

GREENWAY REPORT



HEARTLAND
GREENWAY

WINTER 2023

TRAINING LOCAL FIRST RESPONDERS FOR CO₂ PIPELINE PREPAREDNESS



Safe planning for any pipeline project requires advance information and training for all involved communities.

As part of its commitment to fostering open and regular dialogue, Heartland Greenway has kicked off 2023 with a five-week series of detailed CO₂ training sessions for local police, fire, and emergency teams throughout the project's five-state footprint.

Chris Brown, vice president of capital projects for Navigator CO₂, has been on the road and engaging with groups of 20-40 local officials and first responders throughout the first few weeks of meetings. "In many cases, this is our second or third touchpoint with these local leaders and professionals," he notes. "They appreciate our transparency, and use of data and science to discuss how the project will be designed and constructed with state-of-the-art technology to ensure it operates safely."

The evening sessions cover a wide range of CO₂-related topics, as well as in-depth question-and-answer sessions. "We present real-time updates on our design process and address the variety of safety factors, including industry lessons learned," Brown explains. "We walk through the unique properties of CO₂, status of CO₂ transportation

today and historically, federal oversight of the safety of this infrastructure, project routing and engineering specifications we've developed for this system, and how they were guided by multiple dispersion models we've completed with third-party industry experts in this field."

Audiences for the sessions have included a mix of local officials, including police, sheriffs, emergency responders, and county board members. The teams are conducting three meetings per week over the course of the first five weeks of the new year, and we appreciate the direct one-to-one interactions.

As an engineer, Brown especially enjoys getting into the specifics, from how carbon dioxide is captured and pressurized into a supercritical state, the thickness and metallurgical analysis of the pipeline, and the multi-faceted approach Navigator has taken on safety to minimize impacts, mitigate risk, and meet or in many cases exceed the regulatory standards. "This is just the start of what will be a multi-step process of emergency planning and preparedness," Brown says. "We look forward to building even stronger relationships in these communities in the days, months, and years to come."

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MEET VIDAL ROSA

Navigator SVP of Operations



Vidal Rosa has been busy at work building out Heartland Greenway's ground team and crews throughout the Midwest. He's also been on the road with the team engaging with local first responder teams along the project footprint as part of our first round of safety trainings.

Q: How do you define a project's success?

A: Every project requires efficiently managing an asset to ensure the safety of both the general public and our employees. Safety always comes first, along with effective project management to comply with all applicable local, state, and federal regulations. When you focus on those two elements, guided by real-time metrics, everything else falls into place.

Q: What's the difference between moving oil vs. moving carbon dioxide?

A: When you stop to think about it, most of the liquids we depend on move safely within pipeline systems, whether it's the water we drink, natural gas to heat our homes, or gasoline to fuel our vehicles. As liquids go, carbon dioxide is considered a 'clean' product to move since it's inflammable. And at the end of the day, it's important to remember that pipelines carrying CO₂, just like oil and gas, are heavily regulated in terms of safety of operations.

Q: How does Heartland Greenway staff its project teams on the ground in different states?

A: We look for people with the right mindset who understand the overall culture of pipelines, of course. We also seek out locally-based professionals. Our team members have diversified experiences, deep knowledge, strong ethics, and a successful track record of doing the right thing. Our people are passionate about what they do and are hand selected to contribute to our dynamic working environment.

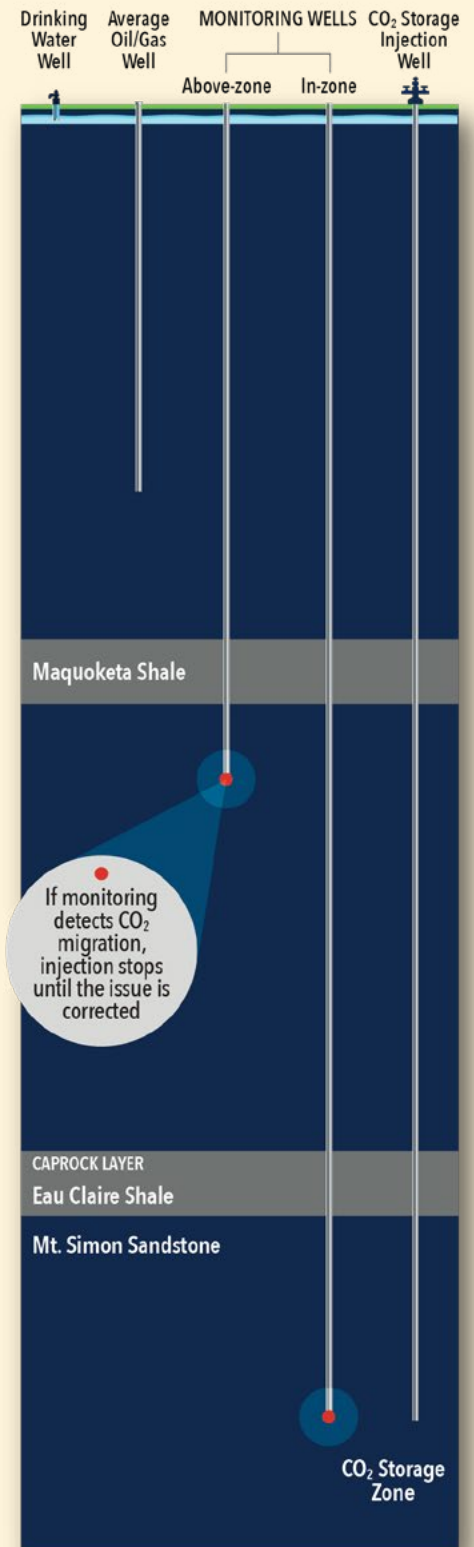
Q: What should everyone know about the first responder training?

A: For me personally, it's been great to make personal connections with the community leaders in Illinois, Iowa, Nebraska, Minnesota and South Dakota. First responder training is a critical first step in any project development process, whether you're constructing a building or installing a pipeline. The training is just one part of what is a multi-step timeline of engagement we have planned with these local emergency response teams, as we continue working into the next steps of localized emergency response plans, ensuring those teams are equipped with the right tools and technologies to respond, and then partnering on drills to test those plans regularly. It's part of building relationships, so residents can see that we care, and further that we truly respect their property and way of life.

Vidal joined Navigator in 2017, bringing more than 25 years of industry experience with roles in pipeline transportation, operations, and business development. He holds a B.S. in Business Administration in Management from the University of Texas Permian Basin. When Vidal's not working, he enjoys spending time with his grandson (and best friend), rooting for the Dallas Cowboys, and golfing whenever time permits.

During our CO₂ safety training, we showed how CO₂ will be injected and stored more than a mile underground, far below critical water resources. **How much farther below?** The image below illustrates how deep CO₂ is injected compared to other common wells.

WELL DEPTH COMPARISON



PROJECT EXPANSION LEADS TO REVISED PERMIT IN ILLINOIS

Navigator CO₂ has negotiated hundreds of miles of pipeline right-of-way easements, thousands of acres of storage pore space, and the necessary well-sites to accommodate the injection of carbon dioxide underground in Illinois. Given the successful progression of permitting and growing commercial commitments, Navigator will be filing a revised permit with the Illinois Commerce Commission by the end of February. With this new permit, Navigator will accelerate the development of additional permanent storage locations across multiple counties in central Illinois, which is a proven home to some of the best geology for underground carbon sequestration.



UTILIZING CO₂

Approximately 230 metric tons of CO₂ are being used globally each year, however, new uses are emerging for carbon dioxide to be used in future technologies and innovative applications. Here's a recap of some of CO₂'s current and commercial and industrial uses:

Food and Beverage

Long used for fizzy drinks, CO₂ also extends fruit and vegetable shelf-life, is made into dry ice for refrigeration in transit, and is used in the processing of livestock.



Building materials from minerals

CO₂-cured concrete costs less and performs better than conventionally produced concrete.



Fuels

CO₂ converts hydrogen into sustainable aviation fuel that's easier to use.



Chemicals

CO₂ can replace fossil fuels in chemicals, polymers and bioplastics.



Waste water management

When injected directly into wastewater, CO₂ forms carbonic acid, which naturally adjusts water acidity (pH) to a suitable level.



ASK THE ENGINEER



Andrew Duguid is a Vice President at Advanced Resources International, overseeing the construction of the wells on the Heartland Greenway project. He has more than 15 years of experience with carbon sequestration and holds a PhD from Princeton University in Civil Engineering, in addition to master's degrees in Nuclear and Civil Engineering from Ohio State University.

Q: Why is the Midwest considered a good location for long-term CO₂ storage?

A: Central Illinois is an ideal location for Heartland Greenway's CO₂ storage due to the Mt. Simon sandstone formation that underlies the region. The formation runs more than a mile underground in parts of Illinois, far below all aquifers and critical water resources. Geologic and seismic imaging studies have confirmed that the sandstone has excellent storage capacity. The Eau Claire shale caprock above the sandstone will provide a thick, secure seal to permanently hold the CO₂ in place after it's injected underground.

Q: Where has carbon capture been done before?

A: There have been CO₂ transportation pipelines in operation across the U.S. since the 1970s, and that network has grown to nearly 5,500 miles today. ADM has been sequestering the CO₂ from the fermentation process at their ethanol plant in Decatur, IL as part of a demonstration project with the US Department of Energy for nearly a decade. Red Trail Energy, an ethanol facility in North Dakota, obtained their Class VI injection permit in 2022 and has been successfully injecting the CO₂ from their plant on-site since. Unfortunately, the bulk of the ethanol and fertilizer industry was built in areas that don't have the adequate geology for sequestration or sufficient demand for utilization, so transportation of the CO₂ is necessary.

Q: How much new infrastructure is required to meet carbon capture industry goals?

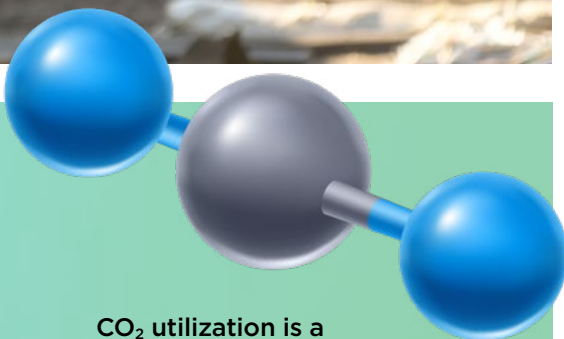
A: According to Clearpath Foundation, a nonprofit focused on clean energy solutions, 4,000 additional miles of pipeline will need to be built each year for the next 25 years to meet the growing needs of processors to transport their CO₂ emissions.

The scale of pipeline infrastructure needed to support longer-term CCUS around the world is considerable. The International Energy Agency estimates the need is roughly 100 times larger than what currently exists.

Pipelines remain the safest, most environmentally friendly, efficient, and reliable mode of transportation for gas and liquids.



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CO₂ utilization is a complement, not an alternative, to CO₂ storage for large-scale emissions reductions. Utilization can play a role in meeting climate goals as part of a “piece of the puzzle” approach. As research and development for new, innovative means of CO₂ utilization evolves into commercial scale application, it will still require pipelines as the most efficient, effective, and safest means of transporting CO₂- and the Heartland Greenway will provide that.

Source: International Energy Agency <https://www.iea.org/reports/putting-CO2-to-use>

SEISMIC SURVEYS LEAD THE WAY IN SAFE PROJECT PLANNING



Vibroseis truck in Illinois. Photo Credit: Allan Châtenay, Explor. (Explor CCUS project in Illinois, 2022)

In several Central Illinois counties, a different type of survey is under way to map underground formations where carbon dioxide could be permanently stored for the Heartland Greenway project.

A seismic survey is a geophysical technique, similar to an ultrasound, that develops images of rock layers below ground. The survey is conducted using sensors, called geophones, which are temporarily installed at the surface to listen to echoes from sound waves reflected from subsurface layers.

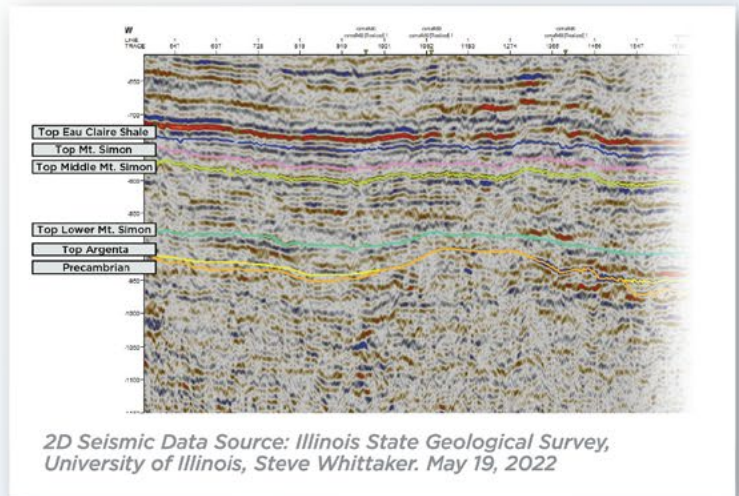
Heartland Greenway teams use a wide range of data and remote sensing techniques before going into

the field to minimize our environmental footprint and reduce risk. All pertinent information to assure safe and efficient operations is managed through our IntelliSeis system, which provides design, planning, implementation, and analysis for field operations, as well as navigation and real-time tracking for the multiple survey teams working on the project.

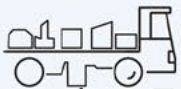
The seismic survey process is straightforward and minimally disruptive. Crews first drill a series of small holes, generally within the public right-of-way along roads, then place geophone sensors into them to detect and record ground movement.

Next, special ‘vibroseis’ trucks are brought in for a very specific purpose: to generate seismic waves, or pulses, underneath the earth’s surface. The trucks are equipped with large metal plates called pads that send vibrations underground. The waves bounce off the multiple layers of rock formations and are recorded by special sensors to create accurate maps of the complex layers underground. Truck vibrations can only be felt within 100 feet – less than what a train produces.

Heartland Greenway works with local county officials on the necessary permits. Operations are not conducted when there is any significant risk to public or private property. Safety is assured by use of high visibility clothing, lighted vehicles, and proper on-site flagging by crews.



VIBROSEIS TRUCK



GEPHONE ARRAY



DATA COLLECTION



Seismic waves provide accurate, detailed maps of geologic properties and formations extending miles deep.

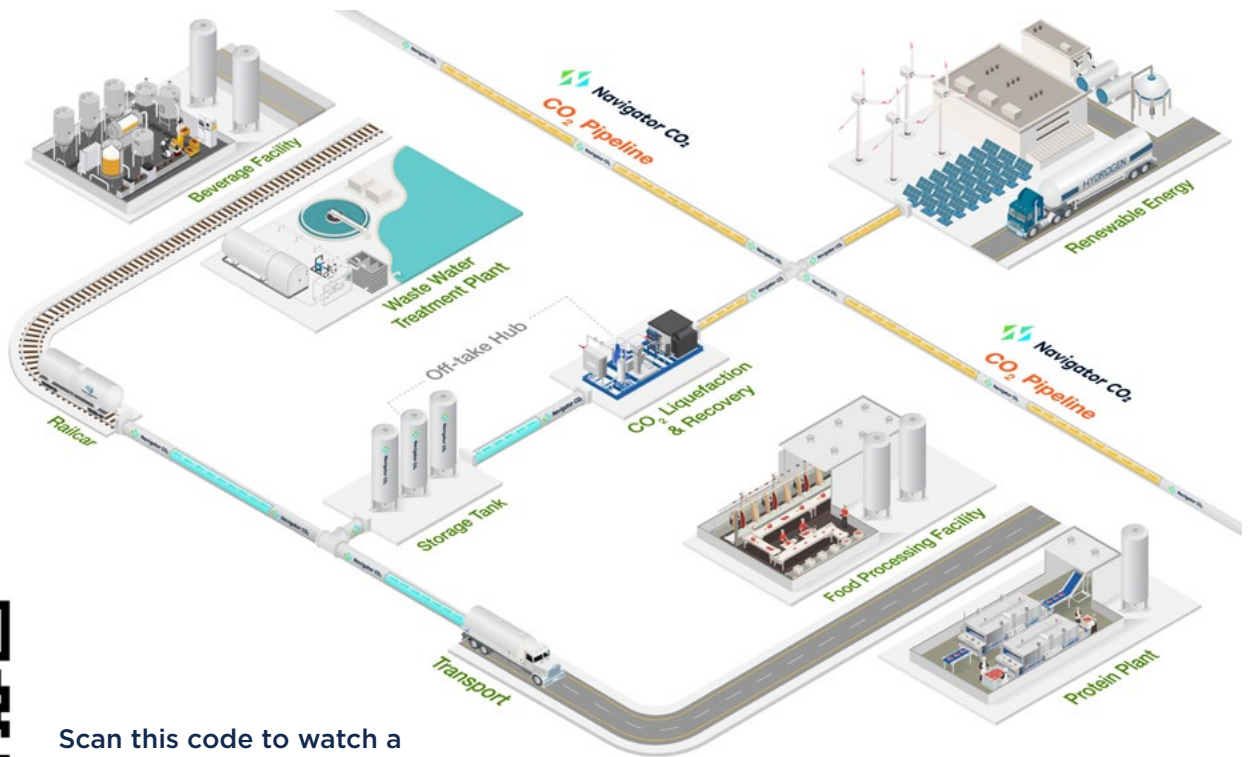
Heartland Greenway Overview

Heartland Greenway is a carbon capture, utilization, and storage (CCUS) system that will provide biofuel producers and other industrial processors in five Midwest states with a long-term, cost-effective means to reduce their carbon footprint. Constructed and operated by Navigator CO₂, Heartland Greenway will serve industrial customers in Illinois, Iowa, Minnesota, Nebraska, and South Dakota.

The Heartland Greenway carbon management platform will involve capturing carbon dioxide (CO₂) from industrial processes, and transporting the CO₂ via pipeline to either: injection wells for permanent storage deep underground in geological formations, or terminal assets that allow other manufacturers to utilize CO₂ in their processes. Once fully realized, Heartland Greenway

will transport and store up to 15 million metric tons of CO₂ annually, which is equivalent to the emissions from approximately 3.2 million cars.* Construction is expected to start in 2024, and with phased-in operations throughout 2025.

Navigator CO₂ is an Omaha-based company managed by Navigator Energy Services. Navigator is pioneering a path to sustainable carbon solutions by specializing in CCUS and has safely constructed and operated more than 1,300 miles of new pipeline infrastructure since 2012. Navigator CO₂ builds and operates its projects to meet or exceed safety requirements, while minimizing impacts to the environment, landowners, and public during construction and ongoing operations.



Scan this code to watch a video about our full service CCUS platform.

CONTACT US

The Greenway Report is a quarterly publication of Omaha-based Navigator CO₂ Ventures, with headquarters at 13333 California St., Suite 202, Omaha NE 68154.

For additional information, please visit the Heartland Greenway website at heartlandgreenway.com, email info@heartlandgreenway.com or call 402.520.7089.



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