

## **Oil and gas development and underground injection**

Recent reporting in the media has focused some attention on the deep underground injection of exploration and production (E&P) waste. An article published in The (Fort Collins) Coloradoan on December 28, 2012, began with a sentence that asserted energy companies were allowed to “pollute drinking water aquifers with oil and gas drilling and fracking waste” in Colorado.

The Colorado Oil and Gas Conservation Commission (COGCC) encourages public understanding and discussion of oil and gas development, and takes its regulatory role to protect the public and the environment – including ground and surface water - very seriously. With this in mind, we wanted to provide additional information and context in order to address concerns that might be raised by the Coloradoan article and other media coverage of deep injection. An accurate understanding of this and other issues related to oil and gas development is important as industry activity continues to move into new areas along the Front Range, where many residents have little experience with industry practices and regulatory oversight.

### **Underground Injection Control program - overview**

The Underground Injection Control (UIC) program is part of the federal Safe Drinking Water Act (SDWA) administered by the U.S. Environmental Protection Agency (EPA). In Colorado, the EPA has delegated primacy of Class II well (exploration and production wastes) to the Colorado Oil and Gas Conservation Commission. The permitting process is set up so that underground sources of drinking water (USDWs) - both current and potential future sources - are protected. A provision exists for exempting an aquifer to be used as an injection zone. These zones must meet criteria showing that the aquifer is unlikely to ever be used as drinking water. COGCC Rule 324B. addresses drinking water aquifers. These requirements must be met:

- (1) It does not currently serve as a source of drinking water, and either subparagraph (2) or (3) below apply;
- (2) It cannot now and will not in the future serve as a source of drinking water because:
  - A. It is mineral, hydrocarbon or geothermal energy producing or can be demonstrated by a person filing an application pursuant to Rule 325, or Rule 401, to contain minerals or hydrocarbons that, considering their quantity and location, are expected to be commercially producible; or
  - B. It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical; or
  - C. It is so contaminated that it would be economically or technologically impractical to render the water fit for human consumption;
- (3) The total dissolved solids content of the ground water is more than three thousand (3,000) and less than ten thousand (10,000) milligrams per liter and it is not reasonably expected to supply a public water system.

The aquifer exemptions we have been issuing meet the requirements of both (2) and (3) of Rule 324B. All wells need to submit a water analysis from the formation before the injection permit is issued. If the total dissolved solids (TDS) in the water is above 10,000 milligrams/liter (mg/l) the water is considered to be exempt because it would be very expensive to desalinate this water for drinking water purposes (the TDS must be 500 mg/l or less for human consumption although cattle and poultry can drink water at 3,000 mg/l). If the water is below 3,000 mg/l, an aquifer exemption will not be approved because it may be economically possible to desalinate this water even considering the costs of pumping the water up from deep formations. COGCC also has a policy of not issuing permits for injection into formations less than 2,000 feet deep. These shallow depths may allow for cost effective desalination since pumping the water up will be cheaper than from a deeper formation. The aquifer must meet both of these conditions to be considered economically unfeasible for using as drinking water: TDS above 3,000 mg/l and depth greater than 2,000 feet. It also must not currently be used for drinking water.

### **Six examples cited in the Coloradoan article**

- The aquifer exemption granted on October 22, 2012, was for three formations located over 9,000 feet below the surface. These formations are below the formations that oil and gas are being extracted from in Weld County. There are no water wells within one-half mile of this well. Stock watering wells in the area are about 50 feet deep. There are shale layers above the injection formation which are considered confining areas because they are impermeable to water transport. The Ingleside, Owl Canyon, Niobrara, and Pierre formations are shale layers above the injection formations. The TDS of the water in the injection formations is 4,000 to 5,000 mg/l. The depth and TDS of this water makes it unlikely that anyone will ever be able to economically produce this water for drinking.
- The aquifer exemption granted on July 13, 2012, was for three formations over 8,800 feet deep. The TDS is between 3,800 to 4,170 mg/l. Like the above mentioned well, there are no drinking water wells within 1/2 mile of the well location and all stock water wells are in the Oglallala Aquifer. Between the Oglallala and the injection formations are three shale layers: the Carlyle, Niobrara, and Pierre formations. Again, this water is unlikely to be used for drinking water because of the cost to pump it up from such depths and then further decontaminate it to drinking water standards.
- The aquifer exemption granted on August 24, 2011, was for three formations also over 9,000 feet deep. The TDS is between 6,133 and 7,734 mg/l. There are four water wells within 1/2 mile of this well. The deepest is 180 feet. Between the drinking water formation and the injection formation are three shale barriers: the Carlyle, Niobrara, and Pierre formations. Again, the cost to pump this water up and treat it to drinking water standards in addition to the \$1,000,000 cost to drill a well that deep, make it cost prohibitive. Since injection is taking place 9,000 feet

below the ground, the animal sanctuary referenced in the article is under no risk from this activity.

- The aquifer exemption granted on March 14, 2011, was for three formations over 8,800 feet deep. The TDS is between 3,800 and 4,170 mg/l. There are no drinking water wells within 1/2 mile of the injection well and stock watering wells come from the Oglalla Aquifer. The Carlyle, Niobrara, and Pierre shale formations are between the Oglalla and the injection formation. Again, drilling a million dollar well and then paying for lifting the water and decontaminating it would be prohibitively expensive.
- The aquifer exemptions granted July 25, 2005, and May 26, 2000, are for enhanced recovery wells where water is injected into an oil and gas formation in order to push the oil and gas up nearby production wells. Any water present in these formations would already be contaminated by the benzene and other contaminants that are naturally present in oil and gas that reside in the formation. No one will want to pay to decontaminate this water, much less drink it.

The COGCC has been issuing injection permits since we received delegation from EPA in 1984. There has never been an instance of ground water contamination from a UIC well. There have been to date over 1200 UIC permits issued although about 300 of these wells have since been plugged.