State of Illinois
Rod R. Blagojevich, Governor

Illinois Environmental Protection Agency
Douglas P. Scott, Director

CLASS I UNDERGROUND INJECTION CONTROL (UIC) WELL DRAFT PERMIT for ARCHER DANIELS MIDLAND COMPANY (ADM), DECATUR

What is the purpose of this project?

Archer Daniels Midland Company (ADM) has applied to the Illinois EPA for a Class I Underground Injection Control (UIC) well permit. If issued, the UIC permit will allow ADM to inject supercritical carbon dioxide (CO_2) deep underground into the geologic formation known as the Mt. Simon Sandstone. This is an effort to sequester, or store long-term, the CO_2 gas generated by ADM's ethanol production rather than release the CO_2 into the atmosphere where it acts as a greenhouse gas. A Class I UIC well is used to inject liquid wastes below the lowermost underground source of drinking water (USDW). In this project, supercritical CO_2 will be injected several thousand feet below the lowermost USDW. The maximum total amount of supercritical CO_2 that may be injected under this permit is 1 million metric tonnes, approximately 1.1 million tons (U.S.).

What is "super-critical" CO_2?

Supercritical CO_2 refers to carbon dioxide that is above both its "critical" temperature of 88ºF and "critical" pressure, 1,070 pounds per square inch (psi). "Critical" designates a point in terms of temperature or pressure at which the physical properties or characteristics of a substance change. Supercritical CO_2 has physical properties between those of a liquid and a gas, often referred to as a "fluid."

Where and how deep will the CO_2 be injected?

ADM is located at 4666 Faries Parkway, Decatur, Illinois. The injection well will be located at the facility. Deep beneath much of Illinois, including under the ADM facility, lies the geological formation known as the Mt. Simon Sandstone. The proposed permit would allow ADM to inject supercritical CO_2 into this deep geological formation. At Decatur, this formation is approximately 1,500 feet thick, extending from approximately 6,500 feet below ground surface to approximately 8,000 feet below ground surface.

Are there deep subterranean caves into which the CO_2 is being injected?

No, in this project the supercritical CO_2 will be injected deep into the Mt. Simon Sandstone formation. Sandstone is a porous and permeable rock that has microscopic voids or pores between its mineral particles. In many geological formations, these pores hold water, creating aquifers. In this project, the pore spaces will hold the supercritical CO_2 as well.

How will the CO_2 be kept underground?

The pressures and temperatures deep in the sandstone formation should keep the CO_2 in its supercritical state. Eventually, some of the CO_2 may chemically react with minerals of the sandstone formation and become part of the geology.

How will we know the CO_2 is staying in

Immediately above the Mt. Simon Sandstone formation is the Eau Claire formation. The Eau Claire formation is made up of shale, and is approximately 300 to 500 feet thick deep

place? Could the CO_2 bubble up, acidifying our drinking water aquifer or coming to the ground surface?

beneath ADM. Shales are low-permeability rocks that water does not easily pass through. Consequently, the Eau Claire formation will serve as the primary "confining zone," confining the supercritical CO_2 to the lower, more porous sandstone formation into which it will be injected. The UIC well regulations require the applicant to demonstrate that this shale confining formation is intact (i.e., not penetrated by wells or geologic faults) over the area into which CO_2 is injected. ADM investigated to a 2 ½ mile radius from the wellhead, well beyond the required area, to make that demonstration.

Above this confining layer of shale is approximately 4,700 feet to 5,800 feet of geologic strata that separates the base of the lowermost USDW from the top of the injection formation. The bedrock above the Eau Claire confining layer is made up of various layers of sandstone, shale, siltstone, limestone/dolomite and, nearer to the surface, coal. The shales within these bedrock layers will serve as additional confining layers. Immediately above the bedrock are unconsolidated glacial deposits. The lowest USDW is expected to be within these glacial deposits, 200 to 300 feet below the ground surface.

In addition to geological characteristics offering protections, Class I injection wells are constructed and operated with multiple layers of engineered protections to prevent the movement of fluids into or between USDWs. The well design has casings (large diameter steel pipes) nested inside of each other that will be cemented in place from various depths to the surface; ADM's well will have three nested casings. Continuous monitoring of the injection pressure, injection rate, and annular space pressure will be required during well operation; periodic mechanical integrity testing of the well will also be required. Every two years, temperature surveys of the geological formation will also be performed to detect temperature differences between the injected CO_2 and liquid already in the formations to ensure no fluid is moving upward along the outside of the well casing.

This permit will also allow the installation of up to two injection zone monitoring wells at a later date. These wells, if installed, are intended for research purposes; they are designed to monitor the location of the supercritical CO_2 within the Mt. Simon Sandstone formation. These CO_2 monitoring, or observation, wells are not required by the permit.

Will groundwater monitoring also be required to make sure there is no contamination of our water supply?

Yes, groundwater monitoring of the shallow glacial deposits and bedrock beneath the facility will also be required. These groundwater-bearing geologic units are approximately 200 to 300 feet below ground surface. Four groundwater monitoring wells will be installed; the actual depth of each well will be determined during drilling. These wells will be used to determine the lowermost USDW and to continue to monitor water quality in these shallow units. The lowermost USDW will be determined based on groundwater quality and amount of groundwater produced by the aquifer. The purpose of groundwater monitoring of these shallow geologic units is to ensure that no impacts to the lowermost USDW occur from operation of the UIC well.

I hear this project is an experiment; why is the Illinois EPA permitting an

Deep geological injection of liquid wastes is an established technology utilized in the U.S. since the 1930s. Several Class I UIC wells have been operating in Illinois for many decades. Deep injection of pressurized CO_2 has also become an established technology having been used for decades in the oil industry to recover hard-to-reach oil from depleted

unproven technology?

oil fields. One aspect of the ADM CO_2 sequestration project that is new is the monitoring and data collection program being proposed by ADM to demonstrate that the CO_2 stays in the formation into which it has been injected.

The existing UIC rules were developed over 25 years ago under the Safe Drinking Water Act with the goal of protecting underground sources of drinking water. The United States EPA is currently developing regulations specifically for UIC wells that inject CO_2 for the purpose of geological sequestration. Although the regulations are not expected to be finalized for several years, the currently proposed federal rules are very similar to Illinois' Class I UIC well regulations that govern ADM's draft permit. Once the federal rules are finalized, ADM will be required to submit an application for a permit modification to address any additional requirements of the new regulations.

What happens to the CO_2 when it reacts with the groundwater in the Mt. Simon formation?

Most of the supercritical CO_2 is expected to fill in the pore spaces between the grains of the sandstone. Some CO_2 is likely to dissolve into the water of the saline aquifer. When CO_2 is dissolved in water, a weak carbonic acid, similar to the acidity of soda pop, is formed. Current modeling data indicate that once CO_2 comes into contact with the saline water of the injection zone, some of the water will become weakly acidic, but that over time, some of the minerals in the sandstone formation will react with the CO_2, neutralizing the weak acid and binding the carbon into the mineral structure of the formation.

In other areas of Illinois, the Mt. Simon Sandstone formation has been used for decades to inject industrial wastes with much higher acidity than that generated by the reaction between the existing saline aquifer in this sandstone formation and the CO_2 proposed for injection by ADM. The injection of higher acidity wastes into the Mt. Simon formation under other parts of Illinois has not resulted in the migration of those wastes beyond the anticipated zone and has been protective of the lowermost USDW of the respective area. ADM has provided modeling of CO_2 migration indicating that the CO_2 will not reach the confining layer nor will it migrate beyond 1500 feet from the UIC well even after 100 years.

Whom do I contact for further information concerning this permitting action?

For further information regarding the permit process, please contact:

Ms. Mara McGinnis, Office of Community Relations (#5)
(same address as below)
Phone: 217/524-3288

To whom should I send my comments?

For further information regarding the permit hearing process or to submit written comments on the draft UIC permit, please contact:

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