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IN THE DISTRICT COURT OF LOGAN COUNTY, OKLAHOMA
STATE OF OKLAHOMA

LISA GRIGGS and APRIL MARLER, on behalf of themselves and all others similarly situated,	§	
PLAINTIFFS	§	
vs.	§	**Case No.** Cj. 2016-6
CHESAPEAKE OPERATING, LLC, NEW DOMINION, LLC, DEVON ENERGY PRODUCTION CO., LP and SANDRIDGE EXPLORATION AND PRODUCTION, LLC,	§	
DEFENDANTS	§	

CLASS ACTION PETITION

Plaintiffs Lisa Griggs and April Marler ("Plaintiffs") individually and on behalf of similarly situated owners of real property in Oklahoma, and for their causes of action against Defendants Chesapeake Operating, LLC ("Chesapeake"), New Dominion, LLC ("New Dominion"), Devon Energy Production Co., LP ("Devon"), and SandRidge Exploration and Production, LLC ("Sandridge") (collectively "Defendants") states:

1. This is a class action lawsuit brought by Oklahoma residents who own real property in Oklahoma whose property has suffered damages and losses from human-induced earthquakes caused by Defendants' operations of wastewater disposal wells (also known as "injection wells").

2. Plaintiffs bring this action on behalf of themselves and on behalf of other similarly situated Oklahoma residents who own real property in Oklahoma who have suffered from earthquakes triggered by injection wells owned or operated by the Defendants.

3. Over the past several years, thousands of earthquakes have occurred within the State of Oklahoma, which have only recently been tied to Defendants' injection well operations.

PARTIES

4. Plaintiff Lisa Griggs is a citizen of Oklahoma and a resident of Logan County, Oklahoma. Lisa Griggs owns a real property in Logan County. Ms. Grigg's home in Logan County suffered damages due to earthquakes caused by the Defendants' negligent wastewater disposal operations. Such operations continue, and thus, the earthquakes are continuing and continue to cause damages to Ms. Griggs.

5. Plaintiff April Marler is a citizen of Oklahoma and a resident of Oklahoma County, Oklahoma. April Marler owns real property in Oklahoma County. Ms. Marler's home in Oklahoma County suffered damages due to earthquakes caused by the Defendants' negligent wastewater disposal operations. Such operations continue, and thus, the earthquakes are continuing and continue to cause damages to Ms. Marler.

6. Defendant Chesapeake Operating, LLC ("Chesapeake") is a corporation existing and operating under the laws of the State of Oklahoma that does business within the State of Oklahoma and has its principal place of business at 6100 N. Western Avenue, Oklahoma City, OK 73118-1044.

7. Defendant New Dominion, LLC, ("New Dominion") is a corporation existing and operating under the laws of the State of Oklahoma that does business within the State of Oklahoma and has its principal place of business at 3400 SE 59th St., Oklahoma City, OK 73135.

8. Defendant Devon Energy Production Co., LP ("Devon") is a corporation existing and operating under the laws of the State of Oklahoma that does business in the State of Oklahoma and has its principal place of business at 20 North Broadway, Suite 1500, Oklahoma City, OK 73102-8202.

9. Defendant SandRidge Exploration and Production, LLC ("SandRidge") is a corporation existing and operating under the laws of the State of Oklahoma that does business within the State of Oklahoma, and has its principal place of business at 1601 Northwest Expressway, Suite 1601, Oklahoma City, OK 73118.

JURISIDICTION AND VENUE

10. Jurisdiction in this Court is proper. This Court has personal jurisdiction over Defendants as they do substantial business in the State of Oklahoma, are headquartered in the State, and operate the injection wells at issue in this judicial district.

11. Venue is proper in this Court as a substantial part of the events or omissions giving rise to the claims set forth in this Petition occurred here.

12. The Oklahoma Corporation Commission (or "OCC") does not have jurisdiction over the property damage claims asserted in this complaint. *Ladra v. New Dominion, et al.*, 2015 OK 53, 353 P.3d 529 (2015).

FACTUAL ALLEGATIONS

Significant Increase in Earthquakes in Oklahoma

13. There has been a dramatic increase in the number and intensity of earthquakes in Oklahoma during the last five years. According to the Oklahoma Geological Survey (OGS), the state saw nearly 600 quakes of magnitude 3.0 or greater in 2014, compared to just one or two per year prior to 2009. From 2009 to 2014, Oklahoma experienced a 108-fold increase in total

earthquakes: from 50 earthquakes in 2009 to 5,417 earthquakes in 2014. Even more earthquakes shook the state in 2016. Indeed, more than 6,000 earthquakes were reported in 2015.

14. The scale to classify earthquakes is logarithmic, meaning that a magnitude 4 earthquake is 10 times more powerful than a magnitude 3, and a magnitude 5 earthquake is 100 times more powerful than a magnitude 3. Earthquakes of magnitude 6 to 7 cause widespread damage and considerable loss of life.

15. On November 5, 6, and 8, 2011, three earthquakes of 5.0, 5.7, and 5.0 magnitude, respectively, occurred in and around Prague, Oklahoma.

16. A 5.0 magnitude earthquake is substantial and can cause significant damage to people and property. An earthquake of this magnitude is also rarely seen in the United States east of the Rocky Mountains.

17. The 5.7 magnitude earthquake in Prague, Oklahoma, was the strongest ever recorded in Oklahoma and was followed, in the next few days, by two more earthquakes of 5.0 magnitude or greater. The earthquakes were responsible for destroying six homes and damaging more than 170 others in Prague, a town of approximately 2,300 people and the surrounding area.

18. In 2014, Oklahoma had more than twice the number of earthquakes as California, making it the most seismically active state in the continental United States. Fifteen earthquakes in 2014 measured more than 4.0 in magnitude and 585 measured more than a magnitude 3 or greater.

19. In 2015, more than 800 earthquakes greater than 3.0 magnitude occurred in Oklahoma, 30 of which were more than 4.0 in magnitude.

20. In only the first 10 days of 2016 Oklahoma experienced 36 earthquakes of 3.0 magnitude or greater, 6 of which registered over 4.0, including a 4.8 magnitude earthquake in Edmond, Oklahoma on January 6 and a 4.1 in Fairview, Oklahoma on January 8.

21. Recently, these thousands of earthquakes occurring in Oklahoma were linked to the oil and gas industry.

Hydraulic Fracturing (Fracking)

22. Invented in 1947, hydraulic fracturing (often colloquially referred to as "fracking"), is a technique that has been used for decades in the oil and gas industry. Approximately one million wells were hydraulically fractured in the United States between 1947 and 2010.

23. Hydraulic fracturing is a technique that aims to improve the production of wells by increasing the number and extending the reach of fluid pathways (i.e., fractures) between the formation and the well by injecting fluid, typically water, at high pressure into low-permeability rocks. The fluid pressure fractures the rocks or stimulates slip across pre-existing faults or fractures. Increasing the fracture density and extent of the fracture network enhances fluid flow and allows for more distant fluids to be accessed by a well. In addition to fluid, a propping agent (e.g., sand) is injected to keep the newly formed fractures open. Following hydraulic fracturing, which takes a few hours to a few days, there is a period where the hydraulic fracturing fluid is allowed to flow back to the surface where it is collected for disposal, treatment or reuse.

24. After the hydraulic fracturing fluid flows back to the surface, the extraction of oil or gas from the wells begins. Initially, vertical oil wells were hydraulically fractured to increase production. Then, in the 1990s, extended reach horizontal drilling technology was developed. This allowed drillers to steer wells more precisely so that they could remain within narrow horizontal and sub horizontal oil and gas reservoirs over great distances. This enabled production

along the length of the well within the production formation. This technology, combined with hydraulic fracturing, unlocked gas and oil resources in tight formations (e.g., shales) and is largely responsible for the recent boom in gas and oil production in the United States.

Fracking Wastewater Disposal

25. Waste fluids are often a by-product of many oil and gas extraction operations. In many instances, they are unsuitable for other uses and must be disposed of. When waste fluids are disposed of, they are often injected deep underground into high-permeability formations, usually deeper than the production reservoirs, for permanent sequestration and isolation from oil or gas reservoirs and drinking-water aquifers. The wells in which these fluids are disposed are known as injection wells, wastewater wells or salt-water disposal wells.

26. The contents of wastewater vary. In some places, it is primarily spent hydraulic-fracturing fluid (e.g., Ohio and Arkansas), whereas in other locations, wastewater often consists mostly of formation brines that come to the surface at the same time as the oil and gas that is extracted. For instance, in Oklahoma, only 10% of the fluid injected into disposal wells is spent fluid that was initially used in hydraulic fracturing and cannot be reused.

Mechanism of Induced Seismicity

27. According to the United States Geological Survey ("USGS"), the Nation's largest science mapping agency that collects, monitors, analyzes and provides scientific understanding about natural resource conditions and problems through multi-disciplinary investigations and provides impartial scientific analyses to the public, fluid injection from wastewater wells can induce earthquakes in four ways: (1) the injection of fluids raises pore-fluid pressure within a fault, (2) the injection of fluids fills and compresses fluids within pore spaces causing deformation (poro-elastic effects), (3) the injection of fluid that is colder than the rock into which it is being injected

causes thermoelastic deformation, and (4) the injected fluid adds mass to the injection formation. Observations and numerical modeling indicate that increased fluid pressure within faults most strongly influences whether an injection well will induce earthquakes.

28. Unfortunately, the injected fluids do not need travel the entire distance from the injection well to a fault for the injection to affect the fault's behavior. Injection can affect a fault's behavior via the change in fluid pressure, which can be transmitted greater distances than fluids themselves. The increase in the fluid pressure that is initiated at the injection well is transmitted to the fault without the fluid traveling the full distance between the well and fault.

29. As fluid is injected into a formation, the fluid pressure within that formation rises. If this fluid pressure increase is transmitted to a fault, the increase in pore pressure counteracts the stresses holding the fault closed (the normal stress), resulting in a lower effective stress. With lower effective normal stress clamping a fault, the frictional resistance to slip is lower and the fault is more prone to slip.

Scientific Support for Causal Link Between Earthquakes and Fracking Wastewater Injection

30. In recent years, scientific studies have established a causal link between the injection of production wastes into the ground through disposal wells and earthquakes in Oklahoma. According to the USGS, hydraulic fracturing, long-term wastewater injection, and enhanced oil recovery have all induced earthquakes in the United States and Canada in the past few years. Research has shown that wastewater disposal is responsible for the vast majority of the increase, including the largest and most-damaging induced earthquakes. Wastewater disposal is responsible for this change because of the duration of injection, the magnitude of the fluid pressure increase, and the size of the region affected by injection.

31. The recent increase in injection-induced seismicity is caused by a corresponding increase in wastewater disposal in the central United States. The earthquake rate increase in Oklahoma, where the vast majority of the increase has occurred (585 of 688 M $\geq$3 earthquakes in the central United States in 2014), corresponds to a doubling of the wastewater disposal rate in the state from 1999 to 2013. Focusing on the areas of increased seismicity within Oklahoma, we find that injection increased by factors of 5–10. Other areas of increased rates of induced earthquakes also experienced sudden increases in wastewater disposal.

32. A March 2013 study investigated the earthquakes in and around Prague, Oklahoma in 2011 and found a correlation between the injection wells operated by the Defendants and the earthquakes devastating the town in November of 2011. *See* Keranen, K.M., Savage, H.M., Abers, G.A., Cochran, E.S. 2013, *Potentially induced earthquakes in Oklahoma, USA: Links between wastewater injection and the 2011 M 5.7 earthquake sequence*, GEOLOGY, Mar. 25, 2013.

33. The USGS also recently issued a statistical analysis showing that the recent increase in Oklahoma's earthquakes are not the result of natural seismic changes. Instead, wastewater injection wells are the most likely culprit. The survey also warns that the rise in seismic activity has raised the chance of a damaging magnitude 5.5 or greater in the state. *See* Record Number of Oklahoma Tremors Raises Possibility of Damaging Earthquakes. USGS-Oklahoma Geological Survey Joint Statement on Oklahoma Earthquakes, Oct. 22, 2013; updated May 2, 2014.

34. On July 3, 2014, the authoritative journal Science published a scientific study showing a sharp increase in central Oklahoma seismicity since 2008. The study linked the earthquakes to wastewater injection operations in central Oklahoma. *See* Keranan, et al., *Sharp increase in central Oklahoma seismicity since 2008 induced by massive wastewater injection*, SCIENCE Vol. 345, 448-451, 451 (July 3, 2014) ("Sharp Increase").

35. This phenomenon is not newly discovered. Well-known examples of water injection into wells causing earthquakes have occurred in Colorado, Texas, India, and China. *See* William L. Ellsworth, Injection-Induced Earthquakes, SCIENCE 341, (2013) *available at http://www.gwpc.org/sites/default/files/files/Earthquakes%20and%20fracking(2).pdf.* The Nemaha fault runs north-northwest between Oklahoma City and southern Kansas. Seismologists found that a magnitude 7 earthquake is possible along that fault. *See* Sharp Increase. Furthermore, they stated that "the increasing proximity of the earthquake swarm to the Nemaha fault presents a potential hazard to the Oklahoma City metropolitan area." *Id.*

36. The USGS and the Oklahoma Geological Society (OGS) have conducted research quantifying the changes in earthquake rate in the Oklahoma City region, assessing and evaluating possible links between these earthquakes and wastewater disposal related to oil and gas production activities in the region. In a joint statement, the USGS and OGS identified wastewater injection as a contributing factor to the 2011 earthquake swarm and damaging magnitude 5.6 event.

37. In February 2015, the USGS found that "[l]arge areas of the U.S. that used to experience few or no earthquakes have, in recent years, experienced a remarkable increase in earthquake activity that has caused considerable public concern as well as damage to structures. This rise in seismic activity, especially in the central U.S., is not the result of natural processes." Significantly, the USGS also noted that "[d]eep injection of wastewater is the primary cause of the dramatic rise in detected earthquakes and the corresponding increase in seismic hazard in the central U.S."

38. In April 2015, an OGS report found that it is "very likely" that most of the dramatic increase in earthquakes in the state has been triggered by oil and gas companies injecting wastewater into deep underground disposal wells.

39. Recently, in a year-end review for 2014, the U.S. Environmental Protection Agency (EPA) noted that many experts concluded that a connection exists between disposal well location, injection volume and rates, and seismic activity. EPA Region 6 End of Year Review of UIC Program for 2014 (transmitted on Sept 29, 2015). EPA was concerned by the continued upward trend in earthquakes and recommended a reduction in the volumes of waste injected into the Arbuckle formation, which is the most critical stratum. *Id.* EPA further recommended more assessment and mapping of the Arbuckle formation and its connection to basement rock. *Id.*

40. Based on publicly available data, the causation link is inescapable. Before 2009, the maximum number of earthquakes measured in a given year in Oklahoma was 195 in 1995. By 2014, the number of measured earthquakes soared to over 5,000, and in 2015, the number of earthquakes was over 6,000. The number of earthquakes that residents can feel has shown an even greater rate of increase. In 2014, Oklahoma had 585 earthquakes of magnitude-3 or greater compared to 109 magnitude-3 quakes in 2013. *See* Trevor Hughes, *'Swarms' of earthquakes strike Oklahoma*, USA Today, Mar. 5, 2015, *available at* http://www.usatoday.com/story/news/2015/03/05/oklahoma-quakes-fracking-oil-gas/24444581/. Since late 2009, the rate of magnitude-3 or larger earthquakes in north-central Oklahoma has been nearly 300 times higher than in previous decades. *See* Doyle Rice, *'Reawakened' faults could trigger big Okla. Earthquakes*, USA Today, Mar. 19, 2015, *available at* http://www.usatoday.com/story/news/nation/2015/03/10/oklahoma-earthquakes-faultlines/ 24702741/. Of course, earthquakes do not respect state boundaries. The earthquake swarm in central and northern Oklahoma also extends to southern Kansas. *See, e.g.*, McNamara et al, Earthquake hypocenters …., Geophysical Research Letters (Jan. 27, 2015) ("Future Hazards") at Figure 2.

41. As discussed in a recent study, "this seismicity appears to be associated with increases in saltwater disposal that originates as 'flow-back' water after multistage hydraulic fracturing operations." F. Rall Walsh III* and Mark D. Zoback, *Oklahoma's recent earthquakes and saltwater disposal*, SCIENCE ADVANCES, 18 June 2015 available at http://advances.sciencemag.org/content/1/5/e1500195.full ("Disposal Study").

42. Importantly, as mentioned above, the risk comes from not only from the increased frequency of earthquakes, but also the likelihood that those earthquakes will continue to be more severe. USGS scientists warn that the smaller earthquakes induced by the injection of production wastes are reawakening long-dormant, 300-million-year-old fault lines across Oklahoma. The faults could trigger much higher-magnitude, and consequently more destructive, earthquakes than the smaller ones that have plagued the state in recent years. *See* Doyle Rice, *'Reawakened' faults could trigger big Okla. Earthquakes*, USA Today, Mar. 19, 2015, *available at* http://www.usatoday.com/story/news/nation/2015/03/10/oklahoma-earthquakes-faultlines/24702741/. According to USGS scientists, these reawakened faults in central Oklahoma could produce earthquakes as powerful as magnitude-5 and 6. *Id.* A USGS geologist stated "Many faults are reactivating, with as many as 17 magnitude-4 earthquakes in 2014." *Id.* In 2011, one even reached magnitude-5.4 near Prague, Oklahoma. Daniel McNamara, research geophysicist with the USGS, compared the fault lines in the Fairview and Edmond areas, which recently experienced 4.1 and 4.8 magnitude earthquakes, to the fault around Prague. "I don't know what to say frankly. It's incredible. I've never seen anything like it in the world," stated McNamara. "The working theory we have going on right now is just after decades of wastewater injection, (we) basically have a fault system throughout Oklahoma that's critically stressed...Basically a lot of faults are at a position where it just takes a little bit of added stress to cause them to move into failure."

http://www.koco.com/news/usgs-expert-ive-never-seen-anything-like-it-anywhere-in-the-world/37323746 (January 8, 2016).

43. The OGS determined in the spring of 2015 that "the majority of recent earthquakes in central and north-central Oklahoma are very likely triggered by the injection of produced water in disposal wells" and that "seismologists have documented the relationship between wastewater disposal and triggered seismic activity." http://earthquakes.ok.gov/what-we-know/ (visited on October 9, 2015).

44. The USGS fully supports this conclusion. For example, an article in *The New Yorker* recently quoted USGS geologist William Ellsworth in reporting that "[d]isposal wells trigger earthquakes when they are dug too deep, near or into basement rock, or when the wells impinge on a fault line. Ellsworth said, 'Scientifically, it's really quite clear.'" Rivka Galchen, *Weather Underground*, The New Yorker, Apr. 13, 2015 *available at* http://www.newyorker.com/magazine/2015/04/13/weather-underground.

45. Recently, two earthquakes of greater-than-magnitude-4 occurred on the same day; further evidencing the higher frequency of more serious earthquakes in the areas of concern. A magnitude 4.4 earthquake hit northern Oklahoma on October 10, 2015, which a USGS seismologist said "had all the hallmarks of an induced quake" and "seem[ed] to be part of an ongoing swarm of induced quakes in the area." *Oklahoma Earthquake likely caused by wastewater injection, seismologist says*, The Guardian, Oct. 10, 2015, *available at* http://www.theguardian.com/us-news/2015/oct/10/oklahoma-earthquake-fracking-us-geological-survey.

46. On the same day, a magnitude 4.5 earthquake hit near the major oil storage and pipeline area near Cushing, roughly midway between Oklahoma City and Tulsa. *See* Michael

Wines, *New Concern Over Quakes in Oklahoma Near a Hub of U.S. Oil*, The New York Times, Oct. 14, 2015 *available at* http://www.nytimes.com/2015/10/15/us/new-concern-over-quakes-in-oklahoma-near-a-hub-of-us-oil.html. Cushing is the location of the world's largest and most important crude oil storage hub. Scientists reported, in a paper published online in September 2015, that a large earthquake near the storage hub "could seriously damage storage tanks and pipelines." Dr. McNamara, the lead author of that study, stated that the recent earthquake continued a worrisome pattern of moderate quakes, suggesting that a large earthquake is more than a passing concern. "When we see these fault systems producing multiple magnitude 4s, we start to get concerned that it could knock into higher magnitudes," he said. "Given the number of magnitude 4s here, it's a high concern." *Id.*

47. The Cushing oil and pipeline hub stores oil piped from across North America until it is dispatched to refineries. *Id.* The New York Times reports that as of last week, it held 53 million barrels of crude. *Id.* The earth beneath the tanks was comparatively stable until last October, when magnitude 4 and 4.3 earthquakes struck nearby. *Id.* At least three more earthquakes with magnitudes 4 and over have occurred within a few miles of the tanks since then. *Id.* The Department of Homeland Security has concluded that a quake equivalent to the record magnitude 5.7 could significantly damage the tanks. *Id.* Dr. McNamara's study concluded that recent earthquakes have increased stresses along two stretches of fault that could lead to earthquakes of that size. *Id.*

48. USGS scientists have also said that a magnitude 7 quake cannot be ruled out. *U.S. Maps pinpoint earthquakes*, The New York Times, Apr. 23, 2015, *available at* http://www.nytimes.com/2015/04/24/us/us-maps-areas-of-increased-earthquakes-from-human-activity.html.

49. The Future Hazards study confirms that more severe earthquakes are likely as a result of ongoing injection of production wastes into the ground through high-rate disposal wells. It states that earthquake clusters associated with long fault structures could give rise to magnitude 5 to 6 earthquakes. Examples include earthquakes associated with the Nemaha fault near Jones, in the Medford and Stillwater regions, and between Langston and Guthrie. Another example is the area around Cushing. The paper concludes that the increased seismicity poses an elevated hazard to infrastructure and the regional population. According a recent paper, the Cushing area earthquakes are associated with reactivated faults that cut into the Arbuckle formation and a subsidiary fault called the Wilzetta-Whitehall. McNamara et al., McNamara, D., at al., *Efforts to monitor and characterize the recent increasing seismicity in central Oklahoma*, THE LEADING EDGE June 2015 *available at* https://profile.usgs.gov/myscience/upload_folder/ci2015Jun0413582855600McNamaraTLE.pdf. That paper notes that most of the earthquakes do not lie along known fault structures, but there may be other fault structures that are being reawakened by the injection that are associated with these earthquakes. *Id.* The most recent paper notes that earthquake activity in this area has been above forecast and that "[i]nclusion of all recent Oklahoma earthquakes in the NSHM [hazard model] significantly increases ground shaking estimates and earthquake hazard . . ., which would result in serious implications for infrastructure design standards. McNamara et al., *Reactivated faulting near Cushing, Oklahoma: Increased potential for a triggered earthquake in an area of United States strategic infrastructure*, GEOPHYSICAL RESEARCH LETTERS (October 23. 2015) available at http://onlinelibrary.wiley.com/doi/10.1002/2015GL064669/pdf.

50. Thus, the injection of large volumes of production wastes into the ground in Oklahoma is causing large numbers of moderate strength earthquakes.

51. These earthquakes have already caused considerable physical damage and mental disquiet. A series of shocks over magnitude 5 in 2011, the largest of which was magnitude 5.6 in the Prague area of Oklahoma, destroyed at least 16 homes and collapsed an historic spire at Benedictine Hall at St. Gregory's University. http://www.newyorker.com/magazine/2015/04/13/weather-underground. Repairing the spire cost about five million dollars.

52. In addition to property damage, the earthquakes have also caused harm to people. For example, Sandra Ladra was at home watching television in her home in Prague, Oklahoma in November of 2011 when an earthquake caused the rock facing on her fireplace to fall. The rocks struck Ms. Ladra, causing her significant injury. Obviously, if much stronger earthquakes over 6 in magnitude struck, far greater numbers of people could be harmed. Greater earthquake magnitude also increases the risk of rupture in storage tanks for oil and other products, causing widespread environmental damage, in addition to property damage and personal injuries. In particular, if a large earthquake were to strike the massive oil storage area in Cushing, huge amounts of oil could be released, causing massive environmental damage. If a large earthquake hit the Oklahoma City area, it could cause thousands of injuries and even fatalities.

53. In spite of these scientific studies, the oil and gas industry insists that Oklahoma has naturally occurring seismicity, that their operations are not causing the earthquakes, and that recent reports linking injection well operations to Oklahoma quakes are not based upon good science.

Defendants' Negligent and Tortious Conduct

54. Defendants operate wastewater injection wells in and around Plaintiffs' homes and within the Class Area (as defined below). These injection wells have caused the earthquakes occurring in the Class Area, and proximately caused damages to Plaintiffs and the putative Class.

55. Since 2009, Defendants have injected huge amounts of production wastes via disposal wells. The total volume of production wastes injected has gone from 2 billion ("bn") barrels in 2009 to over 12 bn barrels in 2014. Focusing on the Arbuckle formation alone, which is the geologic stratum in which most of the earthquakes originate and in which disposal wells discharge large volumes, Defendants account for over 60% of the total volume of production wastes injected in 2014.

56. Overlaying the locations of Defendants' wells onto the places where earthquakes above magnitude 3.5 have been felt shows that earthquakes are occurring in the vicinity of Defendants' wells and along faults that are close to the wells. As more injection has occurred in the central and northern areas of Oklahoma, more and more earthquakes have occurred in those areas. . *Id.* While not all wells cause earthquakes, studies have found that most high volume disposal wells are linked to earthquakes: "Even though quake-associated wells were only 10 percent of those studied, more than 60 percent of the high-rate wells — 12 million gallons or more — were linked to nearby earthquakes" and "of the 45 wells that pump the most saltwater [waste] at the fastest rate, 34 of them — more than three out of four — were linked to nearby quakes." http://www.nytimes.com/aponline/2015/06/18/science/ap-us-sci-manmade-quakes.html?smprod=nytcore-ipad&smid=nytcore-ipad-share&_r=0.

57. The Disposal Study confirms that "the significant increases in SWD [Production Waste disposal] increase pore pressure in the Arbuckle Group, which spreads out away from the injection wells with time, eventually triggering slip on critically stressed faults in the basement." It also confirms that "[i]njection of large volumes of saltwater into the Arbuckle group appears to be triggering the release of already stored strain energy in crystalline basement."

58. Thus, scientific studies support that injection of production wastes induces earthquakes and that Defendants' injection of production wastes is causing the earthquakes that have impacted Plaintiffs and the putative Class.

Defendants Have Disposed of Production Wastes That Caused Earthquakes or Contributed To Their Occurrence and Are Continuing to Do So

59. Defendants have been disposing of high volumes of production wastes into the ground since at least 2009.

60. As demonstrated in the Figures attached to this Petition, Defendants increased their wastewater disposal activities from 2009 to 2014 by about seven fold (Figures 3 and 5). Moreover, much of their injection disposal is done within the Arbuckle Formation (Figure 4). As found by every scientist studying this issue, there is a direct correlation between Defendants' wastewater injection disposal operations and the earthquakes shaking Oklahoma and damaging Plaintiffs and the Class (Figures 6 – 8).

Thus, Defendants contributed and are contributing to the past and present handling, storage, and disposal of production wastes, which is causing earthquakes in Oklahoma that have damaged Plaintiffs and the members of the putative Class.

Property Damage Sustained by Plaintiffs

A. <u>Plaintiff Lisa Griggs:</u>

61. Plaintiff Griggs has owned the real property in Guthrie, Logan County, Oklahoma on which she makes her home since about 2007.

62. The area around Ms. Griggs's home has suffered over one hundred earthquakes of greater than 3.0 in magnitude in the past two years. The most significant earthquakes, and damages to Ms. Griggs's home, occurred beginning in February 2014. Multiple quakes of greater than 4.0

magnitude shook her home between February and about August 2014. In 2015, between about April through about June 2015, several more earthquakes of greater than 4.0 magnitude struck nearby, causing further damage to her home.

63. Upon information and belief, these earthquakes were caused by nearby injection wells owned and operated by Defendants New Dominion, Chesapeake and Devon Energy. Moreover, the earthquakes triggered by their wastewater disposal operations continue around Ms. Griggs's home and areas nearby.

64. As a result of the earthquakes, Plaintiff Griggs has sustained extensive damage to her home, including shifts to the piers of her home's foundation, cracks to the concrete block forming the foundation, separation of the chimney from the home, separation of the cabinets from walls, cracks and separations to exterior brick veneer and mortar joints, cracks to drywall, wracking of doors, damages to door casings, and separations in door and window trim.

65. The damage to her home is in the thousands of dollars.

B. <u>Plaintiff April Marler:</u>

66. Plaintiff Marler has owned the real property in Choctaw, Oklahoma County, Oklahoma, on which she makes her home since about 2012.

67. The area around Choctaw and Ms. Marler's home has suffered nearly one hundred earthquakes of greater than 3.0 in magnitude in the past two years. The most significant earthquakes, and resulting damages to Ms. Marler's home, occurred in mid-2014, when approximately 17 quakes measuring greater than 3.0 occurred in or around the Choctaw area. The largest, measuring 3.7 magnitude, occurred in Choctaw on May 31, 2014. The following day a 3.6 magnitude earthquake struck nearby; and approximately two weeks later magnitude 3.9 and 3.5 earthquakes hit within a few miles of Ms. Marler's home.

68. Upon information and belief, these earthquakes were caused by nearby injection wells owned and operated by Defendants New Dominion and Devon Energy. Moreover, the earthquakes triggered by their wastewater disposal operations continue around Ms. Marler's home and areas nearby.

69. As a result of all of these earthquakes, Plaintiff Marler has sustained damage to her home, including cracks to the foundation, cracks and separations to exterior brick veneer and mortar joints, cracks to drywall, and separations in door and window trim.

70. The damage to her home is in the thousands of dollars.

CLASS ALLEGATIONS

71. Plaintiffs reallege each of the preceding paragraphs, and by this reference incorporates each such paragraph as though set forth here in full.

72. Plaintiffs bring this action, on behalf of themselves and all others similarly situated, as a class action pursuant to 12 O.S. § 2023.

73. The class that Plaintiffs seek to represent (the "Class") is defined as follows:

> All residents of Oklahoma owning real property from 2011 through the time the Class is certified, Class notice has been delivered to the Class, and Class members have had the opportunity to opt out.
>
> Excluded from the Class are Defendants and their directors, officers, employees and agents, and the judicial officer presiding over this case and his/her immediate family members, and any member of the Class that files a timely exclusion.

74. Plaintiffs reserve the right to amend the Class definition if discovery and further investigation reveals that the Class should be expanded or otherwise modified.

75. Plaintiffs reserve the right to establish subclasses as appropriate.

76. This action is brought and properly may be maintained as a class action pursuant to 12 O.S. § 2023 and satisfies the requirements those provisions.

Numerosity

77. In recent years, thousands of earthquakes have been triggered across Oklahoma.

78. These earthquakes are continuing across the state of Oklahoma.

79. The Class is sufficiently numerous and scattered across Oklahoma making joinder of all members of the Class in a single action impracticable, and therefore, the resolution of their claims through the procedure of a class action will be to the benefit of the parties and the Court.

Commonality

80. Plaintiffs' claims raise issues of fact or law which are common to the members of the putative Class. These common questions include, but are not limited to:

(a) whether Defendants' operations caused earthquakes in Oklahoma;

(b) whether the earthquakes in Oklahoma caused damage to the personal and real property of Plaintiffs and the members of the putative Class;

(c) whether Defendants owed a duty to the Plaintiffs and the members of the putative Class and whether that duty was breached;

(d) whether Defendants' conduct amounted to a nuisance;

(e) whether Defendants' conduct is an ultra-hazardous activity;

(f) whether Defendants' operations were negligently performed;

(g) whether Defendants caused a trespass;

(h) whether Plaintiffs and the putative Class Members have suffered damages proximately caused by Defendants' operations; and

(i) whether a judgment including punitive damages is appropriate.

Typicality

81. Plaintiffs' claims are typical of the claims of the other members of the Class they seek to represent because Defendants' wastewater injection operations have caused earthquakes, pose a significant danger, and have caused damages to Plaintiffs and the putative Class Members in a similar manner.

Adequacy

82. Plaintiffs are interested in the outcome of this litigation and understand the importance of adequately representing the Class.

83. Plaintiffs will fairly and adequately protect the interests of the Class sought to be certified.

84. Plaintiffs are adequate representatives of the Class because they have no interests which are adverse to the interests of the members of the Class. Plaintiffs are committed to the vigorous prosecution of this action and, to that end, Plaintiffs have retained counsel who are competent and experienced in handling class-action and complex tort litigation and who are qualified to adequately represent the Class.

Predominance

85. Questions of law or fact common to the members of the Class predominate over questions affecting only individual members.

Superiority

86. A class action is superior to other available methods for the fair and efficient adjudication of the controversy. The predicate issues relate to Defendants' wastewater injection operations, actions and activities, and whether these activities pose a nuisance, are an ultra-hazardous activity, were negligently performed, or caused trespasses. The focus of this action will

be on the common and uniform conduct of Defendants in conducting their wastewater injection operations.

87. Absent class action relief, the putative Class Members would be forced to prosecute thousands of similar claims in different venues around the State of Oklahoma. Such an event would cause tremendous amounts of waste of judicial resources, but the prosecution of these claims as a class action will promote judicial economy.

88. The prosecution of separate actions by individual members of the Class would create a risk of:

a. inconsistent or varying adjudications with respect to individual members of the Class which would establish incompatible standards of conduct for the Defendants; and

b. adjudications with respect to individual members of the Class which would as a practical matter be dispositive of the interests of the other members not parties to the adjudications or substantially impair or impede their ability to protect their interests.

89. Plaintiffs are not aware of any difficulty which will be encountered in the management of this litigation which should preclude its maintenance as a class action.

CAUSES OF ACTION

Count I – Private Nuisance

90. Plaintiffs reallege each of the preceding paragraphs, and by this reference incorporates each such paragraph as though set forth here in full.

91. Defendants' conduct constitutes a private nuisance.

92. Plaintiffs and the putative Class have property rights and are privileged regarding the use and enjoyment of their homes, businesses, and land. Defendants' actions and operations, as described above, have unlawfully and unreasonably interfered with those rights and privileges.

93. Plaintiffs and the putative Class have suffered harm and damages because of Defendants' creation of a nuisance, including:

(a) Damages to the personal and real property of Plaintiffs and the Class;

(b) Interference with the use and enjoyment of property;

(c) Annoyance, discomfort and inconvenience on their property caused by Defendants' nuisance;

(d) Loss of peace of mind;

(e) Diminution of property value;

(f) Economic expenses incurred to protect against earthquakes in the future, including additional structural support and repairs to real property, and premiums for earthquake insurance and related appraisals; and

(g) Economic loss from business interruption.

Count II – Ultra-hazardous Activities

94. Plaintiffs reallege each of the preceding paragraphs, and by this reference incorporates each such paragraph as though set forth here in full.

95. Defendants' actions described above constitute ultra-hazardous activities that involve a high degree of risk of serious harm to a person or the chattels of others, the risk cannot be eliminated by exercising the utmost care, and is not a matter of common usage.

96. As a direct and proximate result of Defendants' ultra-hazardous activities, Plaintiffs and the putative Class have sustained damages, which are the direct and proximate result of Defendants' ultra-hazardous or abnormally dangerous activities, to which Defendants are strictly liable, including:

(a) Damages to the personal and real property of Plaintiffs and the putative Class;

(b) Interference with the use and enjoyment of property;

(c) Annoyance, discomfort and inconvenience on their property caused by Defendants' ultra-hazardous activities;

(d) Loss of peace of mind;

(e) Diminution of property value;

(f) Economic expenses incurred to protect against earthquakes in the future, including additional structural support and repairs to real property, and premiums for earthquake insurance and related appraisals; and

(g) Economic loss from business interruption.

Count III - Negligence

97. Plaintiffs realleges each of the preceding paragraphs, and by this reference incorporates each such paragraph as though set forth here in full.

98. Defendants owed a duty to Plaintiffs and the putative Class to use ordinary care not to operate or maintain their injection wells in such a way to cause or contribute to seismic activity. Defendants, experienced in these operations, knew or should have known of the connection between injection wells and seismic activity, and acted in disregard of these facts.

99. Defendants breached their duty to Plaintiffs and the putative Class to use ordinary care and not to operate or maintain their injection wells in such a way to cause or contribute to seismic activity.

100. As a direct and proximate result of these acts, omissions, and fault of the Defendants, the Plaintiffs and the Class have suffered damages and injuries reasonably foreseeable to the Defendants, including:

(a) Damages to the personal and real property of Plaintiffs and the Class;

(b) Interference with the use and enjoyment of property;

(c) Annoyance, discomfort and inconvenience on their property caused by Defendants' negligence;

(d) Loss of peace of mind;

(e) Diminution of property value;

(f) Economic expenses incurred to protect against earthquakes in the future, including additional structural support and repairs to real property, and premiums for earthquake insurance and related appraisals; and

(g) Economic loss from business interruption.

Count IV - Trespass

101. Plaintiffs reallege each of the preceding paragraphs, and by this reference incorporates each such paragraph as though set forth here in full.

102. Plaintiffs and the members of the putative Class are and have been lawfully entitled to possession of their property.

103. Defendants, without the permission or consent of Plaintiffs and any putative Class Members and without legal right, intentionally engaged in activities that resulted in concussions or vibrations entering Plaintiffs' and Class Members' property. Such unauthorized invasion of Plaintiffs' and the Class Members' property interests constitutes a trespass.

104. Because of Defendants' trespass, Plaintiffs and the putative Class have suffered damages, including:

(a) Damages to personal and real property of Plaintiffs and the putative Class;

(b) Interference with the use and enjoyment of property;

(c) Annoyance, discomfort and inconvenience on their property caused by Defendants' trespass;

(d) Loss of peace of mind;

(e) Diminution of property value;

(f) Economic expenses incurred to protect against earthquakes in the future, including additional structural support and repairs to real property, and premiums for earthquake insurance and related appraisals; and

(g) Economic loss from business interruption.

PUNITIVE DAMAGES

105. Defendants' actions, in knowingly causing seismic activity because of their injection well operations, constitute wanton or reckless disregard for public or private safety, and thus, subject to a claim for punitive damages, for which Plaintiffs and the putative Class seek an amount sufficient to punish the Defendants and to deter them and others similarly situated from such conduct in the future.

DEMAND FOR JURY TRIAL

106. Plaintiffs and the putative Class respectfully demand a trial by jury.

PRAYER FOR RELIEF

WHEREFORE, Plaintiffs and the Class pray that this Court enter a joint and several judgment against Defendants and in favor of Plaintiffs and the Class, awarding Plaintiffs and the Class the following relief:

i. An Order certifying the Class as requested in this Petition;

ii. An Order appointing as Class Counsel the undersigned counsel for Plaintiffs and the putative Class;

iii. Compensatory damages according to proof;

iv. Punitive damages;

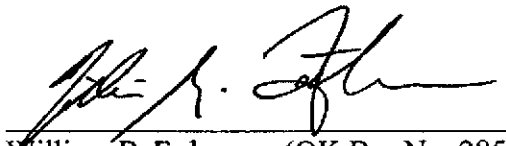
v. Awarding attorneys' fees, expenses, and costs;

vi. Pre-judgment and post-judgment interest; and

vii. All other relief to which Plaintiffs and the Class are entitled or that the Court deems just and proper.

Date: January 12, 2016

Respectfully Submitted,



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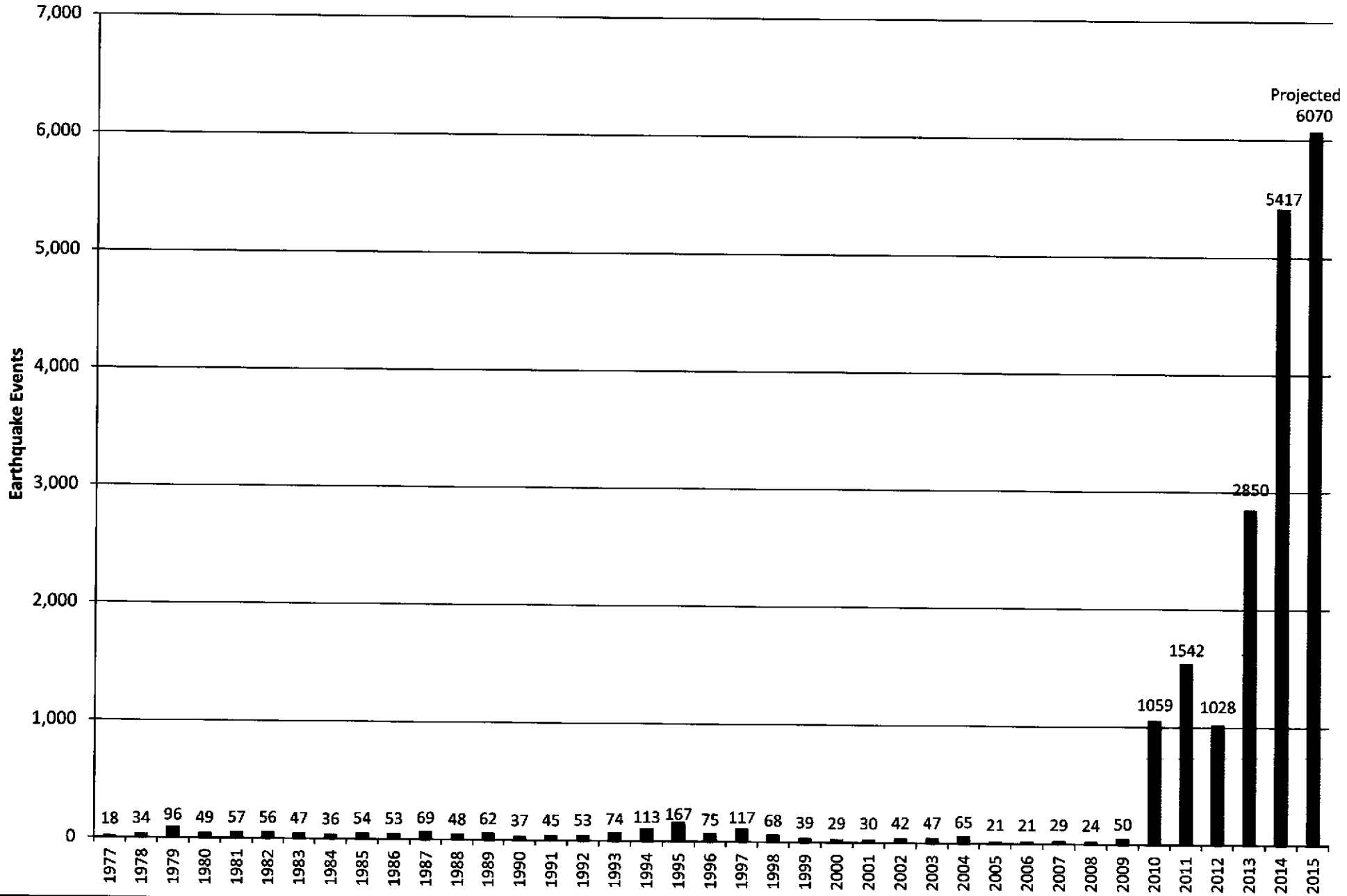
Attorneys for Plaintiffs and the Class

Figure 1

Oklahoma Earthquakes

1977-2015 (through 10/21/15)



Source: Oklahoma Geological Survey

Projection based on average of 16.63 events/day as of 10/21/15

Figure 2

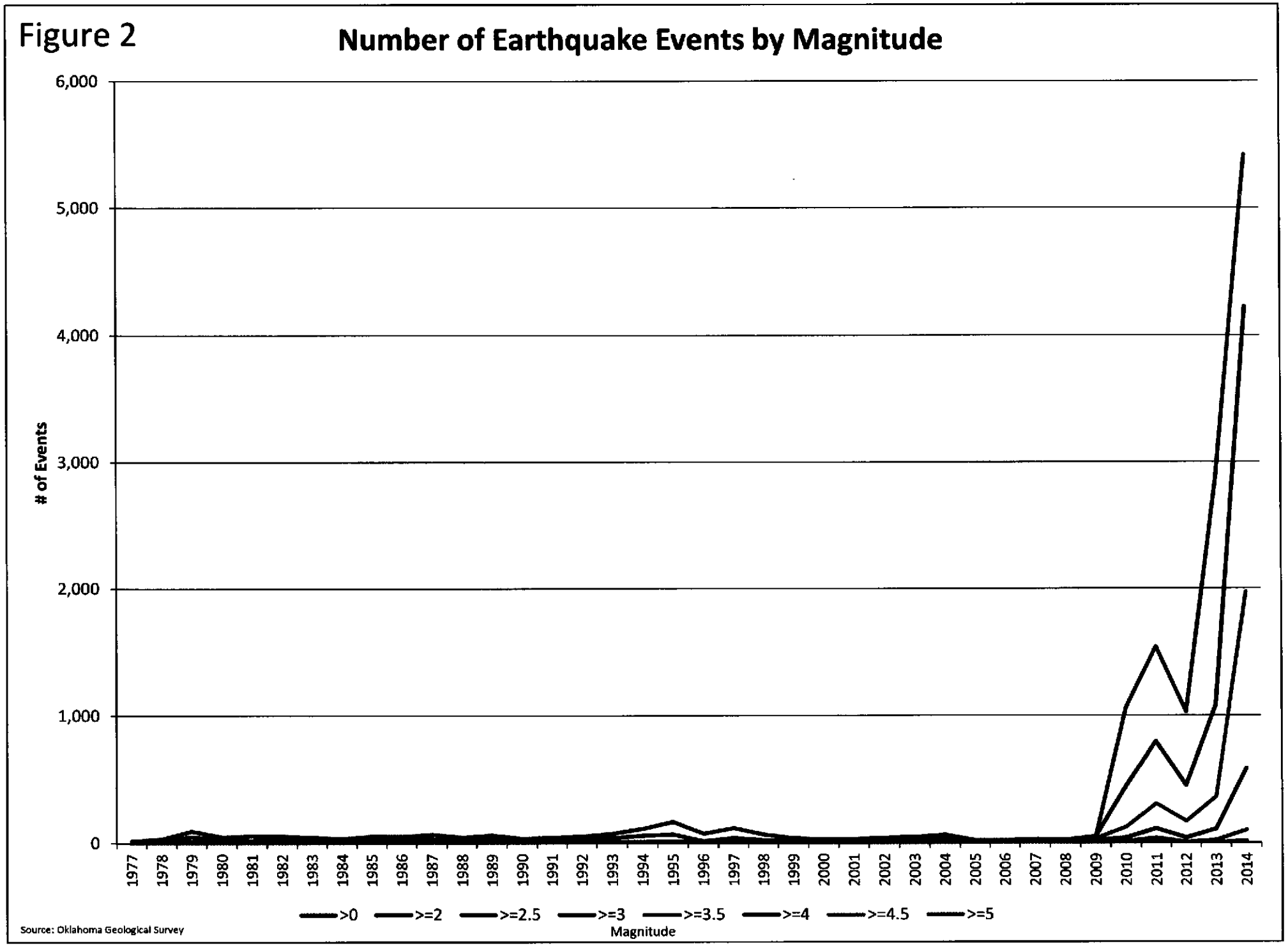

Number of Earthquake Events by Magnitude
6,000
5,000
4,000
3,000
2,000
1,000
0
# of Events
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
>0
>=2
>=2.5
>=3
>=3.5
>=4
>=4.5
>=5
Magnitude
Source: Oklahoma Geological Survey

Figure 3

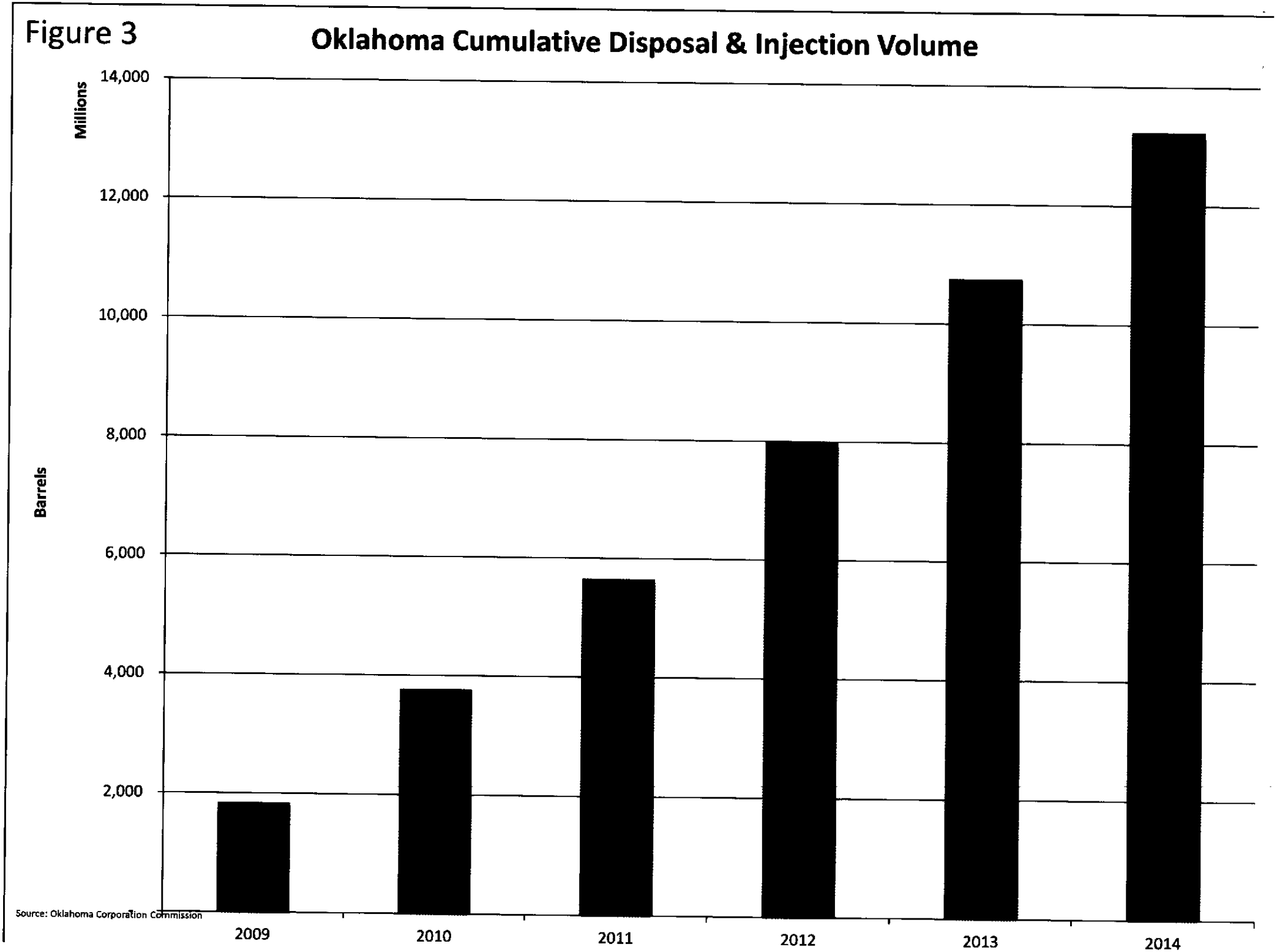
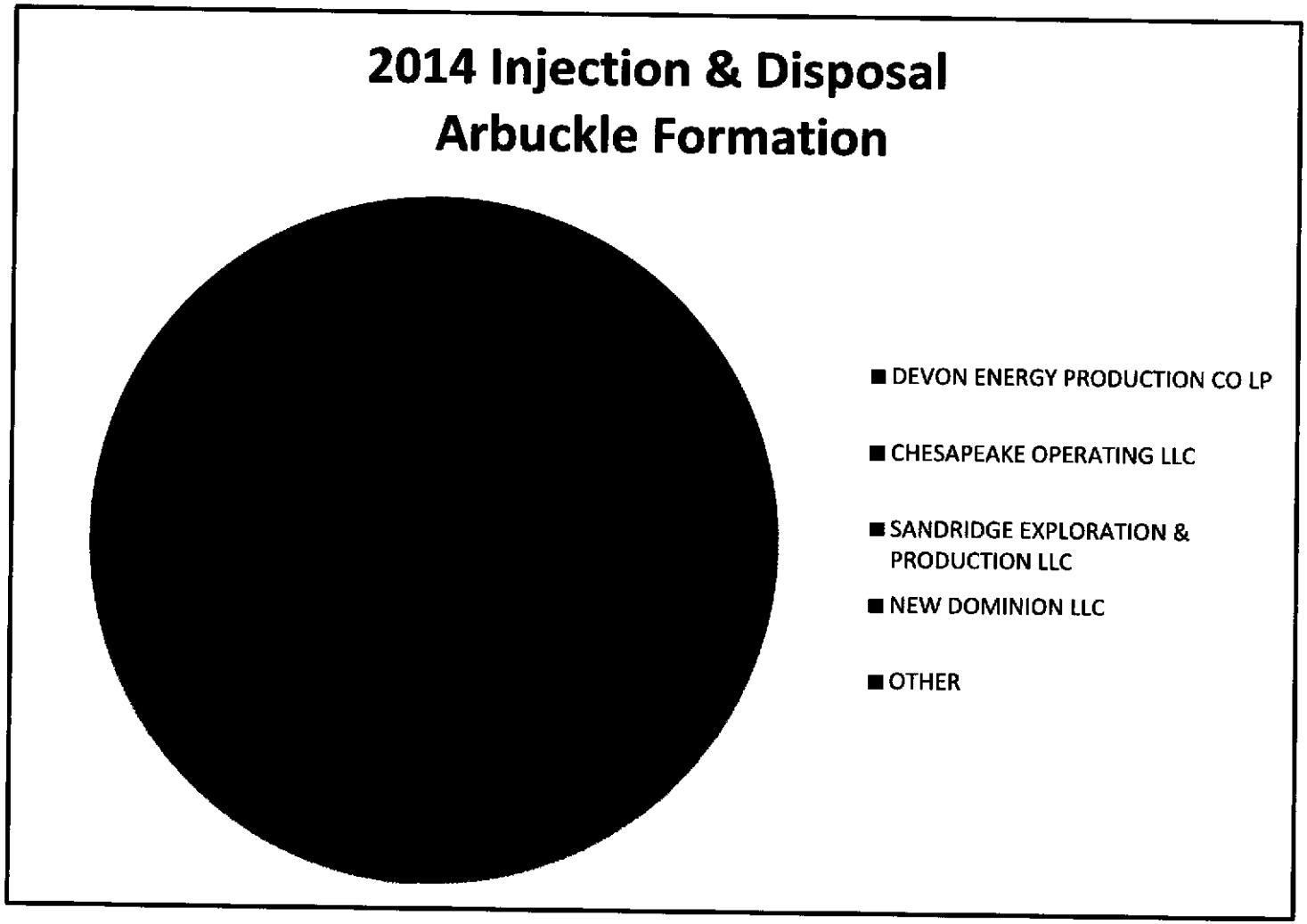

Oklahoma Cumulative Disposal & Injection Volume
Millions
Barrels
14,000
12,000
10,000
8,000
6,000
4,000
2,000
2009
2010
2011
2012
2013
2014
Source: Oklahoma Corporation Commission

Figure 4

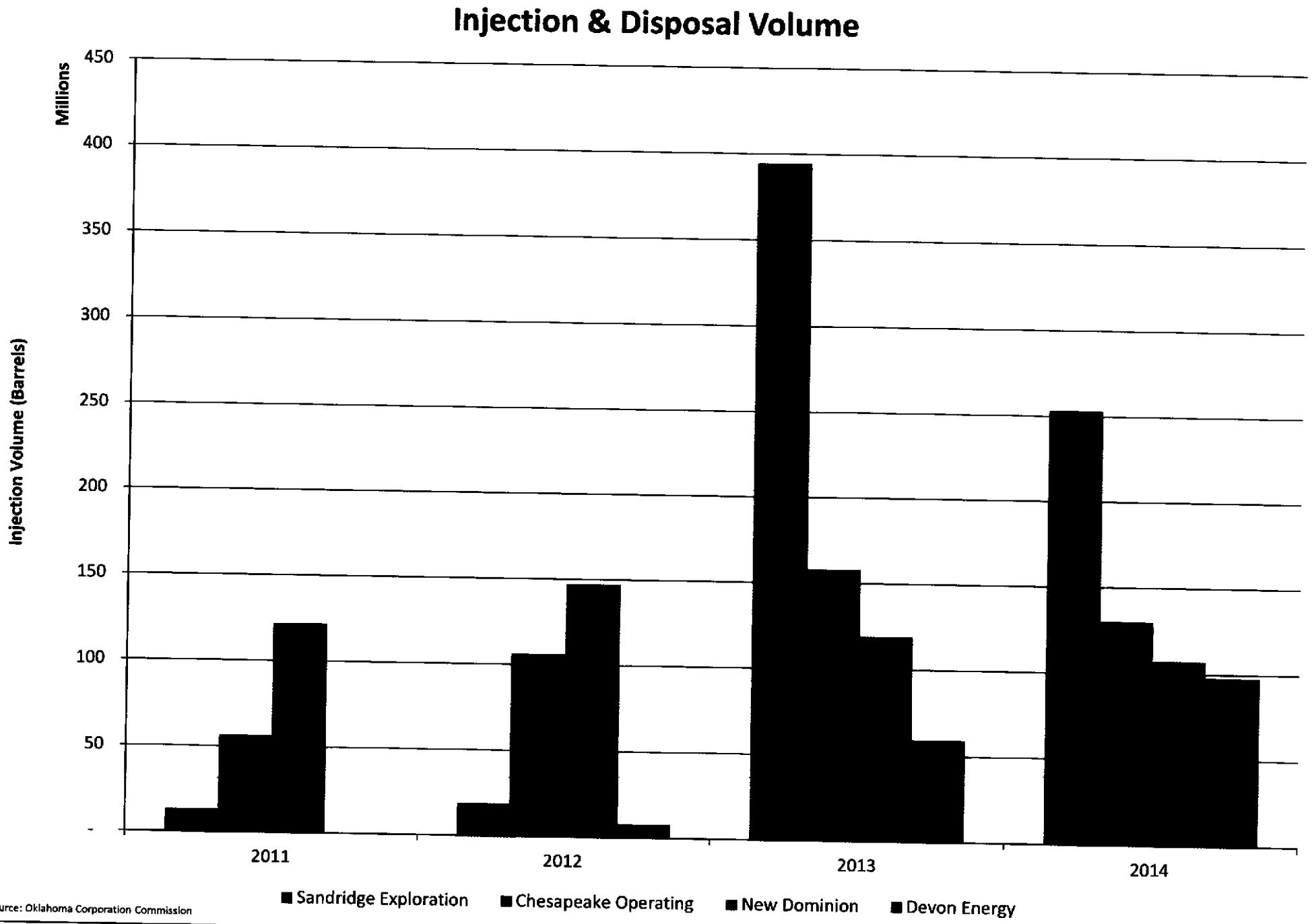


Operator	Injection Volume (bbls)
DEVON ENERGY PRODUCTION CO LP	64,555,296
CHESAPEAKE OPERATING LLC	73,885,836
SANDRIDGE EXPLORATION & PRODUCTION LLC	201,767,276
NEW DOMINION LLC	72,081,172
OTHER	261,551,899
TOTAL	**673,841,479**

Operator	# of Wells
DEVON ENERGY PRODUCTION CO LP	36
CHESAPEAKE OPERATING LLC	14
SANDRIDGE EXPLORATION & PRODUCTION LLC	91
NEW DOMINION LLC	6
OTHER	258

Source: Oklahoma Corporation Commission

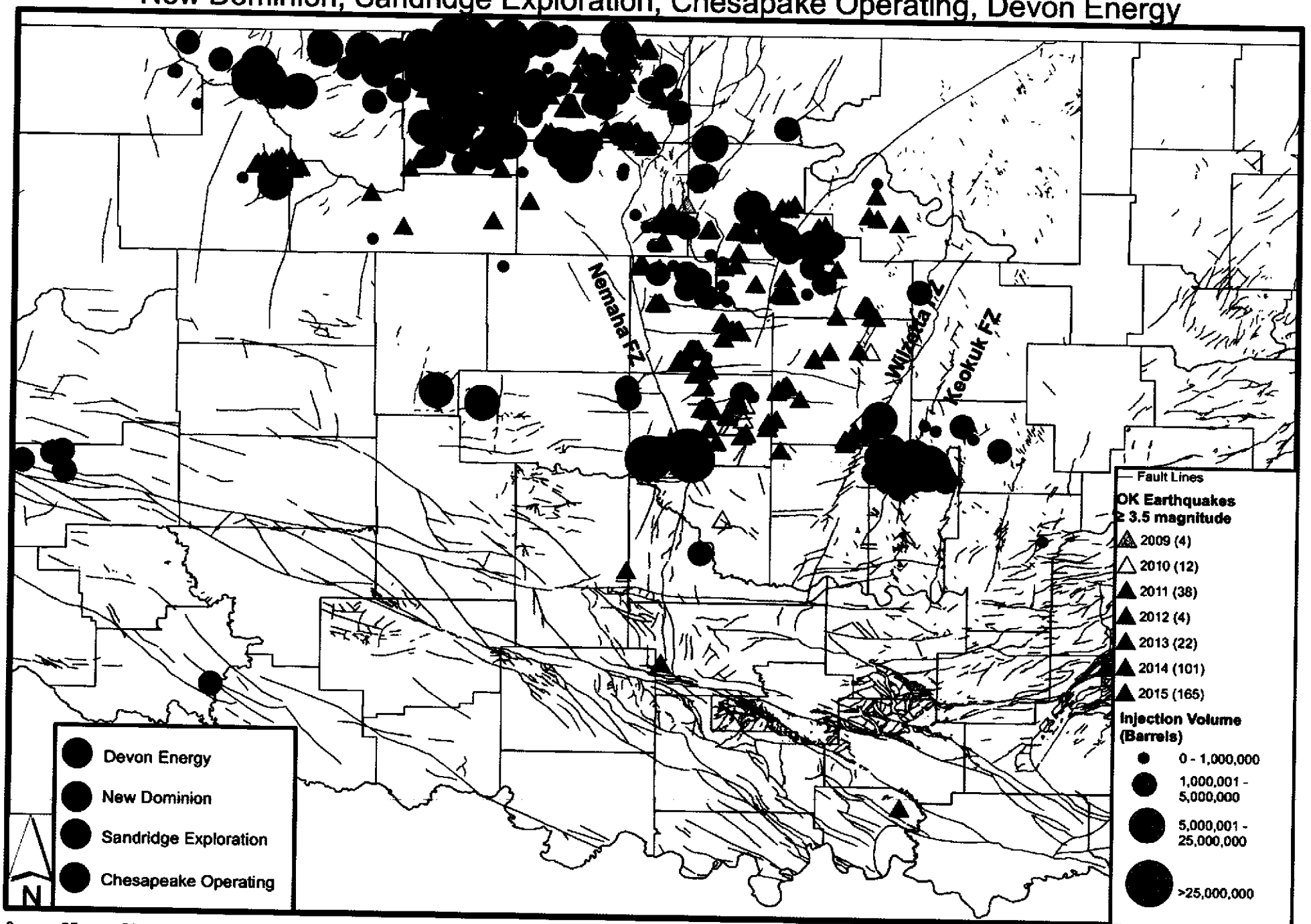
Figure 5



Source: Oklahoma Corporation Commission

Figure 6

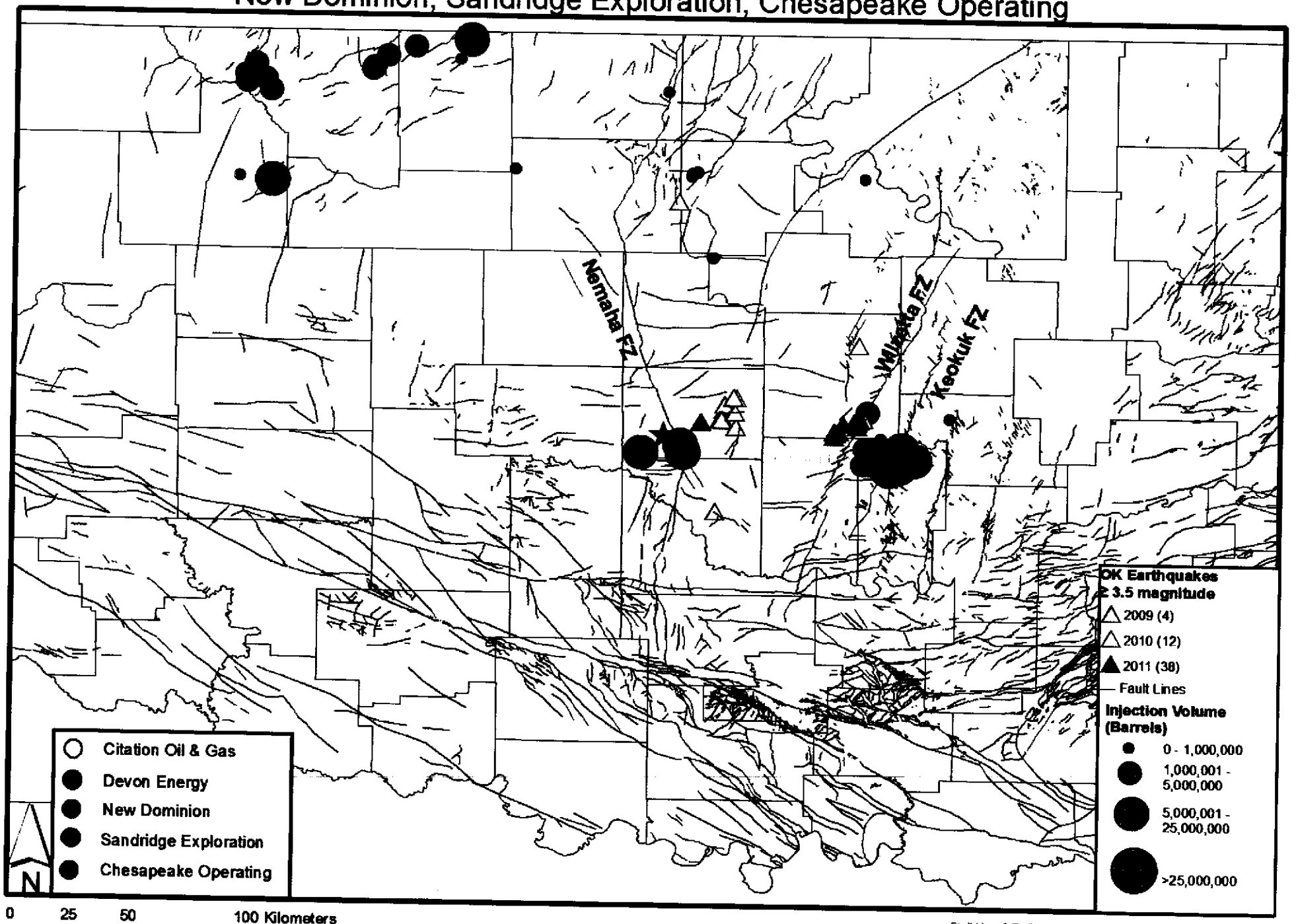
2011-2014 Cumulative Injection & Disposal
New Dominion, Sandridge Exploration, Chesapake Operating, Devon Energy



Fault Lines & Earthquakes - Oklahoma Geological Survey
Injection Well Locations & Volumes - Oklahoma Corporation Commission
Earthquakes Displayed ≥ 3.5 magnitude, 2015 earthquakes thru 10/12

Figure 7

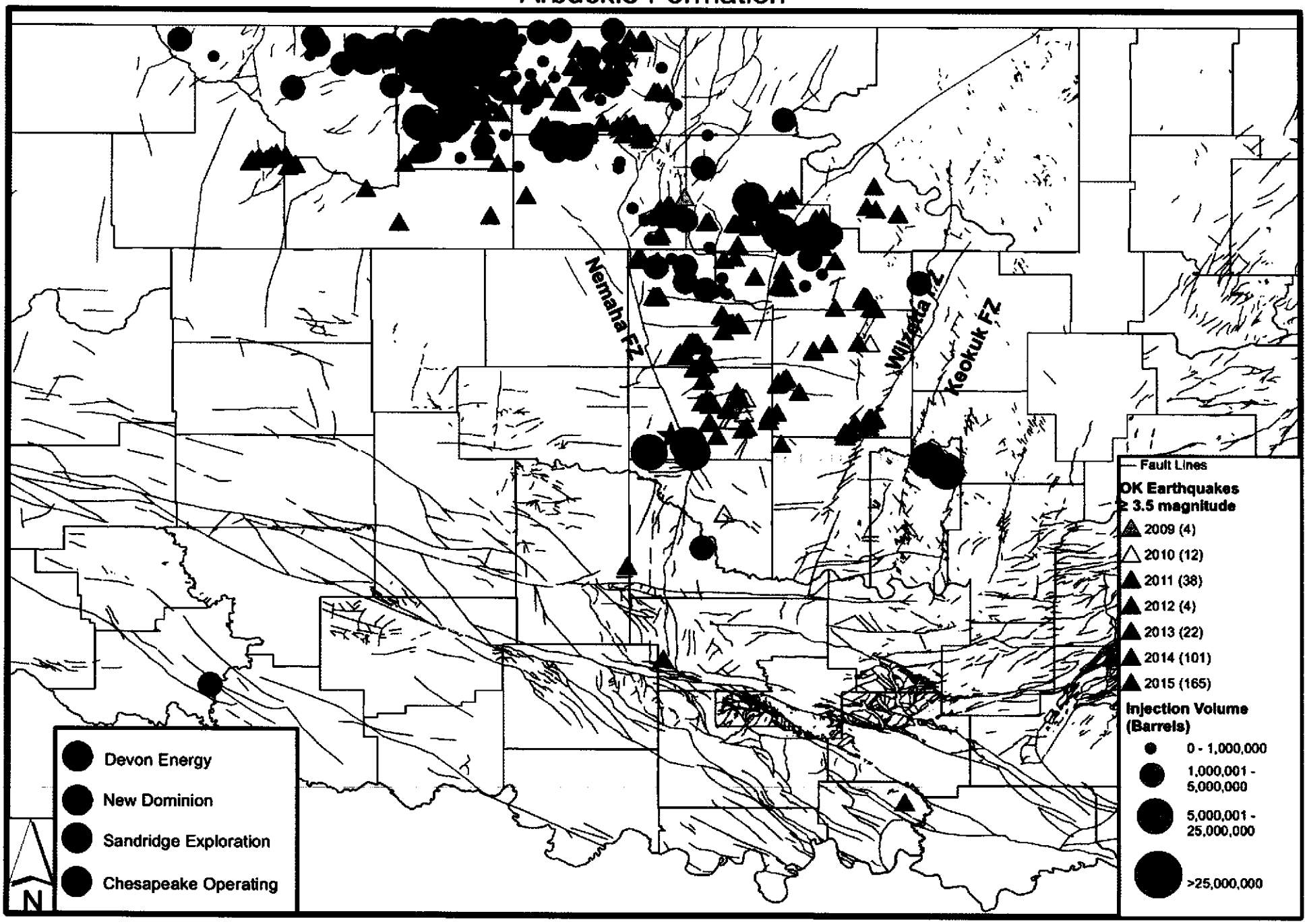
2011 Injection & Disposal
New Dominion, Sandridge Exploration, Chesapeake Operating



Fault Lines & Earthquakes - Oklahoma Geological Survey
Injection Well Locations & Volumes - Oklahoma Corporation Commission
Earthquakes Displayed ≥ 3.5 magnitude, 2015 earthquakes thru 10/12

Figure 8

2014 Injection & Disposal Volume
Arbuckle Formation



Fault Lines & Earthquakes - Oklahoma Geological Survey
Injection Well Locations & Volumes - Oklahoma Corporation Commission
Earthquakes Displayed ≥ 3.5 magnitude, 2015 earthquakes thru 10/12