



Underground Wastewater Disposal

Top Ten Questions and Answers

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1. What is underground wastewater disposal?

Wastewater disposal, as the name suggests, refers to the management of contaminated water from industrial, commercial or domestic sewage activities. For oil and natural gas production, wastewater is generated during drilling and production operations. Wastewater must be managed under one of two federal laws – the Clean Water Act (CWA) or the Safe Drinking Water Act (SDWA). The CWA regulates wastewater that is discharged to surface waters. The SDWA regulates wastewater that is injected into disposal wells. This Q&A addresses wastewater managed under the SDWA.

These “injection wells” are regulated under the SDWA’s [Underground Injection Control \(UIC\) program](#). Wells used for disposing of wastewater from oil and natural gas production – including hydraulic fracturing – are categorized as “Class II” by the U.S. Environmental Protection Agency.

When an oil or natural gas well is hydraulically fractured, typically several million gallons of water (along with sand and other additives) are pumped into a hydrocarbon bearing rock formation deep in the ground. Some of this water will remain locked in the formation, but some will come back up through the well to the surface. The water is known as “flowback.”

Underground deposits of oil and natural gas typically also contain large volumes of water. Thus, when oil or natural gas is produced, salty water is typically produced alongside it, which is known as “produced water” or brine. In Oklahoma and California – two of the largest oil producing states in the country – the amount of produced water from a conventional oil well often exceeds the volume of oil by more than 10 to one.

Flowback and produced water can be treated and then reused in other oil and natural gas wells. But often times, it must be injected into wastewater disposal wells, which are drilled several thousand feet below the surface.

The wastewater (most of which is produced water) is deposited into deep geologic structures, many of which have trapped brine for millions of years. These structures are often a mile or more below underground drinking water sources, separated by billions of tons of impenetrable rock. [\[Back to Top\]](#)

2. Is underground wastewater disposal new?

No. The U.S. Environmental Protection Agency has regulated underground injection since the mid-1970s, after passage of the federal Safe Drinking Water Act. The EPA also notes that widespread use of wastewater disposal wells [began in the 1930s](#). [\[Back to Top\]](#)

3. How many wastewater disposal wells are there?

According to the U.S. Geological Survey, of the roughly 150,000 Class II UIC wells, there are about [40,000 wells](#) in the United States used for commercial disposal of wastewater from oil and natural gas production. The remaining Class II wells are used for secondary recovery of oil and natural gas from conventional wells. Other injection wells receive waste from a variety of industries, and are [classified by the EPA](#) into six categories according to the material injected and the industry from which it is sourced. For example, Class I UIC wells are safely used for the disposal of hazardous wastes. [\[Back to Top\]](#)

4. Is disposal the same thing as hydraulic fracturing (“fracking”)?

No. Many media reports have suggested wastewater disposal is the same thing as hydraulic fracturing. This is inaccurate.

Hydraulic fracturing (“fracking”) refers to a well stimulation process that will enhance the flow of oil or natural gas from a production well. By law, this process is regulated by the individual states, not the federal government, although there are some exceptions to that (such as when diesel is used in the fracturing process).

Wastewater disposal, on the other hand, refers to the injection of wastewater into a designated well, which is typically much deeper than the production well where “fracking” occurs.

It’s worth noting that wastewater is generated from oil and natural gas wells regardless of whether hydraulic fracturing is used. This is because hydrocarbon bearing formations typically contain plenty of water as well, which is called “produced water” when it is pumped to the surface along with oil or natural gas.

Generally, a well is hydraulically fractured, and the wastewater will then be taken to a separate injection well for disposal. [\[Back to Top\]](#)

5. Are disposal wells only used for wastewater coming from oil and natural gas wells?

No. Other industries frequently use disposal wells for their wastewater.

The U.S. EPA has [six separate categories of injection wells](#), based on what is being injected and the industry from which the material is sourced. For example, the [pharmaceutical industry](#) uses injection wells (which are classified as “Class I” wells) for the disposal of hazardous wastes, as does the food industry and many manufacturers. [\[Back to Top\]](#)

6. Do disposal wells cause earthquakes?

Scientists, especially in recent years, have been examining a possible link between wastewater disposal and small seismic events. In the 1960s, scientists determined that an injection well used by the Rocky Mountain Arsenal in Colorado was linked to seismicity in the region.

Although some researchers have suggested a more definitive link than others, most credible experts have noted that the risk of seismicity from wastewater disposal is low. The [U.S. Geological Survey](#) says that, of the 40,000 disposal wells used for oil and natural gas wastewater, “only a small fraction of these disposal wells have induced earthquakes that are large enough to be of concern to the public.”

The [National Research Council](#), in noting that “only a very small fraction” of energy-related injection activities have been linked to seismicity, also concluded:

“Tens of thousands of waste water disposal wells have been drilled in the United States to dispose of the water generated by geothermal and oil and gas production operations, including shale gas production. Water injection for disposal has been suspected or determined a likely cause for induced seismicity at approximately 8 sites in the past several decades.”

Much of the focus in recent years has been on Oklahoma, which has thousands of wastewater disposal wells. The Oklahoma state geologist [has cautioned](#) that there were “zero seismograph stations prior to late 1970s” in the state, and now there are 20, suggesting recent observations about increased seismic activity may be due in part to the increased ability to detect when those events occur. Also, as the Oklahoma Independent Petroleum Association (OIPA) has [noted](#): “Because crude oil and natural gas is produced in 70 of Oklahoma’s 77 counties, any seismic activity within the state is likely to occur near oil and natural gas activity.”

In short, it’s possible for wastewater injection to induce seismic events, but the scientific consensus is that the risk is low, and the overwhelming majority of disposal wells operate safely. Still, states such as Texas, Oklahoma, Ohio, and many others have updated their regulations in recent years to address concerns of induced seismicity, including new permitting requirements and the ability to shut down wells linked to seismicity. [\[Back to Top\]](#)

7. Does wastewater disposal threaten drinking water supplies?

No. Properly constructed disposal wells do not pose a credible risk of water contamination.

In its assessment of wastewater disposal regulation, the [U.S. Government Accountability Office](#) concluded in June 2014 that the states it reviewed “have safeguards, such as construction requirements for injection wells, to protect against contamination of underground sources of drinking water.” It should also be noted that regulatory oversight is a dynamic process, and technological improvements often result in added efficiency.

One of the main purposes of disposal wells is actually to reduce the risk of water contamination, be it at the surface or underground. As the [U.S. EPA](#) notes: “By injecting the brine deep underground, Class II wells prevent surface contamination of soil and water.” [\[Back to Top\]](#)

8. Who regulates wastewater disposal wells?

Wastewater disposal is an activity covered by the Underground Injection Control (UIC) program, which is part of the federal Safe Drinking Water Act that is administered by the U.S. EPA. However, the EPA often grants what’s known as “primacy” to individual states if their regulatory programs meet a baseline of standards. If granted primacy, a state regulatory agency – not the EPA – would be in charge of the day-to-day oversight.

This is done for a variety of reasons, the most important of which is the fact that state regulatory agencies have a much longer history overseeing and managing oil and natural gas programs than does the EPA (the EPA has only been in existence since 1970). In some cases, state programs on wastewater disposal are actually stronger than what direct EPA oversight would provide.

A list of laws that apply to wastewater disposal, including a state-by-state breakout, can be found on the Groundwater Protection Council's [website](#). [\[Back to Top\]](#)

9. Why don't companies recycle wastewater instead?

Many of them actually do. In Pennsylvania, [87 percent](#) of the wastewater generated by Marcellus Shale production is reused in additional operations. As the [Associated Press](#) recently found: "Recycling is rapidly becoming a popular and economic solution" in Texas, where requests for recycling permits grew 15-fold between 2011 and 2012.

Still, most experts agree that carefully regulated underground injection should remain an option for safely disposing of wastewater. [\[Back to Top\]](#)

10. Where can I learn more about wastewater disposal and injection?

Here are some good resources:

- U.S. Environmental Protection Agency: [Underground Injection Control program \(Class II\)](#)
- U.S. Geological Survey: [Induced Earthquakes](#)
- Groundwater Protection Council: [Class II UIC Regulations – Federal and State](#)
 - See also: [Energy-Related Injection](#) || [UIC Fact Sheet](#)
- Oklahoma Corporation Commission: [Underground Injection Control Department](#)
- Texas Railroad Commission: [Saltwater Disposal Wells - FAQs](#)
- Ohio Department of Natural Resources: [Underground Injection Control – General Information](#)
- Colorado Geological Survey: [Earthquakes Triggered by Humans in Colorado](#)
- Colorado Oil and Gas Conservation Commission: [UIC Program Overview](#)
 - See also: [UIC Seismicity](#)

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