

Public Comment on First Carbon Storage Draft Permits

FutureGen Industrial Alliance Inc. Carbon Storage Wells
Morgan County, Illinois

April 2014

You're invited

The EPA will hold an open house and a formal public hearing on the FutureGen draft permits at:

MacMurray College
447 E. College Ave.
Jacksonville, IL

Wednesday, May 7

Open House and Q&A,
11 a.m. – 1 p.m. and 5 – 7 p.m.

Public hearing, 7 – 9 p.m.

Oral and written comments will be recorded or accepted at the hearing. EPA will provide a summary of its proposed decision but will not answer questions during the hearing.

How to comment

In addition to accepting comments at the public hearing, EPA will accept written comments until May 15. Comments can be sent to Jeffrey McDonald or submitted online at the web page below:

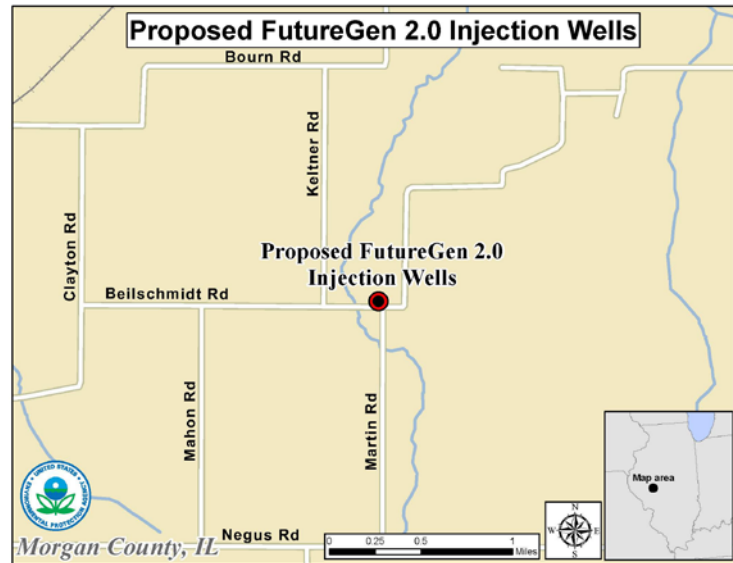
Jeffrey McDonald

U.S. EPA
UIC Branch (WU-16J)
77 W. Jackson Blvd.
Chicago, IL 60604-3590

Web resources

www.epa.gov/region5/water/uic/futuregen/

You may call EPA toll-free at 800-621-8431, 8:30 a.m. - 4:30 p.m., weekdays.



**This map shows where the proposed injection wells will be.*

The U.S. Environmental Protection Agency has proposed to approve permits to allow FutureGen Industrial Alliance to inject and store carbon dioxide, or CO₂, underground at a facility in Morgan County, Illinois, approximately 11 miles northeast of Jacksonville. The process is called “carbon capture and storage,” or “carbon sequestration.” EPA is accepting comments from the public on the draft permits.

These are the first Class VI permits for carbon sequestration in the United States. CO₂ is a greenhouse gas that contributes to climate change. Carbon sequestration is a means of reducing greenhouse gas emissions.

FutureGen would capture CO₂ emissions from a coal-fired power plant in Meredosia formerly operated by Ameren Energy Resources. FutureGen would then purify the CO₂ and put it under high pressure to turn it into a liquid so it can be piped to four wells and injected deep into the ground.

FutureGen plans four main wells and several additional wells that the company would use to monitor the injection, under EPA oversight. FutureGen selected the well locations after a long period of scientific research and planning. This is to make sure the wells would work as planned according to local geography and geology.

The four injection wells would be drilled from a single location to a depth of about 4,000 feet below ground (see figure on fifth page). FutureGen plans to inject approximately 1.1 million metric tons of CO₂ per year into a type of rock known as the Mount Simon Sandstone over 20 years, for a total of 22 million metric tons. Sequestering 1.1 million metric tons a year is the equivalent of removing 232,000 cars from the road.

How did EPA make its draft decision?

In reviewing FutureGen's permit application, EPA evaluated technical information and project-specific data, such as:

- Advanced computational modeling to determine the proposed project area.
- The rock layers through which the proposed injection wells would be drilled, to confirm that the CO₂ will stay where it is injected.
- The location of drinking water resources near the project and how they will be protected.
- The proposed well construction design.
- The characteristics of the CO₂ to be injected.
- The proposed approach and technologies FutureGen will use to operate and monitor the project during and after injection.
- The financial resources FutureGen will have available to responsibly operate, monitor and close the project.
- FutureGen's approach to ensure that the project will protect underground sources of drinking water, public health and the environment.

What happens next in the permit process?

EPA will review all public comments before making a final decision on whether or not to grant the permits. The Agency will respond to all comments on the draft permits.

If EPA decides to issue final permits, FutureGen would be allowed to drill the proposed wells.

Information Repository

The draft permits and fact sheet are available at:

Jacksonville Public Library
201 W. College Ave.
Jacksonville, IL

Administrative Record

The administrative record index is available on the web page identified below. The full administrative record, including all data and information submitted by FutureGen in support of its permit applications, is available for public review at EPA's Chicago regional office. The office is open 8:30 a.m. – 4:30 p.m., weekdays. To review the administrative record or for additional information, contact Jeffrey McDonald at 312-353-6288 or mcdonald.jeffrey@epa.gov.

On the Web

For more information about the FutureGen project:

www.epa.gov/region5/water/uic/futuregen/

Legal Notice

To preserve your right to appeal any final permit decision, you must either comment during the public hearing or send in written comments on the draft permit decision by the end of the comment period.

The first appeal must be made to EPA's Environmental Appeals Board; only after all EPA review procedures have been exhausted may you file an action in the appropriate Circuit Court of Appeals.

Technical background and details of FutureGen's carbon storage project

The EPA's review of FutureGen's permit application and supporting documentation indicates no environmental impact should result from the proposed injection, so EPA intends to issue the permits.

Because the four injection wells are similar and are drilled from a single well pad, the injected CO₂ will form one comingled plume. Therefore, permit provisions and plans are identical for all four wells.

Title 40 of the Code of Federal Regulations Parts 144 and 146 require EPA permits for carbon storage, known as Class VI permits, to specify conditions for the construction, operation, monitoring, reporting, plugging, post-injection site care and site closure of Class VI injection wells to prevent movement of fluid into any underground source of drinking water, or USDW. See 40 CFR Parts 144 and 146 for the general provisions of underground injection permits.

Here, in accordance with 40 CFR 124.8, is general information and highlighted permit conditions specific to these wells.

Area of Review and Corrective Action: In accordance with 40 CFR 146.84, the Area of Review, or AoR, is the area surrounding the injection wells where any improperly sealed, completed or abandoned wells that penetrate the confining rock zone could provide a conduit for fluid migration. The AoR for these wells has a radius of approximately 24 miles and was delineated pursuant to 40 CFR 146.84(c)(1) using a model that predicts the movement of the CO₂ plume and pressure front based on information about planned injection and the subsurface rock. See the figure on the sixth page.

Three wells within the AoR penetrate the confining rock zone – a properly constructed test well installed by FutureGen and two wells approximately 16 miles from the injection site that have been properly plugged.

As required at 40 CFR 146.84(e), FutureGen will re-evaluate the AoR by re-running the models at least every five years over the life of the project to verify, based on monitoring and operating data, that the CO₂ plume and pressure front are moving as predicted. If there are any changes from predictions, FutureGen must revise the project-specific plans described here and EPA will modify the permits per 40 CFR 144.39.

Underground Sources of Drinking Water: USDWs are defined by UIC regulations as aquifers or portions thereof which contain less than 10,000 milligrams per liter of total dissolved solids and are being used, or could be used, as a source of drinking water. The base of the lowest USDW near the wells, the St. Peter Sandstone formation, is 1,942 feet below ground.

Injection and Confining Zone: Injection is limited to the Mount Simon and Eau Claire rock formations between 3,785 feet and 4,432 feet below ground. This zone is separated from the lowest USDW by 1,843 feet of rock, including an impermeable confining zone as a barrier to fluid movement. EPA has reviewed company information, including maps, well logs, cores and the results of seismic surveys, and determined that geologic features will allow the Mount Simon formation to receive the amounts proposed to be injected without fracturing, and that the confining zone will provide a suitable trap so that the CO₂ will remain in place and USDWs will not be endangered, as required under 40 CFR 146.83.

Construction Requirements: Proposed construction of the wells meets the regulatory criteria of 40 CFR 146.86. All Class VI wells must be constructed with materials and cements that can withstand exposure to CO₂ and CO₂/water mixtures without excessive corrosion over the life of the project. Class VI wells must also be cased and cemented to prevent the movement of fluids into or between USDWs. The wells will be equipped with an automatic surface shut-off device that will shut off the well if any permitted operating parameters – such as injection pressure – diverge from permit limitations. FutureGen may not commence construction, including drilling, of any new well until a final permit has been issued and is effective.

Injection Fluid: The permits limit injected fluid to CO₂ from the Meredosia Power Plant. Captured emissions will be passed through a purification and compression unit, and then transported through an underground pipeline to the wells. The fluid will contain trace impurities but will be 97 percent CO₂. FutureGen anticipates injecting a total of 22 million metric tons of CO₂ over 20 years.

Maximum Injection Pressure: The maximum injection pressure will be limited to 2,237 pounds per square inch gauge at 3,850 feet to ensure that the pressure during injection does not initiate fractures in the injection or confining zones, pursuant to 40 CFR 146.88(a). This in turn ensures that the injection pressure will not cause the movement of injection or formation fluids into a USDW as prohibited by 40 CFR 146.86(a).

Monitoring and Reporting Requirements: In accordance with 40 CFR 146.90, FutureGen will implement an approved Testing and Monitoring Plan. The company will analyze the CO₂ monthly to provide information about its characteristics. FutureGen must also demonstrate well integrity before injection begins and throughout injection operations. FutureGen must conduct and pass a two-part mechanical integrity test, in

accordance with 40 CFR 146.8 and 146.89, before EPA will authorize FutureGen to inject. After injection begins, the company will continuously observe and record injection pressure, flow rate and volume and pressure on the annulus to detect any leaks in the casing, tubing or packer. FutureGen must also demonstrate external mechanical integrity using a temperature or noise log, or other approved method, yearly to detect any fluid movement behind the casing. FutureGen will test the wells for signs of corrosion quarterly to provide early warning of well material corrosion due to contact with CO₂ in the presence of water that could compromise the well.

FutureGen will also monitor the environment near the wells to verify that the project and the injected CO₂ are behaving as predicted. The company must perform groundwater quality monitoring throughout the AoR quarterly for the first three years, then on a semi-annual or annual basis, to detect geochemical changes that may be a result of changes – such as leaching or mobilization of heavy metals and organic compounds or fluid displacement – that could impact USDWs. Pressure fall-off testing will be performed at least every five years to verify that the injection zone is responding to injection as predicted. FutureGen will also track the movement of the CO₂ plume and pressure front using direct methods (e.g., pressure measurements) and indirect methods (e.g., passive seismic monitoring) to verify that the CO₂ plume and pressure front are moving as predicted or to provide early warning if they are not.

In accordance with 40 CFR 144.54 and 146.91, FutureGen will submit results to EPA semiannually or within 30 days of the completion of a mechanical integrity test or other required testing.

Emergency and Remedial Response: In accordance with 40 CFR 146.94, FutureGen developed a site-specific Emergency and Remedial Response Plan that identifies resources that may be at risk due to the injection activities, including four USDWs. The plan, an enforceable part of the permits, also describes responses that would be taken to address adverse events, and the staff and equipment available to support this and other such activities. The emergency and remedial response provisions of the permits will facilitate expedient responses and prevent or mitigate harm to the environment, including USDWs.

Financial Responsibility: In accordance with 40 CFR 146.85, FutureGen has demonstrated, and will maintain, adequate financial responsibility to perform all needed corrective action on wells in the AoR, to plug the injection wells, to perform all required post-injection site care and close the site, and to conduct any needed emergency and remedial response to address adverse events at the site. FutureGen will cover these costs and demonstrate financial responsibility with a trust fund.

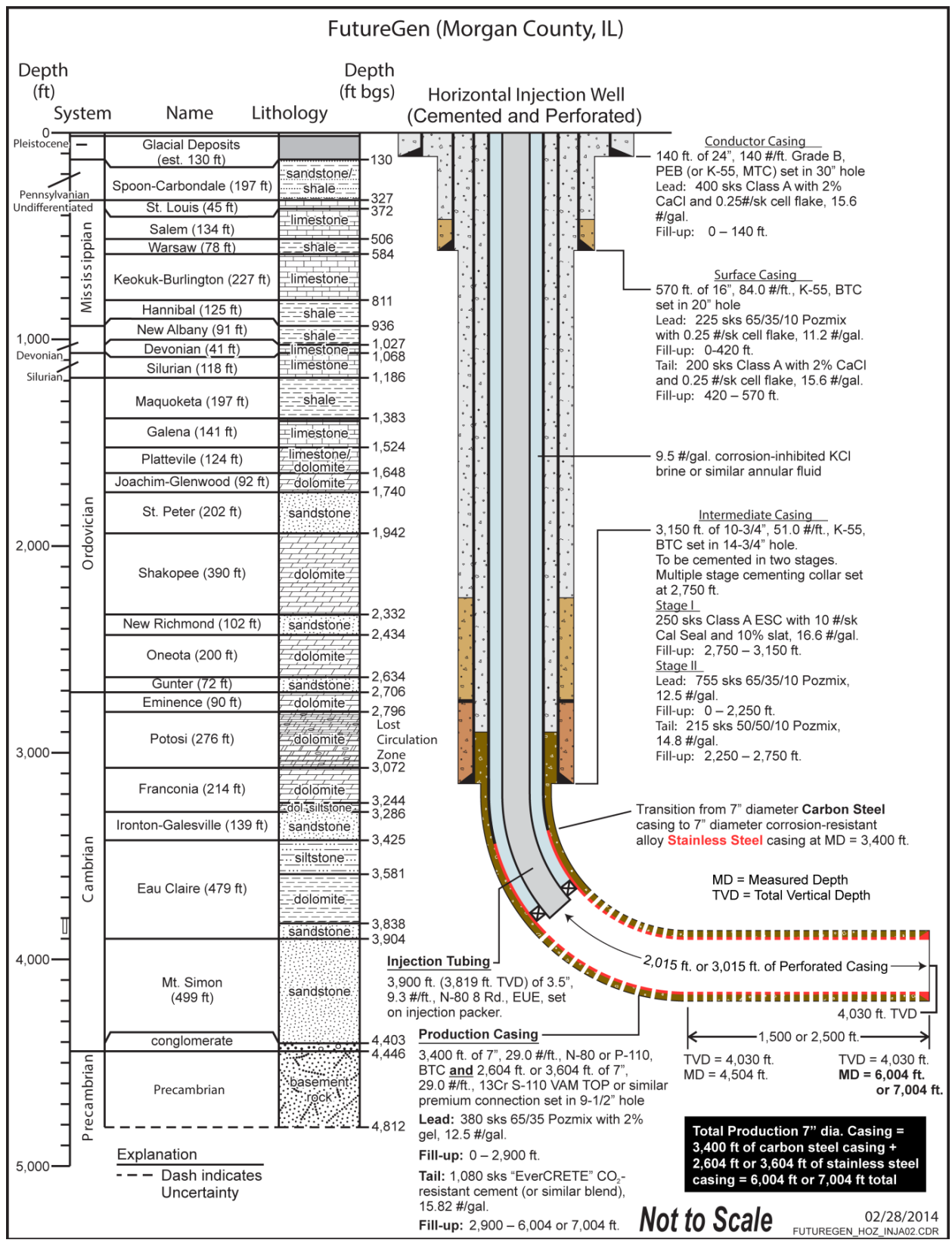
Cost estimates must be updated within 60 days prior to the anniversary date of the establishment of the financial instruments. This ensures resources are available to perform these USDW-protective activities without using public/taxpayer money.

Well Plugging: In accordance with 40 CFR 146.92, the permits include an Injection Well Plugging Plan for environmentally protective well closure at the cessation of injection operations. The wells will be plugged using approved materials that are compatible with CO₂/water mixtures to ensure the wells will not serve as a conduit for fluid movement.

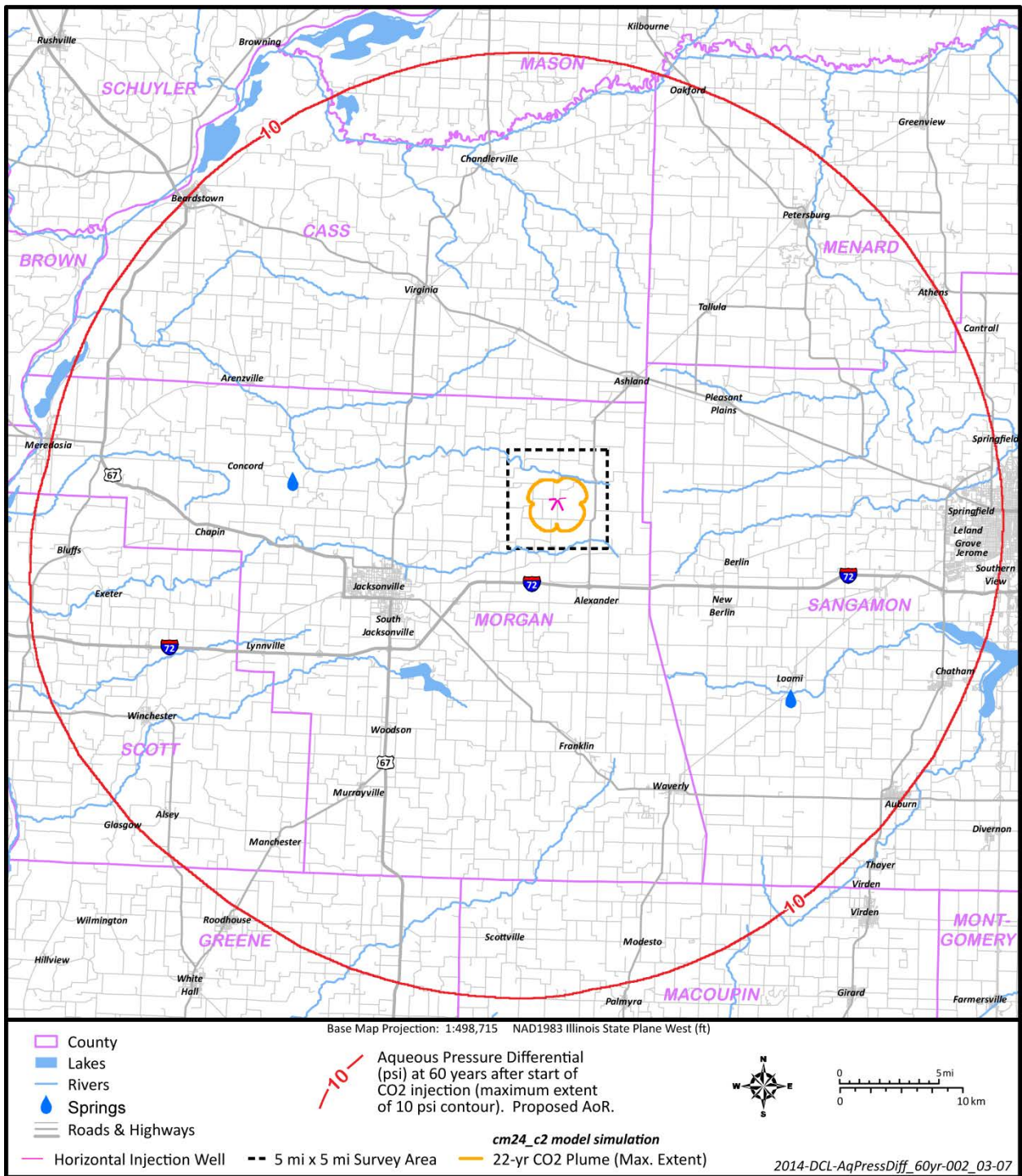
Post-Injection Site Care and Site Closure: In accordance with 40 CFR 146.93, FutureGen must implement an approved Post-Injection Site Care and Site Closure Plan. Following the cessation of injection, the company must continue to monitor groundwater quality, track the movement of the CO₂ plume and pressure front in a manner similar to that described under “Monitoring and Reporting Requirements” above. This monitoring will help confirm predictions about the behavior of the CO₂ plume and pressure front (i.e., that pressure should subside after injection ceases) and provide early warning of USDW endangerment. FutureGen will continue this post-injection monitoring for at least 50 years and until they can demonstrate based on monitoring and other site data that the site does not pose a risk to any USDWs and that site closure may be authorized. Following authorization of site closure, FutureGen will plug all monitoring wells with CO₂-compatible materials to ensure they cannot serve as conduits for fluid movement and will restore the site to its original condition by removing all equipment and planting vegetation.

Issuance and Effective Date of Permits: In accordance with 40 CFR 124.15, the permits will become effective immediately upon final issuance if no public comments are received during the public comment period that request a change in the draft permits. However, if public comments are received that request a change in the draft permits, the final permits will become effective 45 days after the date of issuance unless the permits are appealed.

In accordance with 40 CFR 144.36(a), the permits will be in effect for the life of the project unless they are otherwise modified, revoked and reissued, or terminated as provided at 40 CFR 144.39, 144.40 and 144.41. The permits will expire in one year if FutureGen fails to commence construction, unless a written request for an extension of this one year period has been approved by EPA. Authorization to inject under the permits will be granted following well construction and FutureGen is in compliance with additional requirements as outlined in the permits and regulations at 40 CFR 146.82, 146.86, 146.87 and 146.89.



For reference, the deepest underground municipal water supply wells in Jacksonville are 95 feet.



Area of Review (10 psi circle) and 22-year CO₂ plume