What is an Injection Well?

An injection well is used for emplacement of fluids underground. Injection wells range from a few feet to over 10,000 feet in depth. The design of such wells ranges from very low technology constructions such as a shallow dug well or natural sinkhole with surface modifications, to highly engineered designs with multiple casings, cement, and other components for downhole fluid and pressure control, monitoring, and overall environmental protection.

Injection wells are used in many industrial and resource management activities. Some of the most common of these activities include production and refining of petroleum and other mineral resources, chemical manufacturing, electric power generation, air conditioning and heating, food processing, drinking water treatment, commercial waste management, environmental remediation, and aquifer storage and recovery. When properly sited, constructed, and operated, injection wells can effectively maintain environmental safety in each of these activities.

According to rules adopted by the U.S. Environmental Protection Agency (EPA) and states in response to the Safe Drinking Water Act (SDWA) of 1976, no injection well may be allowed to endanger an Underground Source of Drinking Water (USDW). Such wells must be permitted or otherwise authorized with the necessary terms and conditions to ensure USDW protection.

Federal and state rules define six classes of injection wells. The principal factors used to define each well class include the type of activity and source or general nature of the fluids associated with that activity; a secondary factor in defining well class is the depth of injection relative to USDWs.

Class I wells are used to inject industrial and municipal wastewater safely below USDWs; these wells may be permitted to include hazardous and radioactive wastewater in the injected fluids.

Class II wells are associated with injection related to the exploration and production of oil and gas and the storage of hydrocarbons.

Class III wells are used for injection for production of minerals such as uranium, sulfur, and brine.

Class IV wells inject hazardous or radioactive waste into or above USDWs, and therefore have a general prohibition on their construction and use.

Class V wells comprising the majority of injection wells, are mostly shallow wells not in other defined well classes and inject nonhazardous fluids generally into or above USDWs. Common uses of Class V wells include remediation of groundwater contamination, air conditioning and heating, stormwater management, and aquifer storage and recovery.

Class VI wells are used for injection of carbon dioxide (CO2) below USDWs for long-term geologic storage (geologic sequestration).

Under state law (Chapter 27, Texas Water Code), responsibility for regulation of injection wells is divided between the Railroad Commission of Texas (RRC) and the Texas Commission on Environmental Quality (TCEQ). RRC's responsibility includes Class II, Class III for production of brine, Class V for geothermal energy production, and Class VI in areas of historic or potential oil, gas, or geothermal resource production. TCEQ is responsible for all other injection wells, including Class I, Class III for production of uranium and sulfur, Class IV, most of Class V, and Class VI in areas without historic or potential oil, gas, or geothermal resource production.

Resources and Useful Links

- RRC *Injection and Disposal Wells Frequently Asked Questions (FAQs),* https://www.rrc.texas.gov/about-us/faqs/oil-gas-faq/injection-and-disposal-wells-faqs/
- RRC's *Injection Storage Manual*, https://www.rrc.texas.gov/oil-and-gas/publications-and-notices/manuals/injection-storage-manual/.
- TCEQ's "Underground Injection Control Permits" webpage, https://www.tceq.texas.gov/permitting/radmat/uic_permits/uic.html.
- TCEQ's webpage, "Oil and Gas Facilities: Additional Information," includes regulations on air, water, and waste related to the oil and gas industry in Texas, https://www.tceq.texas.gov/assistance/industry/oil-and-gas/oilgas_additional.html.
- U.S. Environmental Protection Agency's (EPA's) webpage, "Protecting Underground Sources of Drinking Water from Underground Injection (UIC)," https://www.epa.gov/uic.
- EPA's webpage, "General Information About Injection Wells," includes links to individual web pages for each of the UIC well types, Class I – VI, which include comprehensive information on each injection well type as well as cross-sectional diagrams, https://www.epa.gov/uic/general-information-about-injection-wells#how_protect.
- EPA's SDWA website, https://www.epa.gov/sdwa.
- The Ground Water Protection Council's website provides information and links relating to wells, underground injection practices, and groundwater protection, https://www.gwpc.org.
- The Texas Groundwater Protection Committee (TGPC) Oil, Gas, & Mining webpage has additional information and links on this subject, https://tgpc.texas.gov/oil-gas-mining.

Other Frequently Asked Questions (FAQs)

To find additional FAQs visit the Texas Groundwater Protection Committee's FAQ webpage at https://tgpc.texas.gov/frequently-asked-questions-faqs.