

January 2009

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Recommended Citation

Anderson, Owen L. (2009) "Geologic CO2 Sequestration: Who Owns the Pore Space," *Wyoming Law Review*. Vol. 9: No. 1, Article 2.

Available at: <https://scholarship.law.uwyo.edu/wlr/vol9/iss1/2>

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WYOMING LAW REVIEW

VOLUME 9

2009

NUMBER 1

GEOLOGIC CO₂ SEQUESTRATION: WHO OWNS THE PORE SPACE?

Owen L. Anderson*

I. INTRODUCTION

As scientific findings supporting global warming are increasingly embraced by society, government officials and carbon-producing industries face the challenge of how to lessen greenhouse-gas emissions. The energy industry, which is often blamed for global warming, offers an innovative potential remedy: geologic carbon-dioxide (CO₂) sequestration—“the injection of CO₂ into deep . . . geologic formations for the explicit purpose of avoiding atmospheric emission of CO₂.”¹

Currently, CO₂ is produced and sold for use in enhanced-oil-recovery projects (EOR). CO₂ is injected into oil-bearing strata to stimulate oil and gas production,²

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¹ Elizabeth J. Wilson & Mark A. de Figueiredo, *Geologic Carbon Dioxide Sequestration: An Analysis of Subsurface Property Law*, 36 ENVTL. L. REP. 10114, 10115 (2006).

² *Id.* at 10118.

and the CO₂ that is produced with oil can be reinjected.³ Incentives encourage the use of CO₂ for EOR purposes, including tax credits in Texas, but no incentives presently exist to sequester CO₂ underground.⁴ Nevertheless, because using CO₂ for EOR is an established practice, “[i]t is very likely that initial [geologic sequestration] projects will be linked to EOR projects.”⁵

Geologic sequestration as a permanent waste-storage possibility involves injecting CO₂, in either gas or liquid form, into deep subterranean strata or caverns. The technology for geologic sequestration is “already adequate and will steadily improve,” but one of the greatest impediments to successful implementation of sequestration is public acceptance, which will develop as the public becomes more aware of its advantages.⁶ Also, federal and state governments must agree on a CO₂ sequestration regulatory policy that will encourage CO₂ emitters and entrepreneurs to undertake this expensive endeavor.⁷ “There are no technical or physical barriers to [geologic sequestration]. . . . The only thing that stands in the way of progress at the moment is policy.”⁸ Of course, CO₂ sequestration must also be commercially viable, and commercial viability may, in part, depend on how the property-rights issues are resolved.

As geologic CO₂ sequestration projects gain momentum, property rights and related liability issues will be important concerns, as Texas courts have yet to sort out ownership and liability issues pertaining to the use of subsurface pore spaces for CO₂ sequestration and other uses—regarding both directly targeted tracts and tracts that may suffer CO₂ migration.

Section II of this essay discusses the ownership of subsurface pore space in Texas—an important inquiry to determine which property-interest holder has the sequestration rights. Section III briefly considers property-related liability issues regarding CO₂ injection and sequestration. Then, Section IV draws comparisons and conclusions between the application of these legal principles and CO₂ sequestration. Appendix 1 provides a brief discussion of the ownership of stored CO₂ and the nature of a CO₂-sequestration right. Appendix 2 provides a brief discussion of the laws of some other petroleum-producing jurisdictions.

³ THE PETROLEUM ECONOMIST, LTD., FUNDAMENTALS OF CARBON CAPTURE AND STORAGE TECHNOLOGY 38–39 (Tom Nicholls ed. 2007).

⁴ *Id.*

⁵ Wilson & de Figueiredo, *supra* note 1, at 10118.

⁶ THE PETROLEUM ECONOMIST, *supra* note 3, at 8–9.

⁷ *Id.*

⁸ *Id.* at 16.

II. OWNERSHIP OF THE PORE SPACE

When CO₂ is injected into the subsurface, the injector must either own or have permission from the owner of the subterranean pore space. Under the common-law maxim, *cujus est solum, ejus est usque ad coelum et ad inferos*, a fee-simple owner of land owns the entire tract “from the heavens to the depths.” Thus, a fee-simple owner owns the subterranean pore spaces. The question of pore-space ownership arises when the fee-simple interest is severed into a mineral estate and a surface estate. As between the surface owner and mineral owner, most jurisdictions, including Texas, have not specifically determined the ownership of subterranean pore spaces. Because of the lack of a definitive answer to the question of who may grant the right to store CO₂, the Interstate Oil and Gas Compact Commission Task Force on Carbon Capture and Geologic Storage stated in a September 2007 report: “Perhaps the most important aspect of Texas law is that the question of pore space ownership is not clearly settled, highlighting the need for statutory and regulatory clarity.”⁹

The lack of consistent Texas case law leads to the inefficient, yet realistic, conclusion that permission from both the surface owner and mineral owner is certainly the cautious approach. Nevertheless, I submit that the most likely “owner” of the pore space is the surface owner. I reach this conclusion based on four general principles:

First, a property right not expressly conveyed is retained, or conversely, a property right not expressly reserved is conveyed.¹⁰

Second, when a fee-simple owner transfers the mineral estate or transfers the surface estate, reserving minerals, two separate or severed estates in land are created.¹¹

Accordingly, if Able, fee-simple owner of Blackacre, conveys the “oil, gas, and other minerals” to Baker, Able would retain, as part of the so-called surface estate, everything not granted by the severance deed—that is, everything but the “mineral estate,” which in this case would be any oil, gas, and minerals subsisting in Blackacre. Likewise, if Able conveyed Blackacre to Baker, reserving oil, gas, and minerals, Baker would receive everything not reserved by Able—that is everything

⁹ INTERSTATE OIL AND GAS COMPACT COMM’N TASK FORCE ON CARBON CAPTURE AND GEOLOGIC STORAGE, STORAGE OF CARBON DIOXIDE IN GEOLOGIC STRUCTURES, A LEGAL AND REGULATORY GUIDE FOR STATES AND PROVINCES 17 (2007). The Executive Summary of the report states: “The interest of states in the geologic storage of CO₂ arises because, in addition to conservation, it is among the most immediate and viable strategies available for mitigating the release of CO₂ into the atmosphere.” This indicates the public policy rationale for supporting CO₂ geologic storage. *Id.* at 9.

¹⁰ *Duhig v. Peavy-Moore Lumber Co.*, 144 S.W.2d 878, 880 (Tex. 1940).

¹¹ *Humphreys-Mexia Co. v. Gammon*, 254 S.W. 296, 299 (Tex. 1923).

but any oil, gas, and minerals subsisting in Blackacre—*i.e.*, the mineral estate.¹² Thus, in either case, the owner of the surface estate would own the subterranean pore space. Of course, a deed or reservation could expressly address ownership of pore spaces, but, typically, does not.¹³

Third, Texas law recognizes the mineral estate as dominant over the surface estate, a concept often overstated. In proper context, “dominant” means that the mineral owner has the right to *use* as much of the airspace, surface, and subsurface as is reasonably necessary to explore for and exploit the minerals belonging to the mineral owner,¹⁴ subject to the limitation of the “accommodation doctrine.” The accommodation doctrine requires the mineral owner to accommodate the surface owner’s reasonable existing uses to the extent that the mineral owner may reasonably be able to do so while still being able to exercise exploration and exploitation rights.¹⁵

This third principle has a flip side: the surface owner cannot unreasonably interfere with the interests of the mineral owner.¹⁶ Under Texas law, the meaning of “other minerals” in the granting clause of a mineral deed includes “all valuable substances . . . whether their presence or value was known at the time of conveyance”¹⁷ Thus, any minerals present in the property may belong to the mineral owner, and the surface owner must reasonably accommodate exploration and exploitation.¹⁸ This broad construction of the term “minerals” implicitly means that the mineral owner has a potentially broad right of reasonable use that the

¹² Similar reasoning should apply where the severance of oil and gas rights is classified as a profit. The holder of the oil and gas rights would have the right to exploit any oil and gas but the underlying fee owner would retain all other rights—presumably including ownership of pore spaces.

¹³ The granting clause of oil and gas leases frequently conveys the right to store hydrocarbons. *See, e.g.*, *Ryan Consol. Petroleum Corp. v. Pickens*, 285 S.W.2d 201, 203 (Tex. 1955) (lessor “granted, demised, leased and let and by these presents does grant, demise, lease (and) let unto said lessee, with the exclusive right to prospect, . . . operate, produce, *store* and remove therefrom oil, gas, casinghead gas, and all petroleum products . . .”) (emphasis added). Of course, the right to store oil, gas, casinghead gas, and all petroleum products does not specifically address CO₂ or “ownership” of the pore space. Moreover, when leasing, a mineral-interest owner cannot confer rights that are greater than what such owner holds.

¹⁴ *Getty Oil Co. v. Jones*, 470 S.W.2d 618, 621 (Tex. 1971). *See also* *Ball v. Dillard*, 602 S.W.2d 521, 523 (Tex. 1980); *Humble Oil & Ref. Co. v. Williams*, 420 S.W.2d 133 (Tex. 1967) (discussing excessive use).

¹⁵ *Getty Oil Co.*, 470 S.W.2d at 621–22; *Sun Oil Co. v. Whitaker*, 483 S.W.2d 808, 810–11 (Tex. 1972).

¹⁶ *Ball*, 602 S.W.2d at 523.

¹⁷ *Moser v. U.S. Steel Corp.*, 676 S.W.2d 99, 102 (Tex. 1984).

¹⁸ *Id.* at 103 (citing *Getty Oil Co.*, 470 S.W.2d 618).

mineral owner may affirmatively protect.¹⁹ Accordingly, even though the surface owner may own the pore spaces, the mineral owner has broad rights to penetrate or otherwise use them in connection with mineral exploration and exploitation. Indeed, commercial deposits of oil and gas occupy pore spaces within geologic traps. Thus, the mineral owner may be able to enjoin CO₂ sequestration that prevents, greatly hinders, or endangers the capture of oil and gas. But does the “dominance” of the mineral estate address “ownership” of the pore space? Indirectly, yes.

Texas courts categorize the mineral-owner’s right as a right to *use* the surface, subsurface, and airspace to capture oil and gas that is owned by the mineral owner in fee-simple determinable.²⁰ For example, in *Getty Oil Co. v. Jones*, the court stated: “We now hold *explicitly* that the reasonably necessary limitation extends to the superadjacent airspace as well as to the lateral surface *and subsurface* of the land.”²¹ This holding indirectly recognizes the surface-owner’s title to the subsurface because the court’s express reference to the subsurface is in the context of discussing the rights of the mineral owner to *use* that which belongs to the surface owner.²² However, assuming the surface owner owns the pore spaces, the surface owner must nevertheless reasonably accommodate the mineral-owner’s use of the pore spaces in connection with mineral exploration and exploitation operations. Likewise, if the mineral owner owns the pore spaces, then, presumably, the mineral owner must accommodate the surface-owner’s use of the subsurface in connection with the surface-owner’s retained rights. Thus, in either case, the cautious CO₂ sequestration operator would secure permission from both surface and mineral owners.

Assuming that the surface owner “owns” the pore space, the mineral-estate owner nevertheless has the right to use the pore space to facilitate mineral exploration and exploitation. This right of use would include the right to inject substances, such as CO₂, for purposes of enhanced oil recovery. The fact that CO₂ injection might also result in the long-term sequestration of CO₂ should not, in my opinion, alter the right of the mineral-estate owner to engage in CO₂ injection for enhanced oil recovery. Thus, the mineral-owner’s right to inject CO₂ for enhanced oil recovery, including the additional goal of long-term CO₂ sequestration, should fall within the mineral-owner’s right of reasonable use even though “ownership” of pore spaces lies with the surface owner.

¹⁹ See, e.g., *Emerald Coal & Coke Co. v. Equitable Gas Co.*, 107 A.2d 734 (Pa. 1954) (finding that a coal company successfully enjoined subsurface gas storage that was to occur in stratum directly beneath an active coal mine).

²⁰ In the case of solid minerals, a full mineral interest would be owned in fee-simple absolute and include a similar right to use the surface, subsurface, and airspace.

²¹ *Getty Oil Co.*, 470 S.W.2d at 621 (emphasis added).

²² *Id.*

That CO₂ is also injected for sequestration should be no different than injecting saltwater for EOR. When saltwater is injected, either partially or wholly for EOR or disposal purposes, permanent sequestration of the saltwater is contemplated, although, potentially, the saltwater could be withdrawn for use in another EOR project. The same would hold true with CO₂, but, if one purpose of CO₂ injection is to address concerns about global warming, the objective of permanent sequestration would be a paramount concern, which would necessarily require a robust regulatory system to assure that this objective is achieved. As with water, however, such a regulatory system might not prohibit the later withdrawal, use, and reinjection of CO₂ for another EOR project, as long as the CO₂ was ultimately sequestered. On the other hand, the right to inject CO₂ solely for sequestration, unrelated to enhanced-oil recovery, would most likely be held by the surface owner.

Another indication that the surface owner owns the subsurface after a mineral severance is that the surface owner retains groundwater rights.²³ In *Sun Oil Co. v. Whitaker*, the Texas Supreme Court held that Sun, the oil and gas lessee, acting under a lease from the fee-simple owner who subsequently conveyed the surface estate to Whitaker, had the right to use groundwater to the extent reasonably necessary to produce oil and gas.²⁴ In other words, Sun's right to *use* groundwater implicitly recognizes surface-owner title to the groundwater. Although surface-owner title to groundwater does not necessarily mean that the surface owner holds title to subsurface pore spaces, the Texas groundwater cases give no hint of another possibility.

Fourth, a regulatory agency with the power to authorize regulated activities, such as the Texas Railroad Commission, authorizing underground gas storage or saltwater disposal, has no authority to determine property rights.²⁵ Thus, the fact that a regulatory agency has issued a permit to an operator for geologic CO₂ sequestration does not give that operator title to any subsurface pore spaces. However, when considering liability, a permit may be of some relevance if CO₂ migrates beyond the tract where it is injected—an issue addressed in the next section.

Although no Texas case law finally determines the ownership of subterranean pore spaces as between the surface and mineral owner, a handful of cases shed

²³ *Pfluger v. Clack*, 897 S.W.2d 956, 959 (Tex. App. 1995), *writ denied*. Texas is perhaps the only remaining state to adhere to the “absolute ownership” theory regarding groundwater. *See City of Sherman v. Pub. Util. Comm’n*, 643 S.W.2d 681, 686 (Tex. 1983) (“The absolute ownership theory regarding groundwater was adopted by this Court in *Houston & T.C. Ry. Co. v. East*, 98 Tex. 146, 81 S.W. 279 (1904).”).

²⁴ 483 S.W.2d 808, 811 (Tex. 1972).

²⁵ *See, e.g., Ryan Consol. Petroleum Corp. v. Pickens*, 285 S.W.2d 201, 207 (Tex. 1956); *Pan Am. Prod. Co. v. Hollandsworth*, 294 S.W.2d 205, 211–12 (Tex. Civ. App. 1956), *writ refused n.r.e.*

some light on the issue. The facts of an unreported case are on point; however, the issues discussed by the appellate court are not. Nevertheless, *Makar Production Co. v. Anderson*²⁶ illustrates the ownership issue, and the trial court's findings and conclusions are a matter of record. In this case, at the request of the lessor's successor in interest to an oil and gas lease, the trial court permanently enjoined the lessee's successor from bringing saltwater produced from wells located on other tracts onto the leased premises and from injecting the saltwater into subsurface strata beneath the leased premises.²⁷ The injunction was issued even though the Railroad Commission had issued a permit for the saltwater disposal.²⁸

The injunction was granted on the ground that the oil and gas lease did not expressly authorize the lessee or its successors to use the leased premises as a commercial waste-disposal site.²⁹ Thus, while *Makar* implies that the fee-simple owner could have expressly leased disposal rights, the rights are not leased by implication. In Texas, an oil and gas lease is not a "lease," but a conveyance of any oil and gas in place for the duration of the lease—typically a fee simple determinable.³⁰ Because a lease conveys a fee simple determinable, this same reasoning should also apply to the severance of minerals by a mineral deed or to a reservation of minerals in a deed that conveys the surface. Thus, while a mineral deed may expressly convey, and a reservation may expressly reserve, underground disposal and storage rights, such rights are not conveyed or reserved by implication. Accordingly, in a typical mineral deed, title to pore spaces is not conveyed by implication. Likewise, in a typical reservation of minerals, title to pore spaces is not reserved by implication.

CO₂ sequestration is somewhat analogous to underground gas storage. Somewhat surprisingly, Texas law does not finally determine whether the owner of the surface or the owner of the mineral rights holds the right to store gas underground. If Texas case law did answer this question, then this same case law would likely determine which owner holds CO₂ sequestration rights. Two contrasting cases illustrate the issue. *Emeny v. United States*, a federal Court of Claims case applying Texas law, held in favor of surface owner's title to storage rights.³¹ In contrast, in *Mapco, Inc., v. Carter*, a Texas appellate decision, the mineral owners prevailed on their ownership claim.³²

²⁶ *Makar Production Co. v. Anderson*, No. 07-99-0050-CV, 1999 WL 1260015 (Tex. App. 1999), *no writ*.

²⁷ *Id.* at *2.

²⁸ *Id.* at *1–2.

²⁹ *Id.* at *2–3.

³⁰ See *Cherokee Water Co. v. Forderhouse*, 641 S.W.2d 522, 525 (Tex. 1982); *Stephens County v. Mid-Kansas Oil & Gas Co.*, 254 S.W. 290, 292 (Tex. 1923).

³¹ *Emeny v. United States*, 412 F.2d 1319 (Ct. Cl. 1969).

³² *Mapco, Inc., v. Carter*, 808 S.W.2d 262 (Tex. App. 1991), *rev'd in part on other grounds*, 817 S.W.2d 686 (Tex. 1991).

In *Emeny*, the federal Court of Claims, applying Texas law, concluded that the surface owners retained the gas storage rights.³³ In this case, fee-simple owners leased tracts “for the sole and only purpose of mining and operating for oil and gas and of laying pipe lines . . . to produce, save, and take care of said products.”³⁴ The lessees developed a stratum called the Bush Dome for natural gas. This gas contained small amounts of helium. Due to the strategic nature of helium, the United States acquired these leases by purchase or condemnation and later brought in helium-gas mixtures for storage in pore spaces in the Bush Dome, where some native gas had already been extracted.³⁵ The court concluded as follows:

The surface of the leased lands and everything in such lands, except the oil and gas deposits covered by the leases, were still the property of the respective landowners. . . . This included the geological structures beneath the surface, including any such structure that might be suitable for the underground storage of ‘foreign’ or ‘extraneous’ gas produced elsewhere.

It necessarily follows that the 1923 oil and gas leases on the lands containing the Bush Dome did not grant to the lessee—or to the defendant as the present holder of gas rights under such leases—any right to use the Bush Dome for the storage of gas produced elsewhere.³⁶

In *Humble Oil & Refining Co. v. West*, the Texas Supreme Court cited *Emeny* for the proposition that the surface owner retained “the geological structures beneath the surface, together with any such structure that might be suitable for the underground storage of extraneous gas produced elsewhere.”³⁷ However, Professors Smith and Weaver have observed: “. . . that [this] proposition was hardly crucial to the outcome of the case,”³⁸ which was an action by royalty owners who asserted rights in the stored gas on the ground that the gas was being commingled with native gas in the reservoir.

An unreported decision of the Court of Appeals for the Third District also supports surface-owner title to pore spaces. In *FPL Farming, Ltd. v. Texas Natural*

³³ *Emeny*, 412 F.2d at 1323.

³⁴ *Id.*

³⁵ *Id.* at 1323.

³⁶ *Id.*

³⁷ *Humble Oil & Refining Co. v. West*, 508 S.W.2d 812, 815 (Tex. 1974) (citing *Emeny*, 412 F.2d 1319).

³⁸ ERNEST E. SMITH & JACQUELINE LANG WEAVER, TEXAS LAW OF OIL AND GAS § 2.1.B.3 (Matthew Bender & Co. and LexisNexis Group 2007).

Resources Conservation Commission, the court implicitly accepted the notion that surface owners own the pore spaces.³⁹ The surface owners of tracts nearby a proposed non-hazardous-waste-disposal site challenged the issuance of the disposal permit, alleging that the agency acted beyond its authority and alleging a taking on the ground that the evidence indicated that, within ten years, the injected waste would likely reach the subsurface stratum beneath their property.⁴⁰ The court affirmed the agency order but indicated that “should the waste plume migrate to the subsurface of FPL Farming’s property and cause harm, FPL Farming may seek damages from EPS.”⁴¹ This statement, which is dicta, suggests that the court believed that the surface owners held title to the subsurface strata, as the court’s statement does not say that the “surface” itself must be harmed for FPL to have a cause of action.

In contrast to *Emeny*, the court in *Mapco* held that the mineral owner held title to the subsurface storage space for natural gas.⁴² In *Mapco*, owners of certain fractional mineral interests brought a partition action against the surface owner, who also owned a fractional mineral interest and was storing gas underground.⁴³ The storage reservoir was created by partially leaching salt from a salt dome.⁴⁴ Salt is recognized as a “mineral” in Texas.⁴⁵ In awarding owelty damages, the court reasoned as follows:

Texas adopted the view that interest in minerals, such as oil, gas, salt and other minerals are susceptible of ownership in place in the ground prior to production of the minerals at or on the surface. The Texas rule is that this interest in minerals is an interest in real property. Thus, the fee mineral owners retain a property ownership, right and interest after the underground storage facility—here, a cavern—had been created. These same fee mineral owners are vested with ownership rights, including, of course, entitlement to compensation for the use of the cavern. . . . Thus, Texas law would recognize the continuing property ownership interest of the fee mineral estate owners in the cavern

. . . .

³⁹ FPL Farming, Ltd. v. Tex. Natural Res. Conservation Comm’n, No. 03-02-00477-CV, 2003 WL 247183 (Tex. App. 2003) *no writ*. The court noted that it was “assuming without deciding” that the surface owners had implicit “existing rights” in the deep subsurface beneath their land. *Id.* at *3.

⁴⁰ *Id.* at *1 n.3 (stating that the plaintiffs do not own the mineral interests associated with the property).

⁴¹ *Id.* at *5 (citing TEX. WATER CODE ANN. § 27.104 (West 2000)).

⁴² *Mapco, Inc. v. Carter*, 808 S.W.2d 262 (Tex. App. 1991), *rev’d in part on other grounds*, 817 S.W.2d 686 (Tex. 1991).

⁴³ *Id.* at 264–65.

⁴⁴ *Id.* at 274.

⁴⁵ *Id.* (citing *State v. Parker*, 61 Tex. 265, 268 (1884)).

....

. . . The Appellees [plaintiff mineral-interest owners] . . . owned an undivided, but large majority, interest in the fee title and fee estate to the minerals in place and, as such, they had a fee title interest in the cavern after the minerals were extracted.⁴⁶

Thus, the *Mapco* court, although ultimately reversing on other grounds,⁴⁷ concluded that, because the mineral owner had title to the salt, the mineral owner had title to the salt cavern and walls of the cavern.⁴⁸

Query whether the court would have reached the same conclusion if the storage reservoir had been created in a subsurface formation that did not contain “minerals.” Arguably, *Mapco* applies only when storage space is created by *partially* excavating a mineral-bearing strata and then using that strata’s excavated space for storage. Surface owners may strongly argue that *Mapco* does not support mineral-owner title in generic subsurface strata because the court emphasized the fact that the mineral owner created the storage space by mining a mineral deposit. The storage space was not a naturally occurring pore space, but rather an excavated cavern, and the storage container was itself that same mineral that had been partially extracted. Moreover, the mineral owner would presumably have the right to use the cavern to extract the remainder of the salt.⁴⁹

Concluding Thoughts: Notwithstanding *Mapco*, surface owners have the stronger argument for ownership of pore spaces and hence subsurface CO₂ sequestration rights that are not related to EOR. Nevertheless, mineral owners, as holders of the dominant estate, have the right to explore for and produce oil, gas, and minerals without unreasonable interference from the surface owner. When a surface owner unreasonably interferes with the rights of the mineral owner, the surface owner may be enjoined and liable for damages. In *Ball v. Dillard*, the Texas Supreme Court stated that the rights of surface and mineral owners are “reciprocal and distinct” and that “[n]either party can interfere with the rights of the other.”⁵⁰ Therefore, a surface owner, by asserting a right of pore-space ownership and by engaging in subsurface CO₂ sequestration may not unreasonably interfere with mineral exploration or exploitation. Furthermore, if the storage reservoir contains naturally occurring and commercially recoverable hydrocarbons, then the mineral owners may be deprived of their right to the native hydrocarbon gas in place. Thus,

⁴⁶ *Mapco*, 808 S.W.2d at 274–75.

⁴⁷ *Mapco, Inc. v. Carter*, 817 S.W.2d 686 (Tex. 1991).

⁴⁸ *Mapco*, 808 S.W.2d at 274.

⁴⁹ *See Int’l Salt Co. v. Geostow*, 878 F.2d 570 (2d. Cir. 1989) (construing New York law).

⁵⁰ *Ball v. Dillard*, 602 S.W.2d 521, 523 (Tex. 1980) (citing *Brown v. Lundall*, 344 S.W.2d 863 (Tex. 1961)).

regarding CO₂ sequestration that is not related to EOR, obtaining permission from both the surface and mineral owner is the cautious approach even though I conclude that the storage rights are most likely held by the surface owner. On the other hand, regarding oil and gas development, including CO₂ injection for EOR, only the mineral owner need give permission, such as by executing an oil and gas lease.

If CO₂ sequestration is a goal, whether in addition to, or independent of EOR, then a robust regulatory system is needed to assure that the goal of sequestration is actually achieved. Moreover, a robust regulatory permit process could lessen the likelihood that dissenting surface or mineral owners could launch a successful challenge to a CO₂ sequestration project. If the legislature declares that CO₂ sequestration is in the public interest, if an agency is charged with the duty to regulate and authorize sequestration, if the agency holds a public hearing that meets all due-process requirements, and if the agency issues a permit to inject CO₂ into what the agency finds to be a well-defined and confining stratum after making findings of fact that support the utility of the specific sequestration project, then the likelihood of a successful challenge by dissenting surface or mineral owners is remote.⁵¹ For example, although sequestration may make mineral exploitation below the storage reservoir more expensive, such exploitation is still likely to be possible;⁵² thus, a regulatory taking claim is not likely to succeed. Other grounds for reversal of administrative orders can be avoided through the passage of appropriate enabling legislation and through appropriate agency implementation and processes.

Any regulatory regime should explicitly recognize that the recovery of commercial minerals will generally have priority over the use of pore spaces for CO₂ sequestration so as not to interfere with the rights of mineral developers and so as not to cause the underground waste of mineral resources. While priority rules arising under the recordation acts, coupled with the “dominance” of the mineral estate, might be theoretically used to achieve this end, given the prevailing checkerboard pattern of land and mineral ownership, a regulatory regime that gives primacy to commercial mineral development over CO₂ sequestration would

⁵¹ For a glimpse of what a regulatory law might look like, see H.B. 0090, Enrolled Act No. 25, 59th Wyo. Leg. 2008 Budget Session (effective July 1, 2008). For analogous Texas regulatory law, see TEX. NAT. RES. CODE §§ 91.201–91.207 (regulating underground hydrocarbon storage) and *id.* §§ 91.171–91.184 (regulating underground natural gas storage).

⁵² In general, absent proof that the enjoyment of minerals is impossible, courts have not found that a taking has occurred. *See, e.g.,* City of Abilene v. Burk Royalty Co., 470 S.W.2d 643 (Tex. 1971) and Tarrant County Water Control & Improvement Dist. v. Haupt, Inc., 854 S.W.2d 909 (Tex. 1993).

be a more practical and workable approach.⁵³ In *Storck v. Cities Service Gas Co.*, the Oklahoma Court of Appeals held that, despite contrary provisions in a gas storage lease, the lessors and their mineral lessees had a statutory right to explore for oil and gas in formations other than the one used for storage, subject to the right of the storage lessee to monitor and approve drilling plans and subject to Oklahoma Corporation Commission regulations.⁵⁴ Wrongful interference by the storage lessee could give rise to actual damages, such as damages caused by drainage of oil to nearby lands, and possible punitive damages.⁵⁵

Of course, the ultimate answer may be eminent domain—the common means of acquiring gas storage rights in several states⁵⁶ and under federal regulatory law.⁵⁷ If a party seeking to sequester CO₂ had the power of eminent domain, then no “owner,” whether surface or mineral, would be able to prevent a sequestration project. But the question remains: Who is entitled to compensation for the taking? Currently, the safest answer is to compensate both surface and mineral owners. However, I submit that, under the umbrella of a regulatory regime, a reasonably safe answer would be to compensate surface owners on the theory that they own the pore spaces and hence the sequestration rights. In particular circumstances, mineral owners should be compensated where their ability to exploit known commercial mineral reserves would be prevented by the CO₂ sequestration project, although proving prevention may often be a burden that is too hard to meet. However, if a party intended to inject CO₂ into a gas reservoir containing native gas that was being left in the reservoir as “cushion gas” to prevent water encroachment into the pore spaces, the gas owner should be entitled to compensation for that native gas if the owner can prove that the gas could have been economically recovered.⁵⁸ Moreover, a regulatory agency might find that producing the cushion gas would result in greater comparative waste if water encroachment would ruin the reservoir for sequestration purposes.

⁵³ For an example of a newly enacted regulatory regime, see 2008 Wyo. Sess. Laws ch. 30, principally codified at WYO. STAT. ANN. § 30-11-313 (2008). For analogous law dealing with mineral-development conflicts, such as a conflict between a coal developer and an oil and gas developer, see N.D. CENT. CODE 38-15 (regulatory resolution of conflicts in subsurface mineral production). For an informative article discussing mineral-development conflicts, see Phillip Wm. Lear, *Multiple Mineral Development Conflicts: An Armageddon in Simultaneous Mineral Operations?*, 28 ROCKY MT. MIN. L. INST 79 (1983).

⁵⁴ *Storck v. Cities Serv. Gas Co.*, 575 P.2d 1364, 1368 (Okla. 1977), *remanded* to 634 P.2d 1319 (Okla. Civ. App. 1981) (*citing* OKLA. STAT. tit. 52, § 36.1).

⁵⁵ *Storck*, 634 P.2d at 1322.

⁵⁶ See TEXAS NAT. RES. CODE §§ 91.171–.184.

⁵⁷ See 15 U.S.C. § 717f(c)(1)(A).

⁵⁸ See, e.g., *ANR Pipeline Co. v. 60 Acres of Land*, 418 F. Supp.2d 933, 941–44 (W.D. Mich. 2006); see also *Williston Basin Interstate Pipeline Co. v. An Exclusive Gas Storage Lease Hold in the Judith River Subterranean Geological Formation*, 999 F.2d 546 (9th Cir. 1993) (unpublished, but memorandum opinion is available at 1993 WL 242979).

Another reason favoring eminent domain is the prevalence of co-tenancy title. Co-tenancy title would be of greatest concern if mineral owners held the storage rights because severed mineral interests have become more and more fractionalized.⁵⁹ But whether the pore space is owned by co-tenant surface owners or mineral owners and regardless of the nature of the sequestration interest—whether deemed a lease, an easement, or an outright sale of the pore space—each co-tenant must consent to the burdening or sale of her interest for the sequestration interest to be fully effective.⁶⁰ Similar consent problems arise with successive interests.⁶¹

In conclusion, regarding the issue of pore-space ownership, consider the following statement by Professors Smith and Weaver:

The issue ultimately turns on whether the implied easement to use the surface and subsurface in any way reasonably necessary for exploring, drilling, producing, transporting, and marketing includes the right to store non-native gas. Unlike pressure maintenance and cycling operations, underground injections for storage purposes are not directly related to production. Indeed, they are usually not even associated with initial marketing, but with downstream activities more closely connected to final retail sales. From this perspective, it would seem that the right to store gas produced from a stratum other than the one in question is roughly analogous to the right to open a service station, a right that belongs more properly to the surface estate than the mineral estate.⁶²

Thus, absent an EOR-related CO₂ sequestration, this comment would seem to support surface-owner title to the pore space and hence the right to sequester CO₂.

⁵⁹ See, e.g., *Ellis v. Ark. La. Gas Co.*, 450 F. Supp. 412, 422 (E.D. Okla. 1978) (observing that if “it was the mineral interest owner and not the surface owner who had power to grant storage rights, it would typically mean that hundreds of severed mineral interest owners would have to be contacted if those rights were to be obtained privately”).

⁶⁰ See, e.g., *Elliott v. Elliott*, 597 S.W.2d 795, 802 (Tex. Civ. App. 1980), *no writ*.

⁶¹ See, e.g., *Kemp v. Hughes*, 557 S.W.2d 139 (Tex. Civ. App. 1977), *no writ*. Plausibly, however, by analogy to the prevailing law regarding mineral exploitation by less than all co-tenants, each co-tenant may have the right to sequester carbon if they account to other co-tenants for any net profits. See *Prairie Oil & Gas Co. v. Allen*, 2 F.2d 566 (8th Cir. 1924). While this approach is theoretically plausible, the notion that multiple co-tenants might engage in simultaneous sequestration operations may not be practical. Moreover, while, under the prevailing view, individual co-tenants can exploit minerals without being liable for waste, courts might not view carbon sequestration as analogous to mineral exploitation.

⁶² SMITH & WEAVER, *supra* note 38, § 2.1.B.3.

III. TRESPASS-RELATED ISSUES

The prior section considered pore-space ownership of the tract where the CO₂ sequestration operation directly occurs. This section deals with the thornier question of neighboring tracts. Even if an injecting party holds the appropriate rights regarding the tracts actually used for the sequestration operation, that party may be liable for trespass or related torts if CO₂, whether injected for sequestration or EOR, migrates to neighboring tracts. Because CO₂ sequestration is closely analogous to EOR, wastewater storage, and natural gas storage, case law involving these activities is helpful in assessing the risk of liability to neighboring landowners.

A. *Enhanced Oil Recovery Injections and Fracturing Analogies*

With EOR, trespass issues arise when the injected substance, commonly water, crosses ownership lines, invading neighboring property and perhaps even displacing oil and gas reserves or making recovery of the reserves more difficult and more expensive. Trespass issues can also arise when fracturing operations create fractures that extend beyond the operator's unit. Once again, Texas case law provides an indefinite answer. Some cases recognize a cause of action for subsurface trespass and other cases avoid any definitive rule on the issue.

As with title issues, regulatory bodies, such as the Railroad Commission, have no general authority to authorize trespasses or other torts. However, two cases suggest that regulatory orders may provide some protection. In *Corzelius v. Railroad Commission*, the commission issued an order authorizing a party, as agent of the commission, to drill a directional well to help extinguish a gas-well blowout and fire that was threatening the surrounding area.⁶³ The party responsible for the blowout sought to enjoin this operation on the ground that the agent's well bore would directly invade the party's mineral estate.⁶⁴ In this emergency, the court concluded that the commission's order shielded the driller from being enjoined.⁶⁵ Although a trespass was not enjoined, this case offers little comfort to a party wishing to sequester CO₂ because it deals with an emergency situation.

A case providing more comfort is *Railroad Commission of Texas v. Manziel*.⁶⁶ The plaintiff landowners sought to set aside a commission order authorizing the operator of an adjacent tract to drill an exception-location well close to their tract to inject water for EOR.⁶⁷ The exception well was authorized under the auspices

⁶³ *Corzelius v. Railroad Comm'n*, 182 S.W.2d 412, 413–14 (Tex. Civ. App. 1944), *no writ*.

⁶⁴ *Id.* at 414.

⁶⁵ *Id.* at 416–17.

⁶⁶ *Railroad Comm'n of Tex. v. Manziel*, 361 S.W.2d 560 (Tex. 1962).

⁶⁷ *Id.* at 561.

of a commission-approved voluntary unitization plan.⁶⁸ The landowners sought to set aside the order on the ground that water injected at that location would inevitably cross ownership lines, resulting in a trespass and the early watering out of one of their oil wells.⁶⁹

The court stated that it was presented with the issue of “whether a trespass is committed when secondary recovery waters from an authorized secondary recovery project cross lease lines.”⁷⁰ After discussing the utility of EOR operations the court stated:

We conclude that if, in the valid exercise of its authority to prevent waste, protect correlative rights, or in the exercise of other powers within its jurisdiction, the Commission authorizes secondary recovery projects, a trespass does not occur when the injected, secondary recovery forces move across lease lines, and the operations are not subject to an injunction on that basis. *The technical rules of trespass have no place in the consideration of the validity of the orders of the Commission.*⁷¹

In reaching this conclusion, the court quoted Professors Howard Williams and Charles Meyers:

What may be called a ‘negative rule of capture’ appears to be developing. Just as under the rule of capture a landowner may capture such oil or gas as will migrate from adjoining premises to a well bottomed on his own land, so also may he inject into a formation substances which may migrate through the structure to the land of others, even if it thus results in the displacement under such land of more valuable with less valuable substances⁷²

The result in this case would be more comforting if it had been brought against the operator of the injection well, rather than brought as an action to set aside an order of the Railroad Commission. While a consideration of trespass may have “no place” in a proceeding to determine the validity of a commission order, trespass would be pertinent in a private cause of action in tort. Indeed, the court seemed to recognize this distinction, when it stated:

⁶⁸ *Id.* at 566.

⁶⁹ *Id.*

⁷⁰ *Id.* at 567.

⁷¹ *Manziel*, 361 S.W.2d at 568–69 (emphasis added).

⁷² *Id.* at 569 (quoting HOWARD WILLIAMS & CHARLES MEYERS: OIL AND GAS LAW, § 204.5 (1995)).

[W]e are not confronted with the tort aspects of such practices. Neither is the question raised as to whether the Commission's authorization of such operations throws a protective cloak around the injecting operator who might otherwise be subjected to the risks of liability for actual damages to the adjoining property⁷³

Nevertheless, the court did discuss trespass in some detail and was sympathetic to the view that traditional rules of trespass may not be appropriate for subsurface invasions that are for the greater public good—such as for EOR in this case and, by analogy, perhaps for CO₂ sequestration in a future case. The court's discussion suggests that a regulatory order, issued in the public interest, is necessary if traditional trespass rules are to be avoided.⁷⁴ However, this suggestion begs the following question: If a regulatory order is entered, thereby avoiding traditional trespass rules, what “nontraditional” trespass rules will apply? The issuance of

⁷³ *Id.* at 566.

⁷⁴ For voluntary unitization for enhanced recovery or for the conservation and use of gas, see TEX. NAT. RES. CODE §§ 101.001–101.018. Under § 101.013:

(a) Agreements for pooled units and cooperative facilities are not legal or effective until the commission finds, after application, notice, and hearing:

- (1) that the agreement is necessary to accomplish the purposes specified in Section 101.011 of this code;
- (2) that it is in the interest of the public welfare as being reasonably necessary to prevent waste and to promote the conservation of oil or gas or both;
- (3) that the rights of the owners of all the interests in the field, whether signers of the unit agreement or not, would be protected under its operation;
- (4) that the estimated additional cost, if any, of conducting the operation will not exceed the value of additional oil and gas so recovered, by or on behalf of the several persons affected, including royalty owners, owners of overriding royalties, oil and gas payments, carried interests, lien claimants, and others as well as the lessees;
- (5) that other available or existing methods or facilities for secondary recovery operations or for the conservation and utilization of gas in the particular area or field concerned or for both are inadequate for the purposes; and
- (6) that the area covered by the unit agreement contains only that part of the field that has reasonably been defined by development, and that the owners of interests in the oil and gas under each tract of land in the area reasonably defined by development are given an opportunity to enter into the unit on the same yardstick basis as the owners of interests in the oil and gas under the other tracts in the unit.

(b) A finding by the commission that the area described in the unit agreement is insufficient or covers more acreage than is necessary to accomplish the purposes of this chapter is grounds for the disapproval of the agreement.

an order, even one that includes a finding of fact that no harm will result to neighboring properties, will not necessarily bar a private action in tort.⁷⁵ Perhaps injunctive relief would be denied, limiting a plaintiff to a recovery of proven actual damages resulting from trespass, which could be a difficult burden to meet. Moreover, if a regulatory order is entered, then Texas courts would be unlikely to award punitive damages.

Or perhaps traditional trespass rules would be more fully avoided in favor of a nuisance analysis that would balance the utility of CO₂ sequestration with the gravity of the harm to the plaintiff landowner. This latter approach would treat CO₂ sequestration similarly to the treatment of atmospheric CO₂ emissions—albeit that emitting pollutants into the atmosphere to be carried by prevailing winds through the airspace of neighboring tracts is distinguishable from the intentional injection of pollutants for permanent storage beneath specific tracts. As with trespass, if the sequestration were authorized by a regulatory commission, then injunctive relief to abate a nuisance might be denied and punitive damages might be barred.

In contrast to voluntary unitization for EOR, trespass issues posed by hydraulic fracturing historically did not receive the same favorable treatment that water injection received in *Manziel*. In *Gregg v. Delhi-Taylor Oil Corp.*, the Texas Supreme Court held that courts, not the Railroad Commission, have primary jurisdiction to determine whether a fracturing operation may result in a trespass and whether relief is appropriate.⁷⁶ Finding that cracks resulting from fracture treatments crossing property lines are analogous to drill bits that cross property lines, the court concluded that such an intentional and direct invasion could constitute a subsurface trespass.⁷⁷

In *Geo-Viking, Inc. v. Tex-Lee Operating Co.*,⁷⁸ however, the Texas Supreme Court retreated from its pronouncements in *Gregg*. In this case, an operator sued a well-service company for improperly fracturing a well.⁷⁹ In appealing a damages award, the well-service company argued that the jury should have been instructed to disregard the amount of production obtained from fractures extending beyond

⁷⁵ See, e.g., *Gregg v. Delhi-Taylor Oil Corp.*, 344 S.W.2d 411 (Tex. 1961); compare *Champlin Exploration, Inc., v. R.R. Comm'n of Tex.*, 627 S.W.2d 250 (Tex. App. 1982), *writ refused n.r.e. with* *Muckelroy v. Richardson Indep. Sch. Dist.*, 884 S.W.2d 825 (Tex. App. 1994), *writ denied* (distinguishing *Champlin*).

⁷⁶ *Gregg v. Delhi-Taylor Oil Corp.*, 344 S.W.2d 411, 415 (Tex. 1961).

⁷⁷ *Id.* at 416–17.

⁷⁸ *Geo-Viking, Inc. v. Tex-Lee Operating Co.*, 1992 WL 80263 (Tex. 1992), *opinion withdrawn*, 839 S.W.2d 797 (Tex. 1992).

⁷⁹ *Geo-Viking, Inc. v. Tex-Lee Operating Co.*, 817 S.W.2d 357, 364 (Tex. App. 1991), *writ denied with per curiam opinion*.

the boundaries of the leased land.⁸⁰ The court of appeals rejected this argument,⁸¹ citing the rule of capture, which protects drainage from beneath the land of others.⁸² The Texas Supreme Court initially reversed, finding that fracturing the subsurface of another's land is trespass, precluding application of the rule of capture.⁸³ Subsequently, however, at the request of the parties, the Texas Supreme Court withdrew its opinion and its writ of error, stating that the "application was improvidently granted"⁸⁴ and concluding that "we should not be understood as approving or disapproving the opinions of the court of appeals analyzing the rule of capture or trespass as they apply to hydraulic fracturing."⁸⁵ This ruling left much confusion about whether fracturing that crosses property lines constitutes trespass.

In *Mission Resources, Inc. v. Garza Energy Trust*, the Court of Appeals for the Thirteenth District held *inter alia* that Texas recognizes a cause of action for trespass from subsurface fracture treatments that cross property boundaries.⁸⁶ The court rejected the contradictory holding by the Court of Appeals for the Sixth District in *Geo-Viking*,⁸⁷ citing the Texas Supreme Court's holding in *Gregg*.⁸⁸ On August 29, 2008, the Texas Supreme Court reversed this portion of the case, holding that subsurface hydraulic fracturing was not an actionable trespass because the drainage of hydrocarbons by this means was protected by the rule of capture.⁸⁹ Presumably, the injection of CO₂ for enhanced recovery would be

⁸⁰ *Id.* at 363–64.

⁸¹ *Id.* at 364.

⁸² See, e.g., *Brown v. Humble Oil & Ref. Co.*, 83 S.W.2d 935, 940 (Tex. 1935).

⁸³ *Geo-Viking, Inc.*, 1992 WL 80263.

⁸⁴ *Geo-Viking, Inc.*, 839 S.W.2d at 798.

⁸⁵ *Id.*

⁸⁶ *Mission Resources, Inc. v. Garza Energy Trust*, 166 S.W.3d 301, 310 (Tex. App. 2005), *pet. granted*.

⁸⁷ *Geo-Viking, Inc.*, 817 S.W.3d at 364–64.

⁸⁸ *Mission Res., Inc.*, 166 S.W.3d at 311.

⁸⁹ *Coastal Oil & Gas Corp. v. Garza Energy Trust*, 268 S.W.3d 1 (Tex. 2008) *rehearing denied*. In *People's Gas Co. v. Tyner*, 31 N.E. 59 (Ind. 1892), the Indiana Supreme Court held that the analogous technique of shooting a well to prime recovery was protected by the rule of capture but also subject to the law of nuisance where the shooting, which was done with nitroglycerin, posed a danger to a densely populated area.

I have suggested that the rule of capture would be an appropriate means of resolving the analogous trespass question when geophysical information is acquired from nearby lands through 3-D or conventional seismic operations that occur on other lands. Owen L. Anderson & Dr. John D. Pigott, *3D Seismic Technology: Its Uses, Limits, & Legal Ramifications*, 42 ROCKY MT MIN. L. INST. 16-1, 16-111–16-117 (1996). I have also suggested that the rule of capture should offer similar protection from trespass in the case of hydraulic fracturing. Bruce M. Kramer & Owen L. Anderson, *The Rule of Capture—An Oil and Gas Perspective*, 35 ENVTL. L. 899, 933–36 (2005).

similarly protected. Some of the reasons cited by the court for its decision would also support protecting CO₂ sequestration from trespass actions.

The court reasoned that trespass requires actual injury and that trespass injury should not be inferred when the physical invasion occurs far below the surface. The court noted that the *ad coelum* maxim “has no place in the modern world” and that “the law of trespass need no more be the same two miles below the surface than two miles above.”⁹⁰ The court also reasoned that it should not usurp the lawful authority of the Texas Railroad Commission to decide to regulate, or not regulate, fracturing, should not allow the litigation process to determine the extent of harm (drainage) that is caused by fracturing, and should not allow an actionable trespass (by changing the rule of capture) when the oil and gas industry does not “want or need the change.”⁹¹ Justice Willett, concurring, would have gone further and held that, not only was fracturing not an actionable trespass, it was not a trespass at all.⁹² His concurring opinion discussed the necessity of hydraulic fracturing for the recovery of hydrocarbons. As a matter of public policy, as with hydraulic fracturing, Texas courts should find that no trespass occurs if injected CO₂ crosses property lines. Because CO₂ injection, unlike hydraulic fracturing, will be subject to a regulatory permitting regime, the court should have even fewer concerns about CO₂ injection for enhanced recovery or CO₂ sequestration.

B. Gas Storage Analogy

Natural gas is frequently injected into the subsurface for temporary storage. Underground gas storage is closely analogous to CO₂ sequestration, except that CO₂ sequestration is indefinite, not temporary. Trespass issues arising in the gas storage context offer insight about how Texas courts will likely analyze trespass in the CO₂ sequestration context. Of course, CO₂ sequestration and gas storage are factually distinct: gas storage is an ongoing operation, involving a continuous cycle of injections and withdrawals of gas, while CO₂ sequestration involves injection for permanent storage. CO₂ is essentially a waste product, while gas is a valuable commodity. Moreover, at some point, a CO₂ sequestration reservoir would reach its maximum capacity, at which time ongoing CO₂ injection would come to an end, whereas active gas injections and withdrawals could continue indefinitely. These factual distinctions, however, do not seem significant enough to justify ignoring gas storage *law*, which does seem analogous.

In *Hammonds v. Central Kentucky Natural Gas Co.*, an early Kentucky case, the court reasoned that natural gas injected for storage was really released back

⁹⁰ *Coastal Oil*, 268 S.W.3d at 11 (quoting *United States v. Causby*, 328 U.S. 256, 260–61 (1946)).

⁹¹ *Id.* at 14–16.

⁹² *Id.* at 29 (Willett, J., concurring).

to nature—in essence, abandoned.⁹³ Because the gas was abandoned, the gas had no owner.⁹⁴ Comparing injected gas to captured wild animals returned to nature, the court found that no trespass occurred when the released gas migrated to neighboring property.⁹⁵ However, the court further ruled that when the gas was returned to nature, it became “subject to appropriation by the first person” to capture the gas.⁹⁶

Texas rejected the reasoning of *Hammonds*, finding that injected natural gas is not abandoned but remains the personal property of the injecting party and, as such, is no longer subject to capture by neighboring landowners even if the gas migrates beneath neighboring tracts.⁹⁷ However, because the gas is not abandoned, the question of trespass then arises. In *Lone Star Gas Co. v. Murchison*, the gas storage company acquired the right to store natural gas in what was thought to be a well-defined subsurface reservoir.⁹⁸ However, unknown to the storage company, the reservoir was connected to other subsurface strata, allowing the injected gas to migrate to neighboring subsurface property.⁹⁹ Because the storage company had title to the injected gas as personal property, the court held that the storage company did not lose title to gas that migrated under neighboring land.¹⁰⁰ Neither *Murchison* nor any other Texas case squarely addresses the trespass question—perhaps because of the difficulty of proving actual damages.

Trespass resulting from stored natural gas may be more easily tolerated because its storage is temporary and because it is not a waste product. In contrast, CO₂ might be treated differently because CO₂ is a waste product intended for permanent storage. Nevertheless, if a neighboring landowner suffered actual damages either from CO₂ sequestration or from gas storage, a court would probably award damages on grounds of trespass, nuisance, or negligence, but most likely would not issue an injunction if the sequestration or injection were done under the auspices of a regulatory permit. To avoid a potential damages claim, the cautious approach would be to acquire sequestration or storage rights for the entire reservoir. Moreover, acquiring rights to the entire reservoir, in the case of gas, effectively prevents neighbors from producing stored gas under the guise

⁹³ *Hammonds v. Central Ky. Natural Gas Co.*, 75 S.W.2d 204, 205–06 (Ky. Ct. App. 1934).

⁹⁴ *Id.*

⁹⁵ *Id.* at 206.

⁹⁶ *Id.* *Hammonds* has been greatly limited by *Tex. Am. Energy Corp. v. Citizens Fid. Bank & Trust Co.*, 736 S.W.2d 25 (Ky. 1987).

⁹⁷ See *Humble Oil & Ref. v. West*, 508 S.W.2d 812, 817 (Tex. 1974); *Lone Star Gas Co. v. Murchison*, 353 S.W.2d 870, 880 (Tex. Civ. App. 1962), *no writ* (citing *Chaffin v. Hall*, 210 S.W.2d 191 (Tex. Civ. App. 1948), *no writ*); see also *White v. N.Y. State Natural Gas Corp.*, 190 F. Supp. 342 (W.D. Pa. 1960).

⁹⁸ *Lone Star Gas Co.*, 353 S.W.2d at 871–72.

⁹⁹ *Id.*

¹⁰⁰ *Id.* at 880.

of producing native gas, and, in the case of CO₂, effectively prevents neighbors from drilling into the reservoir in a manner that could result in the escape of CO₂. These risks, however, could be largely ameliorated by a robust regulatory process.

Again, the ultimate answer may be eminent domain. In the case of gas storage, gas utilities in Texas may acquire gas storage rights by eminent domain.¹⁰¹ In addition, the Natural Gas Act of 1938 allows underground gas storage rights to be obtained by eminent domain.¹⁰² Similar legislation could authorize the acquisition of CO₂ sequestration rights. The Texas Underground Natural Gas Storage and Conservation Act of 1977 provides that “the storer has the right to condemn all of the underground storage area and any surface area required for the use and enjoyment of the storage facility.”¹⁰³ More specifically, the Act provides as follows:

After an order of the commission is issued approving a storage facility, a storer may condemn without further attack as to its right to condemn, any subsurface sand, stratum, or formation for the underground storage of natural gas, condemning all mineral and royalty rights as are reasonably necessary for the operation of the storage facility, subject to the limitations of this subchapter, and the storer may condemn any other interests in property that may be required, including interests in the surface estate in the sand, stratum, or formation reasonably necessary to the operation of the storage facility, provided that:

(1) no part of a reservoir is subject to condemnation unless the storer has acquired by option, lease, conveyance, or other negotiated means at least 66- 2/3 percent of the ownership of minerals, including working interests, and 66- 2/3 percent of the

¹⁰¹ TEX. NAT. RES. CODE ANN. §§ 91.171–.184 (2007). This act provides that:

All natural gas in the stratum condemned which is not native gas, and which is subsequently injected into storage facilities is personal property and is the property of the injector or its assigns, and in no event is the gas subject to the right of the owner of the surface of the land or of any mineral or royalty owner’s interest under which the storage facilities lie, or of any person other than the injector to produce, take, reduce to possession, waste, or otherwise interfere with or exercise any control over a storage facility. Upon failure, neglect, or refusal of the person to comply with this section, the storer has the right to compel compliance by injunction or by other appropriate relief by application to a court of competent jurisdiction.

Id. § 91.182 (emphasis added). Note that, by reason of the emphasized language, this statute does not address the right to injected gas that migrates beyond the stratum condemned.

¹⁰² 15 U.S.C. § 717f (2005).

¹⁰³ TEX. NAT. RES. CODE ANN. § 91.180 (2001).

ownership of the royalty interests, computed in relation to the surface area overlying the part of the reservoir which as found by the commission to be expected to be penetrated by displaced or injected gas;

(2) no dwelling, barn, store, or other building is subject to condemnation; and

(3) the right of condemnation is without prejudice to the rights of the owners or holders of other rights or interests of land to drill through the storage facility under such terms and conditions as the commission may prescribe¹⁰⁴

Although the Act seems neutral on the issue of pore-space “ownership,” the Act implies that both mineral and surface owners have rights in the storage strata. Under the Act, the storing party is merely authorized, not required, to condemn subsurface strata, including all mineral and royalty rights, as are reasonably necessary for the operation of the storage facility. This provision allows the storing party to protect its storage rights by condemning any rights to exploit the storage strata and its contents; however, all rights to drill through the strata are expressly preserved. Further, the storing party may condemn any rights in the surface estate in the sand, stratum, or formation reasonably necessary to the operation of the storage facility. If mineral owners owned the pore spaces, then there would be no need to condemn surface interests because the storing party could acquire the rights of reasonable use of the airspace, surface, and subsurface from the mineral owner without the need to acquire any further rights from the surface owner. As a whole the statute implies that the storing party may need to condemn the surface rights respecting the land where injection, withdrawal, monitoring, and transportation operations take place and condemn those mineral and royalty interests that may be actually damaged by storage operations.

C. *Wastewater Injection Analogy*

Another activity closely analogous to CO₂ sequestration is wastewater disposal. Wastewater is often disposed of by injecting it into deep subsurface formations.¹⁰⁵ Wastewater disposal is regulated by the Texas Commission on Environmental Quality,¹⁰⁶ and, in the case of waste disposal from oil and gas operations, by the Texas Railroad Commission.¹⁰⁷

¹⁰⁴ *Id.* at § 91.179.

¹⁰⁵ 46 TEX. PRACTICE SERIES, ENVTL. LAW § 26.12 (2007).

¹⁰⁶ TEX. WATER CODE ANN. §§ 27.001–.024 (2008).

¹⁰⁷ *Id.* §§ 27.031–.038. Section 37.038 provides: “The commission has jurisdiction over the injection of carbon dioxide produced by a clean coal project, to the extent authorized by federal law,

In *FPL Farming, Ltd. v. Texas Natural Resources Conservation Commission*, an unreported case, the Court of Appeals for the Third District, discussed in Section II, above, stated in dicta that a landowner who suffers encroachment of wastewater may seek damage if the plaintiff suffers actual intrusion and actual harm.¹⁰⁸ The state regulatory agency granted permits to a disposal company for injection wells to inject non-hazardous waste at depths between 7,350 to 8,200 feet below the surface.¹⁰⁹ The agency required the applicant to project how far and in what directions the waste may migrate over a 30-year period.¹¹⁰ When neighboring surface owners discovered that the waste was projected to reach their subsurface strata within 10 years of injection,¹¹¹ they asserted that the agency was authorizing an impairment of their subsurface rights.¹¹²

The court “assumed without deciding” that the surface owners had “‘existing rights’ in the deep subsurface beneath their land,” but noted the legal trend that “property owners do not have the right to exclude deep subsurface migration of fluids.”¹¹³ Dismissing the argument that “migration alone will impair [their] existing rights,” the court held that “some measure of harm must accompany the migration for there to be impairment.”¹¹⁴ “[B]ecause of [the agency’s] . . . expertise in the geological effects of subsurface migration of injectates,” the court deferred to the agency’s finding that, in this case, no existing rights would be impaired by the injection.¹¹⁵ Nevertheless, at the end of its opinion, the court indicated that, if the waste did migrate and cause some measure of harm, the surface owners could seek damages from the injector.¹¹⁶ In general, migration and actual harm have been difficult to prove.¹¹⁷ Similarly, in the context of CO₂ sequestration, the difficulty in proving actual intrusion and actual damages is likely to impede

into a zone that is below the base of usable quality water and that is not productive of oil, gas, or geothermal resources by a Class II injection well, or by a Class I injection well if required by federal law.”

¹⁰⁸ *FPL Farming, Ltd. v. Tex. Natural Res. Conservation Comm’n*, No. 03-02-00477-CV, 2003 WL 247183, *5 (Tex. App. 2003), *no writ*.

¹⁰⁹ *Id.* at *1.

¹¹⁰ *Id.*

¹¹¹ *Id.*

¹¹² *Id.* at *4.

¹¹³ *Id.* at *3 (citing *United States v. Causby*, 328 U.S. 256, 260–61 (1946); *Raymond v. Union Tex. Petroleum Corp.*, 697 F. Supp. 270, 274–75 (E.D. La. 1988); *Chance v. BP Chems., Inc.*, 670 N.E.2d 985, 991–92 (Ohio 1996); *Railroad Comm’n v. Manziel*, 361 S.W.2d 560, 568–69 (Tex. 1962)).

¹¹⁴ *FPL Farming, Ltd.*, 2003 WL 247183 at *4.

¹¹⁵ *Id.*

¹¹⁶ *Id.* at *5.

¹¹⁷ *See, e.g.*, *Mongrue v. Monsanto Co.*, 249 F.3d 422, 433 (5th Cir. 2001); *Chance*, 670 N.E.2d at 991–92.

trespass actions by neighboring property owners. Though a surface owner may prove ownership of the subsurface strata and perhaps an actual intrusion, proving actual damage may be difficult. In the end, as with conventional waste disposal, public interest may weigh more heavily in favor of protecting CO₂ sequestration from speculative damage claims.

Concluding Thoughts: Regarding neighboring lands, I submit that permission from neighboring landowners should not be necessary, although receiving permission from the owners of all pore spaces invaded by CO₂ would certainly be the cautious approach.¹¹⁸ My view would be strengthened if Texas were to bolster its CO₂-injection regulatory law with a statute similar to the Texas voluntary unitization law.¹¹⁹ Nevertheless, the weight of analogous Texas case law strongly suggests that the courts will not entertain trespass actions arising from CO₂ injection or sequestration in the absence of actual injury.

IV. APPLICATION OF LEGAL PRINCIPLES TO CO₂ STORAGE

Because EOR, hydraulic fracturing, natural gas storage, and wastewater disposal are all closely analogous to CO₂ sequestration, Texas courts are likely to issue opinions regarding CO₂ sequestration that rely on existing case law addressing these analogous activities. And because strong public-policy arguments can be made in favor of initiatives that will reduce the human CO₂ footprint, Texas courts are likely to render opinions that will encourage the development of a healthy and vibrant CO₂ sequestration industry.

The question of whether the surface estate or mineral estate owns the property interest in the pore space remains. Although the weight of law supports surface-owner title, absent a robust regulatory program to assure and protect the integrity of subsurface CO₂ reservoirs, prudent CO₂ injectors may also elect to obtain permission from mineral owners. As indicated in the prior section, the need for surface-owner permission should ordinarily be limited to permission from the surface owner of the land where the injection operations are conducted. As a practical matter, the need for mineral-owner permission regarding the lands where the injection operations are conducted, and regarding the lands nearby, depends on the likelihood of conflicting mineral operations and on the existence of a robust regulatory system protecting the integrity of the CO₂ reservoir, while still allowing mineral development to occur in a manner that does not impair that integrity.

¹¹⁸ See discussion in prior section. Of course, the operator of a carbon sequestration project might face tort liability for negligent or wasteful operations to injured parties, whether or not such parties gave permission for the operations. *Cf. Elliff v. Texon Drilling Co.*, 210 S.W.2d 558, 562–63 (Tex. 1948) (holding producer liable for negligent and wasteful drilling of a gas well).

¹¹⁹ See TEX. NAT. RES. CODE ANN. §§ 101.001–.018 (2001).

A recent adjudication by the Environmental Protection Agency's ("EPA") Environmental Appeals Board underscores why the storage permittee must gain permission to store from the proper interest holder.¹²⁰ The EPA administers the Safe Drinking Water Act by issuing permits to inject wastewater and other wastes, including CO₂. The petitioners claimed that the EPA's issuance of a permit to store CO₂ authorized a trespass onto the deep subsurface of their adjacent land.¹²¹ The regional EPA permitting authority stated, and the board affirmed, that the permitting program "does not have authority to determine surface, mineral, or storage rights when issuing permit decisions. Issues relating to property ownership or lessee rights are legal issues between the permittee and property owners."¹²² Therefore, the authority may issue permits to the storing party without considering ownership because the only factor that is relevant to the issuance of a permit is whether drinking water may be contaminated. The permit confers no property right and no right to trespass.¹²³ Under these regulations, a wastewater storage permit does not give the holder any property right to store CO₂ underground and does not preclude a cause of action for trespass.¹²⁴ Accordingly, the storing party must be careful to gain permission from the proper property owners—whether the mineral owner, surface owner, or both. At this point, without an affirmative ownership declaration from the Texas courts, it is advisable to gain permission from both—at least regarding the tract where the injection operations will take place.

I have suggested that a robust regulatory process could, at least in some cases, eliminate the need to seek permission from mineral owners where CO₂ is injected for sequestration independent of an EOR project and where there is little likelihood of commercially recoverable oil and gas or where the sequestration operation is unlikely to interfere with ongoing or future oil and gas operations. This suggestion assumes that the surface owner owns the pore spaces. Absent a robust regulatory process and absent clarification of the ownership question, the words of Professor Eugene Kuntz, addressing gas storage, summarize the best practice for CO₂ sequestration:

Because the cases on the subject are few in number and are not in harmony, when a subsurface stratum is acquired for storage purposes, the grant should be taken from the person having the rights to extract the particular substance to be stored,

¹²⁰ Core Energy, LLC, E.P.A. Envtl. Appeals Bd. Permit No. MI-137-5X25-0001, UIC Appeal No. 07-02 (Jan. 15, 2008).

¹²¹ *Id.*

¹²² *Id.*

¹²³ *Id.*

¹²⁴ *Id.*

the surface owner and the owner of any other mineral rights. Prudence also dictates that grants be secured from mineral owners of any separate strata not acquired whose rights of access might be impaired, from owners of various surface interests, and from owners of easements or other similar interests whose rights might be impaired in some way. It should be observed that an ordinary oil and gas lease will not yield the measure of protection required for subsurface storage of gas.¹²⁵

APPENDIX 1

Ownership of Injected CO₂ and the Nature of a CO₂ Sequestration Right

Brief comments are appropriate regarding ownership of injected CO₂ and the nature of a CO₂ sequestration right. Again, legal analogies are helpful. In *Bingaman v. Corporation Commission*, the Oklahoma Supreme Court held that the operator of an EOR unit retained the right to recover gas injected in furtherance of the unitization plan.¹²⁶ That the injector or the injector's contractor retains continuing ownership of, and hence liability for, the injected CO₂ may not be the best policy if CO₂ sequestration is to be encouraged.¹²⁷

The more appropriate legal analogy may be to treat CO₂ similarly to the atmospheric emissions of CO₂. Under this approach, the injector or its contractor would be deemed to have intentionally abandoned the CO₂ and hence be unable

¹²⁵ 1 EUGENE KUNTZ, OIL AND GAS § 2.6(c) (1987) (footnotes omitted).

¹²⁶ *Bingaman v. Corp. Comm'n*, 421 P.2d 635, 638 (Okla. 1966).

¹²⁷ In Texas, the legislature has enacted legislation providing that the Railroad Commission will assume "ownership" of carbon sequestered under a clean coal FutureGen research project. TEX. NAT. RES. CODE ANN. § 119.002 (2006). Upon commission acquisition of title:

the owner or operator of the clean coal project is relieved from liability for any act or omission regarding the carbon dioxide injection location, and the method or means of performing carbon dioxide injection, if the injection location and method or means of injection comply with the terms of a license or permit issued by the state and applicable state law and regulations.

TEX. NAT. RES. CODE ANN. § 119.004 (2007). Similar Illinois legislation regarding a clean coal FutureGen research project provides:

If the FutureGen Project locates at either the Tuscola or Mattoon site in the State of Illinois, then the FutureGen Alliance agrees that the Operator shall transfer and convey and the State of Illinois shall accept and receive, with no payment due from the State of Illinois, all rights, title, and interest in and to and any liabilities associated with the sequestered gas, including any current or future environmental benefits, marketing claims, tradable credits, emissions allocations or offsets (voluntary or compliance based) associated therewith, upon such gas reaching the status of post-injection, which shall be verified by the Agency or other designated State of Illinois agency. The Operator shall retain all rights, title, and interest in and

to assert continuing title to it. This approach would also suggest that a neighboring landowner would have no trespass claim for CO₂ migration, although a nuisance claim would still be possible. However, this approach might also mean that the injected CO₂ would be available to the first finder or appropriator who captured it with the lawful permission of the landowner. Of course, recapture and any assertion of ownership of sequestered CO₂ by finders or any other interference with sequestered CO₂ could be fully addressed through a robust regulatory system, which could include regulatory safeguards to assure that the CO₂ would remain sequestered or, if extracted for some use, would be properly re-sequestered. Control, access to, and use of the strata containing CO₂ could also be regulated to assure that the CO₂ remains sequestered. If necessary, eminent domain could be used to further protect the integrity of CO₂ reservoirs.

A combined abandonment, regulatory, and eminent domain approach is preferable to an approach that would assume that the injector or the injector's contractor would continue to own injected CO₂. In other words, if an injector secured the necessary regulatory permits required under a robust regulatory regime and, acting in good faith, without negligence, and relying on sound science and technology, sequestered CO₂ in a confining stratum, the injector should not be deemed to be the indefinite owner of the CO₂. Realizing that CO₂ can be deadly in concentrated form and acidic if not pure, a comprehensive regulatory program must address how the escape of sequestered CO₂ that endangers public health should be addressed, both in terms of its containment and in terms of compensating injured parties; however, that topic is beyond the scope of this paper.

Under a well-devised regulatory approach, third parties, having a legal right and legitimate need to penetrate the sequestered reservoir to gain access to deeper natural resources, could have the right to do so if regulatory safeguards were followed to prevent the escape of CO₂. So long as these other parties are not prevented from developing deeper resources, they should not have a takings claim.

to and any liabilities associated with the pre-injection sequestered gas. The Illinois State Geological Survey of the Illinois Department of Natural Resources shall monitor, measure, and verify the permanent status of sequestered carbon dioxide and co-sequestered gases in which the State has acquired the right, title, and interest under this Section.

20 ILL. COMP. STAT. 1107/20 (2008). Governor Dave Freudenthal of Wyoming has stated that the federal government must address the long-term liability and indemnification issues regarding the risk of a catastrophic release of sequestered CO₂. Dave Freudenthal, *Carbon Sequestration: Lawyer's Cornucopia or Pandora's Box?*, 31 WYOMING LAWYER 16, 18 (February 2008). For analogous federal law limiting liability for atomic-energy projects, see 42 U.S.C. § 2012 et seq.

The nature of the CO₂ sequestration right could be classified as a license, a lease, an easement,¹²⁸ or an outright conveyance of the pore space.¹²⁹ A 50-year gas storage “lease” was classified as a lease of real property.¹³⁰ The acquisition of a gas storage right by condemnation has been classified as an easement, not the taking of a fee.¹³¹ The classification of a gas storage right as an easement can be significant in determining the compensation required in a condemnation proceeding. If classified as an easement, damages in such an action might be measured by the diminution in value of the burdened fee estate.¹³²

The following discussion of *Reese Exploration Inc. v. Williams Natural Gas Co.*,¹³³ taken from the supplement to the Kuntz treatise,¹³⁴ offers insightful comments regarding the nature of a gas storage right and the consequences of the classification:

In *Reese*, . . . the Tenth Circuit Court of Appeals, applying Kansas law and based upon the granting clauses of oil and gas leases that contained a gas storage provision, held that the right to store gas is not limited to the formation initially used for storage and that no part of the rights had been abandoned. And based upon provisions of the lease assignments, the court held that another party’s oil rights were expressly subject to and inferior to the gas storage rights. The case involved a suit

¹²⁸ When a gas storage right is acquired by eminent domain in Texas, statutory law provides that, upon “abandonment” of the storage facility, the storing party must file in the county deed records an instrument stating that “all property, both mineral and surface, . . . has reverted to those who owned the property at the time of condemnation, or their heirs, successors, or assigns.” TEX. NAT. RES. CODE ANN. § 91.184 (2001). The reference to abandonment suggests that the interest condemned may be an easement, but the reverter language suggests that the interest condemned may be a fee simple determinable or a lease. However, another section suggests that the interest may be voluntarily acquired by “option, lease, conveyance, or other negotiated means” *Id.* § 91.179.

¹²⁹ In *Pitsenberger v. N. Natural Gas Co. Inc.* 198 F. Supp. 665, 677 (S.D. Iowa 1961), the court rejected a challenge to underground gas storage agreements brought on the grounds that the storage permit transaction licensed a permanent nuisance and was therefore unconscionable. *See also* *Keasler v. Natural Gas Pipeline Co.*, 569 F. Supp. 1180, 87–88 (E.D. Tex. 1983) (holding that such transactions are not fraudulent); *Storck v. Cities Serv. Gas Co.*, 575 P.2d 1364, 1369 (Okla. 1977) (holding that such transactions are not fraudulent or against public policy).

¹³⁰ *Storck*, 575 P.2d 1364, 1368 (Okla. 1977), *remanded to* 634 P.2d 1319 (Okla. Civ. App. 1981).

¹³¹ *See* *Peoples Gas Light & Coke Co. v. Buckles*, 182 N.E.2d 169, 176 (Ill. 1962). *See also* *Ozier v. Cent. Ill. Pub. Serv. Co.*, 297 N.E.2d 21, 22 (Ill. App. 1973).

¹³² *Peoples Gas*, 182 N.E.2d at 176.

¹³³ *Reese Exploration Inc. v. Williams Natural Gas Co.*, 983 F.2d 1514 (10th Cir. 1993).

¹³⁴ 1 EUGENE KUNTZ, *supra* note 125, § 3.6(c) (Supp. 2007).

for negligence in permitting injected gas to migrate from an underground gas storage zone into overlying oil sands that were being waterflooded by the owner of the oil rights. The owner of the oil rights charged that the owner of the gas storage rights knowingly increased pressure in its storage formation even though it knew that gas was escaping and hindering secondary oil recovery efforts. The court stated that, while the oil-rights owner owed an implied duty not to interfere with the superior gas storage rights, the gas storage owner owed no corresponding duty to the oil-rights owner. Although the court intimated that the gas storage owner might be subject to an implied covenant to reasonably and prudently conduct its storage operations, the court declined to further address that question because Kansas courts had not applied the reasonable and prudent operator standard to gas storage operations and because the parties had not raised the issue. . . . In reaching its decision, the court never discussed the nature of a gas storage right. Is it like a landlord/tenant lease? If so, then abandonment of part of a gas storage right would not be recognized (*e.g.*, if a tenant who leases a 10-story building uses only the first floor, the tenant will not be found to have abandoned the other floors). Is the gas storage right similar to an oil and gas lease—valid for so long as gas is stored? If so, [partial or complete] abandonment would be possible if the lease is classified as a profit [but the element of intent to abandon is often difficult to prove]. Or is a gas storage right like a general easement? Suppose that, under a general road easement, the road is constructed so that it crosses only a small portion of the burdened land. At that point, the corridor of the easement may be defined and limited. *See generally* 2 American Law of Property § 8.66 (A. J. Casner ed. 1952) and *Columbia Gas Transmission Corp. v. An Exclusive Natural Gas Storage Easement*, 127 O&GR 346, 620 N.E.2d 48 (Ohio 1993) (describing a gas storage right as an easement). Thus, if a gas storage right is like an easement, the storage right might be confined to the formations historically used when the easement is first put to use. Perhaps analogies are inappropriate. Perhaps a gas storage right is *sui generis*. If so, then it should not be compared to other interests, including the oil and gas lease—even though the storage right itself is included in such a lease. Thus, the court's reference to oil and gas lease implied covenants does not seem helpful or appropriate. Indeed, if the gas storage owner owed no duty regarding negligence, it is difficult to see how it would have owed a duty based upon an implied covenant. However, one analogy to an oil and gas lease that does seem appropriate is the right of the lessee to make reasonable use of the surface

subject to the modern accommodation doctrine. In other words, perhaps the gas storage right should have been construed in light of a duty to accommodate multiple uses of the property. Under an accommodation approach, the test would be whether the gas storage owner could reasonably accommodate the efforts by the owner of the oil rights to recover additional oil through waterflooding. This case points out that conflicts among various subsurface users (*e.g.*, coal miners, oil producers, and gas storage users) may not be best resolved by a formalistic application of property interest priority rules originally established without contemplation of this kind of conflict. Perhaps they would be better resolved administratively in a manner that encourages multiple land use, promotes the greatest possible economic recovery of natural resources, prevents waste, protects correlative rights, and encourages accommodation.¹³⁵

APPENDIX 2

Selected Survey of Other Jurisdictions Regarding Pore-Space Ownership

Colorado

Colorado has no case law that expressly addresses pore-space ownership; however, one could argue that *Grynberg v. City of Northglenn*¹³⁶ supports mineral-owner title to pore spaces. In this case, the City, desirous of installing a wastewater reservoir, was required by statute to determine whether the land was suitable for a wastewater reservoir.¹³⁷ The City obtained permission from the surface owner to obtain core samples and such samples were publicly filed with the state officials. Grynberg, an unrecorded lessee of the coal rights, which were held by the State of Colorado, sued for damages to the speculative value of his coal rights. In deciding in favor of Grynberg, the court held that Grynberg, as the coal lessee, had the exclusive right to grant permission to collect core samples from the coal seams. While this case did not hold that Grynberg owned the pore spaces in the coal, such an argument is likely to be made in a case that does involve pore-space ownership. In any event, the *Grynberg* decision seems wrong. A surface owner desirous of intense surface development should have the right to take core samples to determine whether the land is suitable for the intended development. The

¹³⁵ 1 EUGENE KUNTZ, *supra* note 125, § 2.6(c) (Supp. 2007) (citing Phillip Lear, *Multiple Mineral Development Conflicts: An Armageddon in Simultaneous Mineral Operations?*, 28 ROCKY MTN. MIN. L. INST. 79 (1982); N.D. CENT. CODE ch. 38-15, § 2.6(c) (2007)).

¹³⁶ *Grynberg v. City of Northglenn*, 739 P.2d 230 (Colo. 1987).

¹³⁷ COL. REV. STAT. § 37-87-117 (1986 Supp.).

mineral owner should not be allowed to hold the taking of core samples for ransom, which is the practical effect of the decision.¹³⁸

In *Board of County Commr's v. Park County Sportmen's Ranch, LLP*, the Colorado Supreme Court held that the storage of water in an aquifer does not constitute a trespass against neighboring landowners where there was no physical invasion of neighboring lands by directional drilling or occupancy by recharge structures or extraction wells.¹³⁹ In addition, the court concluded that such use of an aquifer would not require the use of eminent domain or the payment of just compensation.¹⁴⁰

Kansas

Kansas has not directly addressed the issue of ownership of storage rights; however, where an oil and gas lease expressly grants storage rights, such rights are considered severable from the right to produce oil and gas.¹⁴¹ In other words, a lessee having storage rights can separately assign such rights to a third party.

In the gas storage context, if gas stored by a private party—as opposed to a public utility having the power of eminent domain¹⁴²—migrates to a neighboring tract, no trespass occurs, but the neighboring landowner is free to produce and claim the gas.¹⁴³ Since the landowner is permitted to produce the migrating gas, thus actually benefitting from the gas migration, the landowner suffers no actual damage.

In *Crawford v. Hrabe*, a case dealing with trespass of water injected for EOR purposes, the Kansas Supreme Court found no actionable trespass. The facts of the case involved a lessee who used wastewater brought onto the leased premises

¹³⁸ After remand and further appeal, Grynberg received no damages. *Grynberg v. Northglenn*, 829 P.2d 473 (Colo. App. 1991).

¹³⁹ *Bd. of County Commr's v. Park County Sportsmen's Ranch, LLP*, 45 P.3d 693, 710 (Colo. 2002).

¹⁴⁰ *Id.* at 715.

¹⁴¹ *Rook v. James E. Russell Petroleum, Inc.*, 679 P.2d 158, 166–67 (Kan. 1984).

¹⁴² Parties having the power of eminent domain may protect their rights by securing a state certificate and by condemning the reservoir, and such parties are further protected from the rule of capture if they can prove by a preponderance of the evidence that injected gas had migrated to adjoining property or to a stratum that has not been condemned. KAN. STAT. ANN. § 55-1210 (2007). See *Williams Natural Gas Co. v. Supra Energy, Inc.*, 931 P.2d 7 (Kan. 1997); *Union Gas Sys., Inc. v. Carnahan*, 774 P.2d 962 (Kan. 1989). For the meaning of “adjoining,” see *N. Natural Gas Co. v. Nash Oil & Gas, Inc.*, 2005 U.S. Dist. LEXIS 10181 (D. Kan. May 16, 2005) (*unreported*). If gas migrates into another stratum, further condemnation may be pursued, but landowners’ damages for the pre-condemnation trespass and unjust enrichment are measured by the fair rental value of such stratum. *Beck v. N. Natural Gas Co.*, 170 F.3d 1018 (10th Cir. 1999).

¹⁴³ *Anderson v. Beech Aircraft Corp.*, 699 P.2d 1023, 1031 (Kan. 1985).

from elsewhere to enhance production on the plaintiffs' land.¹⁴⁴ The plaintiffs claimed their interests had been injured by the migration of this water throughout the premises.¹⁴⁵ The court surveyed other jurisdictions' treatments of subsurface trespass of wastewater, finding that the orthodox rules applied to surface trespasses do not usually apply to subsurface trespass and that, when water is injected to increase production on the lessor's land, no actionable trespass occurs.¹⁴⁶ The court also found that secondary recovery by injecting wastewater was practical and an efficient use of a potentially hazardous waste product. The court held that plaintiffs had no cause of action for trespass.¹⁴⁷

However, in *Tidewater Oil Co. v. Jackson*, plaintiff proved actual damages, and the court held the injector of wastewater for EOR liable when the water flooded the plaintiff's oil wells. The court reasoned:

[T]hough a water flood project in Kansas be carried on under color of public law, as a legalized nuisance or trespass, the water flooder may not conduct operations in a manner to cause substantial injury to the property of a non-assenting lessee-producer in the common reservoir, without incurring the risk of liability therefor.¹⁴⁸

To establish liability, "[i]t is sufficient that the water flooding activities were intentional and the consequences foreseeable. They were actionable, even though lawfully carried on, if they caused substantial injury to the claimants."¹⁴⁹ Nevertheless, because the activity was lawful under a conservation agency order, the court reversed an award of punitive damages.¹⁵⁰

The Kansas Supreme Court has rendered three decisions concerning personal injury and property damage arising when stored gas migrated from the underground reservoir and eventually vented at a surface location in downtown Hutchinson, Kansas. The leak culminated in a massive explosion of natural gas in the heart of the city, killing several people and destroying several businesses.¹⁵¹

¹⁴⁴ *Crawford v. Hrabe*, 44 P.3d 442, 444 (Kan. 2002).

¹⁴⁵ *Id.* at 447.

¹⁴⁶ *Id.* at 448–50 (citing *Holt v. Sw. Antioch Sand Unit, Fifth Enlarged*, 292 P.2d 998 (Okla. 1955)); *Manziel*, 361 S.W.2d at 568; *Geo-Viking, Inc.*, 817 S.W.3d at 357.

¹⁴⁷ *Crawford*, 44 P.3d at 452–53.

¹⁴⁸ *Tidewater Oil Co. v. Jackson*, 320 F.2d 157, 163 (10th Cir. 1963).

¹⁴⁹ *Id.* at 164.

¹⁵⁰ *Id.* at 165.

¹⁵¹ *Hayes Sight & Sound, Inc. v. ONEOK, Inc.*, 136 P.3d 428, 433–34 (Kan. 2006).

The first opinion dealt with an award of negligence and punitive damages for loss suffered by a particular business. The last two opinions dealt with unsuccessful class-action suits.¹⁵²

Kentucky

Two Kentucky cases suggest that the mineral owner may have the right to control the use of potential petroleum-bearing sands.¹⁵³ In *Central Kentucky Natural Gas Co. v. Smallwood*, the court, citing what it believed to be the English rule and without deciding ownership of the pore space, found that the mineral owner had a continuing right to use strata to produce either naturally occurring or stored gas.¹⁵⁴ Thus, the mineral owner controlled the right to use the strata for that purpose. This case must be read in light of *Hammonds v. Central Kentucky Natural Gas Co.*, where the court held that injected natural gas was returned to nature and thus once again subject to the rule of capture.¹⁵⁵ Given the reasoning of *Hammonds* and the migratory nature of gas, the mineral owner would logically own the right to produce the migrated injected gas, but that does not mean that the mineral owner would own the injection right, which, under *Hammonds*, is of questionable value, given that the injected gas was deemed abandoned and subject to the rule of capture. However, in *Smallwood v. Central Kentucky Natural Gas Co.*, as between the mineral owner and oil and gas lessee, the lessee was not allowed to extend a lease beyond its primary term through injection operations where the secondary term of the lease habendum clause required production.¹⁵⁶

Some of the abandonment and rule-of-capture reasoning of *Hammonds* and both *Smallwood* cases was overruled in *Texas American Energy Corp. v. Citizens Fidelity Bank & Trust Co.*:

It is therefore the opinion of this court that, in those instances when previously extracted oil and gas is subsequently stored in underground reservoirs capable of being defined with certainty and the integrity of said reservoirs is capable of being maintained,

¹⁵² Gilley v. Kan. Gas Serv. Co., 169 P.3d 1064 (Kan. 2007); Smith v. Kan. Gas Serv. Co., 169 P.3d 1052 (Kan. 2007).

¹⁵³ See Gray-Mellon Oil Co. v. Fairchild, 292 S.W. 743, 745–46 (Ky. 1927). But see Rice Bros. Mineral Corp. v. Talbott, 717 S.W.2d 515, 516 (Ky. 1986) (oil and gas “ownership is limited to possessing an exclusive legal right to explore and, if oil and gas is found, to reduce that substance to possession and ownership”).

¹⁵⁴ Cent. Ky. Natural Gas Co. v. Smallwood, 252 S.W.2d 866, 868 (Ky. 1952).

¹⁵⁵ Hammonds v. Cent. Ky. Natural Gas Co., 75 S.W.2d 204, 205–06 (Ky. 1934).

¹⁵⁶ Smallwood v. Cent. Ky. Natural Gas Co., 308 S.W.2d 439, 442–43 (Ky. 1958).

title to such oil and gas is not lost and said minerals do not become subject to the rights of owners of surface above the storage fields.¹⁵⁷

Arguably, the court rejected little of the reasoning in *Hammonds*. First, ownership of any gas that was released back to nature and that migrated to nearby lands would presumably lie with the mineral owner, not the surface owner; however, that does not mean that the mineral owner owns the pore space. Second, if the language about maintaining integrity means that the injector controls all rights of access to the gas throughout the full extent of the reservoir—the facts in *Texas American*—then little of *Hammonds* has been overruled as a practical matter because, in *Hammonds*, the injector did not have full control.

Louisiana

In *United States v. 43.42 Acres of Land*, a federal eminent domain case construing Louisiana law, the court stated, “[w]hether a state is governed by an ‘ownership’ or a ‘non-ownership’ theory of mineral rights, the mineral owner cannot be considered to have ownership of the subsurface strata containing the spaces where the minerals are found.”¹⁵⁸ By holding that the surface owner, rather than the mineral owner, was entitled to compensation, the court effectively held that the surface owner has the right to authorize subsurface storage. In *Mississippi River Transmission Corp. v. Tabor*, the court also held that the surface owner owns the storage rights, but the court recognized that the “mineral servitude owner . . . enjoys the ‘right to participate in the production of the remaining natural gas and condensate in the reservoir’ . . . and must be compensated for the expropriation of this right.”¹⁵⁹ However, in a federal condemnation case arising in Montana, compensation for native gas was denied where the native gas could be produced only because of increased pressure caused by the stored gas.¹⁶⁰

The issue of subsurface trespass in Louisiana is less definitive. In *Raymond v. Union Texas Petroleum Corp.*, the plaintiffs claimed saltwater injected under adjacent lands had migrated to their subsurface property.¹⁶¹ The court held that,

¹⁵⁷ *Tex. Am. Energy Corp. v. Citizens Fidelity Bank & Trust*, 736 S.W.2d 25, 28 (Ky. 1987).

¹⁵⁸ *U.S. v. 43.42 Acres of Land*, 520 F. Supp. 1042, 1043, 1046 (W.D. La. 1981).

¹⁵⁹ *Miss. River Transmission Corp. v. Tabor*, 757 F.2d 662, 672 (5th Cir. 1985) (citing *S. Natural Gas Co. v. Poland*, 406 So.2d 657, 666 (La. App. 2d Cir. 1981, writ denied)). *Accord* *B&J Oil & Gas v. FERC.*, 353 F.3d 71 (D.C. Cir. 2004) (addressing the right of the pipeline operator to expand natural gas storage reservoir into area of active oil and gas production). State law determines the parties entitled to compensation. *Columbia Gas Transmission Corp. v. Exclusive Natural Gas Storage Easement*, 962 F.2d 1192 (6th Cir. 1992).

¹⁶⁰ *Williston Basin Interstate Pipeline Co. v. An Exclusive Gas Storage Lease Hold in the Judith River Subterranean Geological Formation*, 999 F.2d 546 (9th Cir. 1993) (unpublished, but memorandum opinion is available at 1993 WL 242979).

¹⁶¹ *Raymond v. Union Tx. Petroleum Corp.*, 697 F. Supp. 270, 271 (E.D. La. 1988).

because the state regulatory agency had issued a permit for the saltwater injection, “it is not unlawful and does not constitute a legally actionable trespass.”¹⁶² In dicta, however, the court noted that a permit does not preclude recovery for actual damages and for inconvenience.¹⁶³ Later, in *Mongrue v. Monsanto*, the Fifth Circuit affirmed the decision of the federal district court in Louisiana, finding that migrating wastewater did not cause the injecting party to be liable for a taking without just compensation.¹⁶⁴ The plaintiffs also asserted at the district court level that the injector had committed subsurface trespass, although this issue was not raised on appeal.¹⁶⁵ Nevertheless, the Fifth Circuit stated that if wastewater had migrated across property lines, “appellants may recover under a state unlawful trespass claim . . . regardless of the permit allowing for injection.”¹⁶⁶ The Fifth Circuit affirmed *Raymond* in another case, reasoning that migration of injected wastewater is not “unlawful” if a valid regulatory permit authorizes the action.¹⁶⁷

Michigan

Michigan law supports the surface owner’s title to subsurface pore space. In *Department of Transportation v. Goike*, the state acquired the surface estate of a tract of land to improve a highway, leaving the former fee-simple owner with only the mineral estate.¹⁶⁸ The issue before the court was to determine who owned the right to store non-native gas in the subsurface pore space.¹⁶⁹ The court held that “the storage space, once it has been evacuated of the minerals and gas, belongs to the surface owner.”¹⁷⁰

In *ANR Pipeline Co. v. 60 Acres of Land*, the court, in dicta, stated that “if injected gas moves across boundaries there may be a trespass.”¹⁷¹ However, the court held that the migration of non-native gas to neighboring property does not give rise to a claim of inverse condemnation.¹⁷²

¹⁶² *Id.* at 274.

¹⁶³ *Id.*

¹⁶⁴ *Mongrue v. Monsanto*, 249 F.3d 422 (5th Cir. 2001).

¹⁶⁵ *Mongrue v. Monsanto*, No. CIV.A. 98-2531, 1999 WL 970354 (E.D. La. 1999), *aff’d*, 249 F.3d 422 (5th Cir. 2001).

¹⁶⁶ *Id.* at 432 n. 15.

¹⁶⁷ *Boudreaux v. Jefferson Island Storage & Hub, LLC*, 255 F.3d 271, 274 (5th Cir. 2001).

¹⁶⁸ *Dep’t. of Transp. v. Goike*, 560 N.W.2d 365, 365 (Mich. App. 1996).

¹⁶⁹ *Id.*

¹⁷⁰ *Id.*

¹⁷¹ *ANR Pipeline v. 60 Acres of Land*, 418 F. Supp. 2d 933, 940 (W.D. Mich. 2006).

¹⁷² *Id.* at 941.

New Mexico

In *Hartman v. Texaco Inc.*, the court held that an oil and gas operator who suffered actual damages from subsurface flooding caused by neighboring waterflooding operations has a cause of action for trespass, but the statutory right of double damages does not apply to a subsurface trespass.¹⁷³ In an earlier case, the New Mexico Supreme Court affirmed a decision of the conservation agency that found that a salt-water disposal operation would not result in salt-water migration to a nearby tract.¹⁷⁴ However, the court stated in dicta:

The State of New Mexico may be said to have licensed the injection of saltwater into the disposal well; however, such license does not authorize trespass. The issuance of a license by the State does not authorize trespass or other tortious conduct by the licensee, nor does such license immunize the licensee from liability for negligence or nuisance which flows from the licensed activity. . . . In the event that an actual trespass occurs by Mobil in its injection operation, neither the Commission's decision, the district court's decision, nor this opinion would in any way prevent Snyder Ranches from seeking redress for such trespass.¹⁷⁵

New York

In *International Salt Co. v. Geostow*, the court construed a conveyance of "mines" of salt to mean that the grantee held fee title to the salt and not to the excavation cavity.¹⁷⁶ Nevertheless, the grantee retained exclusive right to use the cavity so long as salt was not exhausted and mining operations were not abandoned.¹⁷⁷ The case did not involve storage or disposal activities. Rather, the case involved the salt miner's right to continue to use the mined caverns to transport salt from parts of the mine that were beneath other lands. In *Miles v. Home Gas Co.*,¹⁷⁸ the court held that right to store foreign gas belonged to the surface owner. Together, these two cases suggest that the surface owner has title to pore spaces, but the mineral owner has a right to use stratum for ongoing mineral operations.

¹⁷³ *Hartman v. Texaco Inc.*, 937 P.2d 979 (N.M. App. 1997) (construing N. MEX. STAT. § 30-14-1.1).

¹⁷⁴ *Snyder Ranches, Inc. v. Oil Conservation Comm'n*, 798 P.2d 587 (N.M. 1990).

¹⁷⁵ *Id.* at 590.

¹⁷⁶ *Int'l Salt Co. v. Geostow*, 878 F.2d 570, 574 (2d. Cir. 1989) (construing New York law).

¹⁷⁷ *Id.* at 575.

¹⁷⁸ *Miles v. Home Gas Co.*, 316 N.Y.Supp.2d 908 (N.Y. Sup. Ct. App. Div. 1970).

Ohio

In *Chance v. BP Chemicals, Inc.*, the plaintiffs brought a class-action suit against BP Chemicals, claiming *inter alia* that the company had trespassed on their subsurface property rights by injecting waste fluids through injection wells and that the fluids had migrated across their property lines.¹⁷⁹ Relying on the holding from *Willoughby Hills v. Corrigan*,¹⁸⁰ the court found that “ownership rights in today’s world are not as clear-cut as they were before the advent of airplanes and injection wells.”¹⁸¹ Though surface owners may claim to own the land from the heavens to the depths and retain all not deeded in the severance of a mineral estate, limitations exist on their rights to the subsurface.¹⁸²

Just as a property owner must accept some limitations on the ownership rights extending above the surface of the property, we find that there are also limitations on property owners’ subsurface rights. We therefore extend the reasoning of *Willoughby Hills*, that absolute ownership of air rights is a doctrine which “has no place in the modern world,” to apply as well to ownership of subsurface rights.¹⁸³

Therefore, the court found the appellants’ subsurface rights to exclude others extend only to invasions that “actually interfere with the appellants’ reasonable and foreseeable use of the subsurface.”¹⁸⁴

From the rule that subsurface rights extend only to the owner’s “reasonable and foreseeable use,” the court did recognize the operator’s potential liability for subsurface trespass if injected waste interfered with “reasonable and foreseeable use” of the subsurface, not mere title or possession.¹⁸⁵ In other words, the pore-space owner must suffer actual damages. Though the plaintiffs’ claims were deemed too speculative, the court noted that one class member might have a valid claim because the subsurface migration of BP Chemicals’ waste forced that plaintiff to abandon drilling plans.¹⁸⁶ Accordingly, a mineral owner may have a valid trespass

¹⁷⁹ *Chance v. BP Chemicals, Inc.*, 670 N.E.2d 985 (Ohio 1996).

¹⁸⁰ *Willoughby Hills v. Corrigan*, 278 N.E.2d 658, 664 (Ohio 1972) (citing *United States v. Causby*, 328 U.S. 256, 260–261 (1946)) (“[T]he doctrine of the common law, that the ownership of land extends to the periphery of the universe . . . has no place in the modern world.”).

¹⁸¹ *Chance*, 670 N.E.2d at 992.

¹⁸² *Id.*

¹⁸³ *Id.*

¹⁸⁴ *Id.*

¹⁸⁵ *Id.* (emphasis added).

¹⁸⁶ *Chance*, 670 N.E.2d at 993.

claim in Ohio against a party who injects waste on neighboring lands if that waste migrates across property lines and unreasonably interferes with access to oil and gas.

Oklahoma

In Oklahoma, subsurface pore space belongs to the surface owner. In *Sunray Oil Co. v. Cortez*, the Oklahoma Supreme Court held the surface owner had the right to grant permission to inject wastewater into the subsurface, as long as there was no interference with the mineral estate's recovery of oil and gas.¹⁸⁷ Relying on this holding and applying Oklahoma law, a federal district court, in *Ellis v. Arkansas Louisiana Gas Co.*,¹⁸⁸ held that a storage company must obtain permission from the surface owner to store natural gas produced off the leased premises. The court found that the mineral deed allowed the grantee the right to *produce* oil, gas, and other minerals; therefore, the subsurface strata itself was retained by the surface estate.¹⁸⁹ Furthermore, the court noted the public policy interest in such storage, stating that if "it was the mineral interest owner and not the surface owner who had the power to grant storage rights, it would typically mean that hundreds of severed mineral interest owners would have to be contacted if those rights were to be obtained privately."¹⁹⁰ Thus, the surface owner owns the rights for both wastewater injection and gas storage.

In *Oklahoma Natural Gas Co. v. Mahan & Rowsey, Inc.*, the court implicitly concluded that the injector retains title to injected gas that migrated to other lands.¹⁹¹ However, evidence showed that the gas was confined to an identifiable and well-defined formation and that the gas was distinguishable, due to helium content and lack of certain organic compounds, from native gas in the area. Under Oklahoma statutory law, a public utility may acquire underground gas storage rights by condemnation.¹⁹² Under this statutory law, injected gas remains the property of the injector, even if the gas migrates beneath other lands, provided that the injector can prove migration and also that the injector compensates the owner of the invaded stratum.¹⁹³

Oklahoma recognizes a cause of action for private nuisance when injected water injures another's interest in a well or leasehold, even when the water is

¹⁸⁷ *Sunray Oil Co. v. Cortez Oil Co.*, 112 P.2d 792 (Okla. 1941).

¹⁸⁸ *Ellis v. Ark. La. Gas Co.*, 450 F. Supp. 412, 421 (E.D. Okla. 1978), *aff'd*, 609 F.2d 436, 439 (10th Cir. 1979).

¹⁸⁹ *Id.*

¹⁹⁰ *Id.* at 422.

¹⁹¹ *Ok. Natural Gas Co. v. Mahan & Rowsey, Inc.*, 786 F.2d 1004, 1007-07 (10th Cir. 1986).

¹⁹² OKLA. STAT. ANN. tit. 52, §§ 36.1-36.7 (1951).

¹⁹³ OKLA. STAT. ANN. tit. 52, § 36.6.

injected for EOR purposes¹⁹⁴ and even if injection is authorized by the Oklahoma Corporation Commission.¹⁹⁵ However, the requirement of showing actual injury or recoverable damages remains. Therefore, if the waste is injected into a stratum where oil, gas, or other minerals are unrecoverable, the likelihood of showing damages decreases. In *West Edmond Salt Water Disposal Ass'n v. Rosecrans*, the Oklahoma Supreme Court found the owner of an adjacent tract had no cause of action for trespass where the defendant injected saltwater into a stratum already containing saltwater because the owner had suffered no actual damages.¹⁹⁶ The court found underground disposal to be the most practical solution for dealing with wastewater and reasoned “[i]f such disposal of salt water is forbidden unless oil producers first obtain the consent of all persons under whose lands it may migrate or percolate, underground disposal would be practically prohibited.”¹⁹⁷ Nevertheless, Oklahoma recognized a cause of action when damages can be proved. In *West Edmond Hunton Lime Unit v. Lillard*, saltwater injected into a formation migrated onto adjacent land and interfered with the plaintiff’s oil and gas operations.¹⁹⁸

Pennsylvania

In *United States Steel Corp. v. Hoge*, the Pennsylvania Supreme Court held that methane embedded in a coal seam belonged to the owner of the coal seam.¹⁹⁹ Some of the court’s reasoning indicates that the court regarded the coal owner as owning the coal stratum: “[A]s a general rule, subterranean gas is owned by whoever has title to the property in which the gas is resting.”²⁰⁰ “When a landowner conveys a portion of his property, in this instance coal, to another, it cannot thereafter be said that the property conveyed remains as part of the former’s land, since title to the severed property rests solely in the grantee.”²⁰¹ “The landowner, of course, has title to the property surrounding the coal, and owns such of the coalbed gas as migrates into the surrounding property.”²⁰² Nevertheless, “the coal owner’s interest in that situs [is] in the nature of an estate determinable, which reverts to the surface landowner by operation of law at some time subsequent to the removal of the coal.”²⁰³ Since the case concerned ownership of gas, it does not directly

¹⁹⁴ *Greyhound Leasing & Fin. Corp. v. Joiner City Unit*, 444 F.2d 439 (10th Cir. 1971); *Boyce v. Dundee Healdton Sand Unit*, 560 P.2d 234 (Okla. Civ. App. 1975).

¹⁹⁵ *Greyhound*, 444 F.2d at 444–45; *Boyce*, 560 P.2d at 234.

¹⁹⁶ *W. Edmond Salt Water Disposal Ass'n v. Rosecrans*, 226 P.2d 965, 970 (Okla. 1950).

¹⁹⁷ *Id.* at 969.

¹⁹⁸ *W. Edmond Hunton Lime Unit v. Lillard*, 265 P.2d 730, 731 (Okla. 1954).

¹⁹⁹ *U.S. Steel Corp. v. Hoge*, 468 A.2d 1380, 1383 (Pa. 1983) (Flaherty, J., dissenting).

²⁰⁰ *Id.* at 1383 (Flaherty, J., dissenting).

²⁰¹ *Id.* (Flaherty, J., dissenting).

²⁰² *Id.* (Flaherty, J., dissenting).

²⁰³ *Id.* at 1384 (Flaherty, J., dissenting).

address ownership of pore spaces. Would the coal owner's property interest allow him to inject CO₂ into coal for permanent sequestration, which, as a practical matter, would convert his fee simple determinable into a fee-simple absolute?

West Virginia

In *Tate v. United States Fuel Gas Co.*, the West Virginia Supreme Court of Appeals held the surface owner had title to the subsurface space for natural gas storage, based on the language in the particular severance deed at issue.²⁰⁴ The deed severed from the grant a mineral estate in “[t]he oil, gas, and brine and all minerals, except coal underlying the surface of the land.”²⁰⁵ The deed further provided that “minerals” includes “clay, sand, stone, or other minerals [that] may be necessary for the operation for the oil, gas and other minerals reserved and excepted” in the deed.²⁰⁶ The court ruled that the owner of the surface estate held title to the subsurface, including any clay, sand, and stone, subject to the right of the mineral owner to use these substances as necessary to facilitate oil, gas, and mining operations.²⁰⁷ As long as there were no recoverable minerals in the stratum at issue, the surface owner could grant storage rights in the subsurface without unreasonably encumbering the mineral owner's recovery of their property.²⁰⁸ In this case, the atypical reservation was an important part of the court's analysis.

Wyoming

Wyoming has no case law addressing the ownership of pore spaces; however, Wyoming is of special interest because it has enacted legislation that declares that pore spaces are owned by the surface owner for purposes of CO₂ sequestration.²⁰⁹ A separate act, addressing the regulation of CO₂ sequestration,²¹⁰ is based upon the Model Statute drafted by the Interstate Oil and Gas Compact Commission Task Force on Carbon Capture and Geologic Storage.²¹¹

²⁰⁴ *Tate v. United States Fuel Gas Co.*, 71 S.E.2d 65, 71–72 (W. Va. 1952).

²⁰⁵ *Id.* at 67–68.

²⁰⁶ *Id.* at 68.

²⁰⁷ *Id.* at 72.

²⁰⁸ *Id.*

²⁰⁹ 2008 Wyo. Sess. Laws ch. 29, principally codified at WYO. STAT. ANN. § 34-1-152 (2008).

²¹⁰ 2008 Wyo. Sess. Laws ch. 30, principally codified at WYO. STAT. ANN. § 30-11-313 (2008).

²¹¹ INTERSTATE OIL AND GAS COMPACT COMM'N TASK FORCE ON CARBON CAPTURE AND GEOLOGIC STORAGE, STORAGE OF CARBON DIOXIDE IN GEOLOGIC STRUCTURES, A LEGAL AND REGULATORY GUIDE FOR STATES AND PROVINCES, APPENDIX I: MODEL STATUTE FOR GEOLOGIC STORAGE OF CARBON DIOXIDE 31–35 (2007). The Task Force has also drafted model regulations. *Id.* at APPENDIX II: MODEL GENERAL RULES AND REGULATIONS at 36–47, available at http://www.crossroads.odl.state.ok.us/cdm4/item_viewer.php?CISOROOT=/stgovpub&CISOPTR=3726&CISOBX=1&REC=1.

Because no Wyoming case law has addressed pore-space ownership, the legislature's declaration of pore-space ownership should be persuasive of Wyoming law, although the Wyoming Supreme Court will likely have the last word regarding nonfederal and non-Indian lands. Neither Wyoming case law nor statutory law would determine whether federally-owned or Indian-owned mineral rights—encompassing millions of acres in Wyoming—includes ownership of pore spaces. Although no federal case law addresses pore-space ownership, limited reservations of minerals, such as the reservation of coal, is not likely to reserve pore spaces in the federal government.²¹²

On the other hand, a broad reservation of minerals, such as the one under the Stock-Raising and Homestead Act of 1916 (“SRHA”),²¹³ might arguably reserve pore spaces because of the very broad interpretation given to such reservations by the federal courts.²¹⁴ Nevertheless, I believe that the SRHA provision requiring the reservation of “coal and other minerals” in patents, no matter how broadly defined by the federal courts, should not be construed as reserving pore spaces. In *Watt v. Western Nuclear, Inc.*, the court, in a five to four ruling, held that gravel was a “mineral.”²¹⁵ Writing for the majority, Justice Marshall stated: “we interpret the mineral reservation in the Act to include substances that are mineral in character . . . , that can be removed from the soil, that can be used for commercial purposes, and that there is no reason to suppose were intended to be included in the surface estate.”²¹⁶ This statement emphasized the extraction of substances that are mineral in character.

Nevertheless, some language in the opinion might leave open the possibility for the federal government to claim pore spaces. For example, Justice Marshall concludes:

Finally, the conclusion that gravel is a mineral reserved to the United States in lands patented under the SRHA is buttressed

²¹² *Cf.* *Amoco Prod. Co. v. So. Ute Indian Tribe*, 526 U.S. 865 (1999) (holding that the reservation of coal in patents issued under the Coal Lands Acts of 1909 and 1910 did not include methane gas embedded in coal).

²¹³ 43 U.S.C. § 299 (West 1993).

²¹⁴ *Cf.* *Watt v. W. Nuclear, Inc.*, 462 U.S. 36 (1983) (holding, on a vote of five to four, that the reservation of “coal and other minerals” in a patent issued under the Stock-Raising and Homestead Act of 1916 reserved gravel); *United States v. Union Oil Co.*, 549 F.2d 1271 (9th Cir. 1977) (holding that the reservation of “coal and other minerals” in a patent issued under the Stock-Raising and Homestead Act of 1916 reserved geothermal resources on the ground that legislative history revealed that Congress intended to reserve all mineral fuel resources). *But see* *BedRoc Ltd. LLC v. United States*, 541 U.S. 176 (2004) (holding that the reservation of “coal and other valuable minerals” in a patent issued under the Pittman Underground Water Act of 1919 did not reserve sand and gravel); *United States v. Hess*, 194 F.3d 1164 (10th Cir. 1999) (vacating a ruling that the reservation of “all oil and gas, coal and other minerals” in a land exchange reserved gravel).

²¹⁵ *Watt*, 462 U.S. at 55.

²¹⁶ *Id.* at 53.

by “the established rule that land grants are construed favorably to the Government, that nothing passes except what is conveyed in clear language, and that if there are doubts they are resolved for the Government, not against it.” [citations omitted] . . . In the present case this principle applies with particular force, because the legislative history of the SRHA reveals Congress’ understanding that the mineral reservation would “limit the operation of this bill *strictly to the surface of the lands*.”²¹⁷

Although this statement of legislative intent is broad enough to encompass federal ownership of subsurface pore spaces, the Congressional focus of the Act was on reserving minerals, not pore spaces. Thus, I would argue that the SRHA does not vest ownership of pore spaces in the federal government.

²¹⁷ *Id.* at 59–60, citing legislative history in H.R.Rep. No. 35, 64th Cong., 1st Sess. 18 (1916) (emphasis in original). *United States v. Union Oil Co.*, 549 F.2d 1271 (9th Cir. 1977) contains similarly broad language: “All of the elements of a geothermal system—magma, porous rock strata, even water itself—may be classified as “minerals.” *Id.* at 1273–74. Note, however, that even this Ninth Circuit opinion is silent about the pore spaces, and the thrust of the opinion regarded geothermal resources as a mineral because of its energy potential. In *Rosette Inc. v. United States*, 277 F.3d 1222, 1227–29 (10th Cir. 2002) (holding that geothermal resources were minerals under the SRHA), the court summarized the holding in *Watt* as follows:

. . . [T]o qualify as a ‘mineral’ under the reservation of the SRHA a substance must be 1) mineral in character, i.e. inorganic, 2) removable from the soil, 3) usable for commercial purposes, 4) and of such a character that there was no reason to suppose Congress intended it to be included in the surface estate.

. . . .

The question is not what Congress intended to reserve, but rather what Congress intended to give away in its grant to the landholder in the SRHA. The established rule is that land grants are construed favorably to the government and nothing passes except that which is conveyed in clear language, resolving all doubts in favor of the government.