Ground Water & Underground Injection Control

Key Message

The success of the deep well Underground Injection Control (UIC) program in isolating massive volumes of pollutants from underground sources of drinking water and other parts of the ecosystem has led some national policy makers to assume that no additional federal funding is needed, even though new challenges and responsibilities continue to be added to the program.

The two most serious challenges and responsibilities confronting the UIC program today are:

- Some types of shallow injection wells, such as motor vehicle waste disposal wells, large-capacity cesspools, stormwater drainage wells, and some types of septic wells, continue to be among the most neglected sources of ground water contamination in the country.
- Technologies necessary for the management of residuals from water treatment and for the geosequestration of carbon dioxide (CO_2) will require very large numbers of new injection wells, far exceeding present program resource capabilities.

Without additional federal funding, federal and state UIC programs will not be able to eliminate the harmful impacts of high-risk types of shallow injection wells, nor maximize the benefits of safe underground injection to enable new technologies for providing safe drinking water and environmental protection.

Photo: Lindsay Taliaferro, Ohio EPA.

The threat to Underground Sources of Drinking Water (USDWs) posed by Class V wells is inherent in their general shallowness and the fact that they are often located over aquifers. Contamination incidents tend to be associated with the most prevalent of the high-risk types of Class V wells.

UIC—the Growing Pains

"We must change our lives, so that it will be possible to live by the…assumption that what is good for the world will be good for us. And that requires that we make the effort to know the world and to learn what is good for it. We must learn to cooperate in its processes, and to yield to its limits."

Wendell Berry | *The Long-Legged House*

why the UIC Program matters to ground water…

Underground injection refers to the placement of fluids into the subsurface through a well bore. The federal UIC program, designed to prevent contamination of underground sources of drinking water (USDWs), divides injection wells into five classes based on usage. (See "About UIC" page 9•5.) The practice of underground injection has become diverse in its many applications and is essential to activities such as petroleum production, chemical processing, food production, manufacturing, mining, operation of many small specialty plants and related businesses, and remediation of ground water contamination.

Underground injection is used to isolate more than 50 percent of the liquid hazardous waste and a large percentage of the nonhazardous industrial liquid waste generated in the United States. While other options exist, such as wastewater and chemical-specific treatment technologies, it would be very costly to treat and, in fact, questionable to release the billions of gallons of wastes produced each year to surface waters. In addition, the residuals from such treatment could have a negative impact on sensitive aquatic systems.

Whether in adolescent humans or regulatory programs, "growing pains" are symptomatic of fast or uneven growth that outstrips supporting resources. As the UIC program transitions from its origin in the early 1980s, it is experiencing significant new changes that are creating the kinds of problems that might be described as regulatory growing pains.

A "mature" regulatory program suggests that the major processes are working smoothly, the principal issues are well understood, and significant problems

Treated municipal wastewater is pumped more than 3,000 feet deep underground through a Class I injection well in South Florida.

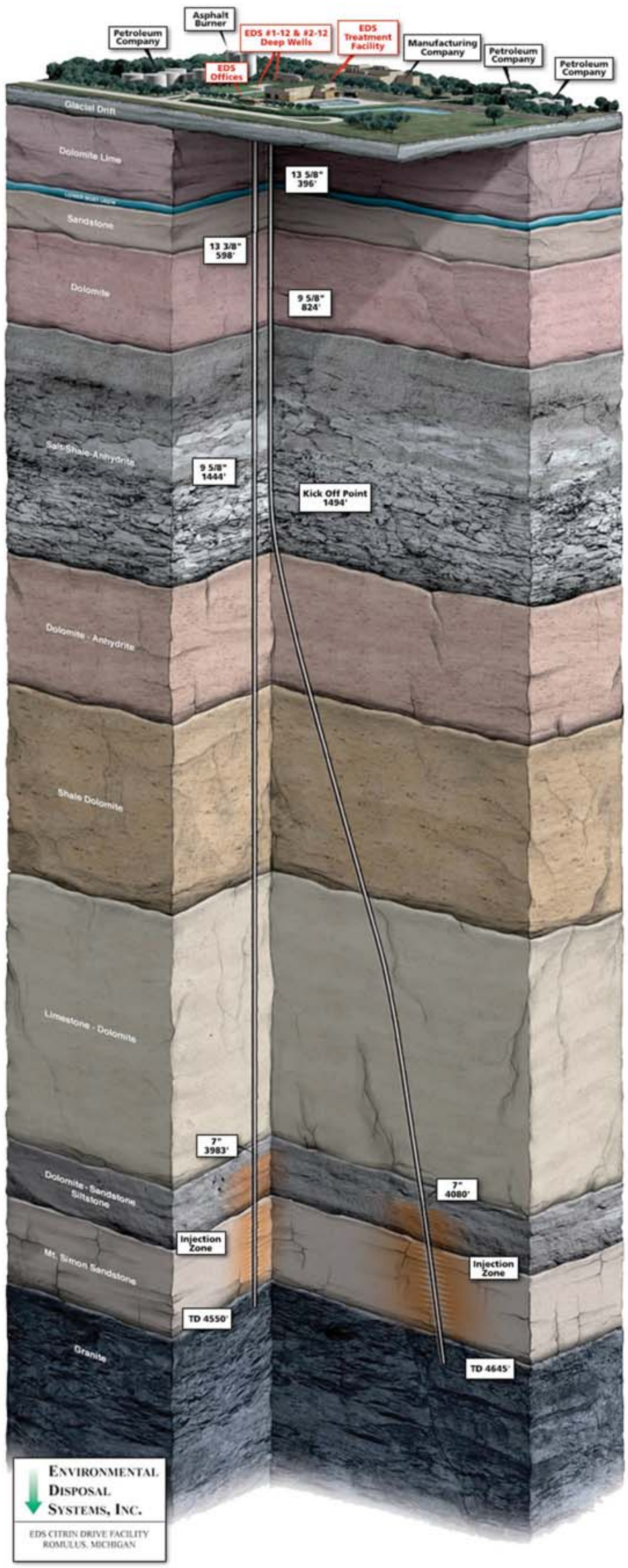


Figure 1. *A simplified earth cross section showing Class I injection wells. Source: Class I injection well permit application, USEPA Region 5*

encountered have been solved. For Class I, II, III, and IV types of UIC wells, this is true. However, the Class V category of the UIC program has not kept pace with the maturation of the rest of the program. Additional financial resources are needed to conduct essential inventories, inspections, and compliance monitoring.

Historically, the general public (and many regulators) assumed the greatest environmental risks existed in the Class I, II, and III programs. This has a negative effect on the substantial resource needs of the larger Class V shallow injection well program, where it has become apparent that most of the environmental risks exist.

There is a serious lack of appreciation for the fact that the level of federal funding for the UIC program has remained at approximately $10.5 million for the past 16 years, and has, in effect, been diminished by inflation. During these years, state agencies responsible for the UIC program have faced increased federal compliance and reporting requirements and significantly more administrative paperwork, not to mention severe individual state budget deficiencies. The result has been that while the workload and responsibilities for oversight of this federal UIC program have been substantially increasing, the financial capacity to carry them out has been decreasing.

The UIC program's "growing pains" in regard to Class V injection wells are illustrated by a 2004 survey of state UIC programs conducted by the Ground Water Protection Council (GWPC), which concluded that the shortfall of funds for Class V permitting and enforcement programs for these high-risk types of wells is much greater than originally thought. Specifically, the survey indicated that full implementation of the Class V regulations would require an additional $56 million above FY2003 and subsequent USEPA budget levels of $10.2 million. Based on the results of the survey, GWPC estimated that there were at least 1.5 million Class V wells nationwide, many of which existed without permits or the

Photo: 1986, CH2M Hill and Sterling Fibers

Neale Sharitz at an industrial primary injection wellhead that Sterling Fibers, Inc. constructed in 1971 in Milton, Florida. This wellhead configuration is typical of a Class I disposal well at an industrial facility.

knowledge of state or federal regulatory agencies. (GWPC, 2004)

In addition to Class V concerns, a new UIC-related financial need is surfacing with the advent of new technologies, such as drinking water treatment resulting in residuals (e.g., desalination concentrate) and carbon dioxide (CO_2) geosequestration, that are important for providing new drinking water supplies and reducing greenhouse gas emissions. These will likely require thousands of new injection wells, straining already inadequate regulatory program resources. State permit requirements to implement these new technologies will, no doubt, compete with the need to find and eliminate high-risk types of Class V wells in the allocation of limited program funds. Environmental oversight and compliance tracking cannot be sustained without additional funds.

CLASS V SHALLOW WELLS

By far the largest numbers of injection wells in the United States fall into the Class V category—a catchall class used to define injection wells that do not fit into any of the other four classes. Because many Class V injection wells are not regulated, the exact number is unknown. However, there may be more than one million such wells in the United States. Because there are minimal requirements associated with the construction, monitoring, and testing of many types of Class V wells, and because they are often used to dispose of a wide variety of fluids, some of which may be harmful, Class V wells can pose a substantial risk to ground water.

Class V wells can be used for both beneficial and harmful injection activities. They are used to inject or dispose of nonhazardous fluid into or above a USDW. The beneficial activities can include remediating

Photo: USEPA

Photo: Oregon DEQ

Photo: USEPA

Floor drains and open pits such as these pose a substantial threat to ground water.

ABOUT UNDERGROUND INJECTION CONTROL (UIC)

When Congress passed the Safe Drinking Water Act (SDWA) in 1974, oil and gas operators had been injecting saltwater into deep rock formations to increase oil recovery for more than a quarter century. Until 1974, however, the practice was managed under a variety of regulations, state by state. It took nearly a decade after passage of the SDWA for USEPA to implement a standardized program governing underground injection.

The purpose of the UIC program is to ensure that underground injection of fluids is managed so as to protect USDWs. This goal is accomplished by setting the physical and operational standards that apply to the practice. The UIC program establishes requirements for well construction, operation, monitoring, and testing. When these requirements are met, injection wells can be a valuable tool for protecting ground water and other environmental components by securely isolating wastes and enabling the cleanup of existing shallow ground water contamination.

The SDWA divides injection wells into the following five classifications based on use:

◆ Class I

Isolating hazardous, industrial, and municipal waste through deep injection.

U.S. facilities produce billions of gallons of hazardous, industrial and municipal waste every year. Some of the waste is injected deep below any drinking water source, protecting the public.

In the 30 years of the SDWA, Class I wells have isolated more than ***4 trillion gallons of waste fluid***—the amount of water that flows down the Mississippi River into the Gulf of Mexico every 17 days.

◆ Class II

Preserving drinking water resources by injecting oil and gas production waste.

Each barrel of oil produced in the U.S. includes an average of about 10 barrels of produced water (brine). Most brine, about 24 billion barrels annually, is injected into oil and gas bearing formations to increase production. This practice preserves streams and rivers and protects USDWs.

In the 30 years of the SDWA, Class II wells have injected nearly ***720 billion barrels of brine***—enough barrels to stretch from Earth to Mars about 10 times.

◆ Class III

Minimizing environmental impacts from solution mining operations.

Solution mining operations produce 50% of the salt used in the U.S., as well as uranium, copper, and sulfur. These injection wells provide needed minerals while limiting the impact on the environment.

In the 30 years of the SDWA, Class II wells have safely mined ***330 million tons of salt***, or enough salt to fill a salt shaker 7 times higher than the Statue of Liberty.

◆ Class IV

Preventing ground water contamination by prohibiting the shallow injection of hazardous waste (except as part of an authorized cleanup).

Shallow injection wells used by large and small businesses to dispose of radioactive waste threaten drinking water resources. About 50% of Americans rely on ground water for drinking water, and the need for safe, reliable sources in the future is increasing. Therefore, Class IV injection is prohibited outside approved remediation programs.

◆ Class V

Managing the injection of all other fluids to prevent contamination of drinking water resources.

More than 600,000 shallow injection wells are used for disposal, ground water storage, and prevention of salt-water intrusion. When properly managed, these wells offer communities an option for wastewater disposal.

In the 30 years of the SDWA, the Class V Program has ***identified and managed more than 300,000 of an estimated 1.5 million injection wells.*** The challenge for the future is to identify the remaining wells and work with their owners to keep injection safe.

***TOTAL INJECTION WELL NUMBERS** (approximate)*

◆ ***Class I: 488 wells (121 hazardous, 255 nonhazardous, 112 municipal)*** [Texas World Operations, Class I Inventory of the U.S., September 2006] ◆ ***Class II: ~167,000 wells*** [www.epa.gov] ◆ ***Class III: ~20,000 wells*** [Subsurface Technology, Inc. Class III Well Inventory, January 2004] ◆ ***Class IV: Banned for other than EPA-approved remediation purposes*** ◆ ***Class V: ~1.5 million wells (projected inventory)*** [GWPC Class V Inventory, The Cadmus Group, 2004]

A BAD SITUATION NIPPED IN THE BUD

Here's a story that has a positive ending because state UIC inspectors noticed a problem, acted quickly, monitored the ground water, and prevented a contamination incident.

A trucking company's maintenance facility is located just outside an unsewered small town in east central Ohio, where all residences are on private wells and septic systems. Several private wells are within 100 yards of the trucking company operation and dry wells. The town is underlain by a highly productive sand-and-gravel aquifer, and trucking company operations are upgradient of neighboring wells. Ohio Environmental Protection Agency UIC inspectors noticed the facility while inspecting a nearby site, but until that day they had no knowledge of the site.

The inspection found floor drains in the maintenance area that directed spilled motor oil and other wastes to several dry wells. The dry wells were oil-stained and had free oil floating in them. After several years of enforcement, the company owners agreed to remove the dry wells and the contaminated soil around them. Ground water monitoring around the facility determined that no residual ground water contamination was left after the dry wells were removed. Luckily, none of the surrounding private wells were found to be impacted by ground water contamination.

Unfortunately, situations like this are all too common, but more typically go unnoticed until contaminants are discovered in somebody's drinking water.

Source: Lindsay Taliaferro, Ohio EPA.

contaminated ground water, aquifer storage and recovery, aquifer recharge, subsidence control, and geothermal resource development. But there are also unknown numbers of shallow wells throughout the country used to inject wastes and contaminated runoff water directly into or above USDWs.

The risk Class V wells pose to ground water depends on various factors, including the types of waste fluids injected, well construction, local geology, and proximity to local water supply with regard to well location and depth. But since shallow Class V injection wells have the greatest potential to adversely impact drinkable ground water, it is reasonable to expect that they should be located and either permitted or closed.

Class V wells can be located anywhere, but they are especially common in areas without sewers—areas that are also most likely to depend on ground water for their drinking water source, typically from private wells. In addition, Class V wells are often used in sewered areas to dispose of stormwater. In municipalities that prohibit increased surface water discharge from new development, Class V wells are used to dispose of runoff.

State UIC programs are generally constrained by the lack of resources. This means that they are often unable to implement their programs as vigorously as desired. For this reason, some programs may sometimes be more reactive than proactive. This is particularly true in the regulation of Class V wells. Because of the prevalence of Class V wells and their increased use for waste disposal as well as a drinking water storage and recovery solution, federal, state, and local governments must act quickly to become more proactive in finding and assessing these wells, so they don't become a health threat and an economic liability.

Fuel spills flowing into drains at refueling stations like this one are a common source of ground water contamination.

RULES AND STRATEGIES FOR MANAGING CLASS V WELLS

Under the existing federal regulations, Class V injection wells are "authorized by rule" (40 CFR 144). This means that Class V wells do not require a permit if they do not endanger underground sources of drinking water and they comply with other UIC program requirements. These requirements include: (1) submitting basic information about Class V wells (e.g., location, legal contact, nature of the disposal activity) to USEPA or the state primacy agency, and (2) constructing, operating, and closing Class V wells in a manner that protects underground sources of drinking water.

Because of the large population and diverse types of Class V wells, USEPA and the states have targeted the Class V wells that pose the greatest environmental risks for regulatory development, education and outreach, and enforcement where necessary. Particular attention is given to wells located in source water protection areas.

In its 1999 Class V Rule, Phase I, USEPA established minimum standards specific to two types of wells that pose a high risk to USDWs: large-capacity cesspools and motor vehicle waste disposal wells.

In June 2002, USEPA issued a blanket regulatory statement for the rest of the universe of Class V wells, determining that, for the time being, additional federal requirements were not needed. It was noted that the use and enforcement of existing federal UIC regulations were adequate to prevent Class V wells from endangering USDWs.

In its determination, the agency set forth a strategy that would prioritize Class V program actions to ensure that these wells are constructed, operated, and maintained to protect USDWs. These actions include continuing to implement the long-standing UIC regulations and assisting well operators on using best management practices and compliance tools, exploring nonregulatory approaches for voluntary practices, and coordinating with other USEPA programs and authorized state UIC programs to educate and inform as many facilities owner/operators as possible. Clearly, the involvement of state and local governments and the public is essential to the success of this strategy.

The Problem with Shallow Wells

The threat to USDWs posed by Class V wells is inherent in their general shallowness—bottom-hole depths are at or above USDWs. These shallow wells, many of which are used to drain, discharge, or dispose of unwanted fluids, are difficult to regulate because they are inconspicuous, extremely diverse, and large in number.

Photo: USEPA

Existing motor vehicle waste disposal wells like the one in this photo can provide a direct contaminant pathway to ground water.

There are approximately 30 types of Class V wells and—besides large-capacity cesspools and motor vehicle waste disposal wells, which are both prohibited by regulation—many are either underregulated or not regulated at all. The overwhelming majority of these wells are shallow, low-tech systems such as drywells, improved sinkholes, mine drainage and backfill wells, seepage pits, catch basins, French drains, and retention ponds. Not all these "wells" pose a threat to ground water; however, it is important to understand what goes into them. While some Class V wells are technically sophisticated in design and operation (e.g., geothermal Class V reinjection wells), their numbers are small by comparison to the total number.

Most Class V wells are used for disposal of low volumes of liquid. However, some are used for high-volume liquid injection, such as for aquifer recharge or subsidence control. Except for (septic) disposal tanks serving single families or systems serving fewer than 20 persons, sumps, septic systems, cesspools, and drain fields are classified as injection wells. Any business or operation that provides a product or service and whose sinks or drains are not connected to a sewer could have a shallow injection well. Communities without stormwater sewer systems often use shallow injection wells to control flooding during storm events.

In general, contamination incidents tend to be associated with the most prevalent of the high-risk types of Class V wells. For example, stormwater wells are typically located along roads and in parking lots, where spills of oils, gasoline, and other contaminants can occur. States typically lack the resources to adequately inventory Class V wells or search for associated contamination.

A SENSE OF DISARRAY

We know much more about underground injection now than we did when the federal UIC program began in the mid-1980s. Yet that knowledge is not adequately reflected in our regulatory approach to injection wells in general, and to Class V wells in particular. As a result, some Class V injection wells are falling through the regulatory cracks, and a general sense of disarray prevails. There are several reasons for this, including:

- The severe shortfall of UIC program resources has been an obstacle to enabling USEPA to develop a more flexible well-classification system to better address real problems.
- So many different activities and injection liquids fall into the Class V category that, with limited resources, it is very difficult to formulate regulations for specific activities.
- Regulatory authority over Class V wells varies widely among states. Some of the same injection activities regulated within the UIC program in one state are regulated within another program in other states; and in some states these same injection activities may not be regulated by any program.
- Class V inventory databases are fragmented and difficult to compare among states. States and USEPA regions can have different well subclassifications and construction criteria.
- Overlapping regulatory programs, such as UIC Class V wells, septic systems, and stormwater, have historically lacked coordination at both federal and state levels.
- Some owners of existing or proposed underground injection wells that technically fit into one of the other three (Class I, II, III) categories seek to have these wells placed into Class V to avoid more complicated and costly operational requirements. This is owing in part to the fact that some of the UIC regulations are unnecessarily burdensome and have no environmental benefits—and thus place impediments on beneficial new technologies that provide new sources of safe water supplies and the ability to capture and sequester CO_2.

What We Don't Know Could Hurt Us

The universe of Class V wells has expanded and is manifesting unique differences in various parts of the country. As of FY2007, there are little, if any, resources at the state level for a systematic search to find all Class V wells; many states have only partial or even no databases, providing a very incomplete national picture of the Class V well inventory. Yet, knowing what you have is the first step in figuring out where you need to put your resources. Until these wells are located and inventoried, it will be difficult to even estimate their potential to contaminant drinking water.

NEW INJECTION STREAMS

There are a number of new injection practices associated with environmentally important technologies that are in competition with other Class V wells for limited program oversight resources. When the SDWA was passed and wells were placed into the five UIC classes, it was difficult to predict the evolution of industrial practices and the future need for flexibility in the well-classification scheme. However, within the past several years many technological changes have occurred that highlight the pressing need for reconsidering well classifications—either developing new classifications or modifying existing classes to handle new waste streams.

Providing flexibility in the UIC well-classification system must begin with the federal UIC regulations. Although a primary purpose of these regulations has been to provide consistency to UIC activities across the nation, the regulations are inflexibly grounded in technology that is at least 25 years old. In a number of ways, these regulations impede the development and implementation of new drinking water treatment technologies that require use of underground injection by weighing them down with permitting burdens that have no environmental benefit.

Without streamlined regulatory requirements and procedures, the large number of new wells needed for new technologies will overwhelm the resources available for well construction review and approval, creating severe backlogs in permit-application processing. Consequently, there is a need to step back and consider establishing a new, more flexible, comprehensive, and systematic approach to UIC and related programs. One reason this effort has not been undertaken by program regulators is that the preliminary work and the formal rulemaking involved are both very resource-intensive.

Among the new technologies that will need cost-effective forms of underground injection for managing byproduct streams are carbon capture and storage (geosequestration), to assist in decreasing greenhouse gas emissions, and water treatment by membrane and ion exchange methods to convert salt or brackish water into drinking water. The new waste streams associated with these technologies are CO_2 and drinking water treatment residuals, such as desalination concentrate.

Carbon Dioxide Geosequestration

Global climate change has become generally accepted as an environmental threat, believed to be, in part, the result of CO_2 released into the atmosphere through activities such as fossil-fuel burning. In order to mitigate the impacts, new technologies are being developed to capture CO_2 before it is emitted into the atmosphere. Major multinational corporations, universities, USEPA, and the U.S. Department of Energy have joined in efforts to slow the rise in global warming.

The principal challenge with capturing CO_2 is that, once captured, it must be kept out of the atmosphere. Estimates of the volumes that could eventually be generated from this process are in the trillions of metric tons annually. While other potential isolation methods are being investigated (e.g., deep-ocean and terrestrial isolation), one of the most promising is geosequestration by underground injection into deep subsurface rock formations.

CONCENTRATE DISPOSAL APPLICATION

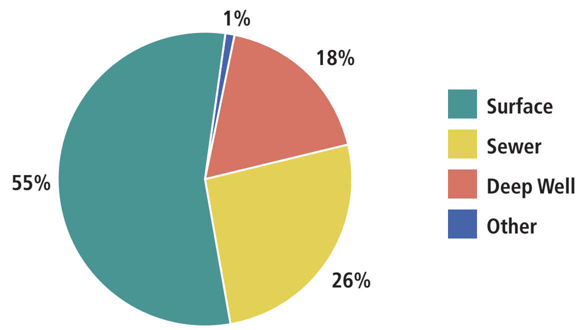


Figure 2. *This pie chart shows the distribution, by volume, of various concentrate-disposal options (a 2005 two-state snapshot).*

Source: Sandia National Laboratories

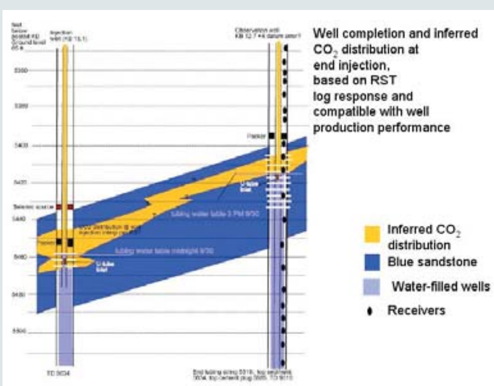
However, a number of technical and regulatory issues must be resolved before this technology can be effectively used to isolate large quantities of CO_2. Among these are ownership of the injection zones, cost of injection, the propensity for CO_2 to migrate underground more readily than conventional fluid-injection streams, prevention of leakage from the injection zones, the effect that CO_2 may have on the injection zones, and the long-term consequences of exposing well components to CO_2.

When fully implemented, the number of wells needed for effective CO_2 sequestration could ultimately be many thousands—and that is only for the United States! Such large numbers of wells, if regulated using the traditional Class I approach for deep-well injection of an industrially generated by-product, would bog down the UIC permitting process. Many of those working on this problem believe that a new specialized class or subclass of injection well is needed that has proper environmental safeguards along with streamlined authorization requirements.

An efficient option is injecting CO_2 for enhanced oil recovery (EOR) in Class II injection wells, as used successfully in the Permian Basin of west Texas since the 1970s (see “Frio Brine Project” page 9•10). Class II wells are notably faster to permit than Class I wells. However, the EOR option, alone, is not sufficient in reservoir capacity, geographic distribution of wells, or

THE FRIO BRINE PROJECT YIELDS POSITIVE FEEDBACK FOR LARGE-VOLUME CO_2 INJECTION

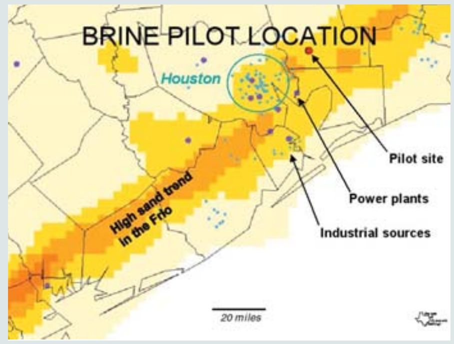
The U. S. Department of Energy funded a unique $4.14 million field experiment to test whether carbon dioxide (CO_2) can be sequestered in underground brine-bearing sandstone. The Frio Brine Pilot Project is part of an ongoing research initiative of the Gulf Coast Carbon Center (GCCC) to develop new capabilities to enable cost-effective sequestration of CO_2. Researchers selected a well-known high-permeability, high-volume sandstone, the Frio Formation, as the CO_2 injection interval. This formation is representative of a broad area of the Gulf Coast, an ultimate target for large-volume CO_2 geosequestration.



Above and right: Frio Brine Pilot Project: CO_2 injection/observation wells and cross-section schematic.

Source: The University of Texas at Austin, Bureau of Economic Geology

The Frio Formation in the project area is brine saturated (i.e., not productive of oil or gas). This distinction was of primary importance in the project design. Through the pilot project, investigators hoped to increase knowledge concerning the potential for CO_2 geosequestration using similar brine-saturated formations worldwide. This would be a longer-term and more volumetrically significant option than that provided in the existing precedents for CO_2 injection for enhanced oil or gas recovery.



Map showing the location of the Frio Brine Pilot Project along the Gulf Coast.

Source: The University of Texas at Austin, Bureau of Economic Geology

Project goals included the development of monitoring protocols and predictive models to provide a better understanding of the fate and transport of injected CO_2 in the subsurface, including the trapping mechanisms that determine the effectiveness of geosequestration in keeping CO_2 isolated from the atmosphere.

The initial phase of the project involved detailed characterization of the local and regional geology of the project site in Liberty County, Texas, for use in constructing models and interpreting test results. Since 2004, two successful episodes of injection have been completed (injecting 1,600 tons and 300 tons of CO_2, respectively) with extensive monitoring within the injection interval and the overlying formations. Monitoring during the injection and postinjection periods included pressure and temperature measurement, wireline logging, seismic data collection and analysis, and two-phase fluid sampling.

Good matches were obtained between the observed and modeled evolution of the injected plumes. Over the monitoring period, plume stabilization was observed, suggesting that modeling predictions of arrested movement (trapping) of CO_2, limiting buoyant migration "updip" are correct.

More information on the Frio Brine Pilot Project is available at *http://www.beg.utexas.edu/environqlty/co2seq/fieldexperiment.htm*

CO_2 CAPTURE AND SEQUESTRATION

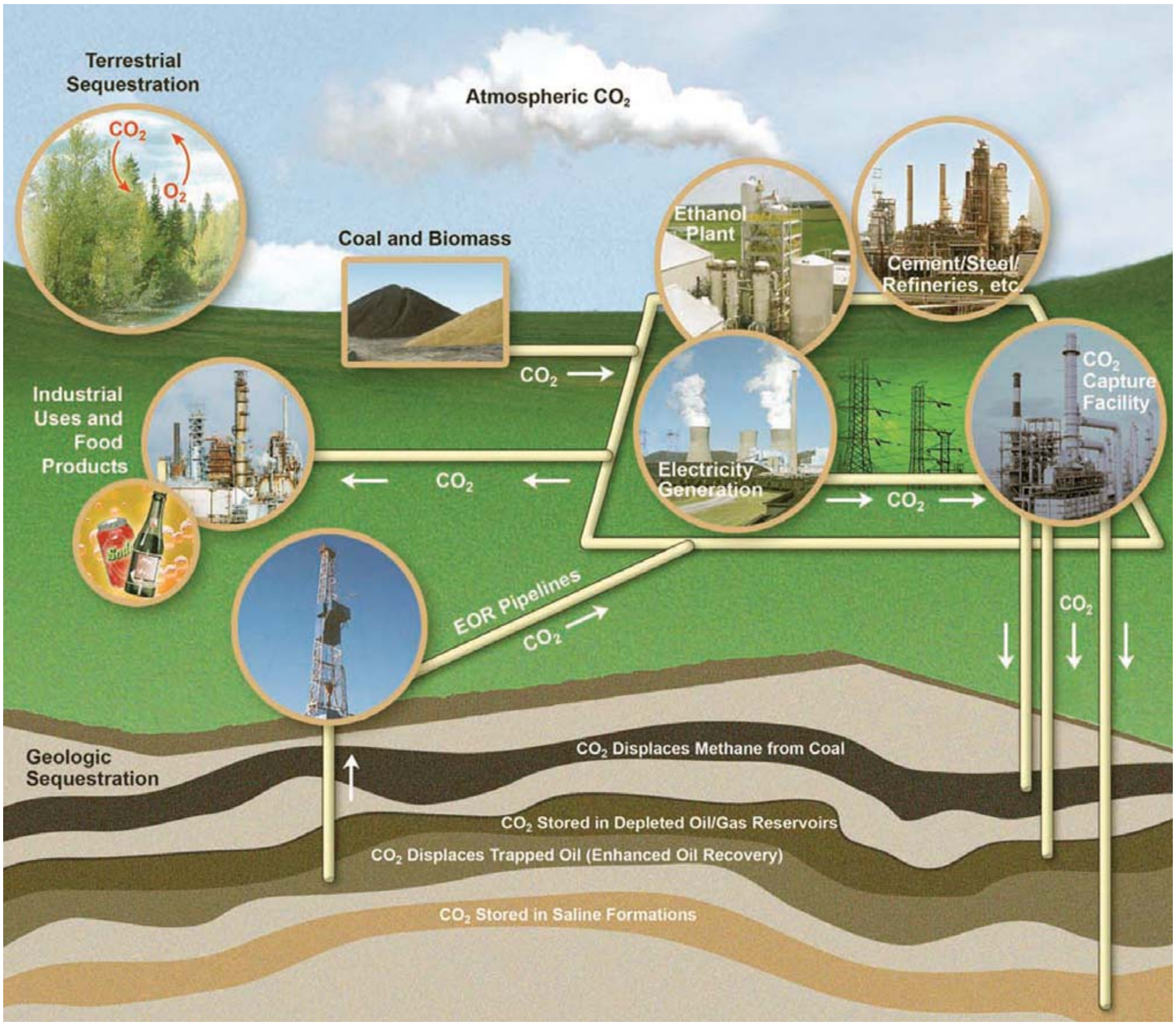


Figure 3. *Flow diagram showing sources of CO_2 and their pathways to sequestration.*

Source: Carbon Sequestration Atlas of the United States, USDOE

available timeframe for remaining oil production to solve the overall CO_2 sequestration challenge.

Disposal of Drinking Water Treatment Residuals

Properly designed and operated underground injection wells provide an ideal method of isolating drinking water treatment residuals, including highly concentrated salts from desalination operations, metals (e.g., arsenic), radionucides (e.g., radium), and known carcinogens (e.g., perchlorate) from USDWs. The traditional UIC approach for injecting such water treatment residuals uses a Class I well. However, the greater regulatory burdens associated with this well class, in the timeframes required for permitting and the costs of construction and operation, constitute significant impediments to its widespread use for injecting these residual streams.

In 2006, USEPA issued *Drinking Water Treatment Residual Injection Wells: Technical Recommendations,* a report authored by the UIC National Technical Workgroup to evaluate the technical aspects of and develop recommendations on the use of underground injection wells for disposal of drinking water treatment residuals. The report identifies 101 drinking water treatment residual injection wells that are currently permitted or authorized. These wells are classified as Class I nonhazardous or Class V wells, and the permit requirements, where specified, are generally similar to federal Class I requirements. The report addresses several data gaps and other areas where follow-up actions are recommended.

Other less burdensome options receiving consideration include Class II enhanced oil recovery (EOR) and deep Class V injection wells. However, each of these approaches has its drawbacks. In particular, the Class II EOR option will not be economically practical in areas distant from oil production, and the Class V option will require the conjunction of rather unusual geologic and hydrologic conditions.

FUNDING—THE ULTIMATE UIC IMPEDIMENT

As explained earlier, two great challenges facing the UIC Program are the need for more effective regulation of Class V wells and improved readiness to regulate waste streams associated with new technologies. The principal obstacle to meeting either of these challenges is the lack of sufficient funding for the state regulatory agencies.

Locating, inspecting, closing (if necessary), and/or remediating the higher-risk types of mostly shallow Class V wells is critical. If improperly used and left unchecked, such wells can cause ground water and drinking water contamination. Therefore, the future success of this critical part of the UIC program is in increasing jeopardy if more funds are not added at the federal level and passed onto the state-primacy programs. Neither USEPA nor the state-primacy agencies can continue to implement this federal program effectively without additional resources.

Similarly, without large increases in UIC Program funding, progress in implementing new technologies for addressing global climate change and developing new water supplies for growing populations will be impeded. However, if funds are provided to the new technologies/waste streams initiatives, it cannot be to the detriment of the Class V well problem. Both need to be addressed.

If these issues are not addressed, Class V wells will remain the program's stepchild, leaving some drinking water at substantial risk for years to come. Even so, at present funding levels, the initiatives associated with new technologies will hardly be the winners, because resources will be insufficient for their optimal development as many proposed projects become stalled in the permitting-process backlogs described earlier. Without additional funding, in the competition between Class V and the new technologies and streams, a lose-lose outcome is likely.

Key Term

USDW—UNDERGROUND SOURCE OF DRINKING WATER

An Underground Source of Drinking Water as defined in Title 40, *Code of Federal Regulations* (40 CFR) Section 144.3 is an aquifer or part of an aquifer that:

a. Supplies any public water system, or contains a sufficient quantity of ground water to supply a public water system and currently supplies drinking water for human consumption or contains fewer than 10,000 milligrams/liter of Total Dissolved Solids (TDS); and

b. Is not an exempted aquifer. An exempted aquifer is part or all of an aquifer which meets the definition of a USDW but which has been exempted according to the criteria found in 40 CFR.

Recommended Actions

To Congress:

- **Increase annual funding for the national UIC program to $56 million to allow for more reasonable regulation of current UIC facilities, and provide additional funding for new injection streams that require safe management.**

To USEPA:

- **Revise the current injection well classification scheme to make it more consistent with current and future program needs and to provide greater flexibility for cost-efficient regulation of new injection streams.**

Underground injection control is all about protecting underground sources of drinking water!

McFarland dry spring cave, Jackson County, Alabama.

Photo: Alan Cressler, USGS

South Charleston, Ohio, water tower.

Photo: Alan Cressler, USGS

Section 9 References: Ground Water and Underground Injection Control

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USEPA. 2006. *Drinking Water Treatment Residual Injection Wells: Technical Recommendations.* Available at: *http://www.epa.gov/region5/water/uic/ntwg/dwtr_final_report_01-19-07.pdf*

Suggested reading and viewing:

GWPC Training video on Class V Service Station Wells.

Injection Wells: An Introduction to Their Use, Operation, and Regulation, GWPC. *http://www.gwpc.org/e-library/e-library_documents/e-library_documents_uic/uic%20brochure%208-2005.pdf*

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