmental justice concerns based in part on the CO₂ pipeline rupture in Satartia, Mississippi in 2020³³ and the lack of a federal regulatory framework,³⁴ environmental NGOs have rallied strong opposition to the construction of CO₂ pipelines. Other than CO₂ pipeline safety, which is regulated at the federal level by the Pipeline and Hazardous Materials Safety Administration (“PHMSA”) or delegated to states by PHMSA, CO₂ pipeline regulation largely occurs at the state and local level through siting and zoning requirements.³⁵ Environmental groups and local citizens have had success in using those requirements to delay CO₂ pipeline projects, in some cases even to the point of project abandonment.

For example, in October 2023, Navigator CO₂ Ventures cancelled a CO₂ pipeline project that would have transported CO₂ from over thirty Midwest ethanol plants to Illinois for injection and storage after it was denied permits required for construction of the pipeline.³⁶ Similarly, Wolf Carbon Solutions (“WCS”) withdrew its application for a Certificate of Authority to authorize construction of a CO₂ pipeline in Illinois after the Illinois Commerce Commission recommended denial of the permit. WCS has, however, indicated plans to reapply.³⁷ The permit challenges these pipeline projects faced were largely the result of local and NGO opposition to the projects based on safety and compliance concerns. Another major CO₂ pipeline project, the Midwest Carbon Express proposed by Summit Carbon Solutions, recently received approval from the Iowa Utilities Board (“IUB”) of a permit to construct, operate, and maintain a 688-mile CO₂ pipeline through 29 counties in Iowa and to exercise eminent domain to obtain certain parcels of land needed for the pipeline.³⁸ However, the IUB conditioned the approval on Summit receiving pipeline approvals from the other states through which the project would travel as well, including North and South Dakota, which had previously rejected Summit’s pipeline siting and construction applications, respectively, after strong public opposition.

This opposition to CO₂ pipelines and “Not In My Backyard”/NIMBY thinking may lead to resistance to CO₂ pipelines construction outside the Midwest as well. Additionally, individual counties may put in place ordinances require setbacks or other requirements for CO₂ pipelines or try to enact moratoria on construction of new CO₂ pipelines. Accordingly, when developing pore space siting strategies, CCS project proponents should consider potential issues with CO₂ pipeline

³³ <https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2022-05/Failure%20Investigation%20Report%20-%20Denbury%20Gulf%20Coast%20Pipeline.pdf>

³⁴ See Congressional Research Service, “Carbon Dioxide (CO₂) Pipeline Development: Federal Initiatives,” (June 2, 2023), available at <https://ersreports.congress.gov/product/pdf/IN/IN12169#:~:text=Currently%2C%20states%20have%20primary%20siting,e.g.%2C%20across%20federal%20lands>); “Council on Environmental Quality Report to Congress on Carbon Capture, Utilization, and Sequestration,” (June 30, 2021), available at <https://whitehouse.gov/wp-content/uploads/2021/06/CEQ-CCUS-Permitting-Report.pdf>.

³⁵ *Id.*

³⁶ Congressional Research Service, “Siting Challenges for Carbon Dioxide (CO₂) Pipelines” (November 30, 2023), available at <https://ersreports.congress.gov/product/pdf/IN/IN12269>.

³⁷ *Id.*

³⁸ Iowa Utilities Board, In re: Summit Carbon Solutions, LLC, Docket No. HLP-2021-0001, Final Decision and Order, (June 25, 2024), available at https://wcc.efs.iowa.gov/cs/idcplg?IdcService=GET_FILE&RevisionSelectionMethod=latest&allowInterrupt=1&DocName=2147516&noSaveAs=1&utm_medium=email&utm_source=govdelivery.

construction that may result from local resident and environmental group sentiments near the potential project area.

Even where a CO₂ pipeline development faces no regulatory hurdles, local resistance to pipelines generally or CO₂ pipelines specifically may result in landowners refusing to allow the pipeline to cross their land. Eminent domain authority may help mitigate this risk. Chapter 111 of the Texas Natural Resources Code provides that eminent domain may be exercised for the siting of a CO₂ pipeline that is a common carrier pipeline.³⁹ A common carrier is defined as a person that “owns, operates, or manages, wholly or partially, pipelines for the transportation of carbon dioxide or hydrogen in whatever form *to or for the public for hire* [...]”⁴⁰ The Texas Supreme Court has ruled that the test for proving whether a CO₂ pipeline is a common carrier with the power of eminent domain is whether there exists a “reasonable probability” that, “at some point after construction,” the pipeline will serve the public.⁴¹ To prove this, a developer must point to evidence of public service, such as a post-construction contract with at least one unaffiliated customer.⁴² The ability to connect a CCS project’s injection well to such a common carrier pipeline should be explored when developing the pore space siting strategy.

c. Contested Case Hearings

Pore space siting strategies should take local and environmental group sentiment into account not only for purposes of siting near viable CO₂ pipelines, but also for siting in areas that reduce the likelihood of opposition to the Texas state geologic storage facility permit. Environmental groups filed comments on the RRC’s 2022 CCS rulemaking voicing concerns about the RRC’s Class VI primacy request and have recently requested that EPA revoke the RRC’s primacy over the Class II UIC program, citing among other things risks related to CO₂ injection and legacy wells.⁴³ These activities suggest that environmental groups may seek to challenge CCS permits issued by the RRC through Texas’ contested case hearing process. The risks of such permit challenges include permit revisions, permit suspension, permit denial, and/or delays to project development.

In Texas, “[a]ffected persons may protest an application.”⁴⁴ The request for a contested

³⁹ TEX. NAT. RES. CODE § 111.002. Additionally, Texas Business Organizations Code § 2.105 states that “a corporation, general partnership, limited partnership, limited liability company, or other combination of those entities engaged as a common carrier in the pipeline business for the purpose of transporting oil, oil products, gas, carbon dioxide...has all the rights and powers conferred on a common carrier by Sections 111.019-111.022, Natural Resources Code.”

⁴⁰ *Id.* (emphasis added).

⁴¹ *Denbury Green Pipeline-Texas, LLC v. Tex. Rice Land Partners, Ltd.*, 510 S.W.3d 909, 911 (Tex. 2017).

⁴² *Id.* at 916; *Hlavinka v. HSC Pipeline Partnership, LLC*, 650 S.W.3d 483, 495 (Tex. 2022).

⁴³ RRC Comments received for Various Rules in 16 TAC Chapter 5 (updated Aug. 16, 2022) <https://www.rrc.texas.gov/general-counsel/rules/proposed-rules/comments-received/05242022-comments-for-various-rules-in-chapter-5/>; *Petition to Determine by Rule that Texas’ Class II Injection Well Permitting Program No Longer Represents an Effective Program to Prevent Underground Injection from Endangering Drinking Water Sources and Fails to Comply with the Requirements of the Safe Drinking Water Act* (Mar. 1, 2024), available at <https://commissionshift.org/wp-content/uploads/2024/03/2024.03.01-FINAL-Petition-to-EPA-to-Revoke-Texas-Class-II-Primacy-.pdf>.

⁴⁴ RRC, “Amendments to 16 TAC Chapter 5, relating to Carbon Dioxide (CO₂)” (August 22, 2023), available at <https://www.sos.state.tx.us/texreg/archive/September82023/Adopted%20Rules/16.ECONOMIC%20REGULATION.html#106>. 16 TAC § 5.102(1) (“Affected person” is defined as a “person who, as a result of activity sought to be

case hearing must be filed within 30 days of publication of notice of the draft permit.⁴⁵ The RRC contested case hearing⁴⁶ process is similar to a court proceeding and involves motions, discovery, legal arguments, and sworn testimony before a RRC hearings examiner. The RRC will then issue a final decision that grants, denies, or modifies and adopts the permit.⁴⁷ Parties may move for rehearing of the RRC’s decision and, later, appeal to Travis County district court.⁴⁸

The contested case hearing process could delay permit issuance by several months, and uncertainty could persist longer if a party subsequently seeks judicial review of the RRC’s permit decision. While the risk of a state permit challenge cannot be eliminated, the risk may be mitigated through early outreach to the community and potentially affected persons as well as strategic siting of the CCS project.

d. TCEQ-Permitted Injection Wells

CCS projects should also be sited to avoid impacts to existing and previous injection wells. Not only is this good practice to avoid creation of potential CO₂ migration pathways or permit noncompliances, but it is also required under the RRC’s rules. CCS project proponents must submit a copy of their geologic storage facility permit application to the TCEQ. CCS project proponents must then obtain a letter of determination from the TCEQ concluding that the drilling and operating of the CO₂ injection well will not impact or interfere with any previous or existing TCEQ-permitted injection wells or their associated waste plumes.⁴⁹ TCEQ-permitted wells include Class I, III, IV, and V UIC wells. The RRC will not issue a geologic storage facility permit to the CCS project until this letter is obtained and submitted. In addition to the project siting strategy, obtaining this letter should also be factored into the CCS project planning timeline.

VI. How much pore space is needed for the CCS project?

A CCS project proponent should obtain pore space rights sufficient for the extent of the CO₂ plume as it spreads out underground over the life of project. Due to uncertainty about where the plume may ultimately move, consideration could be given to acquiring option rights, release rights for unneeded pore space, and buffer areas. It is also important not to forget that pore space should be acquired for both the horizontal and vertical extent of the projected CO₂ plume. This may entail specifying in pore space deeds, leases, or easements which formations or depths are included in the property interest.

Failure to obtain sufficient pore space rights may result in a potential trespass or nuisance claim if injected CO₂ travels into pore space in which the facility operator has not secured pore

permitted has suffered or may suffer actual injury or economic damage other than as a member of the general public.”).

⁴⁵ 16 TAC §§ 5.204(b)(2), 5.204(b)(1)(A).

⁴⁶ Although 16 TAC § 5.204 references a “public hearing,” the RRC confirmed, in responding to comments regarding the proposed Chapter 5 rules, that “[t]he references to a hearing in §5.202(d) and §5.204(b) mean a contested case hearing.” RRC Office of General Counsel Memorandum: Amendments to 15 TAC Chapter 5, relating to Carbon Dioxide (CO₂) at 22 (Aug. 30, 2022), available at <https://www.rrc.state.tx.us/media/0tta0c3k/adopt-amend-ch5-hb1284-epa-primacy-sig-08302022.pdf>

⁴⁷ 16 TAC § 1.126. In conjunction with issuing the final permit, the RRC is also required to issue a response to public comments that responds to all significant comments received on the draft permit. 16 TAC §5.204(b)(5).

⁴⁸ *Id.* at § 1.128; Tex. Gov’t Code § 2001.145.

⁴⁹ 16 TAC § 5.203(a)(2)(D).

space rights. These claims are discussed in more detail below. An additional issue that may arise when acquiring pore space involves owners who cannot be located or holdout owners who refuse to provide the project with rights in their pore space. Similar to unitization or pooling in the oil and gas context, statutorily required “amalgamation” or “integration” of holdout pore space has been put in place for CCS projects in some states. A summary of this concept and its current status is below.

a. Trespass and Nuisance Claims

If injected CO₂ travels into pore space for which a CCS project proponent has not obtained pore space rights, a third party could potentially bring state common law tort claims for trespass and/or nuisance. Under Texas law, trespass to real property is defined as an unauthorized entry upon the land of another and includes entry of a person on another’s land and causing or permitting a thing to cross the boundary of the premises.⁵⁰ At face value, this would mean that any injected CO₂ or any other substance that the CCS project causes to enter the subsurface property of another could constitute a trespass. However, the Texas Supreme Court has signaled potential receptivity to the notion that there may be limitations on the application of trespass to deep subsurface activities, similar to limitations on trespass in the airspace over a property, and has expressly left open the question of whether deep subsurface trespass is an actionable claim in Texas.⁵¹ With regard to mineral estates, however, Texas case law indicates that a trespass claim may be successful, regardless of depth, if the interference infringes on the mineral estate holder’s ability to exercise its rights.⁵² A nuisance is a condition that substantially interferes with the use and enjoyment of land by causing unreasonable discomfort or annoyance to persons of ordinary sensibilities.⁵³ A pore space owner may have difficulty proving interference with use and enjoyment of its land based on deep subsurface activity.

The risk of subsurface trespass or nuisance claims may be mitigated through careful project siting and subsurface characterization, and by acquiring sufficient pore space rights to accommodate a growing CO₂ plume. The pore space acquisition strategy could also potentially account for situations in which the CO₂ plume moves in unexpected ways by acquiring enough pore space to establish a buffer around the expected CO₂ plume or, in the absence of actually acquiring pore space in a buffer zone, by engaging with pore space owners within that buffer zone early on so there is already groundwork in place should pore space within the buffer zone be needed.

⁵⁰ *Barnes v. Mathis*, 353 S.W.3d 760, 764 (Tex. 2011).

⁵¹ *Regency Field Services, LLC v. Swift Energy Operating, LLC*, 622 S.W.3d 807 (Tex. 2021) (“We have not decided whether subsurface migration can cause an actionable trespass to a surface owner’s possessory interest in the subsurface space.... We need not decide that issue here either, because Swift asserts claims for trespass to its nonpossessory rights as a mineral lessee (which we did recognize in *Lightning Oil*), not to possessory rights as a landowner.”); *Coastal Oil & Gas Corp. v. Garza Energy Tr.*, 268 S.W.3d 1, 11 (Tex. 2008) (“the ancient common law maxim that land ownership extends to the sky above and the earth’s center below ... has no place in the modern world. Wheeling an airplane across the surface of one’s property without permission is a trespass; flying the plane through the airspace two miles above the property is not. Lord Coke, who pronounced the maxim, did not consider the possibility of airplanes. But neither did he imagine oil wells. The law of trespass need no more be the same two miles below the surface than two miles above.”).

⁵² *Lightning Oil Company*, 520 S.W.3d at 49.

⁵³ *Barnes v. Mathis*, 353 S.W.3d 760, 763 (Tex. 2011).

b. Pore Space Holdouts

Similar to an oil or gas reservoir, a single pore space reservoir may stretch underneath multiple landowners' properties. In seeking to acquire pore space rights from each landowner within the projected CO₂ plume area, a CCS project proponent may not be able to locate all landowners or may encounter holdout landowners who refuse to provide the CCS project proponent with pore space rights. Some states have enacted laws designed to allow CCS projects to obtain necessary pore space rights from holdout landowners in a process analogous to eminent domain called amalgamation (also called integration, pooling, or unitization). However, Texas has not yet enacted a statute giving CCS projects this right.

The concept of amalgamation is based on the idea that carbon dioxide injected under one landowner's land may end up being stored under another landowner's property. Similar to unitization and pooling in the oil and gas context, amalgamation refers to a CCS project proponent combining the pore space of each of the separate lands overlying a CO₂ repository into one CCS storage facility, or storage unit, into which CO₂ may be injected from any of the amalgamated properties. Amalgamation is generally accomplished through voluntary agreements between the CCS operator and pore space owners. However, several states, including North Dakota, Wyoming, Indiana, Montana, Nebraska, Louisiana, and Utah, have enacted statutes to address situations where landowners within a reservoir refuse to or cannot be located to enter into an agreement to allow use of their pore space thereby preventing voluntary amalgamation.⁵⁴ Under these laws, a CCS project proponent can obtain the right to store CO₂ in a person's pore space without their consent if they can show that they made a good faith effort to obtain those pore space rights and that they have already obtained pore space rights or consent from the owners of the pore space underlying some minimum percentage, for example 70 percent, of the surface area above the proposed storage facility.⁵⁵ Similar to eminent domain, the CCS operator is generally required to equitably compensate the pore space owner for use of their pore space.

Texas law does not currently provide a mechanism for acquiring pore space property rights without the owner's consent. House Bill 4484, introduced in 2023, sought to allow forced integration of pore space from nonconsenting owners where a CCS project had obtained the consent of the pore space owners representing at least 60% of the ownership of the pore space, based on the surface acreage of the proposed geologic storage facility. However, this bill was ultimately never voted on. The lack of available avenues for obtaining pore space from nonconsenting owners in Texas creates an incentive for CCS project proponents to engage with landowners early on and seek voluntary agreements for their pore space, and potentially to site the CCS project in areas where a larger percentage of the pore space is owned by a smaller number of people.

VII. Conclusion

Pore space acquisition is often one of the first steps in developing a CCS project. Therefore, it is important to understand the legal and regulatory framework surrounding pore space in Texas

⁵⁴ See North Dakota Century Code §§ 38-22-08; 38-22-10; Wyoming Statutes § 35-11-316; Indiana Code § 14-39-2-4; Montana Code § 82-11-204; Nebraska Revised Statutes § 57-1612; Utah Code § 40-11-10.

⁵⁵ See *e.g.*, Indiana Code § 14-39-2-4.

in order to get the project off on the right foot and mitigate the risk of project development issues down the road. This involves obtaining the right amount of the right pore space interest, in the right place, and from the right person. While the legal and market framework for pore space acquisition is continuing to evolve in Texas and throughout the United States, this paper is intended to provide a helpful guide to understanding and navigating the process and uncertainties.