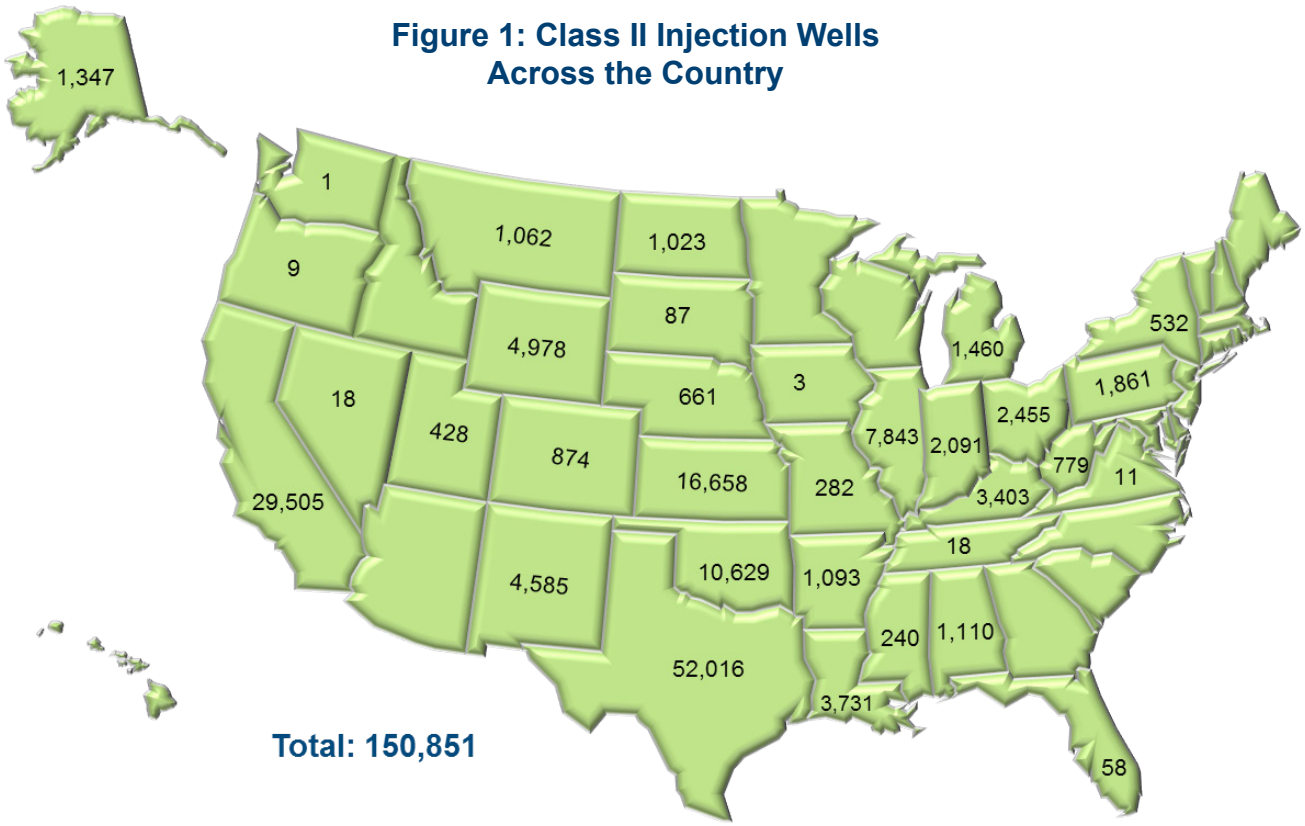
Injection Wells & Induced Seismicity

Induced seismicity is the phenomenon of human activities, such as large engineering projects, causing energy release in the earth. Several investigations are underway exploring a potential link of seismicity to a handful of the nation's approximately 151,000 Class II Underground Injection Control (UIC) wells used by the natural gas and oil industry to dispose of produced waters or enhance resource recovery (see Figure 1).[1] These Class II injection wells (see Figure 2) are a subset of the more than 800,000 injection wells nationwide that handle a wide variety of industrial wastes and the development of various minerals and geothermal energy sources.

Injection wells are regulated by the US Environmental Protection Agency (EPA) under the Safe Drinking Water Act of 1974, through the UIC program. In many cases the EPA delegated authority to implement the UIC program to the states, with 39 states having primary authority over 95 percent of all UIC Class II wells. States must demonstrate that their program is effective in protecting underground sources of drinking water and are subject to EPA oversight.

Figure 1: Class II Injection Wells Across the Country



Data: EPA

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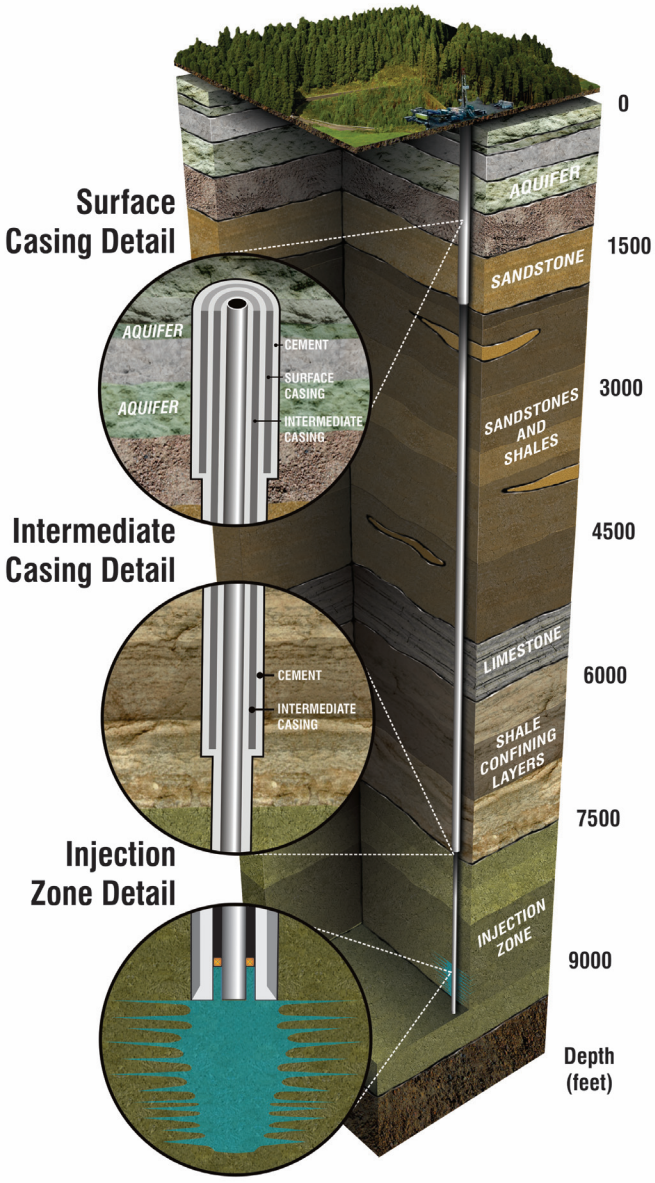
A lot is known about seismic activity and the potential influence of human activity, and scientific studies continue to improve our understanding. Review of the literature published in the past 5 decades indicates that fewer than 40 incidents of seismic activity, which were felt at the surface, were potentially associated with Class II injection wells in the United States. These include widely publicized recent occurrences in Ohio and Arkansas, and earlier occurrences in Texas. As new information from incidents and ongoing studies become available, states respond by adopting new policies or augmenting existing rules that govern geologic and cultural concerns, construction and maintenance standards, plus operating practices for injection volumes, rates, and pressures.

1. US EPA Underground Injection Control Program http://water.epa.gov/type/groundwater/uic/upload/UIC-Well-Inventory_2010-2.pdf (March 15, 2012)

Injection wells pump fluids into deep rock formations. In very unusual circumstances, an induced seismic event can occur when a number of geological and operational factors are collectively present. These infrequent events usually involve hard, dense, and brittle crystalline "basement rock". The magnitude (M), as described using the Richter Scale, of induced events is almost always small, falling below the level that typically would be felt at the earth's surface (approximately M 3.0) and well below the level where there might be property damage (approximately M 5.0 or greater).[2]

Ongoing scientific studies continue to improve the understanding of the mechanics of induced seismicity, helping to inform policy decisions. Local risks can be assessed using the available geologic information to manage identifiable hazards. If induced seismicity is suspected, operating threshold conditions can be adjusted to keep seismicity at low, non-damaging levels. This occurred in the Paradox Valley in Colorado where government operators modified operations to minimize the likelihood of an induced seismic event that has the potential to impact the surface.[3]

Figure 2: Typical Class II Injection Well



anga America's Natural Gas Alliance

energy API AMERICAN PETROLEUM INSTITUTE

AXPC American Exploration & Production Council

2. "Magniture/Intensity Comparison," U.S. Geological Survey. Dated February 22, 2012. http://earthquake.usgs.gov/learn/topics/mag_vs_int.php

3. Ake et. al. "Deep-Injection and Closely Monitored Induced Seismicity at Paradox Valley, Colorado." Bulletin of the Seismological Society of America 95: 664-683 (April 2005).