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When Engineering Solutions Cause Legal Problems: The Developing Field of Reservoir Rights and Liabilities

Joseph A. Schremmer

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I. Introduction

For well over a decade, the pages of this Quarterly have undoubtedly been filled with discussions of cutting-edge drilling and completion technologies like horizontal drilling and massive hydraulic fracturing, as well as the technical challenges of producing oil and gas from unconventional reservoirs. Engineers and geologists have indeed faced and solved many technical and scientific problems that had previously confounded the development of unconventional oil and gas resources.

Many of these advancements of engineering and geo sciences have made it feasible not only to efficiently extract tight oil and gas, but also to inject incredible volumes of substances into the pore spaces within geologic reservoirs for safe disposal and storage. One particular application of advancing injection technology—carbon dioxide sequestration or storage—has taken on a special salience in today’s public debates about climate change mitigation policy.

This article discusses some of the problems that all these engineering solutions have caused for the law of oil and gas. It begins in Part II with a brief outline of how the law slowly develops through the common law process and illustrates how that

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process responds, also slowly, to rapid technological and social changes, like the unconventional hydrocarbon revolution. Part III then surveys how courts have begun to reform the legal rights and remedies in common reservoirs to respond to the revolution. And Part IV concludes with an observation about what contributions the disciplines of engineering and geology might make to aid the law in its response, and thereby help clean up the mess their innovations have created.

II. The Common Law Process and Rapid Technological Change

Oil and gas law is mostly made by judges through the common law process. As disputes arise between parties and are litigated to courts, the courts are called upon to resolve the impasse by applying rules found in prior precedential cases. When a dispute involves a set of circumstances not previously seen in a precedential case, courts must reason whether and how the principles underpinning their prior decisions apply to this novel set of facts. The decisions in these new cases themselves become precedential and the process continues. In this fashion, the common law process grows the law incrementally over centuries but is never complete, just as human-kind’s capacity for getting into fights is timeless and never ending. Since the decades following Colonel Drake’s discovery, the body of oil and gas law has grown very substantially to the point that it fills volumes. Yet, despite its depth and breadth, the law of oil and gas has struggled to respond to the revolution in unconventional oil and gas development.

In particular, the law has struggled to resolve disputes that arise between parties over the use of commonly owned oil and gas reservoirs. For example, may one mineral interest owner (or lessee) hydraulically fracture a well on its property in such a manner as to send frac fissures into the subsurface property of a neighboring landowner and drain oil or gas through the fissures into its own wellbore? Or, may an oil and gas lessee use the subsurface of a neighboring tract to drill a horizontal wellbore to access the minerals under its own lease? Or, is the operator of a saltwater disposal well liable to a neighbor if its injected produced water migrates through the formation into the neighbor’s subsurface property? What if the injected fluid is hazardous chemicals or carbon dioxide, instead?

These and similar questions have percolated through the courts of oil and gas producing states in the past few decades. The results in these cases have been sufficiently varied and confusing that prominent legal commentators have called the law “not entirely unified or coherent.” Such incoherence is common during times of great technological change because the common law process almost always moves slower than society. Nevertheless, legal confusion can and often does depress investment in the use of new technologies that could make more efficient use of subsurface natural resources, including the storage capacity of pore space.

In recent memory (legally speaking), the law had to adapt to a similar technological shift with the advent of commercial air travel. Before airplanes, the English and American law of property held that the owner of land owned the soil as well as the entire column of air above the soil, reaching to the heavens, and the entire column of rock below the soil, reaching to hell. This maxim is known as the *ad coelum* doctrine (pronounced “add see-lum”), but is affectionately known by lawyers as the “heaven and hell doctrine.” Under the *ad coelum* doctrine, when an airplane flies

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over a landowner’s property without the landowner’s permission, it could constitute a trespass, which would entitle the landowner to sue to stop the overflights from occurring in the future. The trouble this legal doctrine would cause commercial airlines and the military is obvious: without the consent of every landowner between the points of departure and arrival, any route would be potentially off limits as a trespass.

As the courts began to hear “airspace trespass” cases, in which a landowner sued another party for flying over the plaintiff’s land, they began to grapple with the practical difficulties that the *ad coelum* doctrine caused for modern aerospace technology. After a good deal of uncertainty, courts eventually began to modify, or refine, the *ad coelum* doctrine to allow for high overflights, thereby modifying, or refining, the extent of the legal rights associated with land ownership. The seminal case came in *United States v. Causby*, in 1932, in which the United States Supreme Court ruled that landowners have no right to sue to stop overflights above their land, but may only sue for damages if constant airplane overflights somehow interfere with the owner’s ability to use and enjoy the surface of its land. This has been the governing rule about ownership and use of the airspace ever since.

III. Refining Reservoir Rights

Like airspace rights before it, the law of subsurface reservoir rights is undergoing a process of refinement brought about by rapid technological and engineering innovations. The process of refining rights and liabilities in the subsurface is substantially more complex, however, for reasons that this Quarterly’s readership will readily appreciate. Unlike the air, the subsurface is invisible and what knowledge we have about it is confined to the realm of scientific expertise. Moreover, unlike the airspace, reservoirs vary widely in their physical characteristics. Some are porous and permeable; some are tight; some are water drive; some are gas drive; and etc. An additional complicating factor is the multifarious types of technological advancements being made in subsurface uses. Unlike a single use—commercial air travel—the subsurface is increasingly capable of a multitude of sometimes inconsistent commercial uses; for example, horizontal drilling, hydraulic fracturing, natural gas storage, waste disposal, carbon sequestration or storage, and energy storage, to name a handful of the most common.

These physical difficulties have always helped form the development of oil and gas law. The foundational principles of the ownership of oil and gas reservoirs are the *ad coelum* doctrine—that the landowner owns all of the underlying rock and the in-situ fluids including oil and gas—and the rule of capture. The rule of capture permits a landowner to drain oil and gas from underneath a neighbor’s property through a well located on the landowner’s own tract. In adopting the rule of capture, early courts reasoned that the behavior and migration of subsurface oil and gas was not well understood and that it was practically impossible to determine from where in a reservoir oil or gas was drained into a well. The physical nature of the resource, and our lack of knowledge of it, shaped the legal rule.

The rule of capture does not permit a landowner to drill a well into the physical boundaries of a neighboring tract to drain oil or gas; this action would violate the *ad coelum* doctrine and constitute a subsurface trespass. The rule of capture also does not permit a landowner to damage or destroy a common reservoir or waste the oil or gas contained therein. On top of these principles of the common law, of course, state legislatures have adopted conservation laws to limit the location, spacing, and density of new wells and the amount or rate of production from wells.

Together with conservation statutes, this small family of principles has formed the basis for ownership and use of oil and gas reservoirs since the early days of the domestic industry. But their strict application to various unconventional drilling and completion techniques proves practically problematic. For example, would the *ad coelum* doctrine bar the use of hydraulic fracturing to create fractures to drain oil or gas from a neighboring parcel of land, which could greatly limit use of the technology, or ought trans-boundary frac fissures be allowed under the rule of capture—which would move the law of subsurface rights in the direction of airspace rights. In Texas, the question was answered in *Coastal Oil & Gas Corp. v. Garza Energy Trust*. Like the *Causby* case did for airspace rights, the *Garza* case refined the *ad coelum* doctrine as it pertains to the deep subsurface of the earth, such that the mere fact that frac fissures cross a landowner’s property line is not sufficient to establish a right to sue under trespass.

Yet, not all courts have been as willing to refine the *ad coelum* doctrine to exempt deep subsurface frac fissures from trespass (Continued)
liability. There is, viewed from a certain perspective, a countervailing practical consideration that warrants imposing trespass liability on cross-boundary fracturing. That being the difficulty small, often unsophisticated landowners have in defending themselves from an offsetting fracturing operation or to reciprocate when a more sophisticated party sends frac fissures across the line into the smallholder’s property.  

Horizontal drilling technology has generated similarly difficult questions. Consider a recent Texas Supreme Court case, Lightning Oil v. Anadarko Onshore E&P. There, Anadarko had an oil and gas lease on state lands, which restricted Anadarko from using the surface of the land to conduct exploration and drilling operations. Anadarko approached the landowner of the neighboring Briscoe Ranch and purchased a surface lease to drill horizontal wellbores from the Ranch into Anadarko’s offsetting minerals. Lightning Oil held the oil and gas lease on the Briscoe Ranch, and upon learning of Anadarko’s plan sued seeking to enjoin Anadarko’s drilling operations on the Ranch. Lightning Oil alleged that Anadarko’s wellbore would trespass on the ad coelum defined boundaries of Lightning Oil’s leasehold interest.

Emphasizing that the wellbores would not be perforated within Lightning Oil’s leasehold premises and that any oil or gas destroyed in the process of drilling Anadarko’s wellbores would be trivial, the court ruled against Lighting Oil and permitted the drilling. In rendering its decision, the court emphasized the practical importance to the oil and gas industry, and derivatively of society itself, of enabling greater use of horizontal drilling to produce otherwise unrecoverable reserves. Meanwhile, other decisions, including prior decisions by Texas courts, have held a defendant liable for trespass for penetrating a plaintiff’s subsurface with non-producing deviated wellbores. Consequently, the question, like Lightning Oil’s precise legal rationale, remains somewhat murky.

Garza and Lightning represent only two of the many emerging legal questions arising from new subsurface technologies. Even more recently, lawyers have turned their attention to a question that no court has yet decided: whether it would constitute a trespass to inject carbon dioxide into a subsurface reservoir for sequestration or storage if the carbon migrates beyond the injector’s property lines and underneath neighboring parcels of land. One possible analogy may be saltwater disposal. When an operator injects produced saltwater into a reservoir or saline aquifer for disposal, it frequently migrates underneath the land of others, yet courts generally do not find this to constitute a trespass absent some accompanying physical harm to the plaintiff’s land or wells. In fact, the Ohio Supreme Court has even permitted BP Chemicals to inject hazardous chemical wastes into a deep saline aquifer underlying hundreds of individual landowners without liability.

These cases appear to establish yet another refinement of the ad coelum doctrine for waste disposal that causes no physical harm to the plaintiff’s land or wells. Until a court actually decides a case claiming subsurface trespass from migrating carbon dioxide, however, it is uncertain whether the rule will cover that factual situation, or, instead, whether the carbon injector will be liable for trespass.

IV. Conclusion: Tailoring the Legal Doctrine to Fit Physical Realities

So how should courts decide these cases? One possible solution is to take a page from the courts that adopted the rule of capture to decide the earliest oil and gas disputes and let the physical realities of the subsurface resource shape the rules. For this, lawyers and judges might be wise to turn to earth scientists and petroleum engineers for guidance.

Based on the knowledge of the physical situation these other disciplines can offer, lawyers may deduce certain principles about subsurface rights and liabilities. For instance, we know that oil and gas and pore space exist within reservoirs and saline aquifers, which are, to some extent depending on their porosity and permeability, interconnected. We know that this means any one owner is limited in its ability to physically exclude others from draining oil or gas from or causing injected substances to migrate into the boundaries of its subsurface property. Additionally, an owner is limited (exactly how limited one might expect an engineer to know) in its ability to monitor the boundaries of its subsurface property to determine when and where they have been breached by an outside invasion. We might also say that these characteristics mean that reservoirs are used most efficiently when the owners are coordinated (“unitized” in the language of oil and gas law) rather than when they compete to produce or inject into the reservoir.

As experience shows from the refinement of airspace trespass, the inherent interconnectedness of subsurface reservoirs counsels against close adherence to rules of exclusion based on the ad coelum and trespass doctrines. Indeed, this is the direction that cases like Garza and Lightning Oil seem to be taking the law. And this development is thanks to the innovations of countless petroleum geologists and engineers who helped accelerate the science of oil and gas production beyond what our legal traditions could readily accommodate.

References


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4 328 U.S. 256, 261 (1946).

5 The modern rule is articulated in its most common form in The Restatement (Second) of Torts § 159 (Am. L. Inst. 1969).


8 See Elliff v. Texon Drilling Co., 210 S.W. 2d 559 (Tex. 1948).


12 Lightning Oil, 520 S.W.3d at 51.

13 Chevron Oil Co. v. Howell, 407 S.W.2d 525 (Tex. App. 1966); Humble Oil & Ref’g Co. v. L&G Oil Co., 259 S.W.2d 933 (Tex. App. 1953).


15 670 N.E.2d 985 (Ohio 1996).

16 Professor David Pierce famously articulated this conclusion in David E. Pierce, Carol Rose Comes to the Oil Patch: Modern Property Analysis Applied to Modern Reservoir Problems, 19 PENN. ST. ENV’T. L. REV. 241 (2011).

Joseph A. Schremmer is an assistant professor of law and the Judge Leon Karelitz Oil and Gas Law Professor at the University of New Mexico School of Law. He teaches courses on oil and gas law, environmental regulation of the oil and gas industry, property law, contracts, business associations, and secured transactions. Before entering teaching, Schremmer practiced law for six years in Wichita, Kansas with Depew Gillen Rathbun & McInteer, LLC.