THE CONCURRENT USE OF LAND FOR CARBON SEQUESTRATION AND MINERAL DEVELOPMENT

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As carbon capture and sequestration projects gain momentum across the United States, questions about the coordination of sequestration with mineral extraction—especially oil and gas development—are growing in urgency. Using many of the same technologies, these two marvels of modern ingenuity aim to exploit the same subsurface resources for different purposes: one to bring out the hydrocarbons and the other to put away the byproducts of their combustion. From needing to drill through each other's operations to reach deeper strata, to competing for the use of reservoir storage space ("pore space"), mineral development and carbon sequestration projects are sure to clash, and disputes are sure to follow.

Landowners, developers, policymakers, lawyers, and courts all have an interest in coordinating these two subsurface industries. To do so, they need look no further than the traditional principles of the common law. This Article presents a detailed account of the common law principles that govern the use of land for the concurrent development of multiple natural resources and constructs a conceptual and analytical framework for applying these principles to coordinate sequestration and extraction. It seeks to show how traditional doctrine can guide not only the adjudication of disputes but also the ex-ante decision-making of sequestration and mineral developers trying to use their property harmoniously without resorting to the courts.

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This is a new question and one that is full of difficulty. The discovery of new sources of wealth, and the springing up of new industries which were never dreamed of half a century ago, sometimes present questions to which it is difficult to apply the law, as it has heretofore existed. It is the crowning merit of the common law, however, that it is not composed of ironclad rules, but may be modified to a reasonable extent to meet new questions as they arise. This may be called the expansive property of the common law.[1]

I. INTRODUCTION

Removing carbon dioxide from the atmosphere and safely storing it underground, the process of carbon sequestration, has emerged as a policy

[1] Chartiers Block Coal Co. v. Mellon, 25 A. 597, 598 (Pa. 1893).

priority in the United States and around the world. The U.N. Intergovernmental Panel on Climate Change (IPCC) reports that widescale deployment of carbon sequestration is necessary for party states to meet their commitments under the Paris Climate Accords.[2] The International Energy Agency believes that it would be "virtually impossible" to meet net-zero energy targets without deployment at scale.[3] To incentivize private parties to undertake the immense costs and risks associated with large-scale carbon sequestration, Congress enacted the Section 45Q tax credit, which it recently made more generous in the Inflation Reduction Act of 2022.[4]

Established energy companies,[5] start-up firms,[6] and federally funded pilot projects[7] are in the preliminary stages of carbon sequestration projects across the country. Law firms large and small are gearing up to represent clients pursuing these projects.[8] And the academic literature around sequestration law and policy is growing rapidly.[9] In short, large-scale carbon sequestration appears to be on, or just over, the horizon. If it indeed comes to pass, it will bring with it the question of how to balance the rights of carbon sequestration developers with those of mineral developers using the same land.

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[2] *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, GLOBAL WARMING OF 1.5 °C. AN IPCC SPECIAL REPORT ON THE IMPACTS OF GLOBAL WARMING OF 1.5 °C ABOVE PRE-INDUSTRIAL LEVELS AND RELATED GLOBAL GREENHOUSE GAS EMISSION PATHWAYS, IN THE CONTEXT OF STRENGTHENING THE GLOBAL RESPONSE TO THE THREAT OF CLIMATE CHANGE, SUSTAINABLE DEVELOPMENT, AND EFFORTS TO ERADICATE POVERTY (2018).

[3] *Global Climate Goals 'Virtually Impossible' Without Carbon Capture - IEA*, REUTERS (Sept. 24, 2020), https://www.reuters.com/article/iea-carboncapture-int-idUSKCN26F0I9.

[4] 26 U.S.C. § 45Q; Inflation Reduction Act of 2022, Pub. L. No. 117–169, § 13104, 136 Stat. 1924, 1924–29.

[5] *See, e.g.*, *Carbon Capture and Storage*, EXXONMOBIL, https://corporate.exxonmobil.com/what-we-do/delivering-industrial-solutions/carbon-capture-and-storage (last visited June 22, 2023).

[6] *See, e.g.*, *A Clean Energy Company Providing Environmental Services to Decarbonize Industry and Mitigate Climate Change*, ENCHANT ENERGY, https://enchantenergy.com/ (last visited June 22, 2023).

[7] *CarbonSAFE Initiative*, NAT'L ENERGY TECH. LAB., U.S. DEP'T OF ENERGY, https://netl.doe.gov/carbon-management/carbon-storage/carbonsafe (last visited June 22, 2023).

[8] *See, e.g.*, Elizabeth L. McGinley, *Firm of Choice for CCUS Projects and Transactions*, BRACEWELL, https://bracewell.com/practices/carbon-capture-utilization-and-storage (last visited June 22, 2023).

[9] *See, e.g.*, Tara K. Righetti, et al., *The Carbon Storage Future of Public Lands*, 38 PACE ENV'T. L. REV. 181 (2021); Neil Craik et al., *The Legal Framework for Carbon Dioxide Removal in Canada*, 59 ALTA. L. REV. 833 (2022).

A. The Problem and its Importance

When it comes to sequestering carbon underground, not just any geologic formation will do. Suitable rock formations must be porous, like a sponge, so that the carbon molecules can take up space within the rock's microscopic pore spaces.[10] The carbon also needs to flow through the rock so that a single injection well can fill up a large area of formation.[11] In geology terms, the formation must be permeable, which it is if its pore spaces are sufficiently interconnected.[12] The formation also must be well contained underneath an impermeable layer of rock to keep the carbon from escaping to the surface or into a shallow freshwater aquifer.[13]

Fortunately, there are many known areas with suitable geology. We know because we have been exploring them for over a century, searching not just for good pore space, but for oil and natural gas.[14] Hydrocarbons (the technical name for oil and gas) are also found in porous and permeable rock layers trapped by an impermeable seal or cap ("reservoirs").[15] Indeed, depleted oil and gas reservoirs are a common target for sequestration projects.[16] Another ideal type of reservoir for sequestration are saline aquifers—porous and permeable rock layers saturated with brine water from ancient seas.[17] Like carbon sequestration, oil and gas production uses the pore space in saline aquifers for reinjecting incidentally produced wastewater ("produced water") for disposal.[18] Oil and gas operations also inject produced water and carbon dioxide into the pore space of depleted reservoirs to increase their productive life ("secondary or enhanced recovery").[19]

The upshot is a competition for good pore space, and the layers of rock and land that surround and sit atop it. The contest pits the upstart carbon

[10] EPA Underground Injection Control Program, 40 C.F.R. § 146.83(a) (2023) (defining the minimum geologic criteria for siting a Class VI carbon injection well).

[11] *Id.*

[12] *Id.*

[13] *Id.*

[14] INT'L ENERGY AGENCY, ENERGY TECHNOLOGY PERSPECTIVES 2020: SPECIAL REPORT ON CARBON CAPTURE UTILISATION AND STORAGE: CCUS IN CLEAN ENERGY TRANSITIONS 103–09 (2020).

[15] JOHN S. LOWE ET AL., CASES AND MATERIALS ON OIL AND GAS LAW 7–8 (7th ed. 2018).

[16] INT'L ENERGY AGENCY, *supra* note 14, at 112.

[17] *Id.*

[18] *Id.*

[19] LOWE ET AL., *supra* note 15, at 311–12. Enhanced recovery injects other substances, sometimes including carbon dioxide, into pore space to like effect. *Id.* at 886–87.

sequestration industry against the incumbent oil and gas industry. In in the ordinary course of business, however, this competition plays out not between two industries in the abstract, but between individual parties that hold property rights in the same tract of land.[20] The competition will usually pit an oil and gas lessee (sometimes a giant transnational corporation, other times a small- or medium-size private business, and still other times an individual human) against the holder of the right to inject carbon for sequestration.[21]

It is important for many reasons that we understand how to order the contest over pore space. It is important to the landowner who is considering selling or leasing rights to the oil and gas or to sequester carbon under the land, while retaining possession and use of the land's surface for his or her own purposes. It is important to the individual oil and gas developer or carbon sequestration operator that they understand what they may and may not do on and under a tract of land with relation to the other competitor. This may inform how they plan their development of the land, how much they are willing to invest in a particular project and how they invest it, what they should do to mitigate the risk of a dispute with another rights holder, and, perhaps, whether to pursue a project in the first instance. The analysis also informs the parties' decisions about whether and how to cooperate or bargain to avoid disputes.

Indirectly, it is also important for society that these rights holder can manage their affairs in coordinated fashion, and both produce oil and gas and sequester carbon for the public good. The public has an interest in landowners, sequestration developers, and mineral developers being able to govern themselves in the pursuit of various goals in reasonably coordinated fashion. The public is also interested in lawyers and judges having a clear understanding of the rights and duties of the parties so that disputes are efficiently, fairly, and consistently adjudicated when relations sour and litigation ensues.

In one sense, this is a new and novel issue. Never before have these two subsurface activities, sequestration and mineral extraction, collided. But the

[20] It is important to distinguish this competition with the conflicts that occur between owners of neighboring tracts of land. When one owner injects carbon that physically invades the boundaries of a neighboring tract without consent, it is subject to a separate legal regime and is usually referred to as a "subsurface trespass." *See generally* Joseph A. Schremmer, *Subsurface Trespass: Private Remedies and Public Regulation*, 101 NEB. L. REV. 1005 (2023). This Article does not address the cross-boundary subsurface trespass problem.

[21] *See* Giacometto Ranch v. Denbury Onshore LLC, No. CV 16-145-BLG-SPW-KLD, 2020 U.S. Dist. LEXIS 200802, at *1 (D. Mont. July 15, 2020).

essence of the problem is old and familiar. That is why the epigraph introducing this Article, penned by the Pennsylvania Supreme Court, manages to encapsulate the problem despite being written in 1893. That court, in *Chartiers Block Coal Company v. Mellon*, grappled with a dispute not between carbon sequestration and mineral development, but between two separate mineral interest owners in the same land.[22] The owner of the oil rights sought to drill through coal seams owned by the opposing party to exploit a deeper reservoir of petroleum.[23] Later generations encountered the problem again when industries emerged for the exploitation of minerals like potash,[24] lignite,[25] and uranium[26]—all located underground and in the same areas as oil and gas. The same problem arose yet again with the expansion of renewable energy development, which brought wind and solar farms to active oil and gas fields across the country.[27]

B. Approaches to the Problem and this Article's Claim

Each new iteration of the "concurrent development" problem spurs litigation and scholarly literature about how to coordinate the competing interests. Certain themes emerge in this literature. One theme is skepticism about the ability of common law principles to coordinate the concurrent development of multiple resources effectively and justly.[28] Skepticism feeds into the second theme, which is the push for legislative or regulatory reform of the common law to achieve favored public policies.[29]

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[22] 25 A. 597, 597 (Pa. 1893).

[23] Problems like this persist to the present day. *See, e.g.*, Fred A. Deering, Jr., *Multiple Use Problems of Operators Both On and Off the Public Domain*, 7 ROCKY MTN. MIN. L. INST. 15 (1962); Phillip William Lear, *Cooperative Multiple Mineral Development Agreements—A Nuts and Bolts Approach*, 43 ROCKY MTN. MIN. L. INST. 3 (1997).

[24] *See, e.g.*, Bryant H. Croft, *Conflicts Between Potash and Oil and Gas Developments*, 10 ROCKY MTN. MIN. L. INST. 2 (1965).

[25] *See, e.g.*, Bruce Kramer, *Conflicts Between the Exploitation of Lignite and Oil and Gas: The Case for Reciprocal Accommodation*, 21 HOUS. L. REV. 49 (1984) [hereinafter Kramer, *Reciprocal Accommodation*].

[26] *See, e.g.*, Guy L. Nevill, *Multiple Uses and Conflicting Rights*, 13 ST. MARY'S L.J. 783 (1981).

[27] *See, e.g.*, K.K. DuVivier & Roderick E. Wetsel, *Jousting at Windmills: When Wind Power Development Collides with Oil, Gas, and Mineral Development*, 55 ROCKY MTN. MIN. L. INST. 9 (2009).

[28] *See generally* Chartiers Block Coal Co. v. Mellon, 25 A. 597 (Pa. 1893).

[29] *See id.*

Consider the example of *Chartiers Block*. The court's quotation in the epigraph praises the common law's ability to meet new questions with wisdom and agility—calling it the common law's "expansive property" and lauding it as the law's "crowning merit."[30] Yet, in addressing the relative rights of the oil and gas and coal owners, the court held that it was "a legislative rather than judicial question" and concluded by calling on the legislature (then in session) to enact legislation regulating the parties' correlative rights.[31] "We find ourselves upon a new road, without chart or compass to guide us," the court complained, forgetting, or perhaps never really believing, its earlier homage to the common law's ability to meet the challenge.[32]

Scholarly commentators are similarly skeptical. Some have argued that the traditional doctrine fails to achieve good social policy regarding the exploitation of natural resources.[33] Others, that the doctrine fails to protect the environment by allowing excessive use of land.[34] Still others, that changes in modern technology, economics, and social values have rendered the common law principles obsolete.[35] These various doubts tend to lead the authors to a common project of deconstructing the traditional doctrines into an ad hoc balancing test that empowers courts to reach more "pragmatic" results in individual cases.[36]

Such scholars often conclude that legislation would more efficiently achieve good public policy than the deconstructed common law doctrine.[37] The skeptical answer to the question of how to coordinate concurrent sequestration and mineral extraction, therefore, would likely be to call on legislatures to enact laws to order the activities on the basis of public policy

[30] *Id.* at 598.

[31] *Id.* at 599.

[32] *Id.*

[33] *E.g.*, Kramer, *Reciprocal Accommodation*, *supra* note 25, at 52–53; Laura H. Burney, *A Pragmatic Approach to Decision Making in the Next Era of Oil and Gas Jurisprudence*, 16 J. ENERGY NAT. RES. & ENV'T. L. 1, 72 (1996).

[34] *E.g.*, K.K. DuVivier, *Sins of the Father*, 1 TEX. A&M J. REAL PROP. L. 391, 408–09 (2014).

[35] Tara Kathleen Righetti, *Liberating Split Estates*, 14 INT'L J. COMMONS 638 *passim* (2020).

[36] Bruce M. Kramer, *The Legal Framework for Analyzing Multiple Surface Use Issues*, 44 ROCKY MTN. MIN. L. FDN. J. 273, 298–301 (2007) [hereinafter Kramer, *Multiple Surface Uses*]; Kramer, *Reciprocal Accommodation*, *supra* note 25, at 62–63; DuVivier, *supra* note 27, at 422; Burney, *supra* note 33, at 72; Righetti, *supra* note 35, at 638.

[37] Burney, *supra* note 33, at 72; Righetti, *supra* note 35, at 638.

and, short of that, for courts to balance the two activities to achieve a pro-social result in each case.[38]

In a phrase, the doctrinal skeptics would treat the interaction of carbon sequestration and mineral development as "a discrete policy problem."[39] Using the rationales of public policy, they would "work backwards to a rule that will serve" the preferred policy.[40] Professors Thomas Merrill and Henry Smith trace this kind of reasoning back to the thinking of Oliver Wendell Holmes "as amplified by the Legal Realists and their successors down to the present."[41] Holmes wrote that "a body of law is more rational and more civilized when every rule it contains is referred articulately and definitely to an end which it subseves, and when the grounds for desiring that end are stated or are ready to be stated in words."[42] Such instrumentalist thinking is common and perhaps even dominant in contemporary jurisprudence on oil and gas law.[43]

This Article takes a contrary approach, claiming that the traditional common law principles are effective at coordinating concurrent sequestration and extraction on the same land precisely because they do not rest on discrete policy rationales or try to resolve specific policy problems. The common law's general principles and formal rules constitute a coherent system by which property owners can coordinate their own development and courts can adjudicate the corelative rights and duties of competitors.

The basic principles of the common law are abstract and generalizable, rather than concrete and specific. Instead of complex and highly contestable notions of social utility and good public policy, they are grounded largely in simple moral intuitions like "one should have to access one's property," "pay

[38] Calls for regulation are already emerging. *E.g.*, Tade Oyewunmi, *Underground Property Rights for Carbon Capture*, KLEINMAN CTR. FOR ENERGY POL'Y (June 7, 2023), https://kleinmanenergy.upenn.edu/news-insights/underground-property-rights-for-carbon-capture/ ("Going forward, it may be necessary for policymakers to develop and enact legal and regulatory provisions that can help resolve potential disputes regarding access and use of subsurface pore spaces and formations for CO2 storage.").

[39] *Cf.* Thomas W. Merrill & Henry E. Smith, Briggs v. Southwestern Energy Production: *Hydraulic Fracturing and Subsurface Trespass*, 16 J. TORT LAW 1, 18 (2023).

[40] *Cf. id.*

[41] *Id.*

[42] *Id.* (quoting Oliver Wendell Holmes, Jr., *The Path of the Law*, 10 HARV. L. REV. 457, 469 (1897)).

[43] *See* Joseph A. Schremmer, *A Unifying Doctrine of Subsurface Property Rights*, 46 HARV. ENV'T L. REV. 525, 534–41 (2022); Burney, *supra* note 33, at 15–19 (describing the benefits of the Holmesian "pragmatic approach" for oil and gas law).

due regard to the rights of others," "first in time is first in right," and "accommodate another's use of a shared thing whenever reasonably possible."[44] The generality and "traditional everyday morality"[45] of these concepts make them relatively stable, comprehensible, and useful as a device for coordinating the often complicated conduct of natural resources developers and landowners. The principles also interconnect and interact in predictable and logical ways, creating a system that property owners and developers of all kinds, possessing disparate goals and varying levels of sophistication, can use as a navigational aid. The system guides rights holders in deciding important questions like what to do with their property interests, what to forbear from doing, when to act or forbear, and in what manner to conduct their actions on the common estate. Furthermore, the doctrinal frameworks guide competing property owners toward arrangements that harmonize their competing uses of the shared land—toward the parties' common good, rather than the good of one at the expense of the other. As will be seen, the doctrines generally prefer accommodating multiple uses of land wherever possible.

In contrast to the common law principles, the ad hoc approach preferred by doctrinal skeptics is highly context dependent. This makes it much more malleable in the hands of a court, which might be considered an advantage by those who "believe that social engineering can come up with more

[44] *See* Thomas W. Merrill & Henry E. Smith, *The Morality of Property*, 48 WM. & MARY L. REV. 1849, 1850–51 (2007) (claiming that the system of property depends upon simple and intuitive moral notions that are "suitable for all members of the community"). The generality, or "formality," of the common law principles and their reliance on traditional moral notions have been the objects of critique by skeptics at various times. Felix Cohen, for example, famously derided traditional property doctrines and their conventional morality as meaningless and superstitious—nothing but a bunch of "transcendental nonsense." *Id.* at 1868 (citing Felix Cohen, *Transcendental Nonsense and the Functional Approach*, 35 COLUM. L. REV. 809, 815–17 (1935)). Even if these critiques are justified, they are somewhat beside the point. It is not the belief in the underlying moral intuitions that makes the doctrinal system function, but the fact that they are intuitive, or at least widely shared. Their common knowledge helps render the system comprehensible and useful for the private actors who are its subjects and seek to engage its principles to aid their practical reasoning about resource development and use. A moral skeptic can understand the basic thrust of "first in time is first in right" even if he or she disagrees that it is normatively justified. This aspect of the common law system is itself a source of normative justification, which is independent from the justification of any of the moral intuitions lying at the system's foundation. Schremmer, *supra* note 43, at 544–55 (arguing that law's ability to guide the practical reasoning of its subjects is a source of its normative justification).

[45] Merrill & Smith, *supra* note 44, at 1867.

satisfactory answers to resource conflicts."[46] But the malleability of ad hoc balancing tests also frustrates the law's usefulness for private actors in charting out their own actions. Balancing does this by destabilizing the law's substantive meaning and requiring much more information and sophistication to reliably predict how a court might balance the actor's resource use with the uses of other rights holders.

While far from malleable, the common law system that coordinates resource development is also not totally inflexible or closed off to social context. On the contrary, several of the doctrines that make up the system incorporate the concept of reasonableness. Merrill and Smith have called reasonableness an "open-textured" concept because it introduces social context into an otherwise formal doctrinal system.[47] Reasonableness standards contextualize many of the questions that must be resolved by the common law system in coordinating multiple resource development. An oil and gas developer, for example, may only use the surface of the land for purposes that are *reasonable* and in a manner that is *reasonable*. To take another example, the owner of carbon sequestration rights in land may have a duty under certain circumstances to accommodate the conflicting activities of a landowner or oil and gas developer, if to do so would be *reasonable*. In these various contexts, reasonableness is a question of fact to be determined on all the relevant circumstances and social context like community standards, industry practices, and the character of the locality. Accordingly, determinations of reasonableness rest with the receptacle of the community's collective good judgment: a jury.

It might be thought that a jury's determination about reasonableness is just as difficult to predict and therefore just as destabilizing as an ad hoc balancing test decided by a court. There are multiple reasons this is not the case. First, to keep the open texture of reasonableness from destabilizing the doctrinal system and rendering it difficult to employ for guidance, courts develop legal rules over time to structure the boundaries of reasonableness determinations. These legal rules specify what conduct may not be considered reasonable and what conduct is reasonable *per se*. Such legal structure is necessarily absent from ad hoc balancing tests, for we could not call them "ad hoc" otherwise.

Second, there are significant benefits to a system that requires private actors to meditate on what a jury would find to be reasonable in planning and

[46] *Id.* at 1869.

[47] Merrill & Smith, *supra* note 39, at 19.

engaging in their own private courses of action. By employing the standard of reasonableness, the common law frequently requires private actors to engage in the hypothetical exercise of considering whether a jury of their peers would ultimately find the contemplated conduct reasonable. This hypothetical exercise encourages the actor to reflect on all the surrounding circumstances as well as relevant customs, practices, and other social facts that might inform a jury's decision-making. It requires the actor to practice the skills needed for practical reasoning, developing a kind of muscle in the actor for conforming his or her plans and conduct to what would be reasonable.

There is comparatively little sense in requiring private actors to engage in hypothetical thinking about how a court might engineer a socially positive resolution of a resource dispute under an ad hoc test. The "ad hoc" nature of this approach alone undermines any attempt to predict how it would be applied, since it provides no prescriptive standards. Rather than operate on prescriptive rules or standards, courts applying an ad hoc approach must implicitly select a policy goal or good, chosen independently of any doctrine, and resolve the dispute in whatever manner seems likeliest to further the chosen good, entering judgment in the private dispute accordingly.[48] For example, a court applying an ad hoc approach to resolve a dispute between an oil and gas developer and a developer of lignite deposits on the same land might enter an order requiring the lignite developer to accommodate the competing needs of the oil and gas developer because this result furthers the state's dependence on the oil and gas industry.[49]

Consider the position of the lignite developer before the litigation. How is this person to order its conduct on the land with regard to the oil and gas developer? Rather than consider what demands reasonableness might place upon the lignite developer, the developer would be left instead to contemplate the importance a court might place on public policy and which policy good or goods the court might seek. Since there are no principles or standards by which to select this criterion, the lignite developer would be left guessing—

[48] *See* JOHN FINNIS, NATURAL LAW AND NATURAL RIGHTS 117 (Paul Craig ed., 2d ed. 2011) (demonstrating that utilitarian calculus always must select some good to pursue that cannot itself be determined on the basis of utilitarian balancing).

[49] *Cf.* Kramer, *Reciprocal Accommodation*, *supra* note 25, at 52–53 (criticizing a formal doctrinal approach to development disputes, explaining that "[i]n a state whose mineral economy is dominated by oil and gas, the question whether such fugacious minerals should be more readily exploitable, in the face of conflicting exploitation of equally valuable surface minerals, must be clearly addressed").

and probably guessing wrongly since, as a lignite developer it is not likely to believe that lignite development is less important than oil and gas development.

Despite all its advantages, the common law framework governing multiple resource development on common land is not perfect. Its general and abstract nature, though a virtue, can also make the system over- or under-inclusive. Because it is largely independent of context, the system will not reach the optimal result in every case, as a more specifically tailored set of rules and standards might. Because of its use of open-textured doctrines like reasonableness, the system is not perfectly determinate. The common law framework might result in suboptimal allocations of resources. For example, the framework might fail to encourage sufficient development of fuel minerals to meet public needs in times of want.[50] It might instead encourage too much production, flooding the market or causing excessive environmental harm. These shortcomings are inherent in a system of abstract general rules.

Nevertheless, the limitations of the common law are no reason to jettison its general principles for ad hoc standards. Other legal institutions exist for private and public participants to refine the system's rougher and fuzzier edges and fill in its gaps. As Merrill and Smith have observed, common law doctrines can provide good baselines for private parties to modify by contract and legislatures and administrative agencies to refine by regulation.[51] These other institutions, private contract and public regulation, may thus improve upon the results that can be achieved under the background common law principles, and it is much easier for them to do so when the background system is stable and comprehensible.[52] It is overall better for courts to leave it to the more specialized legal institutions of contract and regulation to optimize multiple resource development, and focus on the role they are best suited to fulfill: deciding concrete disputes on the basis of generalizable common law principles.

C. Analyzing Concurrent Sequestration and Extraction

The common law principles operate through a system of doctrinal concepts or "forms." Different forms apply to different types of legal relationships. Each form sets up a framework of rules and standards for

[50] *See id.*

[51] *Id.* at 20.

[52] *Id.* at 19–20.

ordering the correlative rights of the relevant interest holders. Intuitive and comprehensible, the frameworks guide decision-making and thereby enable correlative rights holders to coordinate their own affairs toward their common good. The frameworks are not, however, perfectly determinate. They do not provide a single, easy answer to what any rights holder should do in every situation or how every dispute should be resolved. Often, the doctrine requires parties to exercise their own judgment about whether a particular course of action would be reasonable. Where they disagree, it is ultimately up to a jury to resolve the impasse. In close or marginal cases, the doctrine thus encourages rights holders to consider and conform their actions to what the composite wisdom of the community would likely find to be reasonable.

Using the common law principles appropriately is first a matter of applying the correct form and then applying the doctrinal rules and standards the form instantiates. The analysis of any concurrent-development problem thus begins by classifying the legal relationship that exists among the relevant parties so that the appropriate legal form may be selected. The parties may include the developer of a carbon sequestration project, one or more owners of oil, gas, or other mineral rights, and an owner of the surface of the land. The legal relationships shared among the parties are a consequence of the types of property interests they own. This in turn depends on how ownership of the elements of the subsurface of the earth is divided among them.

In this context, there are three fundamental types of legal relationships that might exist between a sequestration developer and a mineral developer. First, where the proponent of carbon sequestration holds title to or a leasehold in the surface estate of land that is subject to a severed mineral interest, the sequestration and mineral developers share a legal relationship that lawyers call "split estates." Second, where the sequestration developer holds a subsurface easement in the land, the two developers share a different legal relationship, that of competing easements in the same property. Third, where the sequestration developer holds title to a separate freehold estate in the pore space or some subsurface stratum or strata, alongside the owner of a separate estate in minerals, the parties' relationship is what I call, for convenience, "coequal estates." Once the parties' relationship is properly classified, the correct doctrinal form may be selected to guide the practical judgment of the parties, or where needed, the judgment of a jury.

The remainder of this Article takes the reader through this analytical framework to demonstrate how the common law principles guide concurrent sequestration and extraction. It begins in Part II Section A, which classifies

the types of physical conflicts likely to occur when carbon sequestration and mineral development are undertaken on the same land. Part II Section B then describes how the three fundamental types of legal relationships would arise within a given parcel. The rest of the Article elucidates the doctrinal frameworks that apply to each legal relationship and applies the frameworks to the likely conflicts outlined in Part II.A. Part III does this for split estates, Part IV for competing easements, and Part V for coequal estates. Part VI concludes.

II. BUILDING THE ANALYTICAL FRAMEWORK

A. Classifying the Likely Conflicts

Not only do carbon sequestration and oil and gas production operations target the same subsurface rock formations, they also utilize many of the same technologies and techniques for exploiting them. They both, for example, drill wells, use roads, install equipment on the surface of the earth, use pipelines, and inject fluid into pore space. The result is that both activities use the same land for many of the same activities but to different purposes. The conflicts likely to occur will take place both on the surface of the earth and in the subsurface.

1. Conflicts on the Surface

On any given tract, the developers may compete over available space to site their wells, build their pads, lay their pipelines, or install their ancillary facilities. All this construction and associated operations must coexist with the surface activities of the landowner, who might farm, ranch, or live on the premises among the noise, dust, and disruption.

Both sequestration and oil and gas development require extensive use of the surface.[53] Sequestration requires the drilling of wells to inject carbon into the subsurface and to monitor the carbon plume, just as oil and gas development requires drilling wells to produce hydrocarbons and inject produced water and other substances for disposal or secondary and enhanced recovery.[54] There are nonetheless some differences. Development of an oil

[53] Use of the surface for oil and gas production is discussed generally in Wyatt D. Swinford, *Range War: Conflicts Between Oil and Gas Operations and Wind Farms*, 70 INST. ON OIL & GAS L. § 4.03, § 4.03 [1][a] (2019).

[54] Russell W. Murdock, *The State of CO2 Sequestration in the State of Texas*, 41 TEX. ENV'T. L.J. 65, 67 (2010).

or gas field requires far more wells than a carbon sequestration project likely does. Consequently, many tracts of land in a sequestration project may not have any wells on them. Carbon would be injected into a few wells and allowed to migrate beneath numerous tracts of land. Additionally, injection wells are generally drilled as conventional vertical wells, whereas many oil and gas wells are unconventional, horizontal wells that stretch thousands of feet laterally through a single formation.[55]

Both kinds of wells are constructed on "wellpads" of flattened earth.[56] Wellpads range in size, usually between one and ten acres. Unconventional wellpads tend to host several horizontal wellbores and are therefore much larger than pads for vertical wells.[57] Drilling requires large earthen pits, which are typically covered or buried after completion of the wells. Roads for accessing the drilling site must be constructed to support large equipment and heavy traffic. Pipelines are laid and often buried below plow depth to move fluids. Surface facilities are installed to operate wells and pipelines and to separate and store production.[58]

2. Conflicts in the Subsurface

Three problems are likely to arise in the subsurface: contests over (i) drilling and locating wellbores, (ii) drilling through shallower strata to access deeper strata, and (iii) use of shared pore space.

a. Drilling and Locating Wellbores

Two wellbores cannot exist in the same space at the same time. Horizontal oil and gas wells may cut off areas where a carbon sequestration developer could otherwise have drilled vertical injection and monitoring wells, and vice versa.[59] For these simple reasons, contests over the placement of surface facilities and operations may be mirrored in the subsurface, where developers will compete to locate their wellbores. Drilling also destroys rock and fluid in the wellbore's path, including valuable oil and gas.[60] A carbon injection well might harm a mineral owner's chance to produce some

[55] *See* 40 C.F.R. § 146.86 (2023) (detailing well construction requirements).

[56] *Cf.* Swinford, *supra* note 53, § 4.03[1][a].

[57] *Id.*

[58] *Id.* § 4.03[1].

[59] *See, e.g.*, Lightning Oil Co. v. Anadarko E&P Onshore, LLC, 520 S.W.3d 39, 43 (Tex. 2017) (involving a contest over wellbore placement).

[60] *Id.* at 47.

hydrocarbons, an oil or gas well could damage a formation being targeted for carbon sequestration. Moreover, oil and gas wells are frequently completed by hydraulic fracturing ("fracking") wherein massive volumes of water, sand, and chemical are pumped into the target formation to fracture the rock and increase the flow of hydrocarbons.[61] Fracking can cause pressure to communicate through the formation and damage other wellbores in the vicinity—a phenomenon known as "frac hits" or "frac bashing."[62] Frac hits could endanger sequestration wells near oil and gas wells, especially unconventional wells.[63]

b. Accessing Deeper Zones

The subsurface geologic formations in which we find oil and gas and good pore space for carbon sequestration are generally stacked on top one another. Formations bearing oil and gas and those suitable for carbon sequestration occur at many different intervals of depth. Mineral and sequestration developers may wish to drill through formations being used by the other to access deeper strata. The greatest risk for dispute probably centers on the scenario in which a mineral developer seeks to drill through a shallower formation being used for carbon sequestration.

There are a variety of reasons why developers will hesitate to permit penetration of their carbon plumes. Sequestration projects must maintain close control of the carbon plume to ensure against leakage. Leakage is a potential legal liability for subsurface trespass, nuisance, or harm to public health or safety.[64] Moreover, permitting requirements for a carbon injection well, under the EPA-administered UIC Class VI program, require precautions be taken to avoid contamination of underground sources of drinking water (USDW).[65] Among other things, the program regulations

[61] Thomas Kurth et al., *American Law and Jurisprudence on Fracturing*, 58 ROCKY MTN. MIN. L. INST. 4-1, § 4.05 (2012).

[62] Mark D. Christiansen & David E. Pierce, *When the Horizontal and Vertical Collide: Frac Hits and Operators Quest for Détente in the Common Reservoir*, 61 Rocky Mtn. Min. L. Inst. 12-1, § 12.02[1] (2015); Yoho v. S.W. Energy Co., No. 5:23-CV-101, 2023 WL 5624067, at *1, 3 (N.D. W. Va. Aug. 23, 2023).

[63] *Id.*

[64] *See* Joseph A. Schremmer, *Getting Past Possession: Subsurface Property Disputes as Nuisances*, 95 WASH. L. REV. 315, 373–75 (2020) (discussing carbon migration as a nuisance or trespass).

[65] Wyoming, which has primacy over the Class VI program, has imposed additional requirements on permit holders, including the obligation to post financial assurance for any damage

require long-term monitoring of the carbon storage complex[66] and call on the permit holder to perform "corrective action" on any and all "penetrations" of the complex, which could cause leakage.[67] Penetrations include wellbores of any kind, even plugged and abandoned wellbores, and corrective action may consist of plugging or replugging inactive wells and reinforcing active wellbores.[68]

The unique financing structure of sequestration projects also militates against allowing wellbore penetrations. The federal 45Q tax credit, which is the economic foundation of most projects, requires taxpayers to refund to the IRS any tax credits received for carbon that escapes from the storage complex.[69] California also offers a tax credit for sequestration, the Low Carbon Fuel Standards (LCFS) tax credit, which requires "proof that there is a binding agreement among relevant parties that drilling or extraction that penetrate the storage complex are prohibited to ensure public safety and the permanence of the stored CO_2."[70] Sequestration projects nearly always depend on one or both of these tax credits, bolstering the need to avoid penetrations of the storage formation by oil or gas wells.

c. Occupying Pore Space

Perhaps the most direct conflict between these two subsurface activities will occur within pore space itself. The disputes are readily imaginable. A carbon sequestration project starts to inject carbon into a saline aquifer where an oil and gas operator has been injecting produced water for disposal (or vice versa), or an oil and gas developer sues to enjoin a sequestration project from injecting into a formation that might produce oil or gas. The crux of the problem is that carbon sequestration, both by the nature of the activity and the requirements of environmental and tax laws, precludes use of the formation for other purposes (like water disposal, oil and gas production, or secondary and enhanced recovery). These other activities, in turn may

that may result to mineral interest from the storage complex, and demonstrate that the "discharge of water will not degrade or decrease the availability of mineral resources, including oil and gas." WYO. RULES AND REGS. 020.0011.24 § 26 (2023); WYO. RULES AND REGS. 020.0011.8 § 6 (2023).

[66] 40 C.F.R. § 146.90 (2011).

[67] *Id.* § 146.84(c)(2) & (d).

[68] ENV'T PROT. AGENCY, UNDERGROUND INJECTION CONTROL (UIC) PROGRAM CLASS VI WELL AREA OF REVIEW EVALUATION AND CORRECTIVE ACTION GUIDANCE 65–66 (2013).

[69] 26 U.S.C. § 45Q.

[70] CAL. CODE REGS. tit. 17, § 95490(b)(1) (2020); CAL. AIR RES. BD., CARBON CAPTURE AND SEQUESTRATION PROTOCOL UNDER THE LOW CARBON FUEL STANDARD 119 (2018).

preclude future use of the formation for sequestration. This concern seems to be behind recent litigation brought by landowners against oil and gas lessees for injecting produced water into underlying pore space without paying compensation.[71]

3. Conflicts over Subsurface Exploration

Both carbon sequestration and mineral development require information about subsurface geology, and they must explore the subsurface to get it. Both are looking for the same information about porosity, permeability, stratigraphy, lithology, and the like.[72] There are many techniques for investigating these qualities of the subsurface. Drilling wells, for production or disposal, or purely for exploration, produces substantial data from rock cuttings, well logs, core samples, and drill stem tests.[73] A key exploration method is three-dimensional seismic surveying. Using large "thumper" trucks that send seismic vibrations into the earth and listening devices called "geophones" to record the reflections of those vibrations, 3D seismic can reveal the locations, structures, and other characteristics of subsurface rock formations.[74]

Disputes may arise between mineral and sequestration developers as well as between these developers and owners of the surface where seismic surveying takes place. Between developers, the struggle revolves around access to and use of the information obtained. Until the advent of carbon sequestration, there was little reason for a landowner to explore the subsurface; only mineral developers were interested in subsurface geology.[75] In a world where surface or pore space owners might conduct geological exploration, the owner of mineral rights in a tract of land needs to worry that other explorers may learn information bearing on the value of the oil and gas.[76] Use or publication of that information could deprive the oil and gas

[71] *See* Burlington Res. Oil & Gas Co. v. Lang & Sons Inc., 259 P.3d 766 (Mont. 2011); Mosser v. Denbury Res., Inc., 898 N.W.2d 406 (N.D. 2017); Cont'l Res., Inc. v. Fisher, No. 1:18-cv-181, 2021 U.S. Dist. LEXIS 227504, at *12–13 (D.N.D. Nov. 29, 2021).

[72] *See* LOWE ET AL., *supra* note 15, at 28–34.

[73] *Id.* at 34–42.

[74] *Id.* at 28–34.

[75] Owen L. Anderson, *Geophysical Trespass Revisited*, 5 TEX. WESLEYAN L. REV. 137, 146–50 (1999).

[76] *See, e.g.*, Grynberg v. City of Northglenn, 739 P.2d 230, 234–35 (Colo. 1987) (en banc) (involving depreciation of a mineral estate by publication of geological information).

owner of certain benefits of its property.[77] As it relates to the owner of the surface, seismic surveying often damages crops and even springs of water, leading to conflicts that have brewed between surface and oil and gas interests for decades.[78]

B. Classifying the Clashing Property Interests

How the common law treats a carbon sequestration developer, mineral owner, or surface owner locked in one of the conflicts depicted above depends how it classifies their legal relationship. This, in turn, depends on how the law classifies each party's property interest in the shared land. For convenience, I will label the three dominant types of legal relationships that may exist using the following terms, which may be familiar to lawyers but are largely arbitrary: (i) split estates, (ii) competing easements, and (iii) coequal estates. Following a bit of background discussion, the next three subparts explain how each of these classifications arises based on how rights in the pore space of land are held by the parties.

Imagine a person who owns the entire, undivided fee simple absolute in a tract of land. That person owns the surface of the land as well as all underlying rock layers, the pore space within them, and the fluids within the pore space—including oil and gas.[79] Such landowners ordinarily do not develop the minerals themselves but instead convey the rights to do so to others with the requisite expertise and capital. So, our hypothetical landowner is likely to transfer the oil and gas development rights to a person in the business of exploration and production. This conveyance will probably take one of two forms. It will either be a conveyance of freehold title to the oil and gas, and perhaps other minerals, or a lease of the oil, gas, and other minerals. In fact, such an "oil and gas lease" itself conveys a defeasible freehold interest in the minerals rather than a true leasehold. In either case, the transferee (often described here as the "mineral tenant") takes a present possessory freehold estate in the oil, gas, and other minerals.[80] The transferee's "severed" estate in the minerals enjoys, by implication, if not

[77] *Id.*

[78] *See* Hunt Oil Co. v. Kerbaugh, 283 N.W.2d 131, 133 (N.D. 1979) (involving damage to a natural spring by seismic operations).

[79] This follows from the *ad coelum* maxim, which means "he who owns the soil owns also to the sky and to the depths." *Ad Coelum Doctrine*, BLACK'S LAW DICTIONARY (11th ed. 2019).

[80] 1 PATRICK H. MARTIN & BRUCE M. KRAMER, WILLIAMS & MEYERS OIL & GAS LAW § 202.2 (2023).

expressly in the conveyance, an easement in the estate from which it was created to use the land to develop the minerals.[81]

Our hypothetical landowner still owns every element of the land except the right to develop the oil and gas, subject to the mineral easement. This ownership is usually called a "surface estate" and it includes the pore space underlying the land and into which carbon might be injected for sequestration.[82] If the holder of the present possessory interest in the surface estate (often described here as the "surface tenant") wants to use the pore space for carbon sequestration, there are multiple legal pathways by which to do so. Each pathway leads to one of the three types of legal relationships with the mineral tenant that were introduced earlier: split estates, competing easements, or coequal estates.

1. Split Estates

The surface owner might simply conduct carbon sequestration itself by drilling an injection well on the land. Were the surface owner to do so, his or her rights to use the surface, subsurface, and pore space would be correlative with the easement rights of the severed mineral estate to also do so. This type of correlative legal relationship is that of "split estates": a surface estate and a mineral estate of equal dignity in the same land.[83]

More likely, however, the surface owner would assign the rights to conduct carbon sequestration to another person that, with greater expertise and capital, is arranging a large-scale sequestration project. Our surface owner will almost certainly need to do so because carbon sequestration projects require many thousands of acres of land.[84] The surface owner might convey the sequestration rights through grant of a leasehold interest in the surface estate to the third-party developer, retaining a reversion in the surface estate. Here, the lessee would step into the shoes of the lessor and, as a surface tenant, enjoy present possession of the surface estate much as the lessee under

[81] Callahan v. Martin, 43 P.2d 788, 796 (Cal. 1935); Ramey v. Stephney, 173 P. 72, 73 (Okla. 1918).

[82] *See* Lightning Oil Co. v. Anadarko E&P Onshore, LLC, 520 S.W.3d 39, 50–51 (Tex. 2017).

[83] *See infra* Part III.

[84] *See* James Robert Zadick, *The Public Pore Space: Enabling Carbon Capture and Sequestration by Reconceptualizing Subsurface Property Rights*, 36 WM. & MARY ENV'T L. & POL'Y REV. 257, 269 (2011).

an agricultural lease or wind or solar lease does.[85] The surface tenant's relationship with the severed mineral owner would thus be one of split estates.[86]

2. Competing Easements

A surface owner might instead grant an easement in the land for the purpose of sequestering carbon dioxide in its pore space. Unlike a lease, an easement grants only a nonpossessory right to use the surface owner's property for specified purposes.[87] Consequently, the easement holder does not step into the shoes of the surface owner into a split estate relationship with the severed mineral owner. Instead, the grantee takes an easement in the land alongside the mineral owner's easement for mineral development, creating a relationship of competing easements.

An easement is a logical property interest for this purpose because most tracts of land in a sequestration project are not needed for locating and drilling wells or ancillary surface facilities. The only entitlement a sequestration project needs in most tracts would be the right to allow carbon that was injected elsewhere to migrate into the pore space of the tract and remain there permanently. An easement could certainly also grant rights to use the land's surface for various purposes, perhaps even including drilling wells. More likely, however, an easement would only permit use of the subsurface,[88] or specified formations in the subsurface,[89] for sequestering migrating carbon. In either case, the result would be a surface estate that is subject to both a sequestration easement and the easement of a severed mineral estate.

3. Severed Coequal Estates

Finally, the surface owner might instead attempt to convey to a third party a separate freehold estate in the pore space of the land or within specific

[85] Ernest E. Smith & Becky H. Diffen, *Winds of Change: The Creation of Wind Law*, 5 TEX. J. OIL GAS & ENERGY L. 165, 181–82 (2009).

[86] In this regard, the transaction raises issues like those involved between a wind or solar lessee and a severed mineral owner or lessee. *See id.* at 181–86.

[87] *See* RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 1.2 (AM. L. INST. 2000) (defining easements).

[88] This would be a blanket or "floating" easement. *See, e.g.*, Evans v. Bd. of Cnty. Comm'rs, 97 P.3d 697, 702–03 (Utah Ct. App. 2004).

[89] This would be a specific easement. *See, e.g.*, Brown v. ConocoPhillips Pipeline Co., 271 P.3d 1269, 1271 (Kan. Ct. App. 2011).

subsurface strata, much as landowners convey separate freehold estates in oil, gas, and other minerals.[90] Landowners in West Texas have done this with the wind rights overlying their land. The question that has lingered around wind estate severance, and which would likely cloud conveyances of severed sequestration or pore space estates, is whether common law courts would recognize wind or pore space as an eligible object of freehold ownership.[91] One state, North Dakota, expressly precludes severance of an estate in pore space.[92] Regardless, if a severed estate in pore space were to be lawfully conveyed, it would result in a subsurface estate that is equal in legal status with a severed mineral estate and the surface estate. The holders of these freehold estates would thus find themselves enmeshed in a relationship of coequal estates.

Severance of a freehold estate in pore space differs from the grant of a leasehold interest. A leasehold passes present possession but not seizin, which the lessor retains along with a reversion in the fee.[93] A leasehold continues for a period of months or years, whereas a freehold estate may continue perpetually, subject to the grantor's power to place a special limitation or condition on the grant.[94] Importantly for present purposes, the owner of a freehold estate in sequestration rights does not step into the grantor's split-estates relationship with a severed mineral estate, but instead owns a completely separate estate on the equal footing with the surface and mineral estates. As Part V demonstrates, the difference is consequential.

There would be more than one way to sever an estate in the sequestration rights in land. Two basic methods readily appear: severance of rights to pore space alone ("pore space severance") and severance of all rights in particular subsurface formations ("depth severance"). In a pore space severance, the surface owner might simply convey all the pore space in and under the land or in specified depths or formations (or reserve it from a conveyance of the rest of the land). In a depth severance, the surface owner would sever all rights in and to not only the pore space, but also the rock structures and fluid substances in a defined stratum or strata, like a named formation or

[90] This might also be done by reservation. *Cf.* 1 EUGENE KUNTZ, A TREATISE ON THE LAW OF OIL & GAS, §§ 3.1, 15.9 (MB, rev. ed. 2023).

[91] Smith & Diffen, *supra* note 85, at 179–82.

[92] N.D. CENT. CODE § 47-31-05 (2009).

[93] *Lease*, BLACK'S LAW DICTIONARY (11th ed. 2019).

[94] 52 C.J.S. *Landlord & Tenant* § 29 (2023); *Freehold Estate*, BOUVIER LAW DICTIONARY (Desk ed. 2012).

formations or a specified interval of depth.[95] Either method would, if so recognized, create a coequal estate in the subsurface.

III. SPLIT ESTATES

Much has been written about the legal relationship between split mineral and surface estates.[96] Several leading scholars have criticized the traditional framework as overly formalistic or unfair to surface owners.[97] The various doubts these scholars express about the common law of split estates often presage their advocacy for legislative reform.[98] The common law framework is indeed formal, but this very virtue makes it useable. What follows is a recapitulation of the law that tries to take the forms seriously, rather than as meaningless formalisms or, worse still, as "masks" obscuring the policy or ideological motivations of the courts that apply them, as others have done.[99]

A. The Doctrinal Framework

"Split estates" result when a landowner, exercising a power recognized in every American jurisdiction, separates ownership of mineral substances under the land, such as oil and natural gas, from ownership of the land itself.[100] This may be done either by conveyance or reservation. In either case, the law recognizes a separate, freehold estate in the minerals.[101]

Unless modified by the express language of the grant or reservation, a mineral estate is understood to consist of several rights, powers, and privileges, known as the "incidents" or "essential attributes" of a mineral estate.[102] Central to these attributes is the right to develop the mineral estate

[95] For discussion of depth severances, *see, e.g.*, Tim George et al., *A Survey of Depth Severance Issues and Related Drafting Considerations*, 63 ROCKY MTN. MIN. L. INST. 30-1 (2017).

[96] Kramer, *Multiple Surface Uses*, *supra* note 36, at 640 n.1.

[97] *See, e.g.*, *id.* at 312; Kramer, *Reciprocal Accommodation*, *supra* note 25, at 52–53; Burney, *supra* note 33, at 55–59; David E. Pierce, *Toward a Functional Mineral Jurisprudence for Kansas*, 27 WASHBURN L.J. 223, 241–42 (1988).

[98] *See, e.g.*, Kramer, *Reciprocal Accommodation*, *supra* note 25, at 99; Burney, *supra* note 33, at 72.

[99] *See* Burney, *supra* note 33, at 11.

[100] Righetti, *supra* note 35, at 640–41.

[101] The one exception is that Louisiana's civil law recognizes a mineral servitude, which may extinguish through prescription if not used for ten years. LA. STAT. ANN. § 31:21 (1975); LA. STAT. ANN. § 31:27 (1975).

[102] Altman v. Blake, 712 S.W.2d 117, 118 (Tex. 1986).

and the power to lease the mineral estate to third parties to develop.[103] According to an old common law maxim that "when the law doth give any thing to one, it giveth impliedly whatsoever is necessary for enjoying the same,"[104] the development right necessarily entails an implied right to access, use, occupy, and consume the overlying surface estate. This includes the right to use elements that occur below the surface, like pore space and substances contained therein.[105] The surface estate typically retains all other rights, powers, and privileges in the land.[106] Crucially, this includes title to and possession of the surface of the land as well as the right to use and the power to lease subsurface pore space, subject to the use rights of the mineral estate.[107]

The mineral estate's right to access, use, occupy, and consume the surface estate is in the nature of an easement and is implied as an incident of the mineral estate if not expressed in the organic instrument.[108] As with easements generally, the estate benefited by the easement (the mineral estate) is dominant over the estate that the easement burdens (the surface estate) for all purposes within the easement's scope.[109] Dominance means only that the easement holder enjoys the right to use the servient estate, free from

[103] *Id.*; 1 KUNTZ, *supra* note 90, § 3.2[a].

[104] John. S. Lowe, *The Easement of the Mineral Estate for Surface Use: An Analysis of its Rationale, Status, and Prospects*, 39 ROCKY MTN. MIN. L. INST. 4-1, § 4.02 (1993); 2 WILLIAM BLACKSTONE, COMMENTARIES ON THE LAWS OF ENGLAND *36. It could be said that the reason for the principle derives from the likely intent of the parties to the severance of the mineral interest. Callahan v. Martin, 43 P.2d 788, 796 (Cal. 1935) ("One who grants a thing is presumed to grant also whatever is essential to its use").

[105] Cowan v. Hardeman, 26 Tex. 217, 222 (1862); B.L. McFarland Drilling Contractor v. Connell, 344 S.W.2d 493, 496–97 (Tex. App.—El Paso, writ granted), *vacated*, 162 Tex. 345 (1961) (holding that a mineral tenant may consume subsurface minerals).

[106] *See* Lightning Oil Co. v. Anadarko Onshore E&P, LLC, 520 S.W.3d 39, 44 (Tex. 2017).

[107] *Id.*; Joseph A. Schremmer, *A Unifying Doctrine of Subsurface Property Rights*, 46 HARV. ENV'T L. REV. 525, 560–63 (2022).

[108] *See Callahan*, 43 P.2d at 796.

[109] Warren Petroleum Corp. v. Monzingo, 304 S.W.2d 362, 363 (Tex. 1957); Harris v. Currie, 176 S.W.2d 302, 305 (Tex. 1943). The analysis in this Part assumes that the surface tenant's rights are subordinate to the mineral estate's surface-use easement. It should be noted, however, that where a tenant (even an agricultural tenant) takes leasehold title to the surface estate prior to severance of a mineral interest, the rights of the mineral estate are generally subordinate to the surface tenant's rights, for the duration of the surface lease. Smith & Diffen, *supra* note 85, at 181–82. *Contra* Ball v. Dillard, 602 S.W.2d 521 (Tex. 1980). However, it has been held that the surface tenant cannot exclude the mineral tenant from the premises altogether. Stanolind Oil & Gas Co. v. Wimberly, 181 S.W.2d 942, 944 (Tex. App.—El Paso 1944, no writ).

interferences by the servient tenant, but only as authorized by the scope of the easement.[110] The dominant estate does not take precedence over the servient estate for any other purpose. On the contrary, the dominant estate is duty bound to avoid any surface activities that would exceed the scope of its easement rights.[111] The burdened estate is "servient" only because it bears the corresponding duty not to interfere with the dominant estate's authorized uses.[112] The servient tenant is otherwise permitted to possess and use the servient estate, free from interferences by the dominant tenant acting outside the authority granted by its easement.

The corresponding use rights and non-interference duties running between the parties to an easement make the dominant–servient relationship correlative in nature. Each estate is entitled to use the same land concurrently with "due regard" for the concurrent rights of the other to do likewise.[113] The duty to act with "due regard" for the rights of the other estate is a hollow truism unless each estate's rights are ascertainable; the principle does not, itself, purport to define the parties' respective rights. The substance of each party's rights is instead defined by the scope of the dominant estate's easement, which in turn is circumscribed by the terms of the easement's creation.[114]

The scope of the easement is therefore the key to defining what constitutes "due regard" for the other estate's rights. To the extent the instrument creating the mineral estate defines the scope of the easement, both in terms of what uses are permitted and the standard by which excessive use is to be measured, the instrument controls what regard is due both sides.[115] Otherwise, the law implies the terms of the easement's scope. It does so, again, according to the maxim that the law implies whatever ancillary rights are necessary for enjoying a right expressly granted.[116] The implied easement accordingly permits use of the servient estate to the extent "reasonably

[110] RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.10 (AM. L. INST. 2000).

[111] Eternal Cemetery Corp. v. Tammen, 324 S.W.2d 562, 564 (Tex. App.—Fort Worth 1959, writ ref'd n.r.e.).

[112] Cassinos v. Union Oil Co., 18 Cal. Rptr. 2d 574, 579 (Cal. Ct. App. 1993) (citing Tidewater Oil Co. v. Jackson, 320 F.2d 157, 163 (10th Cir. 1963)); *Tammen*, 324 S.W.2d at 564.

[113] Coyote Lake Ranch, LLC v. City of Lubbock, 498 S.W.3d 53, 60 (Tex. 2016).

[114] Oil and gas leases commonly describe the scope of the lessee's easement, whereas it is uncommon in mineral deeds. Kramer, *Multiple Surface Uses*, *supra* note 36, at 275–76.

[115] Texaco, Inc. v. Faris, 413 S.W.2d 147, 149–50 (Tex. App.—El Paso 1967, writ ref'd n.r.e.).

[116] Callahan v. Martin, 43 P.2d 788, 796 (Cal. 1935) (en banc) (per curiam).

necessary or convenient" for enjoying the mineral estate.[117] Thus, "reasonable necessity and convenience" is the standard measuring the scope of a dominant estate's rights, and by implication the servient estate's rights, under an implied easement.

The standard of reasonable necessity and convenience sets limits on the ends and means for which the easement may be used. Regarding ends, it requires that all uses be for the purpose of enjoying the underlying mineral estate. The standard prohibits use of the servient estate for any other purpose, including uses for the enjoyment of minerals underlying other lands not part of the same mineral estate.[118] Moreover, the standard permits only uses that are reasonably necessary for such purpose. Not every use that would be convenient is permitted. Rather, only uses of the servient estate that are reasonably necessary to the enjoyment of the underlying mineral estate are authorized, but those authorized uses may be pursued in a manner that is convenient to mineral tenant..[119]

The reasonable necessity standard also sets a limit on the manner and means of using the servient estate. Surface activities must be conducted in a reasonable manner, which necessarily excludes excessive or negligent conduct. Thus, even an activity that is necessary for enjoyment of the minerals, such as drilling a well, may exceed the scope of the dominant estate's rights and breach its corresponding duty to the servient estate if not conducted in a reasonable manner. For example, the mineral tenant may not build a wellpad on one hundred acres when ten acres would do.[120]

Within this framework, damage occasioned by the mineral estate to the surface estate is privileged if committed within the scope of the mineral estate's easement: it is *damnum absque injuria* (damage without legal injury).[121] Damage that results from unauthorized, *ultra vires* actions of the mineral estate, which disregard the surface estate's corelative rights—is actionable under multiple theories, including negligence and excessive user

[117] 1 KRAMER & MARTIN, *supra* note 80, § 218; *e.g.*, Harris v. Currie, 176 S.W.2d 302, 305 (Tex. 1943).

[118] *See* David E. Pierce, *Oil & Gas Easements*, 33 ENERGY & MIN. L. INST. 318, 330–31 (2012) (discussing pooling); Joseph A. Schremmer, *Crystal Gazing: Foretelling the Next Decade in Oil and Gas Law*, 66 ROCKY MTN. MIN. L. INST. 5-1, 5-29–33 (2020) (same).

[119] Marvin v. Brewster Iron Mining Co., 55 N.Y. 538, 552–53 (1874).

[120] *See* Vest v. Exxon Corp., 752 F.2d 959, 960 (5th Cir. 1985) ("From the viewpoint of the surface owner when mineral operations are conducted all across his land, interfering constantly with his ranching or farming, the mineral use becomes unreasonable.").

[121] Marland Oil Co. v. Hubbard, 34 P.2d 278, 279 (Okla. 1934).

or abuse of easement.[122] Inversely, the surface tenant may use the surface, even in ways that affect the mineral easement, but is liable to the mineral tenant for actions that unreasonably interfere with (i.e., disregard) the rights of the mineral easement.

To summarize, reasonable necessity is the measure both of the dominant estate's rights to use the servient estate and of what regard is due to the servient estate's correlative rights. Due regard and reasonable necessity are integrated into a system of correlative rights; they are not separate, alternative tests. This system, however, does operate on basically two different kinds of factual problems, for which I will borrow labels originally used to describe a different interpretation by Professor Bruce Kramer.[123] "Unidimensional" problems arise when one tenant's (usually the dominant tenant's) unilateral actions damage the property of the other estate. "Multidimensional" problems, in contrast, happen when both estates pursue actions that conflict with each other, as when a mineral tenant installs pumping units that obstruct the surface tenant's walking irrigator.[124]

1. Unidimensional Problems

Unidimensional problems raise a relatively simple question: was the dominant tenant's use within the scope of its easement? An answer in the affirmative means the dominant tenant exercised its rights with due regard to the servient estate and any damage is *damnum absque injuria*.[125] This is generally a question of fact to be decided in the practical judgment of a trier of fact.[126] When the easement is implied, this question calls on the trier of fact to exercise its practical judgment as to whether the act was reasonably

[122] 1 MARTIN & KRAMER, *supra* note 80, § 218.8; Lowe, *supra* note 104, § 4.03.

[123] Professor Bruce Kramer sorts jurisdictions into those that follow the "unidimensional" approach, which applies only the reasonably necessary standard, and those that follow the "multidimensional" approach, which applies instead the due regard standard and the accommodation doctrine. Courts do not seem to pick and choose between the two standards but rather view them as integrated. *See, e.g.*, Gulf Prod. Co. v. Cont'l Oil Co., 132 S.W.2d 553, 562 (Tex. 1939); Getty Oil Co. v. Jones, 470 S.W.2d 618, 622–27 (Tex. 1971); Brown v. Lundell, 344 S.W.2d 863, 866 (Tex. 1961). My use of "unidimensional" and "multidimensional" to describe two different categories of *problems* rather than two legal standards is nonetheless inspired by Professor Kramer's work.

[124] *See Jones*, 470 S.W.2d at 621.

[125] *Hubbard*, 34 P.2d at 279.

[126] Page Keeton & Lee Jones, Jr., *Tort Liability and the Oil and Gas Industry*, 35 TEX. L. REV. 1, 4 (1956).

necessary to development of the mineral estate.[127] Unidimensional cases thus depend entirely on the dominant tenant's compliance with the easement, which often comes down to what is reasonable.

As the Fifth Circuit Court of Appeals observed, surface and mineral owners are likely to differ over what constitutes a reasonable use of the surface for mineral development.[128] Where a reasonable difference of opinion exists, it is properly the role of a jury to decide, as a matter of fact, whether the mineral tenant's use was reasonable and thus within its rights.[129] As with any jury question, myriad relevant considerations might go into a question of reasonableness. These might include what practices are customary in the industry,[130] the knowledge and state of mind of the mineral tenant,[131] and the feasibility of alternatives available to the mineral tenant,[132] to name a few.

In rendering its practical judgment, the trier of fact's analysis is bounded, or structured, by certain legal principles defining the limits of reasonable necessity. These legal limits include the rule that uses must only benefit the minerals underlying the servient estate, and the rule that uses that are convenient to the dominant tenant but are not necessary are *ultra vires*. There are many such legal boundaries expressed in caselaw.[133] Although the ultimate question of reasonableness might be a matter of wide-ranging practical judgment in any given case, these precedents serve to narrow the permissible outcomes and also help direct the parties' ex ante decision-making.

2. Multidimensional Problems

a. In General

Multidimensional problems arise when both estates want to use the land for conflicting purposes. Multidimensional cases necessarily involve the actions or plans of both estates. Whereas in the typical unidimensional case,

[127] *Id.*; Thompson v. Andover Oil Co., 691 P.2d 77, 82 (Okla. Civ. App. 1984).

[128] Vest v. Exxon Corp., 752 F.2d 959, 960–61 (5th Cir. 1985).

[129] Keeton & Jones, *supra* note 126, at 4, 17.

[130] Grimes v. Goodman Drilling Co., 216 S.W. 202, 204 (Tex. App.—Fort Worth 1919, writ dism'd w.o.j.)

[131] Keeton & Jones, *supra* note 126, at 14.

[132] *See id.* at 12.

[133] *See* Christopher M. Alspach, *Surface Use by the Mineral Owner: How Much Accommodation Is Required under Current Oil and Gas Law*, 55 OKLA. L. REV. 89, 105–18 (2002).

the question involves whether one tenant has acted within the scope of its rights, the typical multidimensional case involves a question of which of the parties' competing activities should receive priority.[134] While conflict-of-uses cases have this two-dimensional character, the principles governing the correlative relationship of the dominant to the servient estate are fundamentally the same. However, the difficulty in applying these principles is greater in multidimensional cases.

Ordinarily, priority belongs to the dominant estate except where the servient tenant can demonstrate that its preexisting or planned use is entitled to priority under the accommodation doctrine.[135] The accommodation doctrine is a legal test that gives form to the principle of due regard in multidimensional situations. The doctrine requires the mineral estate to find an alternative means to its desired end when reasonable alternatives exist, enabling the surface owner to maintain its existing use of the surface, for which it has no alternative.[136] Both the due regard principle and the concept of reasonableness underpinning the scope of the mineral easement support requiring the dominant mineral tenant to accommodate the servient tenant where the accommodation would enable both owners to use the land. It is hardly reasonable to permit a mineral tenant to divest the surface tenant of an ongoing enterprise when a perfectly reasonable alternative exists to meet the mineral tenant's needs. Thus, by preventing the mineral estate from needlessly dominating the surface estate's use of the land, the accommodation doctrine enforces the due regard principle and also helps to maximize concurrent land uses. Nevertheless, the accommodation doctrine must be properly cabined so as not to diminish the regard that is due to the dominant estate. If no reasonable alternative exists for the mineral tenant, and only one party's use can occur, the dominant estate must prevail. The alternative would mean depriving the dominant estate the enjoyment of its property.

[134] *See, e.g.*, Valence Operating Co. v. Tex. Genco, LP, 255 S.W.3d 210, 218 (Tex. App.—Waco 2008, no pet.).

[135] Plans must be part of the design of an overall project already in operation, *id.*, or known to the mineral tenant. Diamond Shamrock Corp. v. Phillips, 511 S.W.2d 160, 163 (Ark. 1974).

[136] Getty Oil Co. v. Jones, 470 S.W.2d 618, 622 (Tex. 1971); *see also* Tarrant Cnty. Water Control & Improv. Dist. No. 1 v. Haupt, Inc., 854 S.W.2d 909, 911 (Tex. 1993) (explaining that the accommodation doctrine is based on the "due regard" concept).

b. The Accommodation Doctrine

The elements of the accommodation doctrine that have developed in caselaw achieve these purposes. Under the accommodation doctrine, the dominant estate must pursue an alternative to accommodate the surface use of the servient estate only if (i) there is an existing use by the servient estate, (ii) that would be substantially impaired by the dominant's estate's intended use, and (iii) there are alternative practices available to the dominant estate that are usual, customary, and reasonable.[137] Although some courts apply the test so as to balance the interests of the dominant and servient tenants when their uses conflict,[138] the accommodation doctrine is not a balancing test. To balance the parties' interests is to disregard the priority of the dominant estate, transferring that property right to the servient estate. Balancing also muddles the system of correlative rights and duties, making it a guessing game for a dominant or servient tenant to reason through how a court might order the rights of the parties.[139]

It becomes clear in applying these elements to concrete cases, as in the following section, that the accommodation doctrine tends to favor the first party to establish a surface use.[140] For the surface tenant to be entitled to accommodation, it must have established its use first. Inversely, if the surface tenant is the first mover in establishing a surface use, the mineral tenant may not disturb the surface use unless it interferes with its ability to enjoy the mineral estate.[141] Like any principle of temporal priority, this fact should incentivize diligent development of the land.

Courts have helpfully structured the application of the accommodation doctrine in the context of a burden-shifting framework. First, the surface tenant bears the burden of introducing evidence that the mineral tenant's actual or proposed conduct has or threatens to substantially impair an existing surface activity of the surface tenant. Second, if this prima facie showing is

[137] *Id.*

[138] *E.g.*, Hunt Oil Co. v. Kerbaugh, 283 N.W.2d 131, 137 (N.D. 1979). Of course, balancing of the equities may be appropriate when one party has requested equitable relief.

[139] *See* Schremmer, *supra* note 107, at 534–44 (criticizing balancing tests).

[140] Schremmer, *supra* note 118, at 5–29.

[141] *See* Lightning Oil Co. v. Anadarko E&P Onshore, LLC, 520 S.W.3d 39, 49–50 (Tex. 2017) (denying relief to mineral tenant because it did not show any concrete plans to drill where the surface tenant's wellbores would be located); Osage Nation *ex rel.* Osage Mins. Council v. Wind Cap. Grp., LLC, No. 11-CV-643-GKF-PJC, 2011 WL 6371384, at *9 (N.D. Okla. Dec. 20, 2011) (denying relief to a mineral tenant for failing to demonstrate that the surface tenant's wind farm conflicted with future drilling plans).

made, the burden of production shifts to the mineral tenant to furnish evidence that its actual or proposed surface conduct is reasonably necessary and convenient, i.e., within the scope of its easement. Third, if this burden is satisfied, the burden shifts again to the surface tenant to rebut the mineral tenant's evidence with evidence of its own that reasonable alternatives are or were available to the mineral tenant at the time of the alleged trespass that would enable both parties to make use of the surface.[142] The burden of persuasion ultimately rests with the surface tenant, so that it must persuade a jury by a preponderance of the evidence that a reasonable alternative is or was available to the mineral tenant.[143]

Each element of the accommodation doctrine requires practical judgment to apply. These judgments ultimately rest in the discretion of a jury.[144] Nevertheless, over decades, courts have developed a cluster of legal rules to structure these wide-ranging inquiries. As to the first element, juries must exercise judgment in determining whether the servient tenant is engaged in a preexisting, incompatible use with the dominant estate.[145] Caselaw has treated as preexisting plans to use the surface that are part of an overall plan of design of a larger project, if the larger project has been commenced,[146] as well as plans that the dominant tenant knew about before commencing its competing use.[147] The second element requires a jury to determine what constitutes an impairment of the servient tenant's preexisting use.[148] In this regard, *Merriman v. XTO Energy, Inc.* held the servient estate must show complete preclusion of its preexisting use and a complete lack of reasonable alternatives.[149]

The third element calls on a jury to decide whether there is a reasonable alternative to the dominant tenant's use.[150] As with all questions of reasonableness, this inquiry is highly fact-specific and requires practical judgment, but courts once again have laid down specific rules that structure

[142] Bay v. Anadarko E&P Onshore, LLC, 912 F.3d 1249, 1257 (10th Cir. 2018); Gerrity Oil & Bas Corp. v. Magness, 946 P.2d 913, 933–34 (Colo. 1997).

[143] *Gerrity*, 946 P.2d at 933–34; Getty Oil Co. v. Jones, 470 S.W.2d 618, 623 (Tex. 1971).

[144] *Bay*, 912 F.3d at 1257; Keeton & Jones, *supra* note 126, at 4.

[145] *Jones*, 470 S.W.2d at 622.

[146] Valence Operating Co. v. Tex. Genco, LP, 255 S.W.3d 210, 218 (Tex. App.—Waco 2008, no pet.).

[147] Diamond Shamrock Corp. v. Phillips, 511 S.W.2d 160, 162–63 (Ark. 1974).

[148] *Jones*, 470 S.W.2d at 622.

[149] 407 S.W.3d 244, 249 (Tex. 2013).

[150] *Jones*, 470 S.W.2d at 622.

the inquiry.[151] One significant decision, *Sun Oil Co. v. Whitaker*, holds that to be considered reasonable, any alternative method to the dominant tenant's preferred use must be available on or within the servient estate.[152] Additionally, multiple courts have held that unconventional directional drilling may be a reasonable alternative.[153] These decisions not only structure the decision-making of courts and juries, they also provide ex ante guidance to surface and mineral tenants (and their counsel) in planning their conduct and resolving their disputes privately.

B. Applying the Doctrine to Guide Specific Conflicts

This section sketches how the doctrinal framework coordinating split estates guides the analysis of disputes in concurrent carbon sequestration and mineral development. Although these principles cannot definitively resolve every dispute that might arise, this section hopes to show the significant degree to which the doctrinal framework helps to order thinking and points toward reasonable resolutions of concurrent-development operations.

1. Use of the Surface

Of the disputes likely to arise between a surface tenant conducting carbon sequestration and a mineral tenant exploiting the oil and gas in the same land, those of the multidimensional variety will be the most difficult. Unidimensional problems ask whether the tenant who acted did so within the scope of its correlative rights. This often will depend on whether the action and resulting damage was reasonable—a question that parties can resolve for themselves or take to a jury. In its operation, the reasonableness standard will naturally cause easement holders to consider their surface uses against that standard and to govern themselves according to it. It is important to note as a practical matter that state-specific surface damage acts will apply to the mineral tenant's use and occupation of, and damage caused to, the land.[154]

[151] *See id.*; Humble Oil & Ref. Co. v. Williams, 420 S.W.2d 133, 134–35 (Tex. 1967).

[152] 483 S.W.2d 808, 812 (Tex. 1972).

[153] Bay v. Anadarko E&P Onshore, LLC, 912 F.3d 1249, 1262 (10th Cir. 2018); Tex. Genco, LP v. Valence Operating Co., 187 S.W.3d 118, 124–25 (Tex. App.—Waco 2006, pet. denied). For unconventional drilling methods to constitute a reasonable alternative, there must be some evidence to establish that they are economically viable. Tarrant Cnty. Water Control & Improv. Dist. No. 1 v. Haupt, Inc., 854 S.W.2d 909, 913 (Tex. 1993).

[154] *See generally* Ronald W. Polston, *Redefining the Relationship Between the Surface Owner and the Mineral Developer*, 12 E. MIN. L. FOUND. § 22.01 (1991).

These acts may require compensation for any and all damage and impose on the mineral tenant duties to give advanced notice of any surface activities and to obtain a surface use agreement with the surface tenant.[155] These statutory enactments, however, do not apply to surface tenants in their use of the surface, for instance, for drilling a carbon sequestration well.[156]

Multidimensional disputes are more complex. In general, they will tend to pose the surface and mineral tenants in a race, with the first to make concrete plans to commence a surface facility or operation likely receiving the advantage.[157] Let us consider two hypothetical multidimensional disputes to demonstrate how the formal doctrines would guide thinking about them. Suppose first that a surface tenant and a mineral tenant each wishes to locate a well—the former for carbon injection and the latter to produce oil or gas—in overlapping locations on the surface of the land. Suppose second that the mineral tenant wishes to use water from an aquifer under the land that the surface tenant wishes to use for its own drilling and completion purposes.[158]

The surface tenant's case for accommodation is strongest when it is the first to establish its surface use—locating its well and using the aquifer's contents—since the accommodation doctrine protects the surface estate's preexisting uses from preclusion by the mineral estate. The first question for the surface tenant is when it has adequately established its drilling operations. Actually locating a wellsite or commencing the use of water before the mineral tenant acts would qualify the uses as preexisting. Merely planning for the location and use of water might establish these operations if they are either known to the mineral tenant[159] or are part of an overall design of a sequestration project that the surface tenant previously commenced.[160]

The surface tenant will next need to consider whether the mineral tenant's well or use of water from the same aquifer would completely preclude the surface tenant's continuing use, as the doctrine requires, or merely impair it in some way.[161] If the surface tenant may continue to pump from the aquifer even after the mineral tenant were to use it, even if it must pump at lower

[155] *Id.* § 22.02[1], 22.02[3].

[156] *Id.* § 22.01.

[157] Schremmer, *supra* note 118, at 5–29.

[158] Note that for purposes of this example, I assume the groundwater is the property of the surface estate and eschew consideration of state-specific groundwater laws to the contrary.

[159] Diamond Shamrock Corp. v. Phillips, 511 S.W.2d 160, 162–64 (Ark. 1974).

[160] Valence Operating Co. v. Tex. Genco, LP, 255 S.W.3d 210, 218 (Tex. App.—Waco 2008, no pet.).

[161] Merriman v. XTO Energy, Inc., 407 S.W.3d 244, 249 (Tex. 2013).

rates or higher expense, the mineral tenant's dominant easement entitles it to first priority in the use of the water. Moreover, if there is water enough for only one of the parties to draw from the aquifer, priority again goes to the mineral tenant if there is no other water source on the premises.[162]

The mineral tenant need only accommodate the surface tenant's drilling location if it can find other workable locations on the premises. It is not enough that the surface tenant's wellpad reduces the available locations for an oil and gas well. The mineral tenant must show that it had prior bona fide plans to drill in the very location or that it lacks anywhere else on the land to drill.[163] It must demonstrate actual conflict with its own plans for the surface.[164] The mineral tenant will often have alternative drilling locations. This is partly because oil and gas wells may be drilled directionally or horizontally to reach bottom-hole locations from a variety or surface locations. Some courts have held these unconventional drilling options to be reasonable alternatives even though more expensive than vertical drilling.[165] This is a case-specific question. In any event, a mineral tenant need not drill from a surface location outside the boundaries of the servient estate, since it cannot be made to search for alternatives outside of the premises of the servient estate.[166]

If the roles were reversed, and the mineral tenant establishes its drilling location or water use first, the surface tenant would have no case for accommodation. The surface tenant will be left to use only whatever locations and groundwater remain after the mineral tenant's reasonable and convenient uses. The surface tenant's only relief would be through a cause of action for trespass or abuse of easement if the mineral tenant's wellpad or water use were to be excessive or unreasonable. Such is the consequence of being the servient estate, and it is one that could have been avoided by narrowing the scope of the mineral tenant's easement by appropriate drafting of the initial mineral severance.

[162] Sun Oil Co. v. Whitaker, 483 S.W.2d 808, 811–12 (Tex. 1972).

[163] Lightning Oil Co. v. Anadarko E&P Onshore, LLC, 520 S.W.3d 39, 49 (Tex. 2017); Lyle v. Midway Solar, LLC, 618 S.W.3d 857, 869 (Tex. App.—El Paso 2020, pet. denied).

[164] Osage Nation *ex rel.* Osage Mins. Council v. Wind Cap. Grp., LLC, No. 11-CV-643-GKF-PJC, 2011 WL 6371384, at *1–8 (N.D. Okla. Dec. 20, 2011).

[165] Bay v. Anadarko E&P Onshore, LLC, 912 F.3d 1249, 1262 (10th Cir. 2018); Tex. Genco, LP v. Valence Operating Co., 187 S.W.3d 118, 124–25 (Tex. App.—Waco 2006, no pet.).

[166] Sun Oil Co. v. Whitaker, 483 S.W.2d at 811–12.

2. Use of the Subsurface

Each of the situations depicted in this subsection is a kind of multidimensional problem. It is possible, nevertheless, for unidimensional problems to occur in the subsurface just as they do at the surface. The typical surface-level unidimensional problem involves unilateral action of the mineral tenant that damages the surface estate. This could also happen beneath the surface when drilling by the mineral tenant damages a reservoir that was otherwise suitable for sequestration. Where the mineral tenant damages the subsurface, liability turns on whether the drilling was reasonably necessary and conducted in a reasonable manner. If, alternatively, the surface tenant's drilling of a carbon injection well damages the mineral estate's chance at producing oil and gas, the question would be whether the interference was unreasonable. Additionally, to fully analyze subsurface unidimensional problems, one must determine the applicability of state surface damage acts to subsurface activities.[167]

a. Locating Wellbores in the Subsurface

Just as one party's surface facilities might obstruct the other's surface facilities, one party's wellbores in the subsurface may impede the other from drilling wherever it likes. What's more, one party's drilling might damage a subsurface reservoir in, or planned for, use by the other party.[168] Sometimes, one party's drilling raises both issues, as in *Lightning Oil Co. v. Anadarko E&P Onshore, LLC*.[169] The parties each held interests in a tract of land called the Briscoe Ranch.[170] Lightning held the mineral interest under an oil and gas lease, and Anadarko held a lease of the surface estate permitting it to drill several horizontal wellbores through the subsurface of the Ranch to access neighboring minerals.[171] Before Anadarko commenced drilling, Lightning sued for an injunction claiming that the proposed wellbores would trespass on Lightning's mineral estate.[172] *Lightning Oil* thus presents a paradigm

[167] Some enactments have been held to apply underground. Burlington Res. Oil & Gas Co., LP v. Lang & Sons Inc., 259 P.3d 766, 770 (Mont. 2011); Mosser v. Denbury Res., Inc., 898 N.W.2d 406, 415 (N.D. 2017).

[168] *See, e.g.*, Elliff v. Texon Drilling Co., 210 S.W.2d 558, 577–78 (Tex. 1948).

[169] 520 S.W.3d 39, 47 (Tex. 2017).

[170] *Id.* at 43.

[171] *Id.*

[172] *Id.*

example of a subsurface conflict between surface and mineral tenants each desiring to drill into the same portion of earth.

The court ruled first on Lightning's complaint that Anadarko's drilling would interfere with Lightning's ability to drill.[173] The court opined that "an unauthorized interference with the place where the minerals are located" by the surface tenant's drilling of a wellbore "constitutes a trespass as to the mineral estate *only if* the interference infringes on the mineral lessee's ability to exercise its rights."[174] Those rights consist of the fair chance to recover the oil and gas in place and the right to use the surface estate for that purpose.[175] Lightning's trespass claim failed this standard because it could not prove that it would suffer irreparable harm as a result of Anadarko's proposed wells.[176] The opinion explains that Lightning's rights would be protected by state regulations governing the spacing of wells and by the accommodation doctrine.[177]

Next, the court addressed Lightning's argument that Anadarko's wellbores would trespass on the mineral estate by "drilling through and extracting a quantum of minerals as part of that process."[178] In rejecting this argument, the court balanced "the relevant interests of Lightning and Anadarko" as well as "the interest of society and the interest of the oil and gas industry as a whole."[179] Finding that horizontal drilling from an offsetting tract is key to producing hard-to-reach minerals, the court held that the benefits of maximizing hydrocarbon recovery and reducing waste outweighed Lightning's interest in the loss of a small amount of minerals.[180]

Lightning Oil reached a defensible result on both claims, but the court's reasoning strays far from the doctrinal framework that justifies it. Anadarko, the surface tenant, was the first mover in the case by proposing to drill its horizontal wells. To establish that Anadarko's actions would breach its

[173] *Id.* at 49.

[174] *Id.* (emphasis added).

[175] *Id.* at 47 (quoting Coastal Oil & Gas Corp. v. Garza Energy Tr., 268 S.W.3d 1, 15 (Tex. 2008)).

[176] *Id.* at 49. It can be difficult to discern from the opinion whether Lightning's claim failed because it did not establish liability or because it failed to demonstrate entitlement to injunction as an equitable remedy. The court's use of "irreparable harm" suggests the latter, but overall the opinion seems best understood as holding Lightning failed to establish liability.

[177] *Id.* at 49–50.

[178] *Id.* at 50.

[179] *Id.*

[180] *Id.* at 50–51.

correlative duties to Lightning as the mineral tenant, Lightning would need to show that Anadarko's wells would unreasonably interfere with Lighting's use of the surface and subsurface to recover the underlying oil and gas. It is Lightning's burden to demonstrate how Anadarko's interference would be unreasonable, such as by proof that it could no longer drill to reach certain portions of the reservoir or that it could only do so at extraordinary cost. Absent such evidence, Anadarko would be entitled to use the surface and subsurface as it wishes. No balancing of the interests of Lightning, Anadarko, and society is necessary or appropriate.[181]

Despite its reasoning and use of balancing, however, *Lightning Oil* confirms the importance of the sequence of action. Where the surface tenant moves first, the mineral owner needs to show unreasonable interference with its rights in the subsurface. Where the first mover is instead the mineral tenant, the surface tenant must show preclusion of its existing surface use. If the mineral owner can then show its surface use was reasonably necessary, the surface owner must then prove the existence of reasonable alternatives to the mineral owner.

Lightning Oil did not have occasion to address another conflict lurking in the subsurface: frac hits or bashes.[182] The question posed in a frac hits case is whether the mineral tenant is liable to the surface tenant for damage caused to a carbon sequestration well by the mineral tenant's fracking an oil and gas well. The mineral tenant in this scenario is likely to argue that the case raises a unidimensional situation in which the damage to the surface tenant's well is *damnum absque injuria* because the fracking was reasonably necessary to produce oil and gas from the formation. The surface tenant is likely to urge, and appropriately so, that the case is multidimensional because the mineral tenant's activity (literally) clashed with the surface tenant's preexisting sequestration well.

The multidimensional theory would invoke the accommodation doctrine, under which the surface tenant is likely to argue that the frac hit totally precluded its continuing use of the well. Assuming the mineral tenant could then demonstrate that its frac operation was reasonably necessary, the next

[181] The court's balancing was misplaced because it occurred at the liability stage; balancing would have been appropriate to fashion an equitable remedy. The court's reliance on well-spacing regulations is likewise inapposite. Spacing regulations prevent waste and protect correlative rights in common reservoirs of oil and gas. While Lightning's rights against Anadarko are indeed correlative, they are the correlative rights of split estates and not of neighbors in a reservoir. *See infra* Part V (discussing correlative rights in common reservoirs).

[182] *See supra* Part II.A.2.a.

question would be whether the surface tenant could produce evidence showing a reasonable alternative to fracking the well in the manner that it was completed. Perhaps the well could have been drilled and completed a safer distance from the sequestration well, could have been completed using a different technique, or the mineral tenant could have paid to reinforce the sequestration well beforehand. If any of these could be proved, the mineral tenant should be required to accommodate the surface tenant by compensating its losses.

b. Accessing Deeper Formations

If the surface tenant wishes to drill through a zone producing oil or gas or that is in use for saltwater disposal, it may do so to the extent that the drilling does not unreasonably interfere with the ongoing production or disposal activities.[183] If, instead, the mineral tenant wishes to drill through a formation containing sequestered carbon dioxide, the accommodation doctrine furnishes the appropriate framework. Here, we have a typical multidimensional problem in which both parties seek to use the same element of the subsurface for inconsistent purposes: the surface tenant is using a formation for sequestration, and the mineral tenant wishes to use the same formation to access a deeper one.

In the latter scenario, the surface tenant's use is preexisting,[184] but it is not certain that the mineral tenant's drilling would preclude carbon sequestration. If not, we could end the analysis there and conclude that the drilling is within the mineral tenant's correlative rights. If the drilling would preclude carbon sequestration, the question would reduce to the availability of other means of accessing the deeper zones from the tract itself. The mineral tenant potentially could access the formation laterally through horizontal drilling, but in all likelihood, this would impermissibly require using other tracts of land.[185] Consequently, the surface tenant's case for precluding the mineral tenant's drilling might fail on two grounds: first, its sequestration activity would not be sufficiently precluded, and second, the dominant estate would lack a reasonable alternative on the premise. The drilling would be allowed,

[183] *Lightning Oil*, 520 S.W.3d at 49 (Tex. 2017).

[184] Planned drilling might be preexisting if part of an overall plan that has been commenced in part. *See* Valence Operating Co. v. Tex. Genco, LP, 255 S.W.3d 210, 218 (Tex. App.—Waco 2008, no pet.).

[185] Sun Oil Co. v. Whitaker, 483 S.W.2d 808, 811 (Tex. 1972).

and the costs associated with corrective action would rest with the surface estate.

c. Occupying Pore Space

Carbon sequestration occupies the pore space within the target zones permanently.[186] The process by which pore space becomes saturated with carbon could unfold either through direct injection from a well located on the surface of the same tract or through migration of carbon injected from wells in the same carbon storage complex located on the surface of neighboring tracts.[187] In either case, the permanent presence of carbon in pore space would preclude, or at least substantially impair, any ongoing and future uses of the pore space for other purposes and could contaminate hydrocarbon reserves. The issue would raise familiar multidimensional questions that tend to favor the first party to lawfully use the pore space.

i. By Surface Estate

The surface tenant may use its pore space to store carbon so long as it does not unreasonably interfere with the mineral estate's rights to use the pore space in oil and gas development. There are multiple conceivable scenarios in which carbon sequestration could do so. Sequestration into a zone where a mineral tenant is injecting saltwater for disposal may increase the downhole pressure and either add to the costs of operating the disposal well or prevent it altogether. Sequestration that diminishes the productivity or efficiency of a producing well or a secondary or enhanced recovery operation would likewise unreasonably interfere with the mineral tenant's rights. Any such impairment of the mineral tenant's ongoing subsurface operations would likely infringe on its surface-use rights.

Sequestration might also unreasonably interfere with the mineral estate if the sequestered carbon dioxide were to contaminate oil or gas reserves and impair the mineral tenant's opportunity to produce them. Hence, in *Cassinos v. Union Oil*, the court held that the surface tenant injured the plaintiff's mineral estate by injecting wastewater into subsurface formations, because the waste contaminated the reservoir and interfered with the plaintiff's

[186] *See* 40 C.F.R. § 146.83(a)(2) (2023) (describing confinement as a minimum criterion for a Class IV well).

[187] Glob. CCS Inst., *Migration-Assisted Storage: Opportunities are (Almost) Endless* (Nov. 18, 2018), https://www.globalccsinstitute.com/news-media/insights/migration-assisted-storage-opportunities-are-almost-endless/.

ongoing oil and gas production.[188] Not every interference with ongoing operations should be actionable, however, because some amount of interference with the mineral estate is permissible as long as it is not unreasonable. The degree of interference with the minerals in place is key. Consider *Lightning Oil*, where the court held that the surface tenant's destruction of a small amount of oil and gas in place would not *unreasonably* interfere with the mineral estate's chance to enjoy its mineral interest.[189]

Even when carbon sequestration does not interfere with ongoing mineral operations or pollute reserves, it could injure the mineral estate by precluding future use of the pore space. It would not be enough, however, for the mineral tenant to show that it has lost the use of pore space.[190] It must prove that the sequestration has unreasonably limited its ability to develop the mineral estate in the future.[191] The mineral tenant must, as in *Lightning Oil*, demonstrate a real conflict with its ability to enjoy the minerals as a prerequisite to recovery.[192]

ii. By Mineral Estate

Mineral tenants occupy pore space for various purposes. By doing so through produced water disposal[193] and secondary or enhanced oil or gas recovery,[194] a mineral tenant might preclude the surface tenant from using the pore space for carbon sequestration. This is permissible to the extent it is incidental to the development only of the minerals associated with the mineral estate. Use of pore space to contain wastewater injected from off-tract mineral production or to conduct secondary or enhanced recovery operations on other lands, without valid pooling or unitization, would be *ultra vires*.

Consider *Brown v. Continental Resources, Inc.*, where the court granted summary judgment to the mineral tenant against the surface tenant's claims for compensation for the use of subsurface pore space for produced water

[188] 18 Cal. Rptr. 2d 574, 579–81 (Cal. Ct. App. 1993).

[189] 520 S.W.3d 39, 50–51 (Tex. 2017).

[190] *See id.* at 49.

[191] *See id.*

[192] *Id.*

[193] Mosser v. Denbury Res., Inc., 898 N.W.2d 406, 415 (N.D. 2017).

[194] Giacometto Ranch v. Denbury Onshore LLC, No. CV 16-145-BLG-SPW, 2020 U.S. Dist. LEXIS 200802, at *12–13 (D. Mont. July 15, 2020).

disposal.[195] The surface tenant conceded that it suffered no physical damage but claimed entitlement to compensation for the use of its pore space nevertheless under the state's surface damage act.[196] The court, however, interpreted the act not to apply to mere use of pore space without some resulting damage to the surface estate.[197] No compensation would have been due under the common law framework, either, as the mineral tenant's use of the pore space came within the implied and express surface-use rights under its oil and gas lease.[198]

In states with applicable surface damage acts, however, the correlative rights of surface and mineral tenants may be quite different. Unlike the *Brown* court, Montana and North Dakota courts have interpreted their states' surface damage acts to require compensation to the surface estate for the mere occupation of pore space.[199] In *Mosser v. Denbury Resources, Inc.*, a surface owner plaintiff sought compensation under North Dakota's act for the mineral tenant's produced water disposal.[200] On certified questions from the federal district court, the North Dakota Supreme Court announced that compensation for lost access and use of pore space due to the mineral tenant's injection operations may be available under the statute.[201] In a reversal of the common law rule, the statute does not require damage to the use or value of the surface tenant's estate.[202] Subsequent litigation in North Dakota in *Continental Resources, Inc. v. Fisher*, developed the law relating to the measure of statutory damages for pore space occupation.[203] *Fisher* clarifies that the surface tenant is entitled to compensation for occupation of the pore space even where it has not prevented the surface tenant from using the pore space now or in the future.[204]

Brown and *Mosser*/*Fisher* provide a stark comparison of the correlative rights of split estates under the common law and surface damage acts,

[195] No. 18-CV-05048, 2021 U.S. Dist. LEXIS 252396, at *23 (D.S.D. Dec. 29, 2021).

[196] *Id.* at *18.

[197] *Id.* at *19–22. It would apply only where the occupation led to damage that was compensable under the act. *Id.* at *22.

[198] *Id.* at *18–19.

[199] Mosser v. Denbury Res., Inc., 898 N.W.2d 406, 415 (N.D. 2017).

[200] *Id.* at 408.

[201] *Id.* at 415.

[202] *Id.* at 415–17.

[203] *See* No. 18-cv-181, 2021 U.S. Dist. LEXIS 227504, at *20–21 (D.N.D. Nov. 29, 2021); Schremmer, *supra* note 20, at 1026–52 (discussing remedies).

[204] *Fisher*, 2021 U.S. Dist. LEXIS 227504, at *16–24.

respectively. Where no statute applies, the common law furnishes a first-mover advantage to the mineral tenant that uses pore space for disposal or secondary or enhanced recovery operations without damaging the subsurface. In contrast, where a surface damage statute applies, the mineral tenant may owe compensation to the surface tenant for the mere occupation of the pore space, regardless of whether the surface tenant has any plans to use the pore space for other purposes, like carbon sequestration.

3. Exploration

Balancing the parties' correlative rights to explore the geological characteristics of the subsurface is difficult. While the mineral estate's right to explore is well established, very little has been written regarding the surface estate's exploration rights.[205] However, the traditional doctrinal framework can guide the analysis toward answers in specific cases. Under those traditional principles, both estates have rights to conduct exploration. The mineral estate includes the right to explore the subsurface as reasonably necessary to develop the minerals, including using and damaging the surface in the process.[206] The surface estate also has the right to explore for purposes that do not unreasonably interfere with the enjoyment of the mineral estate.[207]

Disputes might arise over damage done to one estate by the other's drilling of a well for exploration or scientific purposes, in which case the analysis undertaken above would apply.[208] A distinct problem may occur where a surface tenant's exploration (by an exploratory well, seismic surveying, or otherwise) reveals information bearing on the land's potential for mineral development.[209] What if, as was the case in *Grynberg v. City of Northglenn*, a surface owner's exploration proves that the underlying minerals are not commercially developable?[210] May a surface owner who conducts exploration for its own purposes but learns about the minerals share or publish that information to third parties?

In *Grynberg*, a lessee of the surface estate drilled a well to establish that the land did not contain valuable coal deposits, which it was required do to

[205] Anderson, *supra* note 75, at 146.

[206] *See id.* at 144.

[207] *Id.* at 147–48.

[208] *See supra* Part III.B.2.a.

[209] The opposite might also occur, where a mineral tenant discovers information relevant to the value of the surface estate's pore space or other property.

[210] 739 P.2d 230, 231 (Colo. 1987).

receive a permit for impounding wastewater in the subsurface.[211] The mineral tenant (a coal lessee) sued after the surface owner published the results showing the lack of commercial coal deposits.[212] The court ruled for the mineral tenant, holding that the mineral estate has the exclusive right to conduct drilling to explore mineral deposits.[213]

Grynberg treats the right to explore as exclusive to the mineral estate rather than correlative between the mineral and surface estates. The essence of the split-estates relationship is that each may use the land with due regard to the correlative rights of the other estate. It follows that, absent exclusive language in the instrument creating a mineral estate, each estate enjoys rights to explore the land with reference to the resources over which each holds title. Each estate also owes correlative duties to conduct its exploration with due regard to the exploration rights of the other estate. In the case of the surface estate, for example, the tenant may explore so long as it does not unreasonably interfere with the mineral estate's fair chance at developing the minerals. Obtaining information about the minerals incidentally in the course of exploring subsurface geology for other purposes is not itself unreasonable and, without more, would not interfere with the enjoyment of the mineral estate at all.

Although it ought not be wrongful for the surface estate to obtain incidental information about the mineral estate in its own process, the surface owner may not use such information to interfere with the mineral estate's fair chance at profiting from the minerals.[214] Impermissible uses of information may include publishing the information or using it in negotiations with the mineral owner to obtain a below-market-value price for the minerals.[215] Actions that should not unreasonably interfere with the mineral estate's rights include discovering but not publishing or using information about the minerals, publishing or using information about the minerals solely to satisfy a legal obligation, and selling the information discovered about the minerals to the mineral owner. The touchstone of liability is the effect on the mineral estate's ability to enjoy its property. The same principles ought to apply in the mineral estate's use of the surface to explore the minerals.

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[211] *Id.*

[212] *Id.*

[213] *Id.* at 234.

[214] *Id.* at 237.

[215] *But see* Mallon Oil Co. v. Bowen/Edwards Assoc., Inc., 965 P.2d 105, 112 (Colo. 1998) (finding no duty to disclose information obtained about coalbed methane in negotiations with oil and gas lessee).

IV. COMPETING EASEMENTS

This section outlines the relationship between mineral development and carbon sequestration when the latter is conducted by the holder of a subsurface easement for that purpose. In the past, mineral development typically clashed with easements held by other parties only in narrow circumstances.[216] Most multiple-resource development conflicts arise between holders of freehold or leasehold title (imagine an oil and gas lessee and a coal or solar energy lessee on the same tract), rather than between freeholders or leaseholders and easement holders.

In the carbon sequestration industry, such as it is, developers are likelier to acquire easement rights to accomplish their goals. These easements would likely take one of two forms. One type of easement would permit the migration of carbon into the servient estate's pore space. Another type of easement would give the easement holder the right to use the surface and subsurface of the servient tract to locate injection wells and sequester carbon directly into the tract. The latter arrangement would probably be better accomplished through a conveyance of freehold or leasehold title. Consequently, the first kind of easement is more likely to be common. The principles discussed in this Part apply to both.

A. The Doctrinal Framework

The doctrinal framework governing relations between sequestration easements and mineral development differs in the details from the doctrine governing split estates but shares important conceptual similarities. As before, the relationship is correlative. Multiple parties hold concurrent rights to occupy and use the same land for various purposes and bear correlative duties to pay due regard to the concurrent rights of the other holders.[217] The law orders the correlative relations by granting priority status to certain interests, subject to exceptions requiring the senior or dominant interest to accommodate the conflicting uses of subordinate interests. As before, these principles operate on two distinct sets of problems: unidimensional problems involving the unilateral activity of one holder that damages the other, and multidimensional problems involving conflicting activities.

[216] Imagine a mineral tenant with an oil and gas lease that wishes to locate a surface facility within another party's pipeline easement.

[217] Kramer, *Multiple Surface Uses*, *supra* note 36, at 274.

Sequestration easements would be express easements.[218] Express easements typically describe the purposes and duration of the easement granted and specifically detail what types of surface uses the grant permits.[219] Determining the primary scope of express easement rights is thus a matter of interpreting the objective meaning of the language of the grant to ascertain the grantor's intent.[220] In addition to those easement rights that are expressly granted, the law may imply "secondary easement" rights. Secondary easements "can be regarded either as an easement by necessity or as inherently included within the primary-use rights granted by the easement."[221] As Professor David Pierce explains, the typical pipeline easement furnishes a good example of combined primary and secondary easements: "If the easement does not address the use of the land to construct and maintain the pipeline, these rights will either be deemed to be encompassed by the express purpose of the grant, or implied as a necessary right to enjoy the rights expressly granted."[222] Secondary rights are implied only to supplement otherwise incomplete express terms.[223]

The express terms typically define the location and dimensions of permitted uses. Where these are explicit or necessarily implied by the surrounding circumstances, the easement is a "specific easement."[224] In the carbon sequestration context, a specific easement might identify a particular subsurface formation or formations into which the holder may store carbon. Where instead, the instrument is silent as to location and dimensions, a "blanket easement" results. The location and dimensions of a blanket easement are defined implicitly as "those reasonably necessary to enjoyment of the servitude."[225] A blanket easement in the carbon sequestration context might authorize the holder to inject or permit carbon to migrate into the land without limiting these privileges to any particular subsurface stratum. The servient estate is prohibited from unreasonably interfering with the location and dimensions of an easement, regardless of whether they are specifically defined.[226]

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[218] RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.2 (AM. L. INST. 2000).

[219] *Id.* § 4.1 cmt. d.

[220] *Id.*

[221] *Id.* § 4.10 cmt. c.

[222] Pierce, *supra* note 118, § 9.04[1], at 323.

[223] *Id.*

[224] *See* RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.8 (AM. L. INST. 2000).

[225] *Id.*

[226] *See id.* § 4.9.

The following subsections address the correlative rights of sequestration easements and mineral interests in two separate scenarios. First is the relatively unusual situation in which the owner of the servient estate (that granted the sequestration easement) owns unified title to both the surface and underlying minerals and develops the minerals themselves. The second, more typical scenario involves three parties: the owner of the servient surface estate, the owner of a severed mineral estate or lease, and the holder of a sequestration easement in the surface estate.

1. Sequestration Easement versus Servient Estate

While unusual, it is possible for landowners owning unified title to the surface and underlying mineral estates to strike out on their own in mineral development. When such a landowner grants a sequestration easement, they subject their estate to the burden of the grantee's rights to use the land and pore space as and where specified in the instrument. The parties' correlative rights and duties respecting use of the servient estate are similar to those between split estates, except they are subject to the more general principles of easement law rather than the specialized rules of oil and gas law.[227]

Under general easement principles, the easement holder is entitled to access, use, occupy, and consume the servient estate for the purposes, to the degree, and in the locations permitted by the express grant and any secondary easements rights that may be implied.[228] The easement holder is privileged to incidentally damage the servient estate unless required by the easement's terms to pay compensation. Excessive use or damage is actionable.[229] The servient tenant, meanwhile, retains the right to "make any use of the servient estate that does not unreasonably interfere with the enjoyment of" the easement.[230] While retaining all use rights not granted by the easement, the servient tenant must also forbear from "[a]ctions that make it more difficult to use an easement, that interfere with the ability to maintain and repair improvements built for its enjoyment, or that increase the risks attendant on the exercise of rights created by the easement."[231]

This duty of noninterference is partly measured by the easement's physical dimensions. In the case of a specific easement, the servient tenant is

[227] *See id.* § 1.1(2); Pierce, *supra* note 118, § 9.05[2], at 325–26.

[228] Pierce, *supra* note 118, §§ 9.04–.05, at 324–25.

[229] Lowe, *supra* note 104, § 4.03.

[230] RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.9 (AM. L. INST. 2000).

[231] *Id.* § 4.9 cmt.c.

prohibited from interfering with the specified location where the easement holder's use may occur.[232] Where there is a blanket easement, the location and dimensions of which are not specified in the instrument, the servient tenant must not interfere with any areas the easement holder may reasonably need to enjoy the easement.[233] A servient tenant might unreasonably interfere with the scope of a blanket easement by encroaching on the easement holder's reasonable use and enjoyment, regardless of the physical location of the activity.[234] Within this framework, the parties have correlative rights to use and occupy the land and owe duties not to interfere with the other's reasonable uses.

As they do in the split-estates framework, these principles apply to unidimensional and multidimensional conflicts between easements and the servient estate. In unidimensional contexts, the dispositive question asks whether the actor acted within the scope of their correlative rights. If so, damage resulting to the interests of the other is *damnum absque injuria*. Differences may arise over the scope of a blanket easement, about whether the easement holder's actions within the easement were reasonably necessary to its enjoyment or whether the servient tenant's actions impinged upon a use that would be reasonably necessary. Debates about reasonableness are ultimately for a jury to decide by exercising its wide-ranging practical judgment.[235]

In multidimensional cases, where the parties pursue irreconcilable activities on or under the land, the Restatement calls on the parties to exercise their rights in a "spirit of mutual accommodation."[236] In the Restatement's version of accommodation, if the servient tenant's use might unreasonably interfere with the easement, "the interests of the parties must be balanced to strike a reasonable accommodation that maximizes overall utility."[237] The comments nevertheless place a limit on the easement's holder's duty to accommodate the interfering uses of the servient estate: Any accommodation

[232] *See id.*; *See also* David R. Green, Comment, *Earth and Wind Industries Playing with Fire: The Concurrent Rights of Wind Farm Operators, Oil and Gas Developers, and Landowners in Kansas*, 61 U. KAN. L. REV. 1089, 1101 (2013).

[233] RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.8 (AM. LAW INST. 2000).

[234] Brown v. ConocoPhillips Pipeline Co., 271 P.3d 1269, 1274–76 (Kan. Ct. App. 2011).

[235] *See supra* Part III.A.1.

[236] RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.9 cmt. a (AM. L. INST. 2000).

[237] *Id.* cmt. c.

must be "consistent with effectuating the purpose of the easement."[238] The easement holder needn't sacrifice its opportunity to enjoy the easement.

Professor David Pierce appropriately sees in these Restatement provisions something akin to the accommodation doctrine governing split mineral and surface estates.[239] The correlativity of the parties' relations supports applying a principle of reasonable accommodation. Unlike for split estates, courts have not structured the principle by a formal doctrine. There may be many ways to do so justly, including through the extension of oil and gas law's accommodation doctrine. In general, however, accommodation should be cabined to situations in which the existing use of the servient estate by the servient tenant would be significantly impaired (if not altogether precluded) by the easement holder's intended use, which although reasonably necessary to enjoy the easement may be pursued by a reasonable alternative available on the premises. Where it is reasonably possible to enjoy the easement by a different means, the easement holder's correlative rights do not justify it in blocking concurrent use by the servient estate.

Contrary to the Restatement's view, elucidated in the comments,[240] the social utilities of the competing activities have no bearing on when due regard requires accommodation of a servient interest. While servient tenants and easement holders are likely keenly aware of reasonable alternatives to their preferred uses, they are in a poor position to calculate and weigh the social utility of those uses. Social utility is unusable as a guiding principle to order the thinking and negotiations of the parties. More useful are the guiding principles that the easement holder should be able to use the land as reasonably necessary to enjoy the purpose of its easement but should not be permitted to preclude the concurrent uses of the servient estate where reasonable alternatives are available to avoid this result.

This version of accommodation would not require the easement holder to modify its existing use to accommodate a use the servient estate establishes subsequently. Where this occurs, the Restatement would permit the servient estate to compensate the easement holder for making reasonable changes to the easement to accommodate the former's new use.[241] This rule seems consistent with the basic principles of the parties' correlative relationship,

[238] *Id.*

[239] Pierce, *supra* note 118, § 9.06[2][b], at 341.

[240] RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.9 cmt. c (AM. L. INST. 2000) ("[T]he interests of the parties must be balanced to strike a reasonable accommodation that maximizes overall utility to the extent consistent with effectuating the purpose of the easement . . . .").

[241] *Id.* § 4.8(3). Thus, the servient tenant may obtain "accommodation" at its own expense.

provided that modifications do not impair the holder's ability to enjoy the easement.

2. Sequestration Easement versus Mineral Estate

The likelier scenario for conflict between mineral development and a sequestration easement would arise where the mineral estate is severed and held in freehold title (under a deed or oil and gas lease). In this scenario, the mineral tenant would enjoy express or implied rights to use the surface and subsurface of the land, constituting a separate, competing easement with the sequestration easement. Competing easements share, along with the servient estate, correlative rights to use the land and duties to avoid unreasonably interfering with each other's uses.[242] The competing easements "must exercise their rights so that they do not unreasonably interfere with each other,"[243] but "[i]n the event of irreconcilable conflicts in use priority of use rights is determined by priority in time . . . ."[244]

The principle of temporal priority in this context is not arbitrary. As already established, the grantor of an easement may not unreasonably interfere with the easement.[245] The grantor parted with the unrestrained privilege to use the land and hence cannot later convey that privilege to another.[246] The second taker of an easement therefore never receives the privilege to unreasonably interfere with the prior easement.[247] To hold otherwise would unjustly enrich the second taker of an easement at the expense of the first. It would be unjust because the second taker, unlike the first, took its easement (presumably) with notice that it would lack this privilege. Consequently, the junior easement must forbear from unreasonably interfering with the scope of any senior easement, in the same way that a servient estate must avoid unreasonable interference with the dominant estate. Nevertheless, subject to this limitation, a junior easement is entitled to

[242] *See id.*

[243] *Id.*

[244] *Id.*; Panhandle E. Pipe Line Co. v. State Highway Comm'n, 294 U.S. 613 (1935).

[245] *See* Ogden v. Bankston, 398 So. 2d 1037, 1044 (La. 1981) (stating the grantor of the servitude could not eliminate the benefit conferred by a contract because it has become a matter of personal inconvenience to him).

[246] Green, *supra* note 232, at 1101 (quoting Brooks v. Mull, 78 P.2d 879, 883 (Kan. 1938)). The legal maxim is *nemo dat quod non habet* (no one gives what he does not have). BLACK'S LAW DICTIONARY (11th ed. 2019).

[247] *See* RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.12 (AM. L. INST. 2000).

use the land free from the interference of either the servient estate or a senior easement.[248]

Multidimensional conflicts can also arise between competing easements, and this is where the priority rule favoring first-in-time easements matters most. In consequence of a senior easement's priority over a junior, the latter must accommodate the former's use where the two would irreconcilably clash.[249] A senior easement is generally not required to accommodate the junior's uses in the event of an irreconcilable conflict.[250] In that case, the junior must bear the expense of finding an alternative. Nevertheless, cases can be found permitting a junior easement to make reasonable changes to a senior's use, such as relocating or reinforcing the senior's pipeline to accommodate the junior's road, so long as the changes are made at the junior's expense.[251] Moreover, under the principle of reasonable accommodation, an argument could be made that a senior easement should accommodate a junior where the senior's use would entirely preclude the junior from enjoying its easement *and* a reasonable alternative exists to the senior's use on the premises. Under these circumstances, which largely reflect the accommodation doctrine from oil and gas law and the "spirit of mutual accommodation" from the Restatement, fairness and equity would require accommodation from the senior holder.

B. Application to Specific Conflicts

1. Use of the Surface

a. Easement versus Surface

Many, perhaps most, sequestration easements will not permit use of the land's surface.[252] This subsection focuses on sequestration easements that do allow surface use, for activities like drilling injection wells and constructing ancillary facilities. If the grant includes specific easement rights, the servient

[248] K. Petroleum, Inc. v. Lenape Gathering Corp., No. 22-CV-334-LJV, 2022 WL 4134237, at *6 n.5 (W.D.N.Y. Sept. 12, 2022).

[249] *See* RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.12 (AM. L. INST. 2000).

[250] *See id.*

[251] *See id.* at illus. 2; Buckeye Pipe Line Co. v. Keating, 229 F.2d 795 (7th Cir. 1956); Magnolia Pipe Line Co. v. City of Tyler, 348 S.W.2d 537 (Tex. App.—Texarkana 1961, writ ref'd).

[252] Purely subsurface easements could imply secondary rights to use the surface for narrow purposes, like entering in case of emergencies.

tenant must not occupy the portion of the surface described in the grant, and the easement holder must not exceed those boundaries. It is more likely that sequestration easements will be blanket easements, like the easement conveyed in a typical oil and gas lease.[253] Under a blanket easement, the holder is in a similar position to the holder of an easement for mineral development, discussed earlier.[254] In multidimensional situations, the easement should accommodate the prior surface uses of the servient estate where it would be reasonably possible for both parties' activities to coexist.[255]

b. Easement versus Easement

A somewhat different set of issues attends lands subject to a sequestration easement with surface-use rights and a severed mineral estate with surface-use rights. The easements share correlative rights to use the surface subject to the duty not to unreasonably interfere with the other. Multidimensional conflicts are resolved first on the basis of temporal priority and, where applicable, principles of reasonable accommodation.

For example, suppose a severed mineral tenant intends to build a lease road that would cross a buried high-pressure carbon dioxide pipeline.[256] Suppose further that the road is reasonably necessary to mineral development but would interfere with operation of the pipeline, perhaps by blocking access for maintenance, repair, or emergency response, or by threatening to damage the pipeline during road construction and in the course of the road's use. In this multidimensional scenario, if the mineral tenant is senior because the mineral estate was created before the sequestration easement, the easement holder should accommodate the road. This might include relocating or burying the pipeline deeper or reinforcing the pipeline to withstand road construction and use, all at the junior sequestration easement's expense. If, however, the sequestration easement is prior in time, the mineral tenant will have to bear the expense of relocating its road or relocating, reburying, or reinforcing the pipeline.

It is conceivable that a senior easement should accommodate the conflicting uses of a junior in certain circumstances. Suppose a junior easement holder constructs a wellpad for a sequestration well in a location where a senior mineral tenant later wishes to place a tank battery to store

[253] *See* Kramer, *Multiple Surface Uses*, *supra* note 36, at 275 & n.8.

[254] *See supra* Part III.B.1.

[255] *Cf.* Part III.B.1.

[256] RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.12 cmt. b, illus. 2 (AM. L. INST. 2000).

production from its wells on the premises. Suppose further that there is nowhere else on the premises where the junior could locate its wellpad and still be able to drill a well into its target zone. It is plausible, under principles of reasonable accommodation, that the senior easement should be made to accommodate the junior, if, as a consequence of a strict application of the priority rule, the junior would be unable to exercise its easement rights altogether. A court may be justified in enjoining the senior easement's competing use, but only if the senior has other feasible locations on the premises for its battery. Where the senior lacks a reasonable alternative on the servient estate—in other words, where only one of the competing uses can proceed—priority must go to the senior easement.

2. Use of the Subsurface

a. Drilling and Locating Wells

i. Easement versus Surface

Not every sequestration easement will permit well drilling, and only those that do will encounter the disputes taken up in this (IV.B.2.a) and the following (IV.B.2.b) subsections. Where this is the case, the easement holder may drill where reasonably necessary to access the formations within its easement. Any damage to surface estate, unless otherwise provided by the grant, should be *damnum absque injuria*. Even destruction of hydrocarbons owned by the servient estate, if reasonable and necessary to exercise the holder's easement rights, should be privileged.[257] Where the easement holder's drilling would unreasonably interfere with the existing subsurface operations of the servient estate, like a disposal well or a producing well, under principles of accommodation the easement holder should relocate its well elsewhere on the premises if reasonably possible.[258]

ii. Easement versus Minerals

Conflicts between a sequestration easement and a severed mineral estate over the drilling and location of wellbores will turn on the first-in-time rule of priority. Each is entitled to drill where, when, and as reasonably necessary to achieve the purpose of its easement. When the location of one party's

[257] *See* Lightning Oil Co. v. Anadarko E&P Onshore, LLC, 520 S.W.3d 39, 50–51 (Tex. 2017).

[258] RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.9 cmt. c (AM. L. INST. 2000).

wellbore would unreasonably interfere with the other party's wellbore or its ability to exercise its subsurface rights, the duty to accommodate the other will fall on the junior easement. The junior easement may be required to change the location of its wellbore, pay to reinforce or even redrill the senior's wellbore, or take other actions at its expense to avoid interfering with the senior's use. Under general principles of reasonable accommodation, where the senior's drilling would entirely preclude the junior's ability to exercise its rights, a court may require the senior to accommodate the junior if there are reasonable alternatives. In sum, the same rules as apply on the surface apply in the subsurface.

In the case of a frac hit, where the mineral tenant hydraulically fractures an oil or gas well and interferes with a sequestration well or carbon storage complex, the mineral tenant's liability turns partly on its priority status. The sequestration easement holder is likely to complain that the frac hit unreasonably interfered with its easement, entitling it to compensatory damages.[259] If the mineral easement is senior, however, the mineral tenant might urge in its defense that the parties' activities are irreconcilable and therefore that it, the senior easement, is privileged to damage the junior easement.[260] Even so, under principles of reasonable accommodation, the senior mineral tenant ought to compensate the junior's losses where the frac hit precluded the junior's operations and the mineral tenant could have reasonably avoided the damage—perhaps by drilling and completing the well in alternative locations, choosing an alternative completion technique, or reinforcing the junior's well at the senior's expense ex ante. Only if no such reasonable precautions existed should the loss rest with the junior easement holder.

b. Accessing Deeper Zones

Let us begin with the right of a servient surface estate or a severed mineral estate to drill through a sequestration easement containing carbon dioxide. When drilling through an easement containing carbon, the servient estate may not unreasonably interfere with it, but interference is probably unavoidable.[261] Under federal law, each wellbore penetration of a carbon storage complex requires "corrective action" to avoid leakage.[262]

[259] *See id.* § 4.12.

[260] *Id.*

[261] *See* Swinford, *supra* note 53, § 4.03[1][b] (explaining drilling activities).

[262] *See supra* Part II.A.2.

Nevertheless, the needs of the servient estate in accessing its property located below the easement would likely justify the interreference.[263] In this scenario, then, the servient estate may drill through in a reasonable manner but should be required to compensate the easement holder for the reasonable costs of any corrective action, or other damages, that result.[264]

Similarly, when a severed mineral estate wishes to drill through a carbon sequestration easement, the question should ordinarily be which party bears the costs of resulting damage or corrective action, rather than whether the drilling is permitted. The situation presents a conflict wherein both easements need the same formation for competing purposes. Only where the drilling and the carbon sequestration are truly irreconcilable and no alternative exists to the drilling, should temporal priority determine which activity may proceed. It is probable, however, that the two activities can coexist. Wellbore penetrations of a carbon storage complex are permitted under federal law, provided that corrective action is taken to ensure wellbore integrity.[265]

Where the mineral estate is senior, it is entitled to drill through, so long as it does not preclude the continuing carbon sequestration, and the expenses of corrective action should fall on the junior sequestration easement.[266] Even if the drilling would preclude continued carbon sequestration, the mineral tenant need only pursue reasonable alternatives; in the absence of such alternatives, its priority status would permit it to drill through, nonetheless.[267] Where the sequestration easement is senior, the junior mineral easement may drill through it to deeper strata but must bear the expense of doing so, including the expense of corrective action.[268] The junior may not preclude the senior sequestration operation under any circumstances.[269]

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[263] *See* RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.9 cmt. c (AM. L. INST. 2000).

[264] *See id.* § 4.8 (permitting compensated modifications of the easement).

[265] *See supra* Part II.A.2.

[266] *See* RESTATEMENT (THIRD) OF PROP.: SERVITUDES §§ 4.8, 4.12 (AM. L. INST. 2000).

[267] *See* Swinford, *supra* note 53, § 4.04[1] (explaining that in surface and mineral estate conflict, the mineral estate is dominant and usually wins).

[268] *See* RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.12 cmt. b, illus. 2 (AM. L. INST. 2000); Buckeye Pipe Line Co. v. Keating, 229 F.2d 795 (7th Cir. 1956); Magnolia Pipe Line Co. v. City of Tyler, 348 S.W.2d 537 (Tex. App.—Texarkana 1961, writ ref'd).

[269] Notwithstanding these general rules, the grant of a sequestration easement may expressly prohibit any wellbore penetrations of the easement by the servient estate and any subsequent-in-time severed mineral interests. To qualify for California's Low Carbon Fuel Standards Tax Credit, sequestration owners must provide proof of contractual protections against unconsented penetrations of carbon plumes. *See supra* Part II.A.2.

Turning now to a sequestration easement's right to drill through shallower zones to access strata subject to its easement. Assuming the easement allows drilling, access to the location of a subsurface easement from the surface should be implied as a secondary easement right. Such an easement would certainly privilege drilling through shallower strata of the servient estate and resulting damage should be *damnum absque injuria* unless otherwise provided in the grant. When the easement holder must drill through a shallower mineral-bearing zone of a severed mineral estate, the drilling should be permitted.[270] If the sequestration easement is junior to the mineral estate, it should bear any expenses associated with unreasonable damage to the formation or any modifications required of ongoing mineral operations in the formation.[271]

c. Occupying Pore Space

Another potential conflict is presented where a sequestration easement and a mineral estate both seek to use pore space in the same formation. Carbon sequestration may entirely preclude use of the formation for wastewater disposal, secondary or enhanced recovery, or mineral extraction, and vice versa. Concurrent occupancy of pore space thus poses an irreconcilable, multidimensional conflict between competing easements.

The analysis is complicated because the carbon sequestration easement may be either a specific easement entitling it to a defined stratum, or a blanket easement covering pore space throughout the subsurface. Where it is a specific easement, any use or occupation of the strata subject to the easement by the servient tenant or a severed mineral tenant may constitute actionable interference.[272] To illustrate, suppose *O*, the owner of Blackacre, grants to *A* a sequestration easement in the Morrison formation. *O* may not subsequently inject produced water into the Morrison or drill into the Morrison for oil or gas, if to do so would unreasonably interfere with *A*'s ability to sequester carbon there.

Likewise, if *O* subsequently conveys to *B* the oil, gas, and other minerals in and under Blackacre, *B* may not use the Morrison for purposes that would

[270] *See* Green, *supra* note 232, at 1105 (explaining directional drilling and stating that if no reasonable alternatives exist to avoid surface conflict, a dominant estate holder would be permitted to interfere with existing surface use).

[271] *See* RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.12 cmt. b, illus. 2 (AM. L. INST. 2000).

[272] *See* Green, *supra* note 232, at 1101.

interfere unreasonably with *A*'s ability to sequester carbon there. In this case, *B*'s implied blanket easement to use and occupy the Morrison's pore space is second in time and junior to *A*'s specific easement. *B* thus must avoid interfering with *A*'s easement and yield to *A*'s use in the event of an irreconcilable conflict. If *B* lacks any alternative to using the Morrison and can show that its use of the Morrison would not preclude *A*'s operations, *B* may have grounds for accommodation from *A* to enable *B*'s use of the Morrison.

Were we to assume that *B*'s mineral estate preexisted *A*'s specific easement, then *A* would take subject to *B*'s mineral easement. If *B* previously established some use of the Morrison, like water disposal, *A* must not unreasonably interfere with it. If *A* is the first to use the Morrison, however, *B* cannot be heard to complain so long as alternative formations remain within its blanket easement for it to use to develop the minerals. If no reasonable alternatives are available to *B*, *A* would be wrong to preclude *B*'s use of the Morrison and should incur the costs of accommodating *B*'s reasonably necessary use.

A's rights against *O* and *B* differ if *A* takes a blanket sequestration easement. As to the servient tenant, *O*, and assuming *O* owns the minerals, *A* would be entitled to occupy the pore space anywhere within the boundaries of its blanket easement that does not preclude *O*'s existing operations. *O*, in turn, may use the subsurface so long as it does not unreasonably interfere with *A*'s easement. In these kinds of multidimensional situations, the advantage ordinarily goes to the first of the parties to establish a lawful use. Thus, if *A* sequesters carbon in the Morrison formation, *O* may not use the Morrison as to interfere with *A*'s sequestration operations. Where, however, *O* first uses the Morrison, *A* may be required to accommodate *O*'s preexisting use, despite owning the dominant estate.[273] Accommodation is likely appropriate where *O* lacks any reasonable alternative and *A* could sequester carbon dioxide in a different formation. Yet the reverse is more likely. *A*'s carbon sequestration operations would probably extend well beyond the boundaries of *O*'s estate and *A* would have no flexibility as to which formation to use under *O*'s land. It is much likelier that *O* would have an alternative, which *O* would need to pursue at its own expense.[274]

[273] *See* RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.8 cmts. a & c (AM. L. INST. 2000); Pierce, *supra* note 118, § 9.06[2].

[274] *See supra* Part IV.A.2.

Now suppose that *A*'s blanket easement competes with the blanket easement of *B*'s mineral estate. In a competition of blanket easements, each easement holder is entitled to use the easement as reasonably necessary for its purpose and may not interfere unreasonably with the other easement holder's correlative right to do the same.[275] Unreasonable interfere would encompass using the shared property in a way that interferes with the other holder's existing uses or leaves the other holder with no reasonable alternative uses available on the servient estate. In cases where two easements seek to establish irreconcilable uses, the priority is given to the first easement created.[276]

Here again, the rules favor the first of the easement holders to establish a use. If *A* is the first to use the pore space in the Morrison for carbon sequestration, *B* may not thereafter use the Morrison as to interfere with *A*'s easement. However, if *B* lacks a reasonable alternative to using the Morrison, it may require *A* to accommodate its use, so long as *A* is reasonably able to do so. The costs of doing so should fall on the junior of the two easements. If accommodation is impossible, *A* may be made to pursue its other reasonable options if there is no alternative to *B*'s use. If accommodation is impossible and neither party has a reasonable alternative, only the prior-in-time easement should be permitted to use the formation for its purpose.

3. Exploration

It is unlikely that the grant of a sequestration easement would include, expressly or impliedly, the right to conduct geological exploration. There is thus little potential for conflicts between a sequestration easement and a mineral developer in this regard. Where, however, a landowner grants to another a license to explore the subsurface of the licensor's premises, the licensee would essentially step into the shoes of the grantor and take on whatever correlative rights the licensor surface owner enjoyed to explore the subsurface for carbon sequestration potential. Those rights are examined above in Part III.B.3

V. SEVERED COEQUAL ESTATES

This Part hypothesizes three estates of equal legal status coexisting in a single tract of land: a surface estate, a mineral estate, and an estate in the right

[275] *See* RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.8 (AM. L. INST. 2000).

[276] *See id.* § 4.12 cmt. b.

to sequester carbon dioxide. It assumes (for convenience and not as an endorsement) that the common law would recognize the carbon sequestration potential of land as an independent object of ownership eligible to be severed as a freestanding estate from the land itself. As described in Part II.B.3, an estate in the sequestration rights in land might be done through either a depth severance or a pore space severance. In either case, if the grantor intends to create a separate estate in the land and the law recognizes the conveyance as such, the result is three estates of coequal dignity in the land.

A. The Doctrinal Framework

The first matter to consider is the relationship between a sequestration estate and the surface estate from which it was carved. The second and more complicated matter concerns the relationship between coequal sequestration and mineral estates in the same subsurface.

1. Sequestration versus Surface Estates

In principle, the relationship between a severed sequestration estate and the surface estate is that of split estates, discussed at length in Part III. Whether or not the conveyance or reservation of a sequestration estate provides for use of the surface, based on the common law maxim "when the law doth give any thing to one, it giveth impliedly whatsoever is necessary for enjoying the same," the severed estate should enjoy an implied surface-use easement.[277] The scope of the implied easement should permit the sequestration owner to access, use, occupy, and consume the surface estate as reasonably necessary and convenient for the enjoyment of the severed estate.[278] Within the scope of this easement, the surface estate should be servient in the same dominant–servient relationship that governs surface and mineral estates.[279] Each estate enjoys correlative rights to use the surface but must pay due regard to the rights of the other. The surface estate should be entitled to use and occupy the surface in any way that does not unreasonably interfere with the severed estate's easement. The severed estate should be privileged to damage the surface estate within the scope of its easement.

[277] 2 BLACKSTONE, *supra* note 104104, *19, *36; Cowan v. Hardeman, 26 Tex. 217, 222 (1862); Marvin v. Brewster Iron Mining Co., 55 N.Y. 538, 549–50 (1874).

[278] *See* Callahan v. Martin, 43 P.2d 788, 794 (Cal. 1935);

[279] *See supra* Part III.A.

The parties may find themselves in multidimensional disputes, involving clashes of irreconcilable surface activities. Although the severed estate is dominant, in these situations, fairness demands that the general principle of reasonable accommodation apply. When the severed estate's use would preclude a surface activity of the surface tenant and reasonable alternatives exist on the premises that would permit both estates to pursue their competing uses, the principle of due regard demands that the severed estate pursue its alternative to accommodate the other.[280]

2. Sequestration versus Mineral Estates

The possible coordination problems between coequal subsurface estates are legion. As one court commented about the relations between coequal estates in coal and oil and gas, the correlative rights and duties of the parties "are exceedingly difficult of definition."[281] As in the earlier cases involving the multiple development of coequal estates in minerals, the touchstone for adjudicating these controversies is "to so apply the law as to give each owner the right of enjoyment of his property or strata without impinging upon the right of other owners."[282] This proved difficult in multiple-mineral development cases and promises to be a source of trouble for severed sequestration and mineral estates, as well.

To confuse matters further, commentators are divided about the applicable legal standard for ordering coequal estates. Some, led by Professor Bruce Kramer, assert that the parties' relationship should be governed by a principle of reciprocal accommodation, which would call on courts to resolve disputes based on "ad hoc balancing" of the parties' interests.[283] Others have argued that priority should be given to the first estate to be severed from the land.[284]

It clarifies the task of balancing the parties' rights to understand that there is no single, monolithic legal framework for defining the correlative rights between coequal estates. Neither temporal priority nor ad hoc balancing

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[280] *See supra* Part III.A.2.a.

[281] *Cf.* Rend v. Venture Oil Co., 48 F. 248, 251 (W.D. Pa. 1891) (involving multiple-mineral development).

[282] *Cf.* Chartiers Block Coal Co. v. Mellon, 25 A. 597, 598–99 (Pa. 1893) (involving coal and oil and gas estates).

[283] Kramer, *Multiple Surface Uses*, *supra* note 36, at 298–99, 301; Kramer, *Reciprocal Accommodation*, *supra* note 25, at 62–63; DuVivier, *supra* note 27, at 422.

[284] Nevill, *supra* note 26, at 796; Deering, *supra* note 23, at 604; Lear, *supra* note 23, at 11.

provides a singular governing test. On the contrary, depending on the circumstances, three separate doctrinal frameworks may apply. Certain doctrines turn on temporal priority and others on principles of reasonable accommodation. Classifying each set of facts to determine which doctrinal framework controls a necessary first step in the analysis.

The alternate frameworks are as follows. First, the estates hold competing easements in the surface estate, subject to the doctrinal framework discussed in Part IV.A. Second, subsurface estates hold reciprocal easements in one another to permit each access to deeper strata, governed by principles that inhere between servient and dominant estates, discussed in Parts III.A and IV.A.1 Third, if they both own rights in the same subsurface formation, their relationship within that formation is either that of split estates or of neighbors in a common reservoir.

a. Competing Easements in the Surface Estate

Each severed estate ought to enjoy at least implied surface-use rights. This means that each estate holds an easement in the same servient estate, inviting the possibility that their easements could conflict. Accordingly, the rules governing competing easements should apply to order the surface activities of severed mineral and sequestration estates. Under these principles, each easement holder is entitled to access, use, occupy, and consume the servient surface estate within the scope of its easement and is obligated not to unreasonably interfere with the authorized uses of the other easement holder.[285]

Where the two easements would conflict irreconcilably, posing a multidimensional problem, priority belongs to the easement that was created first, on the principle that the subsequent estate took its easement with notice of the senior's rights.[286] The junior estate must yield to the senior estate in such cases. Nevertheless, the junior may make reasonable changes to the senior's easement at its own expense.[287] Further, under general principles of reasonable accommodation, a junior estate may argue that its uses should be accommodated in situations where the senior's use would preclude the junior's even though reasonable alternatives exist to permit the senior to avoid the conflict.[288]

[285] RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.12 (AM. L. INST. 2000).

[286] *Id.*

[287] *E.g.*, Buckeye Pipe Line Co. v. Keating, 229 F.2d 795, 798–99 (7th Cir. 1956).

[288] *See supra* Part III.A.2.

The justification for an accommodation exception to the priority rule is found in the coequal nature of the competing estates. Under an absolute rule of priority based on time, the senior tenant's use and occupation of the surface could destroy the junior tenant's ability to use and enjoy its estate. Accordingly, to protect the junior tenant's opportunity to enjoy its estate to the greatest possible extent, the senior tenant should be required to accommodate the junior's existing surface use in certain circumstances. The exception, however, cannot defeat the senior tenant's ability to use and enjoy its estate. That is to say, the senior tenant cannot be made to accommodate the junior if the senior tenant's use is reasonably necessary and there are no reasonable alternatives available to it on the servient estate. The junior took its estate (presumably) with notice of the senior interest, and, unlike the senior, had the opportunity to avoid entering this correlative relationship if it did not wish to take second priority. Therefore, in those rare situations where neither senior nor junior tenant can find a reasonable alternative for its desired surface use, the senior must prevail.

Frequently, the competing surface uses of severed estates will be established at different times, such that one tenant's surface use or activity preexists the surface use or activity of the other. Here, as in the relationship between split surface and mineral estates, the advantage often goes to the preexisting surface use.[289] So long as the first tenant to establish a surface use acted within its rights, the tenant wishing to establish a subsequent competing use generally must yield to the established activity. If the first mover enjoys senior priority over the second mover, that is likely the end of the story. However, if the first mover is the junior estate, the second-moving, senior estate may be entitled to accommodation if its intended activity is reasonably necessary and no reasonable alternative to it exists on the servient estate. Otherwise, the senior is effectively subordinated to the junior.

These principles can be synthesized and crystalized into a test closely resembling oil and gas law's accommodation doctrine. The senior tenant must accommodate the surface use of the junior tenant only if the junior tenant's surface use is established before the senior tenant's competing surface use and there are reasonable alternatives available to the senior tenant within the boundaries of the servient surface estate.[290] This arrangement gives maximal effect to both estates' correlative rights in the surface, while respecting the prior right of the senior estate and avoiding the complexity and

[289] *See supra* Part III.A.2.

[290] *See supra* Part IV.A.2.

possible mischief of balancing the parties' interests or the utilities of their activities.

b. Reciprocal Rights of Access and Support

Coequal subsurface estates may be stacked on top of each other. Pore space suitable for carbon sequestration may be buried below a formation containing oil and gas, or vice versa. In light of the commonsense maxim that the law grants by implication what is necessary to enjoy property, this physical fact means that each subsurface estate must have two things, whether or not expressly provided:[291] the right to drill through shallower strata to access property below[292] and the right to subjacent support from deeper strata.[293] These implied rights are not unique to any subsurface estate in particular; each such estate enjoys them, concurrently with other estates, regardless of temporal priority.[294]

These implied correlative rights take the form of reciprocal easements, or "servitudes," that each estate holds in the others.[295] Thus, at any given time, a subsurface estate might be dominant as to its easement for support in a deeper strata owned by another estate, and servient as to that other estate's easement for accessing the deeper strata. In exercising their reciprocal easement rights, each estate must pay due regard to the rights of the servient estate—the aim of the law being to give each owner enjoyment of its property without impinging upon that of other owners.[296] This requires that the dominant estate may use the servient estate only within the scope of its implied rights. Thus, a dominant estate may drill through a shallower servient estate as reasonably necessary to access the dominant estate's deeper property, and it must do so without causing unreasonable damage to the servient estate.[297] The servient estate, in turn, may not unreasonably interfere with the dominant estate's reasonable operations and is not entitled to compensation for damage that results.

[291] Of course, the grant of a severed estate might preclude use of the surface for any purpose. *See* Pierce, *supra* note 118, § 9.04[1], at 323.

[292] Guffey v. Stroud, 16 S.W.2d 527, 528 (Tex. [Comm'n Op.] 1929); Chartiers Block Coal Co. v. Mellon, 25 A. 597, 598 (Pa. 1893); Rend v. Venture Oil Co., 48 F. 248, 250–51 (W.D. Pa. 1891).

[293] Burgner v. Humphrey, 41 Ohio St. 340, 351–52 (1884) (citing cases).

[294] *See Guffey*, 16 S.W.2d at 528 (holding that a second-in-time oil estate could access a gas estate).

[295] *Chartiers Block Coal*, 25 A. at 600 (Williams, J., concurring).

[296] *Id.* at 598.

[297] *Guffey*, 16 S.W.2d at 528.

As ever, these principles operate in both unidimensional and multidimensional situations. Although relatively simple, unidimensional problems will involve the difficulty of determining what drilling is reasonably necessary and, correspondingly, what amount of damage the servient estate must suffer. Trouble mounts when the servient estate, through which the dominant estate wants to drill, is already using the formation. In such multidimensional cases, general easement principles require the parties to exercise their rights with due regard for the other and in a spirit of "mutual accommodation."[298] Thus, if the dominant estate's drilling is likely to preclude the servient estate's use of the formation, the dominant tenant should look for a reasonable alternative, if such is available within the premises. The dominant tenant ought to bear the costs of pursuing any alternative, but where none exists the dominant tenant may drill and the servient tenant must bear the resulting loss to its use.

c. Correlative Rights as Neighbors in a Common Reservoir

Occasions could arise when a severed mineral estate and a severed sequestration estate each holds title to elements of the same geologic formation—the former to the oil and gas and the latter to the pore space in which the oil and gas is entrained.[299] There are two different kinds of relationships that this scenario might occasion, depending on the order in which the two severed estates were created. When the mineral estate is severed from the land first, the relationship between the severed mineral estate and the sequestration estates is one of split estates.[300] This is so because the mineral estate would enjoy, from its creation, an express or implied easement burdening the elements of the surface estate from which it is carved, and these elements would include the pore space. Thus, a later taker of an estate in the pore space would take subject to the mineral estate's easement. Burdened by the mineral easement, the severed sequestration estate would be servient to the mineral estate in the very same way that the surface estate was

[298] RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.8(d) (AM. L. INST. 2000); *see also supra* Part IV.B.1.

[299] Not every subsurface estate will encompass every subsurface formation, and subsurface estates need not overlap. *See generally* George, *supra* note 95 (discussing depth severances in mineral conveyances). A landowner might, for example, convey pore space 5,000 feet below surface to one party and convey minerals below 5,000 feet to another.

[300] *See supra* Part III.

servient to the easement before severing the pore space into a separate estate.[301]

Where, however, the mineral estate is not prior in time to the sequestration estate, it may have no claim to an easement in the elements of the sequestration estate.[302] Such a scenario fits uneasily into any of the legal frameworks previously discussed. The two estates in this setting have correlative rights, but not any of the forms of correlative rights discussed thus far. Neither estate would likely hold an easement in the other with respect to use of a shared formation, nor would they hold competing easements in the property of a third party. Rather, each would directly own an estate in one aspect of the formation—one in the rights to the hydrocarbons and the other in the rights to pore space. The closest analogy that can be drawn is to the relationship between neighboring owners of oil and gas or pore space within a common, interconnected reservoir. The holders of coequal mineral and sequestration estates in a common formation are, in David Pierce's phraseology, members of the same "reservoir community."[303] The biggest difference between true reservoir neighbors and the coequal estates in our hypothetical seems to be the lack of a property boundary dividing the estates.

The applicable legal doctrine governing coequal estates in this setting, therefore, is the doctrine of correlative rights from oil and gas law. Although the correlative rights doctrine is notoriously vague,[304] it boils down to a principle not unlike the due regard principle: correlative rights in a common reservoir of oil, gas, or pore space entitle each owner to the fair opportunity to enjoy a proportional share of the reservoir without waste. Each owner in turn owes a correlative duty not to unreasonably interfere with the other owners' fair opportunity to do likewise.[305] Unlike in the correlative relationships studied to this point, the correlative relationship between members of a reservoir community who are not separated by a property boundary is perfectly equal; none enjoys priority or dominance over the other owners. However, the law does protect established uses of the reservoir, such

[301] *See supra* Part III.

[302] Under the maxim *nemo dat quod non habet*, the grantor cannot grant (expressly or impliedly) an easement in pore space it no longer owns. *Legal Maxims*, BLACK'S LAW DICTIONARY (11th ed. 2019).

[303] David E. Pierce, *Employing a Reservoir Community Analysis to Define and Marshal Correlative Rights in the Oil and Gas Reservoir*, 76 LA. L. REV. 787, 804 (2016).

[304] Schremmer, *supra* note 107, at 534–41.

[305] *Id.* at 560–63 (discussing the fair opportunity principle); 1 KUNTZ, *supra* note 90, §§ 4.3–4.8 (discussing correlative rights in common pools of oil and gas).

as existing oil or gas wells or injection operations, from subsequent interference.

Ordinarily, a reservoir owner is liable to another for violating the latter's correlative rights when (i) the defendant's act (ii) physically invades the plaintiff's property and (iii) damages the plaintiff either by (a) harming its ongoing subsurface activities or (b) depriving it of a fair opportunity to use the subsurface or produce its contents, unless the defendant has made a fair, reasonable, and nondiscriminatory offer to participate in the activity.[306] Additionally, wasteful uses of the common reservoir, i.e., uses for no beneficial purpose, may violate the correlative rights of other owners even when conducted entirely within the defendant's own tract.[307]

Since no property boundary separates the claims of coequal estates within the same formation underlying the same tract of land, the element of a physical invasion is irrelevant in this setting. Otherwise, the same test for defining violations of correlative rights ought to apply between coequal estates both owning rights in the same formation. The test applies in unidimensional cases where one reservoir owner uses a previously undeveloped portion of the reservoir, and multidimensional cases where a reservoir owner's new use collides in some way with another's established or planned operations. The question in unidimensional situations turns on whether the owner's activity constitutes waste or unreasonably interferes with other owners' fair opportunity to use the reservoir. In multidimensional cases, the additional question must be answered of whether the new use harms another owner's ongoing activities. As in other correlative relationships, these principles tend to confer a first-mover advantage on owners by protecting established lawful uses from interference by subsequent operations. Thus, while representing an altogether different set of correlative rights and duties, the relationship between coequal estates here reflects familiar themes.

[306] I call this the "fair opportunity doctrine." Schremmer, *supra* note 107, at 525.

[307] *Id.* at 583.

B. Application to Specific Conflicts

1. Use of the Surface

a. Severed Estate versus Surface Estate

Each severed estate is entitled to use the surface estate as reasonably necessary to enjoy its respective subsurface property. As between the servient surface estate and any of the dominant severed estates, the same rules apply as between split surface and mineral estates.[308] Where the surface uses of the two estates irreconcilably conflict, the rules governing multidimensional problems between surface and mineral estates apply.[309] In multidimensional situations, it is usually the first tenant to establish a lawful use of the surface who prevails, except when the dominant tenant's preferred use must prevail because there are no reasonable alternatives for its purposes.[310]

b. Severed Estate versus Severed Estate

As between separate severed estates, both of which are dominant over the surface estate, conflicts around irreconcilable surface uses should be resolved based on the estates' relative temporal priorities. Thus, if a mineral tenant intends to locate a tank battery in the same location where a sequestration tenant seeks to drill a carbon injection well, and both plans are reasonably necessary to enjoyment of the respective estates, the general rule would permit the senior estate to proceed.[311]

Situations may arise that justify an exception to this general rule and require the senior estate to accommodate the junior's surface use. Suppose the mineral estate is senior. If the mineral tenant wishes to locate its tank battery in the same location where the junior tenant seeks to drill its injection well, the general rule would permit the senior's and preclude the junior's use. However, if the junior tenant could establish that no reasonable alternative location for its well could be found on the surface of the servient estate, and that reasonable alternatives did exist for the senior tenant's intended tank battery, the senior ought to accommodate the junior's use. To permit the senior mineral tenant to locate its tank battery in the only location reasonably

[308] *See supra* Part III.A.

[309] *See supra* Part III.A.2.

[310] *See supra* Part III.A.2.

[311] *See* RESTATEMENT (THIRD) OF PROP.: SERVITUDES § 4.12 (AM. L. INST. 2000).

available to the junior pore space tenant for its injection well would deprive the junior tenant of the opportunity to enjoy its estate. It would also permit one use to go forward where otherwise two could occur in harmony. To be entitled to accommodation, the junior tenant would need to establish both the lack of a reasonable alternative for its intended use and the availability of alternatives for the senior's use. Even where the junior would not be entitled to accommodation, under Restatement principles, it might nonetheless make reasonable changes to the senior estate's use, perhaps by relocating the senior's tank battery, at the junior's own expense.[312]

2. Use of the Subsurface

a. Locating Wellbores in the Subsurface

Where disputes arise between coequal estates over the location of wellbores in the subsurface, the principles governing priority based on the time of each estate's creation apply.[313] Under those principles, priority should be given to the first-in-time, senior tenant except where the junior must be accommodated because it lacks a reasonable alternative location for its wellbore.[314] When the junior tenant can demonstrate that its preferred location is its only reasonable option, the senior tenant may, in justice, be required to accommodate that location, *if* the senior has alternative locations on the premises. In circumstances where one of the estates has already constructed a wellbore in a particular location and the other estate wishes to use all or part of that same location for its own wellbore, the advantage should generally go to the tenant who drilled first. Only in the rare circumstances that a junior estate has drilled in a location that entirely precludes future drilling by a senior estate, or that unreasonably interferes with bona fide prior plans to drill by the senior estate, should the junior be forced to plug or modify its existing wellbore or compensate the senior.

Frac hits might also occur between coequal mineral and sequestration estates, where a mineral tenant fracks a well and severely damages a carbon sequestration well of the sequestration tenant. In this situation, the parties' rights are identical to those of competing easement holders, discussed earlier in Part IV.B.2.a.ii.

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[312] *Id.* § 4.8(3).

[313] *Cf.* Lightning Oil Co. v. Anadarko E&P Onshore, LLC, 520 S.W.3d 39, 50–51 (Tex. 2017).

[314] *See supra* Part IV.A.2.

b. Accessing Deeper Zones

In matters of one estate drilling through another, an analogy may be drawn to cases involving the concurrent development of multiple severed mineral estates.[315] The most famous "multiple mineral development" case may be *Chartiers Block Coal Co. v. Mellon*.[316] The owner of a severed estate in a seam of coal sought to enjoin an oil and gas lessee from drilling through the plaintiff's coal seam to produce a deeper oil formation.[317] Despite not addressing the merits head on,[318] the court recognized the right of both estates to access and use their subsurface property in a "reasonable manner, having due regard for the interest and rights of both parties."[319] This would permit some drilling through the coal seam to reach lower oil-bearing formations, but clearly would not permit drilling "to an extent that will destroy the grant of the coal, nor even to seriously depreciate it, without ample compensation."[320] The oil lessee "cannot bore where he pleases, nor as often as he pleases."[321]

The Texas Supreme Court heard a similar dispute in *Guffey v. Stroud*, when the lessee of gas sued to enjoin the oil lessee from operating a well that produced gas.[322] The court had no doubt that the oil lessee had the right to drill through subsurface "gas pockets" and even "to bring to the surface so much of the gas as was necessary in the proper drilling for oil."[323] These rights were implicit in the grant of the oil lease because they are necessary to the use and enjoyment of the oil.[324] The right to drill through and even consume some gas as reasonably necessary for accessing the oil did not, however, extend to producing gas for its own sake from a well initially drilled for oil.[325] The gas lessee accordingly received an injunction against the oil lessee's well.[326]

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[315] *See e.g.*, Chartiers Block Coal Co. v. Mellon, 25 A. 597, 598–99 (Pa. 1893).

[316] *Id.* at 597.

[317] *Id.*

[318] *Id.* at 599.

[319] *Id.* at 598.

[320] *Id.*

[321] *Id.*

[322] 16 S.W.2d 527, 528 (Tex. [Comm'n Op.] 1929).

[323] *Id.*

[324] *Id.*

[325] *Id.*

[326] *Id.*

In *Rend v. Venture Oil Co.*, the plaintiff owned the coal estate and sought a preliminary injunction against an oil and gas lessee from completing a well and drilling in the future.[327] The complaint alleged that the oil and gas lessee's activities would penetrate coal seams, interfere with coal mining, and devalue the coal estate.[328] Finding that the complaint failed to establish that the drilling was likely to cause specific hazards and that the practice of drilling through coal seams was common and proven safe, the court denied the injunction and the oil drilling went forward.[329]

Taken together, the multiple mineral development cases demonstrate both that each coequal estate has the right to drill through others to access its deeper strata and that the driller is bound to do so only as reasonably necessary and without needlessly or excessively depreciating the value of shallower estates. The correlative relationship therefore would likely permit a mineral tenant to drill through a shallower formation containing sequestered carbon dioxide, if it is done reasonably and not excessively. Likewise, a sequestration estate may drill through shallower strata useful for mineral development as reasonably necessary to sequester carbon in the lower formation. In either case, the drilling is permitted even if it incidentally destroys or consumes some of the property of the other estate; such damage is *damnum absque injuria* to the extent the drilling is necessary and reasonable and not for the purpose of appropriating the other's property.[330]

As always, difficult questions will arise over what drilling is reasonably necessary and, correspondingly, what amount of damage must the servient estate suffer. Consider how parties should reason through this scenario: a sequestration estate objects to a mineral estate's plan to drill through a formation containing sequestered carbon because the wellbore penetration will require expensive corrective action.[331]

In this hypothetical, the mineral estate takes on the dominant role and the sequestration estate the servient role. The servient estate is entitled to use its pore space, but not to unreasonably interfere with the dominant estate's right to access its deeper zones. Because the carbon sequestration constitutes a preexisting use of the servient estate, it may be entitled to accommodation from the dominant estate if the drilling operations would preclude continued

[327] 48 F. 248, 248–49 (W.D. Pa. 1891).

[328] *Id.*

[329] *Id.* at 250–51.

[330] *See Guffey*, 16 S.W.2d at 528.

[331] *See supra* Part II.A.2.c.

use of the zone for carbon sequestration. But this remedy would require proof of a reasonable alternative to the drilling, and the dominant tenant probably cannot drill into its zone without going through the carbon storage formation or using a neighboring tract of land.[332] It is also likely that the drilling would not preclude the carbon sequestration but would only impose some costs of corrective action on the servient estate. No accommodation is likely, and any corrective action expenses will probably rest with the servient estate.

c. Occupying Pore Space

There is little if any precedent to guide the resolution of conflicts between coequal estates over the use of pore space in a shared formation. To orient the discussion, suppose *A* owns a severed pore space estate under Blackacre and *B* owns a severed mineral interest in oil and gas under Blackacre. *A* intends to use the pore space contained in the Entrada formation for carbon sequestration. However, *B* currently injects produced water from its oil and gas operations on Blackacre into the Entrada formation for disposal. The two uses of the formation are incompatible because *A*'s carbon sequestration project requires total control over the formation. This is not a matter merely of accessing one estate by drilling through the other, nor of placing wellbores in the surface. This situation poses a direct conflict between two coequal estates over the use of property they share: the formation's porosity.

If *B*'s severed mineral estate predates *A*'s pore space estate and enjoys an easement burdening *A*'s pore space, the split-estates framework, analyzed in detail above, controls.[333] If instead *B*'s estate cannot claim an easement in *A*'s, the two estates would be, in essence, neighbors in a common reservoir, the Entrada formation, as though separated by a vertical property line. The mineral estate is entitled to use the common reservoir to produce its share of the entrained hydrocarbons, while the pore space estate is entitled to use its share of the reservoir's porosity to sequester carbon dioxide. Each owner is entitled to a fair opportunity to use and enjoy its proportional share of the common formation.[334] One owner's fair opportunity rights are generally infringed when (i) an act by the defendant (ii) invades the plaintiff's property and (iii) damages the plaintiff either by (a) harming its ongoing subsurface activities or (b) depriving it of its fair opportunity, unless the defendant has made a fair, reasonable, and nondiscriminatory offer to participate in the

[332] This would not be required. *See* Sun Oil Co. v. Whitaker, 483 S.W.2d 808, 811 (Tex. 1972).

[333] *See supra* Part III.B.2.c.

[334] Schremmer, *supra* note 107, at 560–63 (discussing the fair opportunity principle).

activity.[335] It may also deprive owners of their fair opportunity to take or use a portion of the reservoir for wasteful, nonbeneficial purposes.[336]

It seems likely that *A*'s proposed operations would interfere with *B*'s continuing water disposal operations, which would make *A* liable to *B* for the resulting damage.[337] Further, if *A*'s proposed sequestration project would preclude any further use of the formation by *B* (which is also likely), *A* would be liable under element (iii)(b) of the test for precluding *B*'s opportunity to enjoy the shared reservoir. However, *A* can respect *B*'s correlative right to continued use of the reservoir and avoid liability under (iii)(b) by first making a fair, reasonable, and nondiscriminatory offer to *B* to participate in *A*'s operations. While *B* has no obligation to accept the offer or even negotiate with *A*, *B* will be deemed to have exhausted its fair opportunity to continue using the Entrada if *B* rejects a fair offer to participate with *A*.[338] While *B* lacks any right to prevent development of the reservoir by *A*, it would be entitled to participate in it, if it so chooses.[339]

3. Exploration

The rights of coequal subsurface estates to explore the subsurface geologically are seriously understudied.[340] At bottom, exploration conflicts are resolvable on the principles already identified. Each estate may use the land as reasonably necessary to explore its property. Each estate is dominant in its relationship to the surface estate. To the extent that the severed estates' surface uses conflict, their priority ought to be determined based on temporal seniority, subject to exceptions to accommodate the junior estate's needs where appropriate.[341]

Subsurface exploration of a particular formation will frequently require use of shallower subsurface zones, either by drilling through them with an exploration well or shooting seismic waves through them in seismic

[335] *Id.* at 525.

[336] *Id.* at 583.

[337] *A*'s liability should be limited to money damages, at least where *A*'s carbon sequestration operations are conducted pursuant to a lawfully issued governmental permit. Schremmer, *supra* note 20, at 1027.

[338] For more on the fair offer exception, *see id.* at 1023–26; Schremmer, *supra* note 107107, at 580–83.

[339] Pierce, *supra* note 118118, § 9.02, at 320.

[340] For the leading treatment, *see* Anderson, *supra* note 75, at 157–61.

[341] *See supra* Part IV.A.2.

surveying.[342] Each estate's reciprocal easement for access should permit both activities.[343] It also follows from these cases that each estate, in shooting seismic or drilling, must not exercise its rights unreasonably or excessively. Nor may it conduct activities intended to appropriate the property of the other estate.[344] Consequently, a mineral tenant may not conduct geological or geophysical exploration for the purpose of appropriating information about the pore space estate for carbon sequestration, nor may a sequestration tenant attempt to appropriate information about the minerals.[345]

A severed estate may also obtain information *incidentally* while exploring its own property that bears on the value of the other severed estate. The incidental information might be likened to natural gas that is incidentally consumed during the drilling of a well to reach a deeper oil-bearing zone. This was held not actionable in *Guffey v. Stroud*, as the deeper tenant's easement rights in the shallower zones permit some use *and consumption* of the overlying strata.[346]

Similarly, it should not be actionable to incidentally obtain information pertaining to a separate severed estate even if it is obtained during investigation of the very same formation in which the other estate has rights. By way of illustration, suppose *A* owns the pore space estate in Blackacre and *B* owns the mineral estate. While investigating the Entrada formation for its potential as a target for carbon sequestration, *A* obtains information about the presence or absence of hydrocarbons in the Entrada, in which *B* has rights as the mineral owner.

The rights of the parties in this setting are like those of neighboring owners in a common reservoir. They each have correlative rights to a fair opportunity to use and enjoy their share of the Entrada, and correlative duties not to impinge unduly on the other's fair opportunity. Courts have held that owners who incidentally obtain information about a neighboring mineral estate while seismic surveying its own property are not liable for trespass.[347] This comports with the fair opportunity principle at the heart of the

[342] Anderson, *supra* note 75, at 157.

[343] *Id.*

[344] *See* Guffey v. Stroud, 16 S.W.2d 527, 529 (Tex. [Comm'n Op.] 1929).

[345] *See id.*

[346] *See id.*

[347] Ohio Oil Corp. v. Sharp, 135 F.2d 303, 308–09 (10th Cir. 1943); Mallon Oil Co. v. Bowen/Edwards Assocs., Inc., 965 P.2d 105, 110–11 (Colo. 1998); *see also* Kennedy v. Gen. Geophysical Co., 213 S.W.2d 707, 711, 713 (Tex. App.—Galveston 1948, writ ref'd n.r.e.) (finding no liability for trespass resulting from seismic vibrations crossing the plaintiff's property line).

correlative relationship between common reservoir owners. Estates in subsurface formations include the right to conduct geophysical exploration. But unlike the right to produce oil and gas or use the storage capacity of pore space, the ability of one owner to explore its subsurface is not reduced by another owner's exercise of the same right. Geological exploration is a non-rival good.[348] Accordingly, the appropriate remedy for an owner whose subsurface information is discovered by another's seismic survey is to go and do likewise: conduct a survey of its own.

However, it is conceivable that certain uses of information obtained incidentally about another estate's property could injure the estate. In our earlier example, were *A* to learn that the Entrada was not suitable for commercial oil or gas production when surveying it for sequestration purposes, publishing that information to third parties could injure *B* by depreciating the value of its rights in the Entrada.[349] The wrong here turns on the deprivation of *B*'s fair opportunity to use or bargain away its interest in the oil and gas—although not all courts agree that loss of the speculative value of mineral rights is compensable.[350]

VI. CONCLUSION

With so many public and private interests committed to mitigating the rate of climate change by sequestering carbon dioxide into the earth's subsurface, there is little reason to doubt that carbon sequestration is coming to the active and depleted oil and gas fields of the United States. The question of how to coordinate these two subsurface activities, along with the agricultural, residential, and commercial uses of the surface of the overlying land, toward their common good is of great importance. If history is any guide, many commentators and even courts will be inclined to petition legislatures or regulatory agencies to enact strict and detailed rules to optimize efficiency and put a thumb on the scale for the industry they deem to be of greater utility to society.

[348] *See* Shell Petroleum Corp. v. Puckett, 29 S.W.2d 809 (Tex. App.—Texarkana 1930, no writ) (concluding the appellant's use of seismic surveying "did not deprive appellees of the right, if they had any, to also use seismographs for such a purpose").

[349] *Cf.* Grynberg v. City of Northglenn, 739 P.2d 230, 234–36 (Colo. 1987).

[350] Not all courts agree that a trespass that reveals no commercial deposits is compensable. Martel v. Hall Oil Co., 253 P. 862, 867 (Wyo. 1927). *Contra* Humble Oil & Refin. v. Kishi, 276 S.W. 190, 191 (Tex. Comm'n App. 1925), rev'd, 291 S.W. 538 (Tex. Comm'n App. 1927).

Before relegating the problem to the political branches, policymakers, and social engineers, lawyers, judges, and commentators should study seriously the background principles of the common law that would apply to order concurrent sequestration and extraction. Few, plain, and simple, the traditional principles order private actors' reasoning about how to conduct their surface and subsurface activities in developing various natural resources on shared land. In operation, the principles direct the actions of correlative rights holders toward the fullest practical enjoyment of their respective property. The doctrine sets up a system of rights and duties within which every rights holder's interest is balanced with every other's according to principles and rules that are intuitive and comprehensible for decision-makers to follow. The system's relative simplicity and formality allows persons of varying legal experience and sophistication to navigate actual and potential conflicts with other resource owners.

While formal, the system is not completely inflexible or insulated from social context. On the contrary, many of its doctrines require reference to social context by incorporating standards of reasonableness. The doctrinal system thus calls on private parties to consider what would be reasonable and what would not be reasonable under the circumstances. Reasonableness, ultimately, is a jury question and thus draws on the collective good judgment of the community. Even though it cannot provide them with easy or definitive answers in many cases, the doctrine both instructs private actors in the exercise of practical reasoning and shines a guiding light for landowners and developers, as well as their lawyers and courts, in ordering their pursuits toward their common good.

To make proper use of the doctrine's guiding light, it is essential to know how to structure the inquiry. This Article frames the analysis around the legal classification of the relevant parties' relationship, as split estates, competing easements, or coequal estates. The essence of each of these legal relationships is correlativity—each owner enjoys rights to use the land for its purposes and bears duties not to interfere with the other's rightful uses. The parties' correlative rights and duties are shaped by the same few, intuitive principles of the common law concerning respect for the fair opportunity of other rights holders, reasonable use of shared property, temporal priority among similarly situated rights holders, and reasonable accommodation of conflicting uses. These principles find unique expression in the doctrinal framework governing each type of relationship.

Which doctrinal framework applies depends on how title to the land, its minerals, and its pore space is held among the parties. Thus, this Article

probes the ways in which a landowner might divide ownership in these resources and explains the property interests that result from each. Of course, the doctrinal frameworks do not operate in a vacuum but become operative when the parties' actions bring them into some conflict. Thus, this Article also explores the likely conflicts between sequestration and extraction occurring within the same land, to provide some hypothetical facts on which to demonstrate the doctrines' operation.

In summary, this Article does two things. It provides a roadmap for parties, their lawyers, and courts showing the sources of likely conflict and the legal principles that guide the parties in avoiding, resolving, and, when necessary, litigating these disputes. It also demonstrates how the traditional common law principles and doctrines can indeed inform the coordination of carbon sequestration and mineral development on shared lands.