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TORT THEORY, LITIGATION & AVENUES FOR RELIEF: HYDRAULIC FRACTURING IN OKLAHOMA

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Introduction

As the 20th century drew to a close, there was an international panic about lowering oil reserves, and dire predictions about a world thrown into chaos as non-fossil fuel alternatives were thought to be our only option for the 21st century. Few would have predicted that, in just a decade, the United States would explode as the world's largest oil and natural gas producer. Responsible for this new wealth of petroleum was a novel technique that allowed producers to access unconventional formations, primarily shales. Shale formations are finely grained, densely packed sedimentary rocks with low permeability, and are rich sources of petroleum and natural gas; currently, they are the most rapid area of growth for US energy production.¹ These formations are able to be explored and harvested through a combination of horizontal drilling and hydraulic fracturing techniques, with Oklahoma leading the charge in commercial fracturing.²

As oil and natural gas production exploded nationwide, old producers were revitalized and new states joined the fray. Pennsylvania and

* University of Oklahoma College of Law, J.D. Candidate 2023. I would like to thank my faculty advisor, Professor Daniel Nicholson, for his contribution and assistance with this article.

1. *Shale Gas 101*, ENERGY.GOV, <https://www.energy.gov/fecm/shale-gas-101> (last visited Feb. 9, 2022).

2. KRISTINA ALEXANDER, HYDRAULIC FRACTURING LAW AND PRACTICE § 23.01 (LexisNexis Matthew Bender 2021) [hereinafter LAW & PRACTICE].

Oklahoma, old giants in conventional resources, once again entered the market with access to previously unreachable—North Dakota, the new kid on the block, had so many new oil wells that there were too few pipelines to keep up.³

For a while, the U.S. enjoyed an economic boom, as small towns transformed into industrial centers overnight and massive amounts of money flowed into the market. The doomsayers of skyrocketing gas prices and energy sector collapse were quieted as the U.S. finally attracted domestic manufacturing once more. However, as with many introductions of new and innovative technologies, trouble was brewing below the surface estate. In 2009, Oklahoma started to experience a surge in seismic activity,⁴ unexpected in a state that sits on few tectonic plate lines.⁵ The earthquakes increased in frequency and magnitude until Oklahoma had more earthquakes of a magnitude 3 or larger between 2014 and 2017 than even California.⁶

While in hindsight, we understand that wastewater disposal is the more likely culprit than fracturing, there is a definite link in the public eye to hydraulic fracturing itself as being the cause, because wastewater disposal is a lesser-known downstream process in hydraulic fracturing. Likewise, some earthquakes are known to have been directly caused by fracturing itself, as recently as a 3.6 magnitude earthquake in 2019.⁷ The largest known earthquake directly caused by fracturing was a 4.0 magnitude in 2018 in Texas.⁸ Earthquakes are one of the most expensive of natural disasters: the Federal Emergency Management Agency estimates that a large earthquake in an U.S metropolitan area would cause \$100–200 billion in damages.⁹ Catastrophic property damage would be at least partly due to the current state and instability of the U.S infrastructure system, which for

3. KEITH B. HALL & HANNAH J. WISEMAN, *HYDRAULIC FRACTURING: A GUIDE TO ENVIRONMENTAL AND REAL PROPERTY ISSUES* 1 (2017) [hereinafter HALL].

4. *Oklahoma Has Had a Surge of Earthquakes Since 2009. Are They Due to Fracking?*, USGS, https://www.usgs.gov/faqs/oklahoma-has-had-a-surge-earthquakes-2009-are-they-due-fracking?qt-news_science_products=0#qt-news_science_products (last visited Feb. 9, 2022) [hereinafter *Surge of Earthquakes*].

5. *Transform Plate Boundaries*, NAT'L PARK SERV., <https://www.nps.gov/subjects/geology/plate-tectonics-transform-plate-boundaries.htm> (last visited Feb. 9, 2022).

6. *Surge of Earthquakes*, *supra* note 4.

7. *Id.*

8. *Id.*

9. KATHERYN MILES, *QUAKELAND: ON THE ROAD TO AMERICA'S NEXT NATURAL DISASTER* 6 (2017).

two decades has received a D average from the American Society of Civil Engineers.¹⁰

The question this article seeks to answer is under what theory of law could plaintiffs argue for compensation and whether they are entitled to such. It also explores the moral liability that oil companies have suffered and whether that is fair and just for energy companies facing twenty-first century levels of demand.

Nearly ten years after the first suits were being brought for torts related to earthquakes, we have the benefit of hindsight as to possible links, the effectiveness of preventative measures, and the foreseeability of injury. We also have regulations from the Oklahoma Corporation Commission (OCC) and the Oil & Gas Conservation Division, which aim to protect both residents from injury and companies from liability. But what is lost through time is the story of the individuals behind the cases, and their fight to find recompense with limited information and a huge dichotomy in power and resources. From these stories we glean lessons in liability and how fracturing fits in a world that is constantly increasing energy consumption but is less and less willing to tolerate the consequences of unbridled consumption.

What Is Hydraulic Fracturing?

To fully understand the legal implications of hydraulic fracturing, it is important to understand the process at a basic level.

A fracture is simply a separation (a crack) in a geologic formation (a rock) which divides it into two or more pieces.¹¹ These can be already naturally present, but the general fracturing process creates artificial fractures by applying a stress which exceeds the tensile strength (a rock's ability to resist breaking) of the formation, which loses its cohesion or cracks along the weakest plane.¹² The point of creating these new fractures in a formation is to facilitate the flow of oil and gas through these new cracks to a drill site. Thus, determining the exact consequences of stress on a formation is extremely important in the design of a fracturing attempt. The magnitude and orientation of principal stresses in the formation must be meticulously graphed to understand the subsequent orientation, height, and containment of the newly created fractures.¹³ The applied stress must

10. *Id.* at 7.

11. LAW & PRACTICE, *supra* note 2, at § 201[1].

12. *Id.*

13. *Id.*

also be reconciled with the natural fractures already present in the formation that create their own weak planes.¹⁴

The two main types of fracturing used today are high-volume hydraulic fracturing and horizontal drilling. High-volume hydraulic fracturing was developed in the U.S. in the 1940s, but exploded in use and popularity as traditional oil fields dried up and it subsequently became more cost effective to use non-traditional sources. “Hydraulic” simply means that the process uses a water-based fluid instead of traditional means (such as explosives). High-volume hydraulic fracturing begins with a vertical or angled well drilled one to two miles below the surface (1.6 to 3.2 kilometers).¹⁵ Along the way the well is fortified with cement or steel to prevent groundwater leakage.¹⁶ Once the well reaches the depth of the targeted formation, the operator blasts 8,000–80,000 cubic meters (cm³) of fracturing fluid (a combination of water, chemicals and sand, and other proppants specific to each company’s manufacturer) into impermeable rock formations at a pressure up to 9,000 PSI, which overcomes its tensile strength and creates the desired fracturing pattern. The pressure difference after the high-pressure pumps are turned off allows the oil and natural gas to flow through these new cracks to the well and the surface.¹⁷ The fracturing fluid then returns along with these hydrocarbons, but now mixed with a variety of toxic contaminants such as heavy metals and even radioactive elements.¹⁸ This fracturing fluid, sometimes called flowback fluid, can be treated to extract the toxins, but doing so is expensive and often beyond the capability of small-town water treatment plants.¹⁹

A hydraulic fracturing well can follow a shell horizontally for multiple kilometers, draining far larger sections of mineral estates than traditional vertical wells.²⁰ There are several environmental concerns that fracturing engineers face during their operations. Water contamination can happen through migration of fracking fluid and gas, but this can be mitigated through geological isolation, water management, and careful well

14. *Id.*

15. Marc Lallanilla, *Facts About Fracking*, LIVESCIENCE (Feb. 9, 2018), <https://www.livescience.com/34464-what-is-fracking.html>.

16. *Id.*

17. Robert B. Jackson, Jessica Owley & James Salzman, *Mineral Estate Conservation Easements: A New Policy Instrument to Address Hydraulic Fracturing and Resource Extraction*, 47 ENVTL. L. REP. NEWS & ANALYSIS 10112, 10112 (2017) [hereinafter Jackson].

18. LALLANILLA, *supra* note 15.

19. *Id.*

20. JACKSON, *supra* note 17.

construction. Geological isolation is especially important, as several thousand feet of impermeable rock formation can almost completely eliminate any threat of unwanted migration making it through to water aquifers.²¹ However, it is not just the fracturing process itself that causes concern. The fracturing fluid that flows back with the hydrocarbons is generally considered too expensive to refine back into its subsequent components and is instead reinjected as wastewater into disposal wells.²² It is this practice that has caused the most controversy as the main culprit of induced seismicity, perhaps the most dramatic of concerns and our focus.

Seismicity, and Its Link with Hydraulic Fracturing

While the link between hydraulic fracturing and earthquakes is becoming more and more clear to private and public actors alike in the past few years, the causality between the two was initially unclear. These mechanisms, while better understood now than even a few years ago, are extremely complex and well outside the expertise of many elected officials and legal professionals. But an understanding of the fundamental mechanisms that can be agreed upon are critical later to the ability of such causation to be recognized at law. After all, there is little in the way of remedy that plaintiffs can bring (under any claim) unless causation in fact can be established by at least a preponderance of the evidence.

Seismicity was the most unexpected phenomenon to occur from fracturing. It is the first time in American legal history that there has been a claim that manmade activities could directly control such a drastic and awe-inspiring natural phenomenon. For example, while the ancient Greeks often built temples along streams made from earthquakes (partly because of the mysterious gases produced therefrom, such as the famous hallucinatory predictions from the Delphi oracle), they considered seismic activity to be from the Underworld, building shrines to Hades and Kore along the Hierapolis fault as an entrance to hell.²³ Stanford geologist Amos Nur introduced a theory (well supported by archaeological and historical evidence) that a series of earthquakes was the cause of the Late Bronze Age collapse circa 1200 B.C., quite literally toppling Southeast Europe, West

21. LAW & PRACTICE, *supra* note 2, at 205[1][a].

22. *Id.* at 303[5].

23. Bethany Augliere, *Earthquakes Shaped Ancient Greek Culture*, EARTH: THE SCIENCE BEHIND THE HEADLINES (Dec. 14, 2017), <https://www.earthmagazine.org/article/earthquakes-shaped-ancient-greek-culture/>.

Asia, and North Africa into the dark ages until 750 B.C.²⁴ Even today, with all the advances of technology that modern civilization brings, earthquakes can cause thousands of fatalities miles from their epicenters in just minutes. China can claim the three deadliest earthquakes in recorded history: the 1920 Haiyuan and 1976 Tangshan earthquakes each caused around a quarter of a million fatalities, only beaten by the legendary 1556 Shaanxi earthquake near a million fatalities.²⁵ More recently, the Haitian government reported over three hundred thousand fatalities in the 2010 Port-au-Prince earthquake (although this number is somewhat disputed).²⁶ Along with the death toll, the most frightening aspect of earthquakes is that experts are completely unable to predict any major earthquake; rather, they can only give an estimate about the probability of an earthquake occurring in a set number of years based on previous activity and fault lines.²⁷

With this background, the idea that fracturing could cause these potentially deadly events would have been an immense cause of public policy concern predating any serious investment in the practice. Furthermore, the areas in which there is the most fracturing (and wells in general) are also generally the areas in which there are the least amount of natural fault lines and historical seismic activity.²⁸

In fact, it is not the fracturing process itself, despite the violence inherent in blasting new cracks in deep formations, that is to blame for most earthquakes. Injection wells, rather than earthquakes, are the most likely to trigger earthquakes.²⁹ As previously discussed, at the end of the fracturing process, water and other fluid waste flows back with the hydrocarbons and is separated from the petroleum products. Generally, this used fracturing fluid is not separated again into its components for reuse, but rather injected into the ground at injection well sites near the drilling site. The faults created by the fluid pressure in these injection wells are our main culprits:

24. Ellen Licking, *Don't Blame the Trojan Horse: Earthquakes Toppled Ancient Cities*, *Stanford Geophysicist Says*, STANFORD U. NEWS SERV. (Nov. 11, 1997), <https://news.stanford.edu/pr/97/971112nur.html>.

25. Hannah Ritchie, *What Were the World's Deadliest Earthquakes?*, OUR WORLD IN DATA (Oct 5, 2018), <https://ourworldindata.org/the-worlds-deadliest-earthquakes>.

26. *Haiti Honors 316,000 Citizens Dead in the 2010 Earthquake*, TELESUR (Jan. 13, 2022), <https://www.telesurenglish.net/news/Haiti-Honors-316000-Citizens-Dead-In-the-2010-Earthquake--20220113-0004.html>.

27. *Can You Predict Earthquakes?*, USGS, <https://www.usgs.gov/faqs/can-you-predict-earthquakes> (last visited Feb. 9, 2022).

28. *Interactive Fault Map*, USGS <https://www.usgs.gov/programs/earthquake-hazards/faults> (last visited Feb. 9, 2022).

29. LAW & PRACTICE, *supra* note 2, at 303[5].

when fluids are pumped *back* into these faults for water disposal, it creates “critical stress” sites.³⁰ Faults, geologically speaking, are fractures in the earth’s subsurface, whether natural or man-made.³¹ Generally, the earth on either side of a fault-line are stationary, as forces such as gravity and friction resist movement.³² However, if shear stress from fluid injection into these wells is strong enough, it can overcome these forces and allow the two sides to slip—and an earthquake is the violent shaking caused when the earth’s subsurface suddenly slips.³³ This is the critical stress point of a fault: when the subsurface shear stresses are sufficient to overcome stationary forces and cause this slippage.

The critical stress point of a fault is thought to be triggered in two manners: (1) increasing pore pressures within subsurface formations, which decreases friction and (2) altering subsurface stresses.³⁴ The first is the method thought to be responsible for linking hydraulic fracturing and earthquakes together.³⁵ The ability of pressure to overcome friction has been well understood by physicists and geologists for many years. Friction, as a force, is simply the product of two factors. First is the coefficient of friction, which can be understood as the “roughness” of a material: for example, it is far harder to push an object across rough cement than it is an ice rink because cement has a higher friction coefficient than smooth ice. The second factor is the magnitude of the force pressing two surfaces together (known to first-year physics students as the “normal force”). This is also easy to understand from everyday life: attempting to push a heavy armoire across a room is far more difficult than pushing a folding chair because the magnitude of gravity pulling down on the armoire (or simply put, its weight) is stronger than a lightweight folding chair.

Pore pressure, which is increased from subsurface injections, acts on a fault very similarly to an air hockey table does with a puck.³⁶ The air pushed through the tiny holes in the surface of an air puck table allow the puck to slip and slide far more easily across the surface than when the table is turned off: the same holds true for subsurface pores when fluid is forced

30. HALL, *supra* note 3, at 182.

31. *Id.*

32. *Id.* at 183.

33. *Id.*

34. *Id.*

35. *Id.*

36. A wonderful analogy from Keith B. Hall and Hannah J. Wiseman in *Hydraulic Fracturing: A Guide to Environmental and Real Property Issues*, at 183. While the prior examples are my own, I could not top their ingenuity here.

through them at high pressures, allowing the two sides of a fault to slip and slide and thus creating earthquakes.

The concept in theory is not difficult to understand, but proof that this is what is really happening in nature is not so easy. First, there is a relatively small number of data points within just a few discrete events.³⁷ For there to be consensus among the scientific community, more research needs to be done in order to understand the true data on fluid injections and volumes.³⁸ The USGS is currently conducting a project to study induced seismicity, reacting to the “string of suspicious quakes in shale-gas areas.”³⁹ The presence of ongoing research has not stopped many individual seismologists and other researchers from independently declaring their unwavering belief that wastewater reinjection is certainly the direct cause of nearby earthquakes. Arthur McGarr, a geophysicist expert for the USGS, as early as 2010 was certain that nearby reinjection sites were to blame for an uptick in earthquakes in Youngstown, Ohio, stating that “[t]here’s no doubt that those Youngstown earthquakes are directly associated with the disposal well there.”⁴⁰ Even the Ohio Oil and Gas Association agreed with McGarr as to that location.⁴¹ John Armbruster, a geologist at the Lamont-Doherty Earth Observatory at Columbia University, reacting to the Youngstown quake, believed that “any disposal well that’s been pumping stuff into the ground for months can cause earthquakes.”⁴² Notably for Oklahoma, several state seismologists raised alarm at the connection between fracturing and injection sites and increased local earthquakes, eventually resulting in an official state response.

Still there is no general scientific consensus. There is no way to determine directly whether an earthquake is natural or manmade as they act and operate the exact same way. Rather the only data anyone can go by is

37. Henry Fountain, *Add Quakes to Rumbblings Over Gas Rush*, N.Y. TIMES (Dec. 12, 2011) <https://www.nytimes.com/2011/12/13/science/some-blame-hydraulic-fracturing-for-earthquake-epidemic.html>.

38. *Id.* (quoting William Leith, USGS senior science advisor for earthquake and geologic hazards).

39. *Id.*

40. Peter Fairley, *Fracking Quakes Shakes the Shale Gas Industry Well Shutdowns Prompted by Fracking-Induced Seismicity May Inspire Technology Tweaks*, MIT TECH. REV. (Jan 20, 2011), <https://www.technologyreview.com/2012/01/20/188290/fracking-quakes-shake-the-shale-gas-industry/>.

41. *Id.*

42. Matt Smith & Thom Patterson, *Debate Over Fracking, Quakes Get Louder*, CNN (June 15, 2012, 3:28 pm), <http://www.cnn.com/2012/06/15/us/fracking-earthquakes/index.html>.

the increase in frequency, magnitude, or duration of earthquakes. The National Research Council (an substituent of the National Academy of Sciences) has concluded that “while the general mechanisms that create induced seismic events are well understood, we are currently unable to accurately predict the magnitude or occurrence of such events due to the lack of comprehensive data on complex natural rock systems and the lack of validated predictive models.”⁴³ In any pending or near future litigation related to Oklahoma earthquakes, there is no direct causal evidence upon which plaintiffs can rely.

The First Case

Sandra Landra was sitting in her home in Prague, Oklahoma, when an earthquake of 5.0 (Moderate on the Richter scale) magnitude struck. This earthquake, later known as the Prague Earthquake, was strong enough to severely damage several buildings and to buckle pavement.⁴⁴ Her home began to shake, dislodging large debris from her chimney that crashed down upon her. She suffered serious injuries to her knees and legs, and had over \$75,000 in personal injury damages.⁴⁵ She sued more than 25 different companies. Although the earthquake occurred in 2011, her suit floated around in limbo as New Dominion filed motions to dismiss, claiming that the Oklahoma Corporation Commission (OCC) had exclusive jurisdiction over oil and gas operation suits.⁴⁶ Landra, in response, argued that New Dominion was misinterpreting Oklahoma statutes that granted jurisdiction to the OCC.⁴⁷

Procedural issues of jurisdiction continued until 2015, when the Supreme Court of Oklahoma agreed with Landra and held that the district court had jurisdiction over private tort actions even when they were related to oil and gas manufacturing.⁴⁸ Title 17, Section 53 states that OCC has exclusive jurisdiction, power and authority with reference to “the exploration, drilling, development, production and operation of wells used in connection with the recovery, injection or disposal of mineral brines.”⁴⁹ However, the

43. *Id.*

44. James Patrick Logan, *What’s Shakin’? Ladra v. New Dominion, LLC: A Case of Consequence for the Hydraulic Fracturing Industry and Those Affected by Induced Seismicity*, 34 *Pace Envtl. L. Rev.* 207, 211 (2016).

45. *Landra v. New Dominion*, 2015 OK 53, ¶ 3, 353 P.3d 529, 530.

46. *Id.* ¶ 4, 353 P.3d at 530.

47. *Id.*

48. *Id.* ¶ 12, 353 P.3d at 532.

49. Okla. Stat. Ann. tit. 17, § 52 (West).

Supreme Court of Oklahoma has repeatedly limited these broad powers to those that concern the public interest and *not* disputes between two private actors.⁵⁰ The court went on to clarify that district courts only had limited powers in regard to OCC: courts could not “collaterally attack” the orders, rules, and regulations of the OCC.⁵¹ A collateral attack is “an attempt to avoid, defeat, evade, or deny the force and effect of a final order or judgment in an incidental proceeding other than by appeal, writ of error, certiorari, or motion for new trial.”⁵² In sum, the court agreed with Landra concerning jurisdiction of state district courts: “Appellees confuse the statutory grant of exclusive jurisdiction to the OCC to *regulate* oil and gas exploration and production activities in Oklahoma, with the jurisdiction to *afford a remedy* to those whose common law rights have been infringed by either the violation of these regulations or otherwise.”⁵³

After defining the roles of the OCC and the judicial system, the Supreme Court of Oklahoma had very little to say regarding substantive law. After acknowledging Landra’s private right of action of ultrahazardous activity and ordinary negligence, the court remanded it to the district court for a ruling on negligence or absolute liability.⁵⁴ Unfortunately for others

50. *Morgan v. Oklahoma Corp. Comm’n*, 2012 OK CIV APP 31, ¶ 10, 274 P.3d 832, 836 (“The OCC oversees the conservation of oil and gas and its jurisdiction is limited to the protection and resolution of public rights.”); *Marathon Oil Co. v. Corporation Comm’n of State of Oklahoma*, 1994 OK 28, ¶ 14, 910 P.2d 966, 970 (“The jurisdiction granted under section 86.4 is limited to the protection of public rights. This protection of public rights includes the prevention of waste and the protection of correlative rights of owners of mineral interests in the land overlying a common source of supply.”); *Rogers v. Quiktrip Corp.*, 2010 OK 3, 6, 230 P.3d 853, 857 (“The Commission, although possessing many of the powers of a court of record, is without the authority to entertain a suit for damages.”); *Northern Pipeline Construction Co. v. Marathon Pipe Line Co.*, 458 U.S. 50, 70, (1982) (“[A] matter of public rights must at a minimum arise ‘between the government and others.’”); *Meinders v. Johnson*, 2006 OK CIV APP 35, ¶ 19, 134 P.3d 858, 86 (“The Corporation Commission has no jurisdiction to award damages or determine private disputes between an industry within its regulatory authority and an individual outside the limited powers granted by the Oklahoma constitution and statutes.”); see also *Grayhorse Energy, LLC v. Crawley Petroleum Corp.*, 2010 OK CIV APP 145, ¶ 12, 245 P.3d 1249, 1254; *Tenneco Oil Co. v. El Paso Nat. Gas Co.*, 1984 OK 52, ¶ 21, 687 P.2d 1049, 1053–54.

51. *Landra*, ¶ 11, 353 P.3d at 531–32.

52. *Id.* (citing *Nilsen v. Ports of Call Oil Co.*, 1985 OK 104 ¶ 11, 711 P.2d 98, 101).

53. *Id.* ¶ 12, 353 P.3d at 532.

54. *Id.*

needing legal guidance, Landra eventually agreed to settle for an undisclosed amount in 2017 before any further substantive proceedings.⁵⁵

Landra still provided two firsts for fracturing litigation. This case was the first time that a private tort from fracturing was brought before the Oklahoman supreme court. It also was the first time that the court established its jurisprudence over these negligence and absolute liability suits. However, this is the only true issue that gained resolution. There was nothing concerning what ordinary care looked like from an operator of an injection well (did they have a duty to refrain from causing or adding to seismicity?), or whether fracturing could fall into the class of ultrahazardous activities. Subsequent cases were still operating with a blank slate.

Mid-Era Cases: 2015–2020

Because *Landra v. New Dominion* ended in settlement, the question of whether claimants could succeed as a matter of law remained unanswered. Landra had based one of her claims for relief upon a strict liability standard, which is a tort liability theory that does not require proof that a defendant was negligent.⁵⁶ Instead, negligence is replaced with participation in an “ultrahazardous activity,”⁵⁷ which in oil and gas cases originated from *Rylands v. Fletcher* in 1868, where the defendant’s water reservoir broke through old mines underneath his property and flooded the plaintiff’s property.⁵⁸ States differ on whether they consider ultrahazardous activity theory to apply to oil and gas production,⁵⁹ but the Oklahoma courts and legislature have not yet ruled on the issue.⁶⁰ Clearly, strict liability is a lucrative option for plaintiffs, because negligence claims require far more

55. *Settlement Reached Between Two Oklahoma Oil and Gas Companies and Prague Resident Injured in 2011 Earthquake*, OKLAHOMA NEWS CHANNEL 4 (Oct. 20, 2017), <http://kfor.com/2017/10/20/settlement-reached-between-two-oklahoma-oil-and-gas-companies-and-prague-resident-injured-in-2011-earthquake/>.

56. RESTATEMENT (SECOND) OF TORTS § 519 (AM. L. INST. 1975).

57. *Id.* (“One who carries on an abnormally dangerous activity is subject to liability for harm to the person, land or chattels of another resulting from the activity, although he has exercised the utmost care to prevent the harm.”).

58. *Rylands v. Fletcher*, L.R. 3 H.L. 330 (1868).

59. HALL, *supra* note 3, at 232.

60. Kate Halloran, *Oklahoma Resident Can Sue for Alleged Fracking-Related Earthquake Activities*, AM. ASS. FOR JUST. (Aug. 6, 2015), <https://archive.justice.org/what-we-do/enhance-practice-law/publications/trial-news/oklahoma-resident-can-sue-alleged-fracking/>.

elements than simple causation, which on its own creates troubles for plaintiffs. While ordinary negligence does not require a state to recognize hydraulic fracturing as an ultrahazardous activity, it presents its own issues as a plaintiff must establish four classic elements by a preponderance of the evidence: injury, duty, breach, and causation.⁶¹

In the same earthquake that damaged Landra's legs, Jennifer Lin Cooper, also a Prague resident, filed a class action suit for all residents of nine counties whose homes were damaged in the earthquakes.⁶² She had \$100,000 in property damages.⁶³ One of the defendants, Spess Oil Company, in its answer claimed that this property damage was not a foreseeable event nor the proximate cause of her injuries.⁶⁴ Spess Oil further sought a declaration that hydraulic fracturing and water disposal were not an ultrahazardous activity.⁶⁵ If the court agreed with the defendants, then both negligence and strict liability would no longer be options for relief.

As to the foreseeability prong in causation, Cooper introduced the testimony of Dr. Austin Holland, a former state seismologist at the University of Oklahoma. As the head seismologist at the Oklahoma Geological Survey, he had previously published research that linked the increase in earthquakes since 2009 in Oklahoma to increased fracturing practices.⁶⁶ He testified under oath that he had received pressure to suppress his findings from top university officials, including former OU President David Boren and Harold Hamm, chairman and CEO of Continental Resources.⁶⁷

The president of the university expressed to me that it had complete academic freedom, but that as part of being an

61. RESTATEMENT (SECOND) OF TORTS § 328(A) (AM. L. INST. 1975).

62. Michelle Charles, *Partial Settlement Reached in Oklahoma Earthquake Suit*, ENID NEWS (Nov 30, 2018), https://www.enidnews.com/news/state/partial-settlement-reached-in-oklahoma-earthquake-suit/article_c8fe56f3-25a5-5ca3-afb9-195670cc1c1b.html.

63. *Id.*

64. Amended Answer and Counterclaim of Defendant Spess Oil Company, *Cooper v. New Dominion, LLC.*, No. CJ201524 (Okla. Dist. Nov. 24, 2015), 2015 WL 9687755.

65. *Id.*

66. Rivka Galchen, *Weather Underground: The Arrival of Man-Made Earthquakes*, NEW YORKER (Apr. 6, 2015), <https://www.newyorker.com/magazine/2015/04/13/weather-underground>.

67. Nick Hazelrigg, *Former OU Researcher, State Seismologist Felt Pressured to Suppress Fracking Research*, OU DAILY (Nov. 17, 2017), https://www.oudaily.com/news/former-ou-researcher-state-seismologist-felt-pressured-to-suppress-fracking/article_3fa235ce-ca4d-11e7-9fe9-a35866d06ac4.html.

employee of the state survey, I also have a need to listen to, you know, the people within the oil and gas industry... . Harold Hamm expressed to me that I had to be careful of the way in which I say things, that hydraulic fracturing is critical to the state's economy in Oklahoma, and that me publicly stating that earthquakes can be caused by hydraulic fracturing was, you know, could be misleading.⁶⁸

The district court hasn't yet gotten the chance to weigh in on the foreseeability of damages. Instead, it approved a motion for settlement from Spess Oil Company, Equal Energy, and Fairfield, who put \$925,000 into a settlement fund.⁶⁹ For the remaining defendant, New Dominion Oil, the district court found (and the court of appeals agreed) that the predominant issue was the causation factor.⁷⁰ The case is on appeal to the Oklahoma Supreme Court, in which New Dominion has argued that issues of ultrahazardous activity, negligence, and nuisance are inappropriate for questions of class certification.⁷¹

New Dominion, ever the remaining defendant, has yet another case pending. Terry and Deborah Felts of Oklahoma County suffered damages from earthquakes of 4.2 and 4.3 magnitude. They sued Devon Energy Company and eleven other defendants for negligent disposal of drilling waste and liability for participation in an ultra-hazardous activity.⁷² All of the defendants besides New Dominion and Callie Oil Company have been dismissed from the suit.

What is, then, the closest that Oklahoma courts have come to ruling on the ultrahazardous or negligence claims of these plaintiffs? The closest we have is from *West v. ABC Oil Company*, a case filed in 2016 in the District Court of Pottawatomie County. Lisa West and Stormy Hopson sued 15 different companies, as individuals and as class representatives, for the

68. *Id.*

69. 3 *Oil Companies Settle in Class-Action Suit over Oklahoma Earthquakes*, INSURANCE JOURNAL (Dec. 4, 2018), <https://www.insurancejournal.com/news/southcentral/2018/12/04/510892.htm>.

70. *Cooper v. New Dominion, LLC*, No. 117,281 (Okla. Ct. of Civ. App., Nov. 15, 2019).

71. *Cooper v. New Dominion, LLC*, No. IN-117281 (Okla. Sup. Ct., Jan. 9, 2020).

72. *Felts v. Devon Energy Production Company, LP.*, No. CJ-2016-137 (District Ct., Oklahoma Cty., Okla., Jan. 11, 2016)

defendants to pay earthquake insurance premiums, both retrospectively and for expected future premiums.⁷³

The claim hinged on the argument that the increased seismic activity in Oklahoma made earthquake premiums unaffordable for Oklahoma residents who had property damage from earthquakes and who would want to purchase policies for future events.⁷⁴ Several defendants filed answers that pointed out, quite correctly, that insurance premiums were not an available remedy under Oklahoma law.⁷⁵

The district court agreed with the defendants that insurance premiums were not a valid remedy, but tantalizingly stated some dicta concerning causation. The court dismissed claims against the defendants for the swarm of earthquakes in Oklahoma County, not finding sufficient causation between the named plaintiffs' injuries and the defendant's activities. However, it left open the possibility for earthquakes in Prague, Fairview, Cherokee, Pawnee and Cushing: "the second amended complaint sufficiently alleges facts to establish a reasonable connection between the injection well activities of the defendants in question and damage to the named plaintiffs."⁷⁶

There are some definitive answers, however, concerning at least the jurisdictional powers of state and federal courts over these cases. *Sierra Club v. Chesapeake Operating LLC* was filed in the United States District Court for the Western District of Oklahoma in 2016, under the Citizens Suit Provision in the Resource Conservation and Recovery Act.⁷⁷ This provision permits a citizen to bring civil action against:

Any person, including the United States and any other governmental instrumentality or agency, to the extent permitted by the eleventh amendment to the Constitution, and including ... past or present owner or operator of a treatment, storage, or disposal facility, who has contributed or who is contributing to the past or present handling, storage, treatment, transportation, or disposal of any solid or hazardous waste which may present an

73. *West v. ABC Oil Company, Inc.*, No. CJ-2016-00049 (District Ct., Pottawatomie County, Okla., Feb. 18, 2016), removed, No. 5:16-cv-00264-F (W.D. Okla., Mar. 18, 2016), appeal pending, No. 18-600 (10th Cir.).

74. *Id.*

75. *Id.*

76. *Id.*

77. 42 U.S.C.A. § 6972(a)(1)(B) (West).

*imminent and substantial endangerment to health or the environment.*⁷⁸

Sierra Club's claim was, of course, for the flowback fluid reinjection that allegedly put Oklahoma residents in "significant and immediate risk."⁷⁹ The only claims for relief, however, were injunctive and declaratory, including limiting reinjection to levels that seismologists agreed would be less likely to cause earthquakes and for independent earthquake monitoring.⁸⁰ The district court granted the defendant's motion to dismiss, concerned that federal jurisdiction would interfere with the state's authority (and its administrative agencies) to establish their own public policies and that the primary relief sought was already available from the OCC.⁸¹ The court, while explaining why federal jurisdiction was inappropriate, cited to the Burford abstention doctrine, which is derived from *Burford v. Sun Oil Co.* from the Supreme Court of the United States.⁸² This doctrine counsels that, where state-court review is available, federal courts should refuse jurisdiction when (1) there are either difficult questions of state law bearing on policy problems or (2) federal review would be disruptive to a state's effort to establish a coherent policy.⁸³ Interestingly, the federal court thought that the primary jurisdiction rested with the OCC, *not* the state district courts.⁸⁴ The court gave five reasons for this recommendation: (1) the factual issues of fracturing endangerment is not within conventional judicial experience; (2) defendants could face conflicting orders from the state courts and the OCC; (3) the issue is already before and being handled by the OCC; (4) the OCC has demonstrated diligence in resolving the issues; and (5) any injunctive relief requested will require scientific and technical expertise with the OCC possesses.⁸⁵ The district court thus granted the defendant's motion to dismiss for lack of subject-matter jurisdiction.

Sierra Club and *Landra* do face some juxtaposition: the federal district court believed that the OCC was best equipped for seismicity-related

78. *Id.*

79. Complaint for Declaratory and Injunctive Relief, *Sierra Club v. Chesapeake Operating LLC*, No. CIV-16-134 (W.D. Okla., Feb. 16, 2016), *Motions to dismiss granted*, 248 F. Supp. 3d 1194 (W.D. Okla., Apr. 4, 2017).

80. *Id.*

81. *Id.*

82. 319 U.S. 315 (1943).

83. *Sierra*, 248 F.Supp.3d at 1202–03.

84. *Id.* at 1206.

85. *Id.* at 1206–09.

disputes, but the Supreme Court of Oklahoma is perfectly amenable to hear these cases. However, the Oklahoma Corporation Commission was created by the Oklahoma constitution in 1907 and the First Legislature gave the Commission its jurisdictional authority.⁸⁶ The authority to regulate what cases the OCC can hear belongs to Oklahoma state courts, despite the federal district court's recommendation. Therefore, it is unlikely unless a higher federal court finds differently than in *Sierra* that we will see cases outside of Oklahoma state courts. That hardly answers questions of substantive law, however, which remains: under what claim can plaintiffs expect Oklahoma state courts to be willing to grant relief?

Public Reaction & Issues

By 2016, the increased seismic activity was starting to be noticeable in more densely populated—and richer—urban areas: Edmond, Oklahoma City, and Tulsa. “No one in a position of authority is taking this seriously,” said state representative Richard Morrisette in 2016, accusing government officials of bowing to pressure from large energy companies.⁸⁷ He attempted to stop drilling at quake sights and ran for a seat at the Oklahoma Corporation Commission.⁸⁸ In Oklahoma City, a grassroots organization called Stop Fracking Payne County held a rally at the Capitol, flocked by residents whose property was damaged by earthquakes. “We have the right to vote. We best get active and do it . . . We have a right to clean air, clean water and a safe environment,” co-founder Angela Spotts announced, chastising state officials who she felt were helping industries that paid for them to be in office rather than the voters who put them there.⁸⁹ Passersby and state officials alike would have spotted signs that said *Stop and Quakes* and *Impeach Gov. Fallin and the Three Stooges at the OCC*.⁹⁰ Morrisette continued to stick his name to the anti-fracturing movement, calling people to create a “stir” against the “special interests” and “industry puppets” at the

86. *Oklahoma Corporation Commission History*, OKLAHOMA CORPORATION COMMISSION (Nov 20, 2020), <https://oklahoma.gov/occ/about/history.html>.

87. Heide Brandes, *Oklahoma Earthquakes Raise Calls for Restrictions on Energy Firms*, SCIENTIFIC AMERICAN (Jan. 11, 2016), <https://www.scientificamerican.com/article/oklahoma-earthquakes-raise-calls-for-restrictions-on-energy-firms/>.

88. Barbara Hoberock, *Victims of Property Damage From Oklahoma Earthquakes Rally in OKC Against Big Oil*, TULSA WORLD (Apr. 13, 2016), https://tulsaworld.com/news/state-and-regional/victims-of-property-damage-from-oklahoma-earthquakes-rally-in-okc-against-big-oil/article_ed9c0218-848d-5b06-b73c-c09ca1d88ec9.html.

89. *Id.*

90. *Id.*

Capitol.⁹¹ A petroleum geologist in attendance even said that big oil had made a “bet with the devil.”⁹²

The outspoken geologist was Robert Jackson, a professor at the School of Earth, Energy, and Environmental Sciences at Stanford University. He would later go on to champion the mineral estate conservation easement (MECE) approach to protect property owners, which if implemented would allow landowners to restrict hydraulic fracturing for particular areas with social or ecological instability.⁹³ “The MECE creates a logical extension of traditional conservation easements ... that would encumber only subsurface rights, and would provide a way to protect land from subsurface mineral extractions, while still allowing the surface to be open to development.”⁹⁴ All of the most important oil and gas producing giants—Alaska, Louisiana, Oklahoma, Texas, North Dakota, Pennsylvania, West Virginia, and Wyoming—have statutory language that could support the formation of MECEs in property deeds.⁹⁵

Executive Response

In 2014, responding to continually increasing earthquakes and unhappy Oklahomans, Governor Mary Fallin created the Coordinating Council on Seismic Activity, with the stated purpose to “gather data and study what is causing earthquakes in the state of Oklahoma but to make it factually based and based on science.”⁹⁶ Governor Fallin went further to clarify that the council would gather and make available the information so “we can look at the very best public policy practices.”⁹⁷ Five individuals of this council were part of the energy industry, as were the two lawmakers in the group.⁹⁸ None of the meetings were open to the public.⁹⁹ This secrecy was legal because the committee was classified as a “pure fact finding group” and

91. *Id.*

92. *Id.*

93. JACKSON, *supra* note 17.

94. *Id.*

95. *Id.* at 3.

96. Ziva Branstetter, *Quake Debate: State’s Earthquake Committee Includes No Residents from Quake Zone*, TULSA WORLD (Feb. 8, 2015), https://tulsaworld.com/earthquakes/quake-debate-states-earthquake-committee-includes-no-residents-from-quake-zone/article_3936dfd9-d889-57d8-97f9-d7698138209b.html.

97. *Id.*

98. *Id.*

99. *Id.*

thus was excluded from Oklahoma's Open Meeting Law.¹⁰⁰ Furthermore, the chairman of the committee announced that they weren't planning on issuing reports or recommendations publicly, passing along that obligation to other folks who are doing reports on seismic activity."¹⁰¹

It would be unfair to propose that nothing was done from the governing authorities in response to reports and public outcry. After the 2015 report from the Oklahoma Geological Survey (that put Dr. Holland under so much heat), which had determined that the majority of recent earthquakes in central and north-central Oklahoma were caused by water disposal, Governor Fallin approved \$1.38 million of state emergency funds to the OGS and other state agencies for further seismic research.¹⁰² Furthermore, one should acknowledge the uniquely difficult position that the Oklahoma Corporation Commission faced: clearly, oil and gas operations needed to continue in the state for both economical and practical reasons. The OCC faced pressure from both elected representatives and members of the public to solve this problem without compromising these operations, the outflow of energy overall, or raising prices. With these goals in mind, the OCC enacted some beneficial and effective policies: for example, one regulation forced oil and gas wastewater disposal to be reduced within a 11,000 square mile radius in Western Oklahoma.¹⁰³ All Arbuckle formation wells (which are in Western Oklahoma region) had to report their disposal wells on a weekly basis, and new applications for wells in that formation cannot receive administrative approval.¹⁰⁴ Within ten miles of the city of Edmond, injection well operators must reduce their volumes.¹⁰⁵ With the aid of the OGS and the Oklahoma Independent Petroleum Association, the OCC created a database for known faults in the state.¹⁰⁶

Lastly, beginning in 2014 the OCC created a "traffic light" system, which overarched staff review of disposal well permits based on their proximity to faults and previous seismic activity.¹⁰⁷ For wells located within six miles of a 4.0 magnitude epicenter, "traffic light" permits of a six-month

100. Okla. Stat. Ann. tit. 25, § 301 (West)

101. *Id.*

102. LAW & PRACTICE, *supra* note 2, at 23.02[10].

103. *Id.*

104. *Id.*

105. *Id.*

106. *Id.*

107. *Id.*

duration are issued, which stops operations entirely if this permit goes “red” (if there is a significant seismic increase reported).¹⁰⁸

Unquestionably, as lawmakers and think-tanks scrambled to find resources to protect landowners and residents from this unexpected and frightening side-effect of fracturing, the public opinion and reputation of oil and gas companies has suffered. Perhaps it is because, finally, there existed a concrete realization of the dangers that our fossil fuel reliance can create. The vague threat of rising sea levels, the two-degree global temperature increase, and other effects of climate change (for which fossil fuels have been generally blamed, even though there are many other areas of modern life that add substantially to global CO₂ levels) don’t carry the same amount of personalized danger than one experiencing unexpected and uncontrollable earthquakes in historically quiet areas.

The Declining O&G Capex Crisis

The court of public opinion has not been kind to oil and gas companies, who have often been villainized for environmental impacts and, as it can be surmised in this paper, damage to nearby property and persons. There are several reasons why this villainization is not only unfair, but also counterproductive to any improvements to the environment and to safety. While this discussion is not strictly limited only to the legal profession, public policy plays a vital role in tort litigation and predictions of how fracturing will be treated in the courtroom.

First, production is always a result of demand. The average U.S citizen alone consumes 2.3 gallons of oil, 7.89 pounds of coal, and 252 cubic feet of natural gas *every day*.¹⁰⁹ In 2020, the split between energy source consumption was 35% petroleum, 34% natural gas, 12% renewable energy (the main sources being hydroelectric, wind, and solar), 10% coal and 9% nuclear energy.¹¹⁰ Even by 2050, despite international promises to focus on renewable energy, most estimate that fossil fuels will still be the primary sources of energy.¹¹¹ Accounting for the 7.1% decrease in energy consumption in 2020 due to COVID lockdowns and restrictions—which created a huge boom-bust cycle—U.S. citizens still use a disproportionately

108. *Id.*

109. *U.S. Energy System Factsheet*, U. OF MICHIGAN CENTER FOR SUSTAINABLE SYSTEMS (2021), <https://css.umich.edu/factsheets/us-energy-system-factsheet>.

110. *U.S. Energy Facts Explained*, U.S. ENERGY INFORMATION ADMINISTRATION (May 14, 2021), <https://www.eia.gov/energyexplained/us-energy-facts/>.

111. *Id.*

huge amount of energy per capita as compared with all other developed countries.¹¹² It is nothing short of hypocritical to throw the blame at the suppliers of our consumerist lifestyles more than at the actors who demand it.

There is also an undeniably correlation between energy consumption (vis-a-vis fossil fuel consumption) and quality of life. If morality is to be introduced into the conversation of energy law and policy, then it must be acknowledged that increasing the quality of life not only for U.S citizens but also developing countries are dramatic examples of the benefits energy independence can bring. For example, China and India in the past few decades have increased their coal and oil consumption by a factor of 5: consequently, this has been followed by a 15-year increase in life expectancy (a great measure of quality of living), skyrocketing GDP per capita, and a plummet in infant mortality in both countries.¹¹³ As the demand for fossil fuels continues to drastically increase, juxtaposed with the reality that we need energy independence to function outside of traditional sources (controlled by tumultuous, non-democratic regimes), the best geopolitical strategy is to invest in efficient and increased harvesting of the resources available within U.S borders and technology that allows their access. Furthermore, fracturing has brought about a glut in domestic natural gas supplies, which has brought down the average American's heating and energy bill by \$2,500 and allowed us to move away from coal, the dirtiest of all fossil fuels in terms of CO2 emission.¹¹⁴

Second, if upstream expenditures continue to decrease due to unreasonable sanctions and lack of public support, there will be disastrous consequences to the U.S and international economy. We have already seen the impact that COVID-19 had on companies due to lower revenues and public demand: a lower upstream capex (capital expenditure).¹¹⁵ Lower upstream investment will continue to result in decreased supply. This in turn results in insufficient supply to meet demand and market instability,

112. Skye Gould & Rebecca Harrington, *Here's How Much Energy US States Use Compared to Whole Countries*, INSIDER (Nov. 30, 2015), <https://www.businessinsider.com/map-of-us-state-energy-use-as-a-foreign-country-2015-11>.

113. Alex Epstein, *The Moral Case for Fossil Fuels* 13–15 (2014).

114. Amanda Clarkson, "The Moral Case for Fossil Fuels." University of Oklahoma College of Law, 20 Jan 2022, University of Oklahoma, Norman. Lecture.

115. Joseph McMonigle, Alan Thomson, Christof van Agt, Rebecca Fitz, & Jamie Webster, *Oil and Gas Investment in the New Risk Environment*, BOSTON CONSULTING GROUP (Dec. 10, 2020), <https://www.bcg.com/en-us/publications/2020/oil-and-gas-investment-during-the-covid-era>.

realized as high prices and boom-and-bust cycles. This sort of economic environment (while perhaps providing a sense of urgency for renewable resource consumption) is not optimal for careful development of fossil fuel alternatives. As it stands, these alternatives either are unable to store energy without relying on batteries that are prohibitively expensive (e.g. wind power, solar) or are not able to be harvested efficiently enough to meet demand (hydropower, geothermal energy, and biofuel).

What does this mean for courts? In technical terms, not much. It would be naive, however, to think that courts operate in a vacuum. Some areas of law have and should keep their finger on the pulse of the nation to determine (1) what standards are acceptable, (2) what constitutes “reasonable” conduct in reality, (3) when those standards are no longer tolerable, and (4) what actions that companies took before and after that change in public standard. These factors are all important when determining when liability should be imposed.

An Uncertain Future

Frustratingly, even after almost a decade of litigation, tort litigation with seismic activity seems still to be bogged down in motions based on jurisdictional and class-action problems, rather than on the strict merits of a negligence or ultrahazardous-based claim. Clearly, there is more to a negligence claim than just causation—breach, for example, might prove difficult for plaintiffs to hurdle—but this element in particular has been the focus of many cases thus far.

Earthquake frequency has decreased steadily in the past three years: there were 639 in 2016, 272 in 2017, 154 in 2018, and 62 in 2019.¹¹⁶ It is largely agreed, and logical to conclude, that the OCC’s actions in reducing wastewater volume injection in faulty areas has contributed to this steady decline. However, the rubble of the past decade has not yet been cleared, as residents injured by such earthquakes have yet to receive court-ordered remedy. Only settlements as of yet have been reached, and Oklahoma higher courts have yet to rule substantively on tort litigation in these areas.

116. Bailey Lewis, *Earthquakes Continue to Decrease in Oklahoma for Third Straight Year*, OU DAILY (Mar. 14, 2019), https://www.oudaily.com/news/earthquakes-continue-to-decrease-in-oklahoma-for-third-straight-year/article_00cefc9c-467f-11e9-b984-2bebe425ee8e.html; Corey Jones, *Oklahoma is Shaking a Lot Less From Even Only a Year Ago, But Still Not Near Historic Seismic Average*, TULSA WORLD (Jan. 6, 2020), https://tulsaworld.com/news/state-and-regional/oklahoma-is-shaking-a-lot-less-from-even-only-a-year-ago-but-still-not/article_ffb7442c-d9d0-5e1c-a451-6c1647c9fa02.html.

It is difficult to predict what these eventual outcomes will be. Narrow areas of liability such as nuisance, strict liability, and even subsurface trespass apply to unique circumstances, but carry with them less prima facie elements to be proved at trial. Negligence is the traditional left-over claim (an “if nothing else, use this” approach), but the prima facie elements of duty, breach and causation each carry with them their own difficulties. Do companies owe a duty to residents, as modern-day Mrs. Palgraffs, to even prevent harm from their activities? *Landra* seemed to lean towards yes, but was settled before any substantive decisions could be reached. Did the companies breach their duties through wastewater injection into old and overburdened sites? Even if, retrospectively, the courts can accurately rely upon the OGS’s conclusion that wastewater injections actually caused the earthquakes, was it foreseeable to a degree that it would be just to hold companies liable?

2022 Update

On January 31, 2022, a few days before the submission of this paper, a 4.5 magnitude earthquake struck in Medford, northern Oklahoma.¹¹⁷ This was the largest earthquake in several years reported in the region.¹¹⁸ The Oklahoma Corporation Commission has directed three Arbuckle wastewater injection wells within six miles of the epicenter to be shut in, while other disposal wells within ten miles are limited to injecting five hundred barrels of waste a day.¹¹⁹ As of February 12, 2022, no injuries or property damage have been reported, except for a broken trophy case at Medford high school.¹²⁰ There have been no filings for property or personal damage in Grant county court.

A Negligence-Based Approach

The most important question to consider is under which claims Oklahomans can best expect to find opportunity for relief. There is little

117. David Koeller, *Earthquake Rattles Oklahoma and Kansas*, OKLA. NEWS CHANNEL 6 (Jan. 31, 2022), <https://www.wowt.com/2022/01/31/earthquake-rattles-oklahoma-kansas/>.

118. *Id.*

119. K. Querry-Thompson, *USGS: 4.5 Magnitude Earthquake Recorded in OK*, OKLA. NEWS CHANNEL 4 (Jan. 31, 2022), <https://kfor.com/news/local/usgs-4-6-magnitude-earthquake-recorded-in-ok/>.

120. Ryan Love, *Reported 4.5 Magnitude Earthquake Felt in Oklahoma*, OKLA. NEWS CHANNEL 2 (Jan. 31, 2022), <https://www.kjrh.com/news/local-news/earthquake-felt-in-oklahoma>.

opportunity by the way of regulatory violations, so nationwide plaintiffs have been turning to traditional common-law precepts.¹²¹ Oklahoma cases are no different, besides that we have as of yet no final rulings on the merits. Four claims for relief have been brought related to seismic activity: trespass, negligence (gross and ordinary), ultrahazardous activities, and nuisance.

A. Trespass

Subsurface trespass is a difficult claim to prevail upon. Trespasses that take place far underground lose the strict liability standard that plaintiffs in standard trespass claims enjoy.¹²² Furthermore, although Oklahoma courts have been silent on this issue, other states such as Texas do not consider infringing P-waves (a result of seismic operations) to be a trespass unless the claimants own a mineral interest.¹²³ Although seismic operations and an actual earthquake are two very different species, this shows a general suspicion for subsurface trespass for residents who only own the surface estate. The rejection of the *ad coelum* doctrine as a viable option in the modern world by the United States Supreme Court—rejecting the common-law theory that land ownership extends from the property line borders to the center of the earth—goes as far back as the mid-nineteenth century in reference to oil and gas activities.¹²⁴ Thus far, moreover, subsurface trespass has only been brought in Oklahoma courts in one form: the actual drilling of a well into another’s property.¹²⁵ At common-law, it is difficult enough to classify even tangible intrusion such as subsurface injection and leakage as an actionable trespass,¹²⁶ let alone induced earthquakes. Although trespass is still part of active litigation,¹²⁷ this is by far the weakest claim for relief for Oklahoma residents.

121. Jason B. Biminow, Annotation, *Liability for Trespass or Nuisance in Hydraulic Fracturing, Hydro-fracturing, or Hydro-fracking*, 41 A.L.R. 7TH ART. 1, § 2 (2019).

122. See *United States v. Causby*, 328 U.S. 256, 261 (1945).

123. *Villarreal v. Grant Geophysical, Inc.*, 136 S.W.3d 265, 270 (Tex. App. 2004).

124. *Causby*, 328 U.S. at 260–61.

125. *Edwards v. Lachman*, 1974 OK 58, 534 P.2d 670 (Okla. 1974).

126. See Christopher S. Kulander, *Common Law Aspects of Shale Oil and Gas Development*, 49 IDAHO L. REV. 367, 379–84 (2013).

127. See *Adams v. Eagle Road Oil, LLC*, No. CJ-2016-00078 (District Ct., Pawnee County, Okla., Nov. 17, 2016), removed, No. 4:16-cv-00757 (N.D. Okla., Dec. 21, 2016), remanded (Apr. 12, 2017), removed, No. 4:18-cv-00568 (N.D. Okla., Nov. 2, 2018), remanded (July 23, 2019); *Reid v. White Star Petroleum, LLC*, No. CJ-2016-00543 (District Ct., Payne County, Okla., Dec. 5, 2016); *Pawnee Nation of Oklahoma v. Eagle Road Oil LLC*, No. Civ-2017-803 (Pawnee Nation District Court, Okla., Mar. 3, 2017); *Bennett v.*

B. Nuisance

Private and public nuisance might present a better option. To prevail on a claim of nuisance, a plaintiff must prove an unlawful act or omission of duty, which has either resulted in personal or property injury or endangered the use of his or her property. “The plaintiff need not show that the defendant's actions were unreasonable; rather, it need only be shown that the *resulting burden* on the plaintiff is unreasonable.”¹²⁸ Whether a nuisance exists, and damages thereof, is a question of fact for the jury.¹²⁹ As of yet there are no fracking-related nuisance rulings from Oklahoma, but recently a private nuisance case in Texas brings some hope to plaintiffs. *Parr v. Aruba Petroleum, Inc.* saw a jury award three million dollars for a claim of intentional private nuisance, whereby a family claimed that Aruba Petroleum’s drilling-related activities near their residence included flaring, construction activity, truck traffic and air pollution that was an unreasonable burden on the private use and enjoyment of their property.¹³⁰ While none of the claims dealt directly with induced seismicity, the jury was willing to award damages for claims outside the traditional concerns of fracking-related nuisance, such as fluid and water contamination.¹³¹ However, there are still many “ifs” for Oklahoma plaintiffs. First, the presence of a nuisance is a question of fact for the jury, so there is no certain relief even if an Oklahoma court sees a successful nuisance claim. Second, there is controversy whether *Parr* should even be classified as a fracturing case, considering that the claims were based on the shale operations as a whole and not specifically related to hydraulic fracturing.¹³²

C. Strict Liability

Strict liability is a highly attractive claim to plaintiffs for good reason, as it doesn’t require a showing of a duty or breach: a claimant only needs to show that the defendant’s actions, however reasonable or unreasonable they might have been, caused an injury.¹³³ This is limited to injuries that are the

Chaparral Energy LLC, No. CJ-2018-58 (District Ct., Logan County, Okla., Mar. 26, 2018), *interlocutory appeal*, No. CI-119122 (Okla. Sup. Ct.)

128. *N.C. Corff P’ship, Ltd. v. OXY USA, Inc.*, 1996 OK CIV APP 92, 929 P.2d 288, 294.

129. *Smicklas v. Spitz*, 846 P.2d 362 (Okla.1992).

130. *Parr v. Aruba Petroleum, Inc.*, No. CC-11-1650-E (Dallas Cnty. Ct. 2014).

131. Hilary M. Goldberg et. al., *It’s A Nuisance: The Future of Fracking Litigation in the Wake of Parr v. Aruba Petroleum, Inc.*, 33 VA. ENVTL. L.J. 1, 12 (2015).

132. *Id.*

133. RESTATEMENT (SECOND) OF TORTS § 519 (1977).

result of an ultra-hazardous activity.¹³⁴ These can be designed by statute or by a court. Oklahoma statutes do not classify fracturing as ultrahazardous, so the court would have to step in to “legislate from the bench.” Ultrahazardous activities should require a six-factor analysis: (1) existence of a high degree of risk of some harm to the person, land, or chattels of others; (b) likelihood that the harm that results from it will be great; (c) inability to eliminate the risk by the exercise of reasonable care; (d) extent to which the activity is not a matter of common usage; (e) inappropriateness of the activity to the place where it is carried on; and (f) extent to which its value to the community is outweighed by its dangerous standards.¹³⁵ A federal district court in Pennsylvania has held that elements (d), (e), and (f) are not satisfied and that hydraulic fracturing does not qualify as an ultra-hazardous activity.¹³⁶ Kansas and Louisiana, while not singling out fracturing specifically, have held that oil and gas drilling operations as a whole do not meet strict liability standards.¹³⁷ Other states, however, are less accommodating. Wyoming classifies all oil and gas drilling operations as ultrahazardous.¹³⁸ Oklahoma courts, in all the cases still alive that include ultrahazardous activities claims, seem to be waiting until after discovery to make any substantive rulings on the viability of strict liability. In the case of *Barton v. Ovintiv Mid-Continent Inc.*, the Oklahoma District Court of Kingfisher County gives some hope to plaintiffs.¹³⁹

Whether an activity is an ultrahazardous one so that strict liability will be imposed is to be determined by the court. The court is to consider “all the factors listed in [Section 520], and the weight given to each that it merits upon the facts in evidence.” Restatement (Second) of Torts § 520, comment (1). Although the court recognizes that the issue can be determined at the pleadings stage, ... the court nonetheless concludes the

134. *Id.*

135. *Id.*

136. Order at 1-2 & n. 2, No. 3:09-cv-2284, *Ely v. Cabot Oil & Gas Corp.* (M.D. Pa. April 23, 2014).

137. *Ainsworth v. Shell O:shore, Inc.*, 829 F.2d 548, 550 (5th Cir. 1987); *Williams v. Amoco Prod. Co.*, 734 P.2d 1113, 1116 (Kan. 1987).

138. See *Hull v. Chevron, U.S.A., Inc.*, 812 F.2d 584, 589 (10th Cir. 1987) (citing *Pan Am. Petroleum Corp. v. Like*, 381 P.2d 70, 73 (Wyo. 1963)) (“Wyoming law recognizes that the drilling of an oil and gas well is an ultrahazardous activity, a dangerous activity.”).

139. *Barton v. Ovintiv Mid-Continent Inc.*, No. CJ-2020-00065 (District Ct., Kingfisher Cty., Okla., Sep. 9, 2020), *removed*, No. 5:20-cv-01098-F (W.D. Okla., Oct. 29, 2020), *order on motion to dismiss*, 2021 WL 1566451 (Apr. 21, 2021).

record in this case is insufficiently developed for the court to appropriately determine whether the doctrine of strict liability should be applied in this case. On that point, the court reminds the parties that we are still at the pleading stage. The question presented is whether plaintiffs have, with nothing more than black letters on white paper, pled themselves into court on the strict liability claim. Any sort of a broad ruling that strict liability might apply in the general circumstances of the drilling of a well in the hope of finding and producing hydrocarbons would be truly extraordinary. But plaintiffs have managed to plead some notably unusual circumstances. Consequently, at this juncture, the court is constrained to conclude that the strict liability claim is not subject to dismissal under Rule 12(b)(6). Defendant may challenge the strict liability claim at the summary judgment stage based upon a more fully developed record.

Barton is still pending, but the court is willing to recognize that hydraulic fracturing is an unusual circumstance in regard to oil and gas operations. No other activity in modern energy cases has such a significant and unique natural phenomenon as an alleged consequence. Thus, even if Pennsylvania courts have declined to consider hydraulic fracturing for the strict liability, at least one Oklahoman court sees the Restatement factors in a different light.

D. Negligence

Finally, there remains the classic common-law claim, negligence. Ordinary negligence is the underlying theme in tort litigation from seismic activity, and this makes sense from the evidence available. It is generally considered the claim that remains viable even if the other common-law claims above are unsatisfactory. Oklahoma recognizes three levels of negligence: (1) Slight negligence, consisting “in the want of great care and diligence”; (2) ordinary negligence, “in the want of ordinary care and diligence”; and (3) gross negligence, in the want of “slight care and diligence.”¹⁴⁰ Slight negligence differs from the latter two categories in the standard of duty: it requires defendants to exercise a high degree of care in their operations.¹⁴¹ One can assume that oil and gas operators in Oklahoma are not held to a standard of care higher than that of an ordinarily prudent

140. Okla. Stat. Ann. tit. 25, § 6 (West).

141. *Wells v. Oklahoma Roofing & Sheet Metal, LLC.*, 2019 OK 45, ¶ 6, 457 P.3d 1020, 1032.

operator, as there is no case law or statute that designates a higher standard. Thus, we are left with ordinary and gross negligence. There is a distinct difference between gross and ordinary negligence in regard to legal remedies, even though they share the same elements: duty, breach, causation, and injury. In gross negligence, the breach of the duty has to be so severe as to constitute recklessness.

Unlike ordinary negligence, however, gross negligence describes such a severe breach of duty as to constitute recklessness, flagrancy, or with deliberate intent. It is a degree of negligence so extreme that it appears either deliberate or committed with a blatant disregard for the reasonable safety of others.¹⁴² A defendant guilty of gross negligence may have known his or her actions would most likely harm others or damage property but did not care and committed the act or omission anyway.

1. Duty

Duty, perhaps the most elusive of negligence elements, must be established before all else. What makes this element so tricky is that a duty is not based on some sort of test, common-sense precept, or found in nature: rather, courts are free to impose a duty on an actor as they see fit. This can be based on morality, foreseeability, public safety, or a variety of other factors. The Supreme Court of Oklahoma has listed out factors based on public policy that it considered for questions of duty in *Lowery v. Echostar Satellite Corp.* The most important factor, Justice Taylor wrote for the majority, is the *foreseeability* of the harm caused. Consequently, a defendant owes a duty of care to anyone who is foreseeably endangered by their conduct, when that conduct causes the foreseeable class of injury. “[The] [f]oreseeable risk of harm establishes the zone of risk to assess whether defendant’s conduct created a generalized and foreseeable risk of harm to plaintiff by a reasonable prudent person standard.”¹⁴³ This zone of risk that grants protection to plaintiffs will not be extended beyond “reason” and “good sense.”¹⁴⁴

The question then becomes, for tort claims based on hydraulic fracturing, whether plaintiffs like Sandra Landra, sitting in her living room in Prague, Oklahoma, faced a foreseeable danger and injury through fracturing activities. Did New Dominion and other oil companies realize that these residents could be affected? Of course, foreseeability is an objective

142. *Fox v. Oklahoma Memorial Hosp.*, 1989 OK 38, ¶5, 774 P.2d 459, 461.

143. *Lowery v. Echostar Satellite Corp.*, 2007 OK 38, ¶ 14, 160 P.3d 959, 964.

144. *Id.*

standard of the “reasonable” person. However, as previously discussed, fracturing processes were being flagged heavily by researchers by the mid 2010’s, and this seemed to be met with heavy resistance from companies and executives. The proliferation of attention that the rising seismic activity was receiving from the media and (eventually) elected representatives could very well have arguably put the reasonable observer on notice that there was some correlation between fracturing processes and an increase in earthquake frequency.

Courts have a history of not finding a duty where it would impose an excessively heavy burden on actors, and Oklahoma courts are no exception. In evaluating whether a duty should exist, the supreme court listed factors beyond foreseeability alone: (1) foreseeability of harm to the plaintiff, (2) degree of certainty of harm to the plaintiff, (3) moral blame attached to defendant's conduct, (4) need to prevent future harm, (5) extent of the burden to the defendant and consequences to the community of imposing the duty on defendant, and (6) availability of insurance for the risk involved.¹⁴⁵

The degree of certainty of harm to the plaintiff and the foreseeability factors are certainly areas where plaintiffs could have a difficult time arguing for a duty. The lack of clear evidence and the delay in administrative action are indications that there was not much certainty as to whether fracturing was causing harm, directly or indirectly. Furthermore, earthquake insurance, while sometimes being expensive, would cover physical property damages not included in homeowners’ insurance packages.¹⁴⁶ There are two problems with earthquake insurance, however: first, because Oklahoma had a history of very little seismicity, residents had no reason to purchase these plans prior to the 2010s; and second, these plans would not cover any bodily injuries sustained.¹⁴⁷

Finally, the question of whether a duty existed is analyzed at the *time of injury*.¹⁴⁸ As seismicity increased and there was more and more scientific evidence available to the community concerning its connection to fracturing

145. *Iglehart v. Bd. of County Commissioners of Rogers County*, 2002 OK 76, ¶ 10, 60 P.3d 497, 502 (citing *Tarasoff v. Regents of Univ. of Cal.*, 551 P.2d 334, 342 (1976)).

146. *Earthquake Insurance*, CALIFORNIA DEPARTMENT OF INSURANCE (last visited Feb. 12, 2022), <http://www.insurance.ca.gov/01-consumers/105-type/95-guides/03-res/eq-ins.cfm>.

147. *Id.*

148. Meredith A. Wegener, *Shake, Rattle, and Palsgraf: Whether an Actionable Negligence Claim Can Be Established in Earthquake Damage Litigation*, 11 TEX. J. OIL GAS & ENERGY L. 115, 130 (2016).

operations, there would be a greater chance of a duty existing. Ultimately that point in time is a line for Oklahoma courts to draw based on the factors above and its discretion. In the interest of having some layer of protection for the community and an opportunity for plaintiffs to be able to have their day in court, it is more likely than not that courts will allow there to be a duty. After all, a duty of ordinary care to not harm others through one's own activity is not a controversial idea, as it isn't a universal duty (actors must already be engaging in activities with some element of danger to others for this to exist) and it allows plaintiffs the *opportunity*, not the certainty, of receiving a remedy.

2. Breach

If Oklahoma courts can be convinced that oil companies owed a duty to not injure Oklahoma residents through their actions, the next question is what exactly this duty is so as to judge a breach. In the absence of a statute, a contract, or even a professional standard of conduct, a breach can be very difficult to define. Assuming that oil companies will be facing a duty of ordinary care, we know that this means the conduct of the "reasonable" person standard. The Restatement of Torts lays out a that standard of conduct for a reasonable man can be established by: (a) a legislative enactment or administrative regulation which so provides, (b) adopted by the court from a legislative enactment or an administrative regulation which does not so provide, (c) established by judicial decision, or (d) applied to the facts of the case by the trial judge or the jury, if there is no such enactment, regulation, or decision.¹⁴⁹ As there is of yet no statute or administrative regulation explicitly laying out the standard of conduct for a reasonable operator in regard to fracturing, the best reference can be found in Oklahoma's Uniform Jury Instructions for negligence:

"Negligence" is the failure to exercise ordinary care to avoid injury to another's person or property. "Ordinary care" is the care which a reasonably careful person would use under the same or similar circumstances. The law does not say how a reasonably careful person would act under those circumstances. That is for you to decide. Thus, under the facts in evidence in this case, if a party failed to do something which a reasonably careful person

149. RESTATEMENT (SECOND) OF TORTS § 285 (1965).

would do, or did something which a reasonably careful person would not do, such party would be negligent.¹⁵⁰

From these instructions, we can surmise that Oklahoma courts would find that oil companies breached their duty of ordinary care if they did not act as a reasonably careful person under the circumstances. While plaintiffs can point to many areas of concern (mainly, increased seismicity) that should have flagged fracturing as hazardous, there are two areas of advocacy that oil companies could bring to the court to show that they acted as reasonable persons would with the information and practices at the time.

First, there is no evidence on public record that New Dominion, ABC Oil Company, or any other oil company had not complied with applicable state and federal laws. While complying with applicable statutes is not dispositive of acting with reasonable care,¹⁵¹ it can certainly be indicative to a jury that these companies were trying to act with reasonable care. Unfortunately, at the time of peak seismic activity, applicable laws were concerned with drinking water contamination, not triggering earthquakes. The Safe Drinking Water Act (SDWA), the main source of regulation for non-federal and non-Indian lands, was concerned with keeping groundwater from being contaminated from nearby injection wells.¹⁵² The United States Environmental Protection Agency as of 2015 required certain information relating to seismic dangers be disclosed (such as nearby faults), but that only applied to states where the EPA had primary authority. In Oklahoma, injection wells are regulated by the OCC. As discussed previously, the OCC requires that injection well operators record injection volumes and pressures monthly,¹⁵³ and daily for injection into the Arbuckle formation.¹⁵⁴ Also in 2014 the OCC introduced their traffic light system as described above. As long as operators remained in compliance with these regulations when earthquakes like in Prague occurred, they could ward off per se negligence.

Second, once oil company defendants have established statutory compliance, they should point to the ambiguity of scientific linkage of fracturing practices and earthquakes and their increased need to keep up with energy demands. They could possibly garner the sympathy of the jury

150. Vernon's Okla. Forms 2d, OUJI-CIV 9.2 (2d ed.)

151. Vernon's Okla. Forms 2d, OUJI-CIV 9.11 (2d ed.)

152. *Overview of the Safe Drinking Water Act*, UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (last visited Feb. 12, 2022), <https://www.epa.gov/sdwa/overview-safe-drinking-water-act>.

153. Okla. Admin. Code 165:105-7(b)(3)(A).

154. Okla. Admin. Code 165:105-7(b)(3)(B).

by presenting a historical backdrop of why hydraulic fracturing practices became so wide-spread in the first place: the dire predictions that petroleum production would peak in the 2000s and then terminally decline,¹⁵⁵ the increasing U.S energy demand for decades prior,¹⁵⁶ and the optimism and economic benefits that the Oklahoma energy sector had created through use of these new technologies. Certainly these companies would not have *wanted* to believe that fracturing practices were causing seismic activity and by proxy personal and property damage to nearby residents. The question for the trier of fact would be, would our “reasonable person” have? Furthermore, how quickly would they have ceased operations? Was waiting for an administrative response and subsequently complying with regulations—which as far as the public record shows, these companies did in fact do—a reasonable course of action?

3. Causation

Causation, the third prong of a negligence analysis, generally consists of two tests. There is actual causation, which is the *sine qua non* (“but for”) of an injury. There is also proximate causation, which courts employ to draw a line of liability somewhere between an actor’s breach and an injury caused to a plaintiff. “In order that a negligent actor shall be liable for another’s harm, it is necessary not only that the actor’s conduct be negligent toward the other, but also that the negligence of the actor be a *legal cause* of the other’s harm.”¹⁵⁷ Courts should be able to establish causation by a preponderance of the evidence through a fact-intensive analysis.

First, we can consider actual causation, the more straightforward of the tests. Here, the courts ask if “the defendant’s conduct is a cause of the event if the event would not have occurred *but for* that conduct; conversely, the defendant’s conduct is not a cause of the event if the event would have occurred without it.”¹⁵⁸ As with all the elements of negligence, this causal link does not have to be absolutely proven: instead, the court should consider a variety of factors to determine whether an earthquake was a product of natural seismic activity or a consequence of man-made activities.

155. Robert L. Hirsch, Roger Bezdek, & Robert Wendling, *Peaking of World Oil Production: Impacts, Mitigation, and Risk Management*, U.S. DEPARTMENT OF ENERGY OFFICE OF SCIENTIFIC AND TECHNICAL INFORMATION (2005), <https://www.osti.gov/servlets/purl/939271>.

156. *U.S. Energy Facts Explained*, U.S. ENERGY INFORMATION ADMINISTRATION (May 14, 2021), <https://www.eia.gov/energyexplained/us-energy-facts/>.

157. RESTATEMENT (SECOND) OF TORTS § 430 (1965).

158. PROSSER & KEETON, *THE LAW OF TORTS* 266 (5th ed. 1984).

Scott D. Davis and Cliff Frohlich presented a list of factors for such consideration in their publication *Did (or Will) Fluid Injection Cause Earthquakes? Criteria for a Rational Assessment*. If the majority of answers to the questions are a “yes,” then it is more likely than not the earthquake was induced.¹⁵⁹

The questions are separated into three categories. First, for background seismicity, the court should ask if the seismic events were the first of its size and character in the region. Second, for temporal correlation, the court should ask if there was a clear correlation between the earthquake(s) in the area and corresponding injection sites nearby. Third, for spatial correlation, the court should ask three questions: whether there are earthquake epicenters within five kilometers of an injection site; did the earthquake(s) occur under the surface at a level near the injection depth; and if not either of these, if there are geological structures that could have channeled seismic flow to the earthquake epicenter. Fourth and finally, the court should consider one last question for injection practices, whether changes in fluid pressure (pore pressure) at the well bottoms and the epicenter of the earthquake were of sufficient magnitude to encourage seismicity.

While Dr. Davis and Dr. Frohlich provide a very reasonable framework, there still remains the defense that it is near impossible to actually determine causation with regard to earthquakes. The United States Department of The Interior’s deputy secretary, David Hayes, has noted this uncertainty that “[w]hile it appears likely that the observed seismicity rate changes in the middle part of the United States in recent years are man-made, it remains to be determined if they are related to either changes in production methodologies or to the rate of oil and gas production.”¹⁶⁰ He also stated in a 2012 report that although the USGS scientists have found a correlation between an increase in seismicity and the injection of wastewater in deep disposal wells, and thus a causal connection cannot be eliminated yet, “there have been no conclusive examples linking wastewater injection activity to triggering of late, major earthquakes even when located near a known fault.”¹⁶¹

159. Scott D. Davis & Cliff Frohlich, *Did (or Will) Fluid Injection Cause Earthquakes? Criteria for a Rational Assessment*, 64 SEISMOLOGICAL RESEARCH LETTERS 207, 207 (1993).

160. Matt Smith & Thom Patterson, *Debate Over Fracking, Quakes Get Louder*, CNN (Jun. 15, 2012), <http://www.cnn.com/2012/06/15/us/fracking-earthquakes/index.html>.

161. David J. Hayes, *Is the Recent Increase in Felt Earthquakes in the Central US Natural or Manmade?*, US DEP’T OF THE INTERIOR, (Apr. 11, 2012), <https://www.doi.gov/blog/Is-the-Recent-Increase-in-Felt-Earthquakes-in-the-Central-US-Natural-or-Manmade>.

However, there is a clear difference between scientific causation and causation at law. Again, causation in negligence is a preponderance of the evidence standard. If it seems to reasonable minds that all of the correlations seen over the years makes it even a modicum more likely than not that there is a causal link between the two, this element can be satisfied. A consideration of all of these factors, or other similar concerns, are plenty sufficient to satisfy the burden of proof for tort law, a preponderance of the evidence. Even if the exact mechanisms are not exactly understood by scientists, the legal system with the evidence at hand is in the position—and indeed, have a responsibility to make a call as to whether victims of seismic activity deserve compensation.

Finally, a discussion of causation at law must include proximate causation, an element that is more convoluted than actual causation, and also an area where defendants could perhaps find repose. An injury is proximately caused by a defendant's actions when "plaintiff's injury is dependent upon the harm (for which compensation is sought) being the result of both the natural and probable consequences of the primary negligence."¹⁶² Proximate causation is an area where, even if actual causation at law is present, a defendant can still escape liability if an injury is not the probable or natural event to occur—in other words, unforeseeable by the defendant at the time of the actionable negligence. The test for proximate cause is similar to the foreseeability analysis for the duty element, except that it is up to the jury to decide instead of the court. Even if now, a majority of the scientific community and the public at large understand wastewater injection and (sometimes) fracturing to foreseeably cause seismic activity, at the time of operations there is certainly an argument to be made that this was unexpected and unintended, and beyond any consequences previously seen in the oil and gas industry.

4. Injury

Injury alone doesn't warrant too long of a discussion: plaintiffs in tort law can receive injunctive or punitive damages, but the most common is compensatory damages. These damages, if a court should find duty, breach, and causation, would likely be compensation for property damages from earthquake damage. In a few isolated cases, like in *Landra*, there would be an opportunity for personal injury damages as well. As punitive damages most often follow intentional torts or cases of gross negligence, it would be highly unlikely for a court to consider.

162. *Lockhart v. Loosen*, 1997 OK 103, ¶ 9, 943 P.2d 1074, 1079.

Conclusion

The rocky decade during the 2010s has left scars in Oklahoma, in her landscape and her residents. As it often seems, with desperate times comes desperate measures, and the breakneck speed in which oil companies strived to keep up with energy demand perhaps left reasonable people willing to do unreasonable things. Oklahoma courts face one question of law and two questions of facts: for the question of law, did these companies face a duty of ordinary care at all? Then for the question of fact, did these companies breach that duty and was that breach the actual and proximate cause of earthquake-related injury? Walking through each of these elements, it is difficult to make a sure prediction. However, based on Oklahoma precedent in negligence-based cases, breach will likely be the closest call and potentially the element that plaintiffs will not be able to satisfy. Continuing fracturing operations while in compliance with all applicable statutes and administrative regulations could be comfortably argued to be operating with a reasonable standard of care. However, ultimately the question is up for Oklahomans to decide—or at least, a jury of Oklahomans, if and when a case finally does make it to the trial phase.

At the legislative and executive levels, the steady decrease in earthquakes has allowed the problems of the past decade to seem like a distant memory, jarringly brought back to the surface as moderate earthquakes still occasionally strike in the heartland. As the wheels of the justice system turn far more slowly, definite answers to what plaintiffs can expect have yet to emerge. But one conclusion is certain: Oklahoma residents has suffered more through increased national and international demand for cheap energy than any other state. Whether we have standing to be made whole through the justice system or only through learning from past mistakes is a question for Oklahoma courts to decide in the very near future.