Kern Citizens for Energy

Frequently Asked Questions:
Oil Production and Aquifer Exemptions

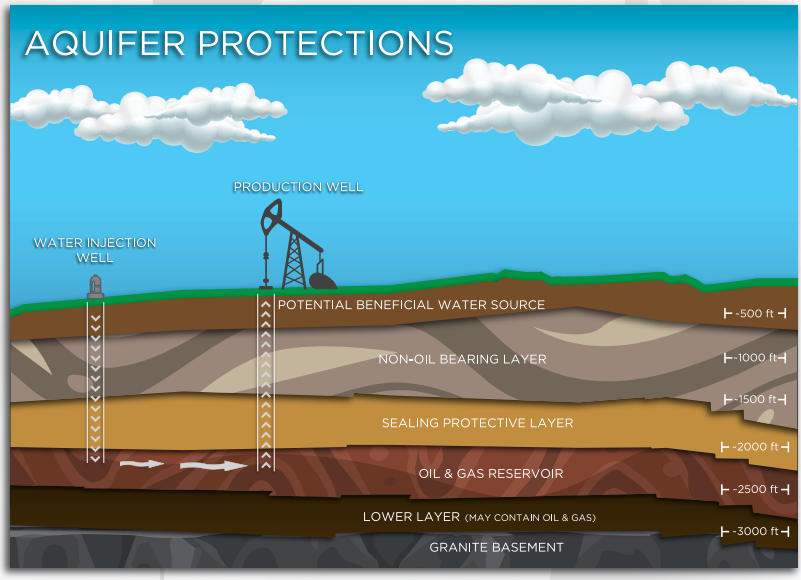
Q: What is an aquifer?

A: The U.S. EPA defines an aquifer as any below ground formation that contains water and is capable of yielding significant amounts of water to a well or spring. The quality of the water has no bearing on whether the formation is defined as an aquifer. Oil and gas reservoirs contain a significant volume of water and therefore can be considered "aquifers" although the industry refers to them as oil and gas reservoirs.

Q: Is water produced during oil production? What happens with it?

A: Roughly 15 or more barrels of water are produced with every barrel of oil in California. During production operations, a mixture of oil, gas and water is pumped to the surface from an underground reservoir (typically located far below ground level) and then separated. As a result of this separation process, the quality of the water is improved because the oil has been removed. However, most of the time, due to its natural characteristics, the produced water has no beneficial use and is returned to the reservoir in a closed loop process. See the diagram below. In rare cases where the natural characteristics are favorable, the water may be used for agricultural irrigation.

Q: Why do aquifers need an exemption?



A: Water resources are important to protect - particularly in California. For many decades, the U.S. EPA has had responsibility under the federal Safe Drinking Water Act for classifying certain aquifers as Underground Sources of Drinking Water (USDW's). An aquifer is considered a USDW if the water in the aquifer contains less than 10,000 milligrams per liter (mg/l) total dissolved solids. Many oil reservoirs contain water under this threshold, which qualifies them as USDWs. However, because the water also contains oil and gas, it is unsuitable for drinking and agricultural irrigation. Nevertheless, these oil reservoirs are required to be formally "exempted" from USDW status by the U.S. EPA prior to injection of produced water. Exemption status is not a gift or "pass" for the industry. Exemptions are granted only after rigorous review to confirm that stringent standards are met.

Further, aquifer exemptions are narrowly granted so that only the portion of an aquifer that is oil and gas productive is eligible for exemption. If other portions of the aquifer do not contain producible hydrocarbons, they will not qualify for exemption. Most oil reservoirs received exemption status as part of a 1982 agreement between the U.S. EPA and the Division of Oil, Gas, and Geothermal Resources (DOGGR).

Q: Who regulates oilfield injection and who is responsible for exempting aquifers?

A: In 1982, the U.S. EPA agreed to allow DOGGR to assume responsibility for regulating oilfield injection in California, also known as Class II injection, under a "primacy agreement." For over three decades, oil producers have continued to produce and develop their oil field operations, in accordance with permits issued by DOGGR pursuant to the primacy agreement.

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Q: What is the issue?

A: The industry has been producing and developing oil operations that are in compliance with permits issued by DOGGR over the last 30 years. An oil field can last over 100 years so the industry investments are capital intensive and long lasting. A few years ago, DOGGR and the U.S. EPA outlined a different process by which aquifers are considered for exemption and required operators to submit revised and updated applications supported by extensive technical and scientific information for dozens of oil fields across California. Under recent amendments to state law, this new process includes review of exemption applications by the State Water Resources Control Board.

Q: What is the status?

A: The industry worked diligently and cooperatively to satisfy all scientific and technical informational requirements and to submit their applications to DOGGR in a timely manner. The exemption applications have been an enormous effort for both the operators and the agencies. For example, one application took an estimated 2,000 geologist man hours.

Hearings will take place to provide the public with an opportunity to comment.

Q: What happens if an operator does not receive the exemption?

A: Under the regulations, an operator must shut down or risk punitive actions by DOGGR. These regulations could lead to the shut down the production of 105,000 barrels of oil per day or 25% of the state's oil production.

Q: What is the economic impact to Kern County?

A: In Kern County, the production of 60,000 barrels of oil per day could be shut down. The loss of tax revenue will make the current Kern County economic crisis even worse, including massive industry layoffs that will ripple through the local economy.

Q: Is this happening because there was groundwater contamination?

A: No. Not a single State or Federal regulatory agency has determined that any source of drinking water has been adversely impacted. After more than 50 years of oil field operations and returning produced water back to where it came from, underground, there are no known instances of groundwater contamination.

Q: Is there a risk to groundwater?

A: No. During this review process, DOGGR has stated that there are no risks to groundwater associated with the current program in California: "the analytical data from the water supply wells that the State ordered to be tested have not shown any contamination of the water supply wells by oil and gas injection activities."[1]

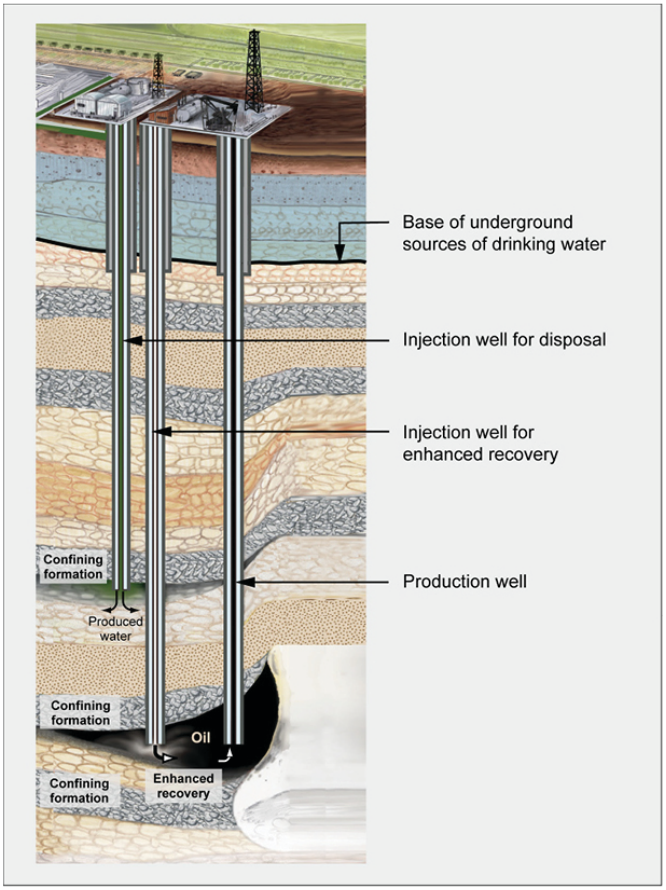
[1] Letter from DOGGR to U.S. EPA, page 5 (Feb. 6, 2015).

Q: How is groundwater protected?

A: In Kern County, oil is typically located thousands of feet below the surface. Where usable groundwater is present, it is typically located much closer to the surface. The usable groundwater and the oil reservoir are separated by a thick layer of naturally-occurring, low permeability material (clay or shale) that does not allow migration of injected fluids into the overlying groundwater. The production and injection wells are designed and built with multiple sets of steel casing and cement to protect any possible exposure to groundwater. This technology has been endorsed by the Ground Water Protection Council for its effective protection of groundwater and has been used for over 50 years.

Figure 2.

Schematic of underground injection wells for disposal of oil and gas wastes and for enhanced oil recovery.



Source: Reprinted from the U.S. EPA (Gómez 2014)

Q: What is steam flooding or steaming?

A: Some oil reservoirs in Kern County contain highly viscous or thick oil. An enhanced recovery technique uses steam to heat up the oil in the reservoir. Two methods, called steam flooding and cyclic steaming in the industry, raise the temperature of the oil so that it flows into the production well. Routinely, this technique does not require water obtained from outside sources. The majority of the time, produced water is utilized to make the steam which is pumped into the reservoir from which it was produced. Steaming is a continuous process and works very slowly, taking up to a decade or more to reach target recovery. Because steam is injected into the oil reservoir, an aquifer exemption must be approved by EPA if the water in the formation contains less than 10,000 mg/L TDS.

Q: How many fields in the Aquifer Exemption (AE) efforts are steaming? What volume do they represent?

A: Steaming is very common in Kern County and has been used since the 60's. Kern County has four of the nation's largest oil fields and three of these fields, Kern River, Belridge and Midway Sunset, utilize steam for oil recovery.

Q: What happens if steaming is discontinued?

A: A number of technical studies have shown significant adverse impacts if steaming is discontinued. If steam ceases to be injected into the reservoir, the heat dissipates, the oil cools down, becomes thick and viscous again, and stops flowing. If oil does not flow, it cannot be produced. For example, one Kern County field currently producing about 4,000 barrels of oil per day is estimated to produce only 500 barrels a day over six months if it is no longer steamed.

This is a 90% reduction in production and will likely shut down the field. For fields producing from the Diatomite formation, the shutdown of steam will have even more dramatic and immediate effects. One Diatomite field currently producing 5,000 barrels of oil per day will see its production reduce to 0 barrels in 4 to 5 days. This field will be shut down and is unlikely to ever be returned to production due to the nature of the Diatomite formation.

Q: What are some of the likely economic impacts if producers are forced to shut down their steaming operations?

A: This will result in an economic disaster for the oil producers and Kern County. It takes potentially a decade or more to reach a targeted rate of oil recovery, therefore steaming is a major investment. A single steam generator costs over $2 million dollars and steaming typically requires many generators as well as the resources involved to permit and meet California's stringent regulations. Producers invested hundreds of millions of dollars over the years and cannot turn off the steam without serious, disastrous effects to oil recovery and ongoing production. In short, they will lose their revenue stream and their investment.

With the current price of oil, producers are also unlikely to restart steaming after they are shut down even if for only a few months. It could take years for producers to recover oil production back to the levels they were at prior to shutting down steam injection. For example, in the 80's, a steam operation was shut down for economic reasons. After the price of oil recovered years later, it took one operator over three years to increase production back to its prior level. Some reservoirs may never return to their previous production levels.

Q: What agencies are involved in the aquifer classification process?

A: Some very important agencies are involved in determining the classification including the U.S. Environmental Protection Agency (U.S. EPA), the Division of Oil, Gas & Geothermal Resources (DOGGR) and the State Water Resources Control Board (SWRCB).

Q: Is the re-injection of produced water a permitted activity?

A: Yes, for more than 30 years re-injection has been fully permitted by the Department of Conservation, Division of Oil, Gas and Geothermal Resources (DOGGR) under the Underground Injection Control (UIC) program. Before a permit is issued, the application is studied by DOGGR engineers and geologists, as well as reviewed by the appropriate Regional Water Quality Control Board. DOGGR engineers evaluate the geologic and engineering information, solicit public comments and may hold a public hearing. DOGGR considers a number of factors when issuing a permit, and if certain stringent conditions are met, subsequently issues the permit.

Q: Are injection wells common in California?

A: Yes. About 60 percent of California's oil production is a result of injection wells.[2]

Q: What regulatory agencies inspect operations? Who is responsible for monitoring the inspections? How often do they inspect?

A: Numerous codes, standards and regulatory requirements applicable to oil and gas operations are closely monitored daily, monthly, quarterly and annually. The agencies responsible include local County agencies, California Division of Oil and Gas and Geothermal Resources (DOGGR), State Water Resources Control Board (SWRCB), the Regional Water Quality Control Boards (RWQCB) and Air Quality Management Districts (AQMD).

Government regulators conduct regular onsite inspections and require testing to make sure all laws protecting public health and the environment are obeyed and strictly enforced. Inspections for the responsible agencies are typically conducted by a registered civil engineer, certified engineering geologist, or others who are specially trained in the specific area of expertise relating to that which is being inspected.

Q: How does the industry protect against leaks or spills?

A: Safety and protection of the environment are the top priorities in the oil and gas industry. All operations statewide are required to employ safety and environmental systems that rigorously maintain mechanical integrity of the wells along with significant amounts of government oversight requirements and reviews, involving regular operator certification/employee training for leaks and spills.

[2] http://www.conservation.ca.gov/dog/general_information/Pages/class_injection_wells.aspx.