NORTH Dakota | Industrial Commission

Be Legendary.

UNDERSTANDING CO_2: NORTH DAKOTA'S ROLE

EMERGENCY MANAGERS FREQUENTLY ASKED QUESTIONS

In North Dakota, we take great pride in our agricultural and energy heritage. As federal regulations are imposing stricter standards, our fossil fuel (oil, coal, gas) and ag producers are under increasing pressure to produce low- or no-carbon products and energy. While this shift brings challenges, it also creates great opportunity for North Dakota with an increase in demand across energy and ag sectors for capturing, using, and storing carbon dioxide (CO_2) deep underground.

Our commitment to safety and responsible practices is, and continues to be, our top priority. As we navigate this shift in significant legal, regulatory, and economic conditions, our priority remains unwavering – ensuring safety and sustainability in every step we take. We are dedicated to finding the best ways to adapt, uphold our values, and continue our way of life while keeping a focus on the health and safety of our communities.

HAS THIS BEEN DONE BEFORE?

Underground CO_2 injection first began more than 50 years ago in western Texas. Decades of data has helped us understand how CO_2 behaves deep underground, and how to safely transport it through pipelines. Today, millions of metric tons of CO_2 are safely transported across the country through 5,000+ miles of pipelines – including nearly 200 miles in North Dakota.

CO_2 CAPTURE AND STORAGE IN ND

- **Red Trail Energy Ethanol Plant, Richardton**
  Began operations on June 16, 2022; captures and stores up to 180,000 metric tons of CO_2 annually.
- **Blue Flint Ethanol, Underwood**
  Began operations on October 28, 2023; captures and stores up to 220,000 metric tons of CO_2 annually.
- **Great Plains Synfuels Plant, Beulah**
  Began operations on February 2, 2024; captures and stores up to 2.7 million metric tons of CO_2 annually.

CO_2 PIPELINES

- **Dakota Gas/Souris Valley Pipeline**
  Began operations in 2000. This 205-mile pipeline runs from Beulah, northwest past Tioga, and into Saskatchewan, Canada. It has been transporting up to 2 million metric tons of CO_2 annually for enhanced oil recovery (EOR) for nearly 25 years.
- **Denbury/ExxonMobile Pipeline**
  Began operations in 2022. The final 9 miles of this pipeline, which starts in Wyoming, delivers CO_2 to the Bowman area for enhanced oil recovery (EOR).

WHAT REGULATIONS GOVERN CAPTURE AND STORAGE IN NORTH DAKOTA?

In 2018, the U.S. Environmental Protection Agency (EPA) granted North Dakota primacy (regulatory authority) of Class VI (CO_2 storage) injection wells within the state. As a result, North Dakota Industrial Commission's Department of Mineral Resources - Oil & Gas Division has authority over all CO_2 storage injection well activities. The North Dakota Public Service Commission approves the siting of transmission pipelines, including CO_2, and the Pipeline Hazardous Materials Safety Administration (PHMSA) is accountable for safety in design, construction, and operation of CO_2 transmission pipelines.

IS STORING CO_2 UNDERGROUND SAFE? IS IT HARMFUL TO CROPS OR WATER?

CO_2 capture, utilization and storage projects are designed to be safe for people, animals, plants, and the environment. Before a CO_2 storage project ever begins, scientists identify and evaluate acceptable sites based on their geological suitability to securely contain CO_2. Ongoing monitoring helps detect and address any potential leaks or issues.

North Dakota's unique geology is perfectly suited for safe storage of CO_2 nearly a mile or more below the surface, and thousands of feet below the water table.

Similar to how oil reserves deep underground do not have an impact on the surface or water supply, CO_2 will also remain safely beneath an impervious cap rock and will not have an impact on the surface, water, soil, or plants thousands of feet above. Crops and grass can grow above these areas, and animals can safely graze.

IS IT SAFE TO TRANSPORT CO_2 IN UNDERGROUND PIPELINES?

When federal pipeline regulations are followed, pipelines outperform the safety standards of both rail and truck transit. Pipelines are designed to safely operate under the pressures (between 1200-2200 psi) required for "dense phase" CO_2 transport. Before any CO_2 is transported, pipelines are filled with fresh water or inert gas at a pressure of 125% of their maximum operating pressure to ensure structural integrity.

Pipelines and storage sites have stringent regulations, monitoring, and mitigation requirements. North Dakota prioritizes significant planning, research, training, and technology to be prepared for any unexpected scenarios.

Local emergency responders play a crucial role in ensuring public safety near CO_2 pipelines. Even though a CO_2 pipeline leak is extremely rare, it is important that first responders have the information they need to prepare for and respond to all potential situations.

Pipeline operators are required to work closely with responders to develop and review emergency response plans and conduct regular training and drills.

HOW DO WE KNOW CO_2 IS INJECTED TO THE RIGHT DEPTH OR ROCK LAYER?

A CO_2 injection well is constructed with a minimum of three layers of steel protection to prevent any underground discharge into the water supply.

The first layer is set below the deepest underground source of drinking water, and cemented back to the surface. The second layer is set into the injection formation nearly a mile or more below the surface, and is cemented in place. The third layer is injection tubing running from the surface to the injection zone. These casings ensure CO_2 only flows to the target formation, and will remain within the porous rock bed layer, covered by a solid cap rock, trapping the CO_2 deep underground.

WHAT SAFEGUARDS ARE IN PLACE TO PREVENT AND IDENTIFY LEAKS?

Safety is ensured through rigorous site selection, extensive monitoring, and regulatory oversight. North Dakota requires extensive review and approval of plans to operate pipeline and storage facilities and inject CO_2. All CO_2 storage projects must include:

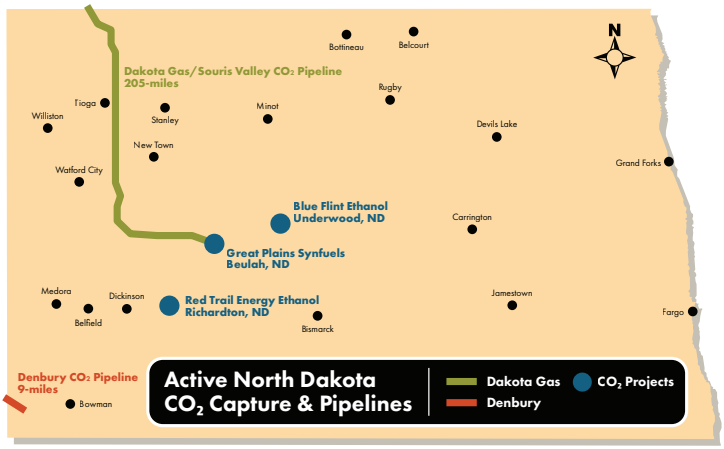
- Class VI well construction with surface casing/cementing protecting water resources, cementing from the surface to the injection point, and corrosion-resistant casing and cement
- Next-Level Monitoring: multi-layer, multi-protection, multi-action 24/7/365
- Operational monitoring for temperature and pressure changes that could indicate early anomalies
- Leak detection and alerts
- Deep underground monitoring to ensure that the CO_2 remains securely in the storage zone
- Surface and near surface monitoring to ensure no environmental effects
- Surface water, groundwater and soil regular testing
- Shutoff requirements
- Risk assessment and mitigation including comprehensive manuals at each site and control center with actions for various scenarios
- Liability on storage facility owner, not landowner
- Post injection site care and closure
- Continuous monitoring after injection ends, until it is demonstrated that the CO_2 stops moving (at least 10 years)

CO_2 storage facility operators must have the proper financial instruments and ability in place to cover the cost of any necessary corrective action, injection well plugging, post-injection site care/facility closure, and emergency and remedial response. These instruments must remain in place until the CO_2 storage facility is approved for closure.

WHAT HAPPENED WITH THE 2020 CO_2 PIPELINE FAILURE IN SATARTIA, MISSISSIPPI?

First, the pipeline operator was cited for violating multiple regulations. Second, the soil where the pipeline was installed was unstable, and susceptible to movement from high rainfall. The incident followed heavy rains (7.5-13.5 inches above average) that resulted in a landslide, rupturing the pipeline as the ground shifted. Lastly, weather conditions, lack of wind, and the density/volume of CO_2 released slowed its dissipation; the operator models underestimated the potential affected area; the operator did not adequately inform emergency responders; and the pipeline did not contain pure CO_2, resulting in this "worst-case" scenario.

One misconception is that this pipeline "exploded." However, CO_2 is non-flammable and non-explosive. Rather, the pipeline experienced "explosive decompression." This happens when a pipe that carries gas or liquid breaks very quickly - like blowing up a balloon and popping it with a pin. The material escapes quickly, causing a powerful rush and noise, disturbing the ground immediately around the break point.



WHAT HAPPENS IF THE CO_2 MIXES WITH WATER (H_2O)?

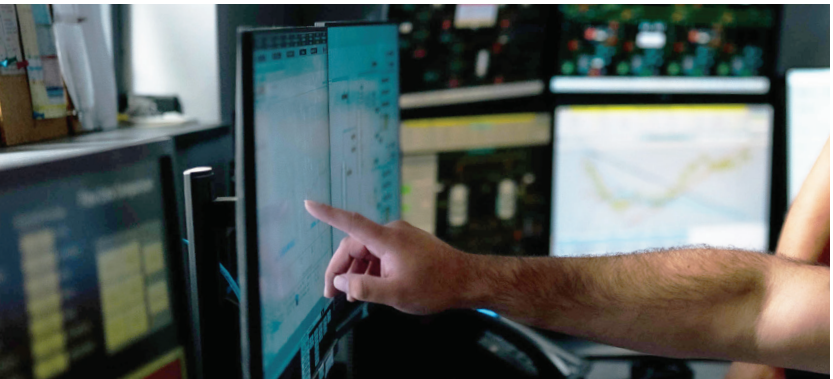
While water and CO_2 combined may be corrosive, systems are designed to incorporate dehydration, so no free water touches the pipeline. Several additional steps are taken to ensure pipeline and equipment integrity through all conditions, including:

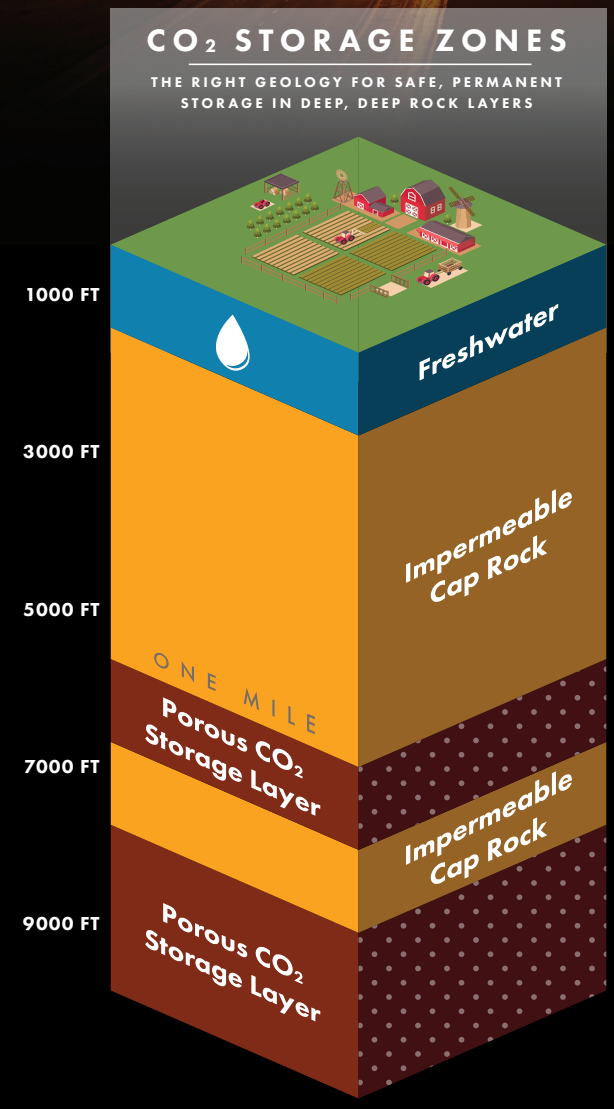
- Using corrosion-resistant materials
- Applying protective coatings or linings
- Using corrosion inhibiting chemicals
- Using cathodic (electrical currents) protection
- Regular monitoring and maintenance

WHAT HAPPENS IF A LEAK IS DETECTED?

Unlike natural gas and liquid petroleum - which are transported through millions of miles of pipelines across the U.S. – CO_2 is not flammable or explosive. In the unlikely occurrence CO_2 escapes from a pipeline or through the surface, it will become dry ice or go back to a gaseous state. While prolonged exposure to high concentrations of CO_2 can cause breathing difficulty, the gas typically quickly evaporates into the air and requires little to no clean-up. In the event of a leak, pipeline systems are designed to automatically shutdown, ceasing all operations until the cause is determined and repaired, and a reporting process through North Dakota's Unified Spill Reporting System is triggered.

Manuals are required at every facility and call center that outline action steps and emergency protocol for any possible leak scenario.





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If you're interested in learning more about CO_2 and North Dakota's role, visit

CarbonND.com

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