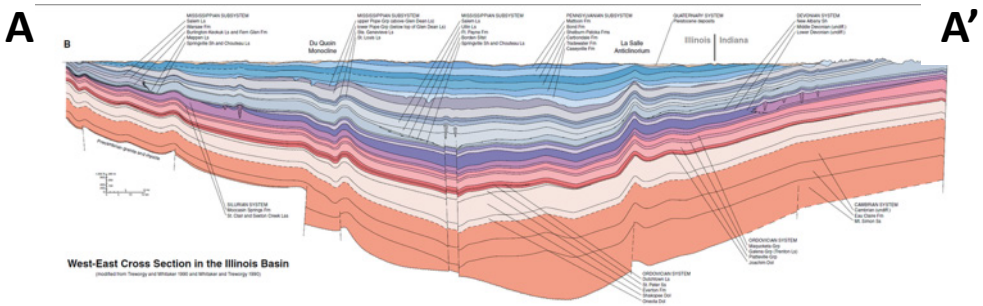
CCUS at Decatur, Illinois: Past, Present, Future

CCS Technical Workshop 2026

Sallie E. Greenberg, Ph.D.

Pioneering Carbon Storage Decatur, Illinois, USA

- **Objective: Safely operate advanced CCS technologies at industrial scale**
- **First U.S. Class VI permits (CCS#1, CCS#2) in operation**
- First injection (2011-2014), second injection since 2017
- **~5 million tonnes of CO_2 from biofuels stored in the Mount Simon Sandstone (2,000 m deep)**
- **Comprehensive monitoring and site characterization**
- Team of 100+ people from 10+ organizations
- 1,000+ visitors from 30 countries
- Illinois Basin Decatur Project Final Report: (https://www.osti.gov/biblio/1806192)



Graphics and information from the Illinois State Geological Survey

ADM's CCS Journey in Decatur, IL

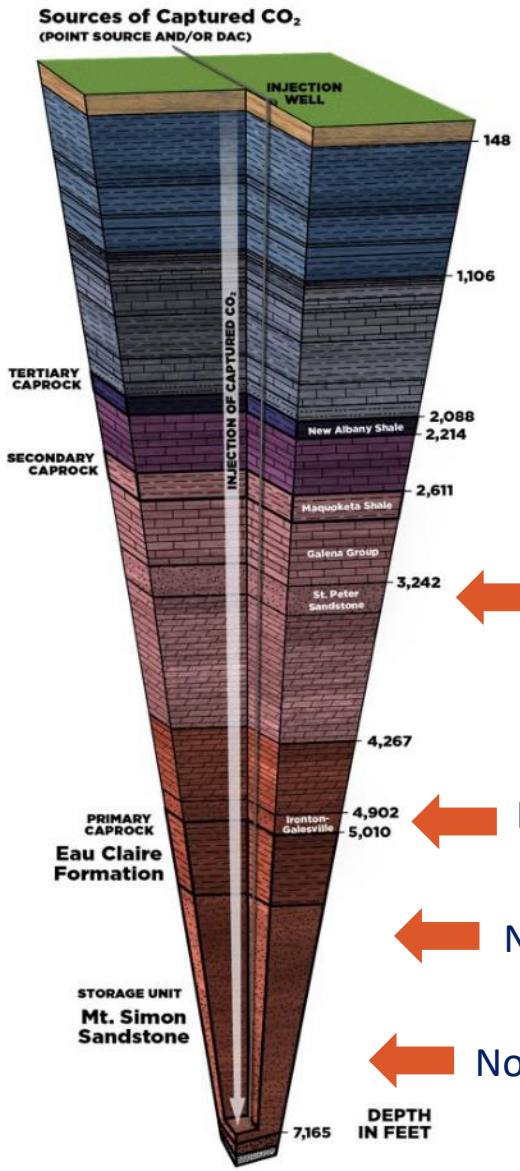
Almost 5 Million Metric Tons Injected to Date

2007 – DOE research grant begins
2010 – DOE grant for IL basin pilot CCS begins
2011 – CCS1 injection online
2014 – CCS1 injection complete
2014 – CCS2 first Class VI permit issued to ADM
2015 – CCS1 converted to Class VI permit
2017 – CCS2 injection online
2022 – Class VI expansion permits for Decatur submitted
2023 – Broadwing project announced
2024 – CCS2 injection paused due to fluid migration
2025 – VW2 and VW1 monitoring wells recompleted
2025 – CCS2 injection restarted

Illinois Basin Geology

(Near Decatur, IL)

Source: Modified from 2022 PRI CCUS Report



= Decatur monitoring zones

Shallow aquifers (<60 m)

Non-potable water

Lowermost Underground Source of Drinking Water (~1,000 m)

Non-potable water (~1,500 m)

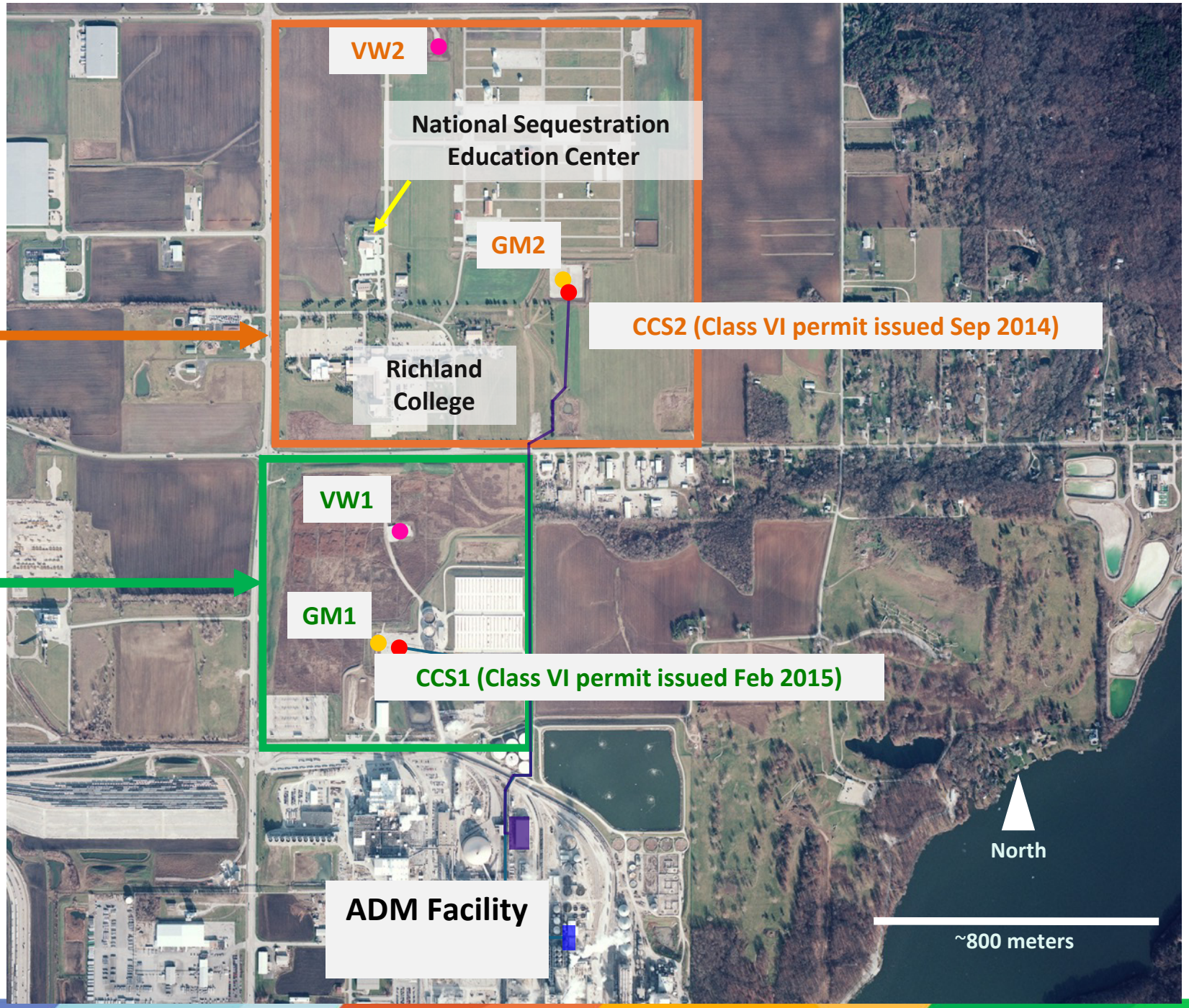
Non-potable water (~1,700 m)

Non-potable water (~2,000 m)

Decatur Storage Sites

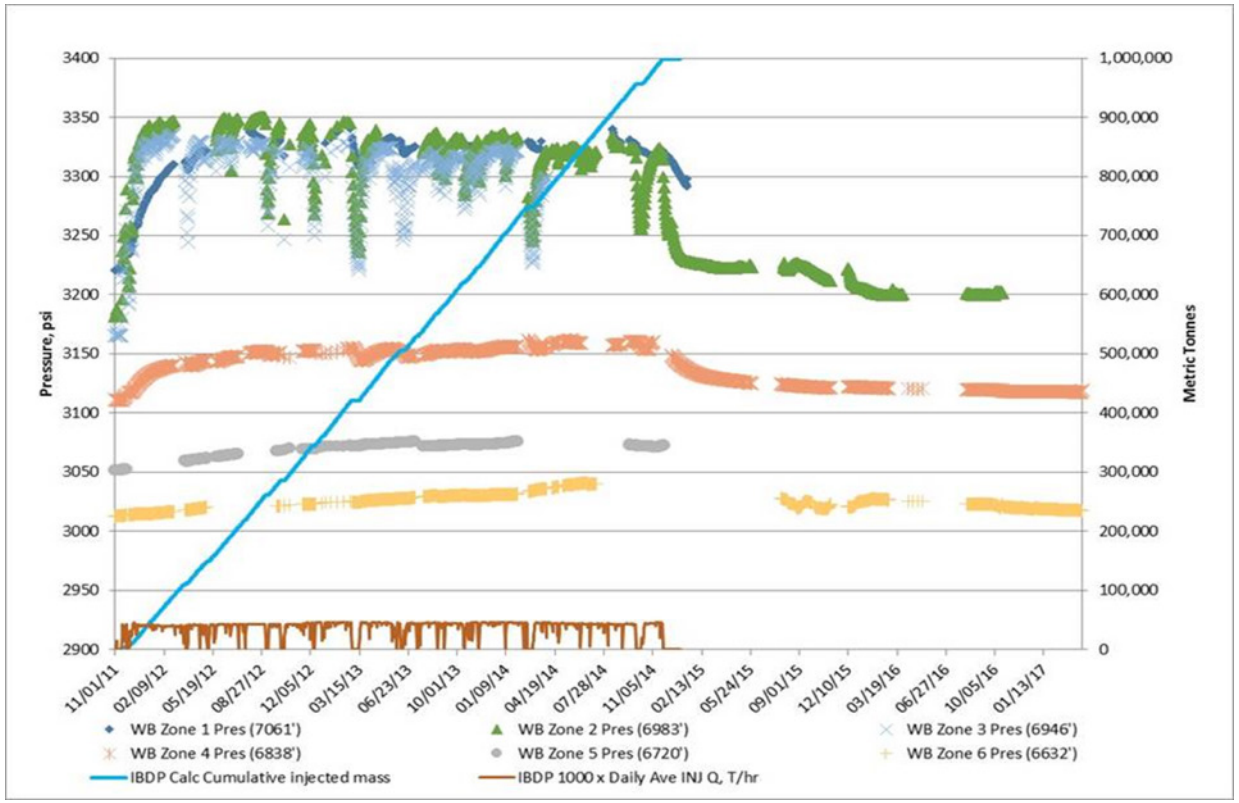
Illinois Industrial Sources CCS Project
2nd and ongoing injection
3.8MT
(2017-present)
Paused from September 2024-August 2025

Illinois Basin - Decatur Project
1st injection
1MT
(2011-2014)



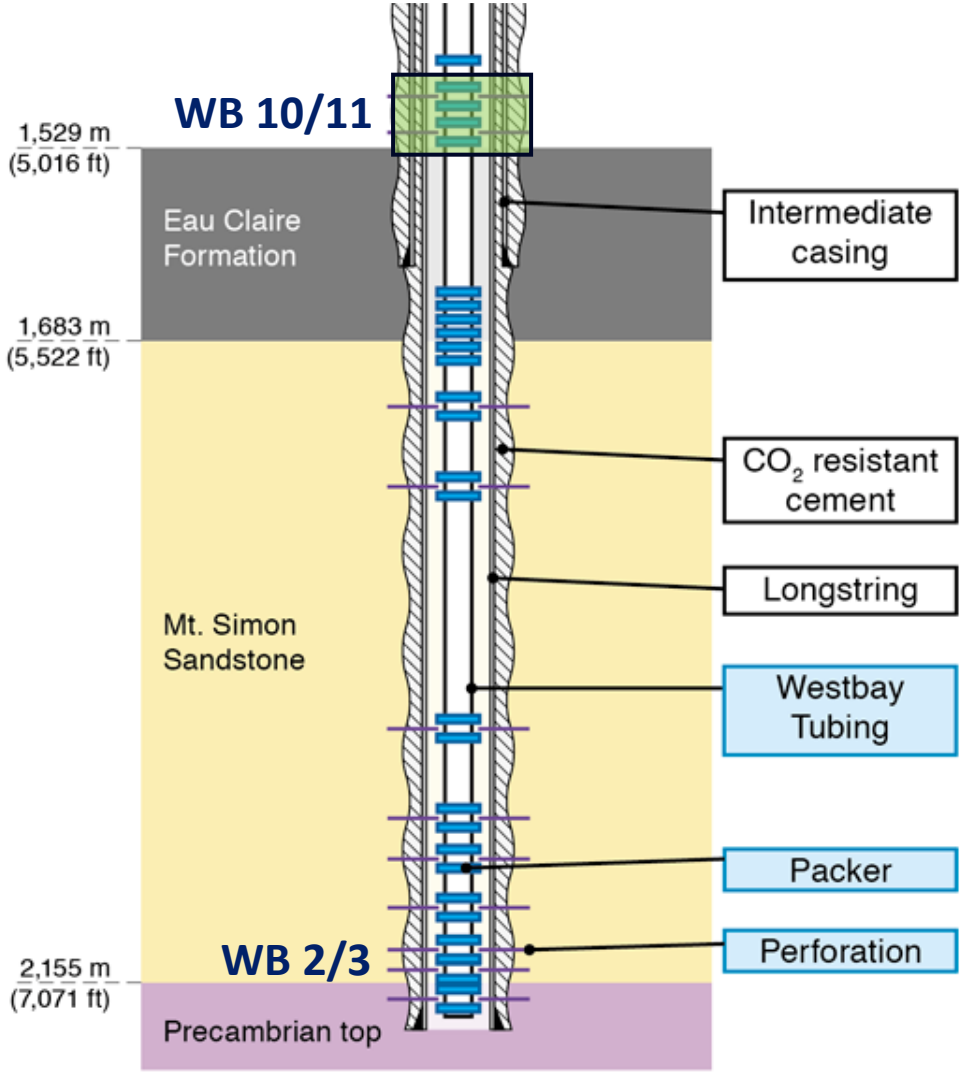
Deep Monitoring Wells (VW1 and VW2)

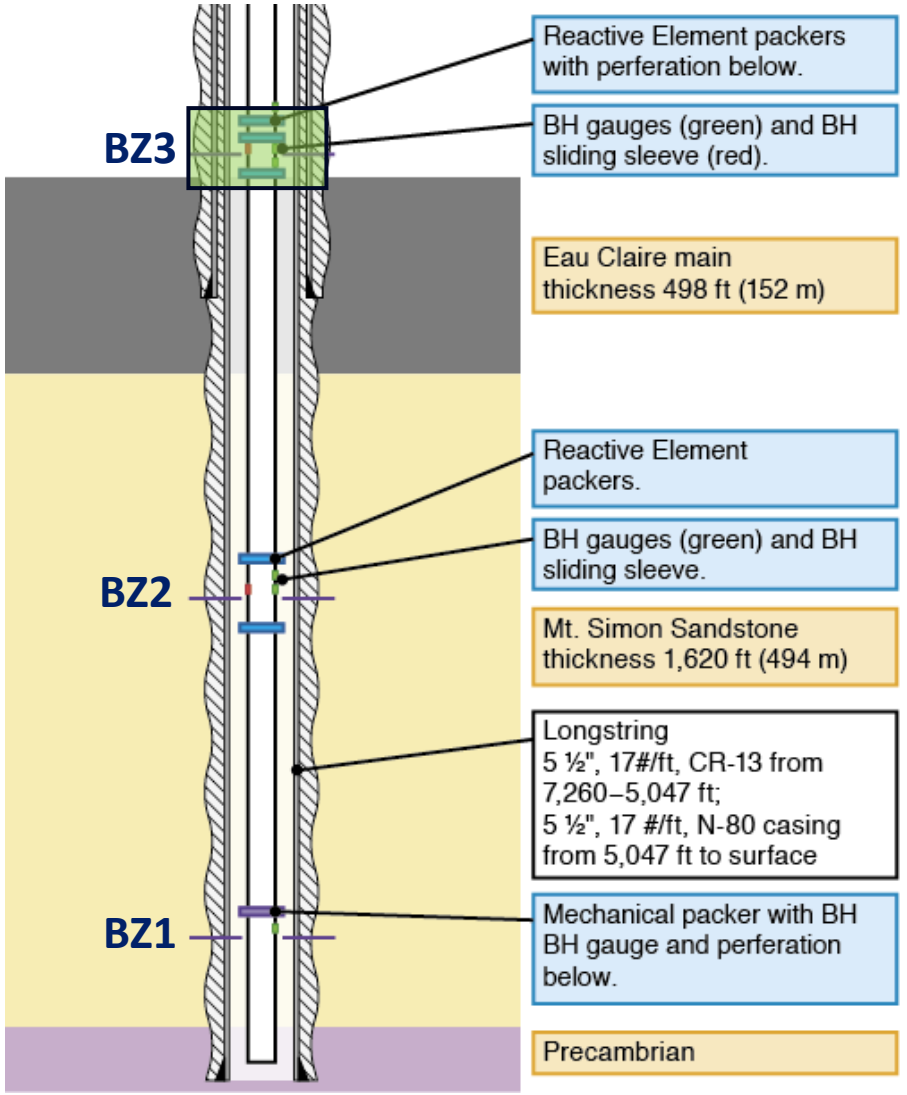
- Designed to meet research, operational, and regulatory objectives
- Designs reviewed and accepted by multiple groups including federal regulatory agency
- Multi-zone monitoring in single well
- Fluid monitoring by multiple methods (e.g., pressure, logging, sampling)
- Yielded important information (e.g., vertical pressure attenuation)



VW1 Pressure responses to CCS1 injection (2011-2014)

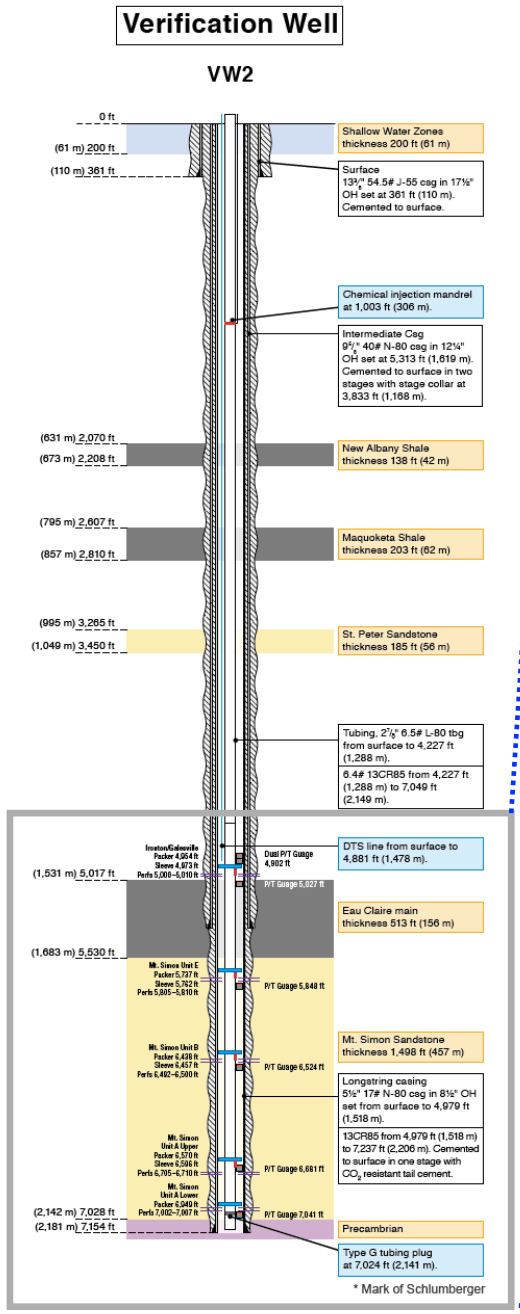
VW1 Completion evolved (2011-2025)

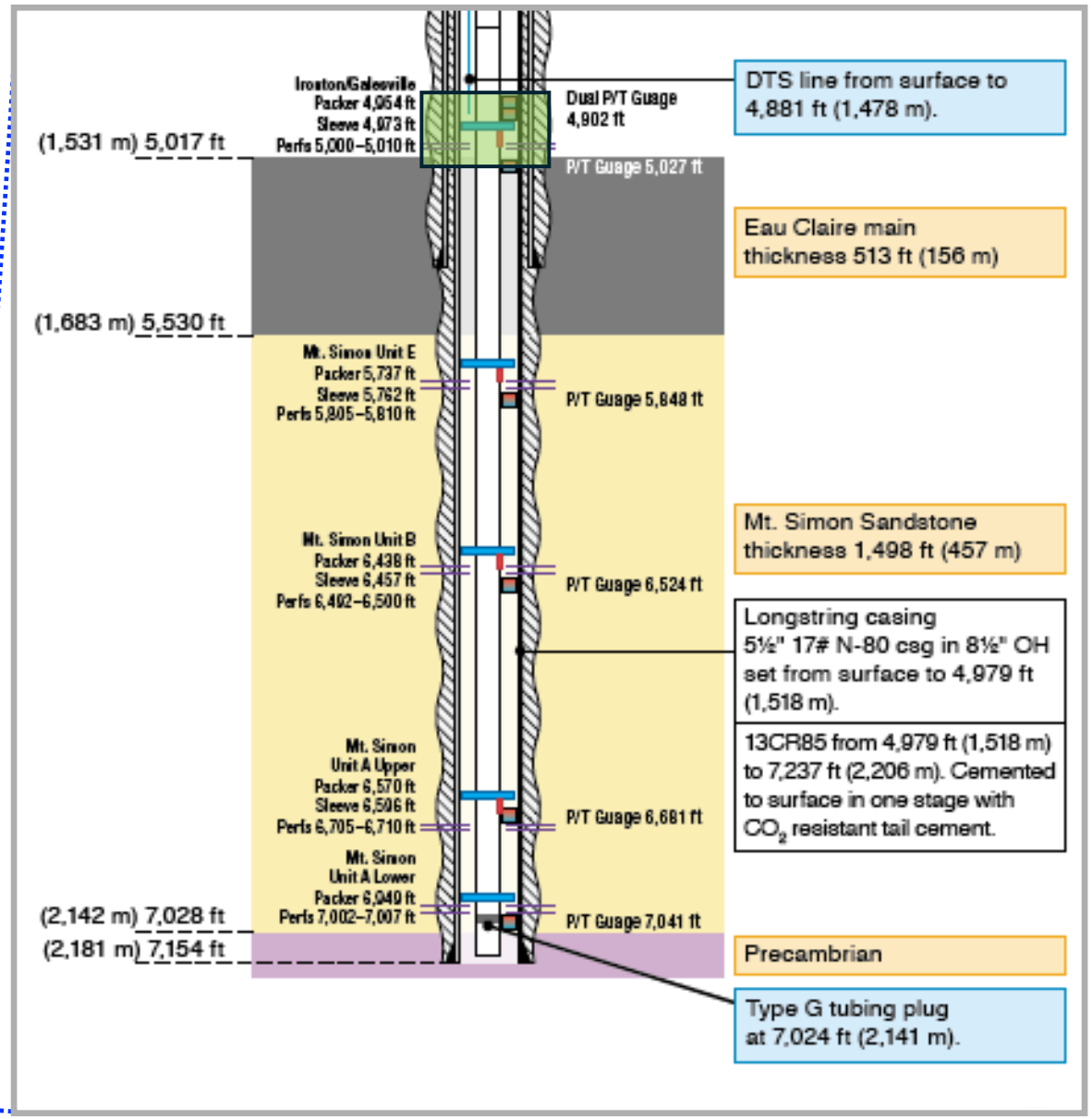




VW2 – Initial Completion

- Completed in 2012
- 5 perforated zones
  - 1 in Ironton Galesville
  - 4 in Mt. Simon
- 13Cr sliding sleeves (4) and HNBR packers
- 13Cr tubing (1,288 m-2,149 m)
- 13Cr longstring (1,518 m-2,206 m)





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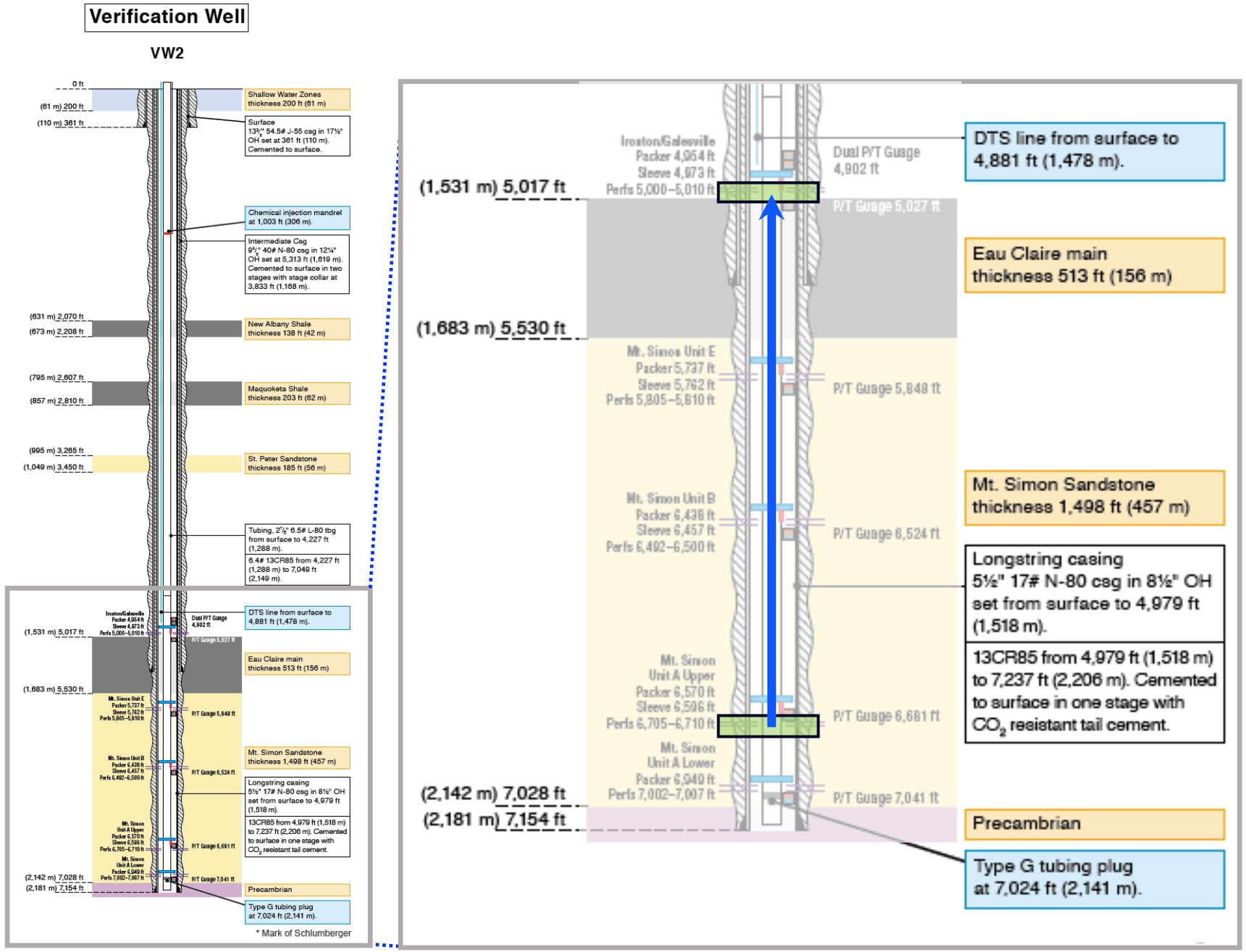


Monitoring Well Indicators and Actions

- Intermittent instrumentation issues identified first – gauges
  - Used back up systems (including other deep wells) for monitoring – manual pressure measurements
- Sampling mechanism and pressure testing impeded
  - Well intervention necessary and tubing was pulled
- Tubing corrosion, tubing integrity compromised
  Anomaly detected directly above caprock @ ~5,000 feet depth
  Fluid migration and CO_2 detected and confirmed by sampling
  - Set temporary bridge plugs to isolate Ironton-Galesville from Mt. Simon
  - Sampling, modeling, and remediation engaged in accordance with USEPA
  - Conducted fluid migration assessment and recompleted the well

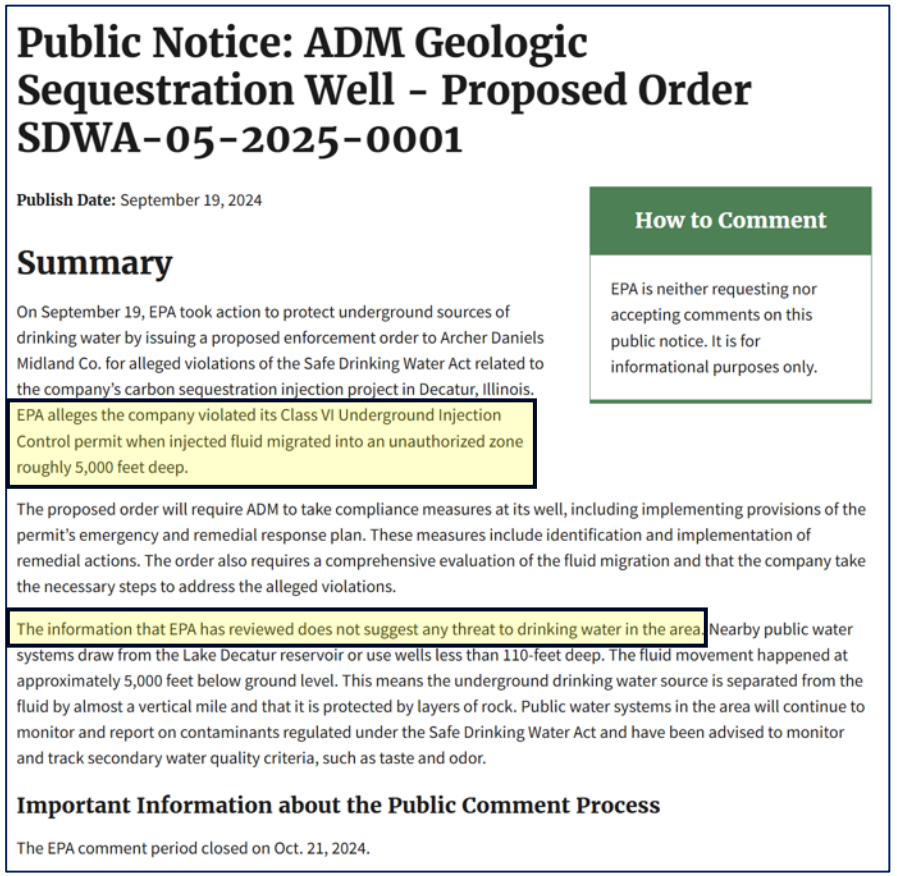
Verification Well Mechanical Integrity Inspections

- ADM proactively paused injection at CCS2 (September 2024)
- USEPA issued an Administrative Order on Consent (AOC) requesting analysis and information
- Pulled packers and inner tubing
- Pulse neutron, noise, caliper, and temperature logs
- Various acoustical methods based on installation and application
- Significant number of data and reference points collected
- Mechanical integrity of the verification well casings was intact

"The injected carbon dioxide and associated fluid did not discharge above ground, and there was no immediate threat to human or livestock health. Drinking water was not threatened…"

Regulatory Actions

- On September 19, 2024, EPA took action by issuing a proposed Administrative Order on Consent (AOC) for alleged violations
- EPA alleges ADM violated its Class VI permit when injected fluid migrated into an unauthorized zone ~ 5,000 feet (~1,500 m) deep
- ADM required to take compliance measures at its [VW2] well, including implementing provisions of the permit's emergency and remedial response plan
- AOC ensures a "full assessment of migration of brine and injected carbon dioxide" and remedial action
- "The information that EPA has reviewed **does not suggest any threat to drinking water in the area**."
- On August 13, 2025, EPA posted final AOC



Public Notice: ADM Geologic Sequestration Well – Proposed Order SDWA-05-2025-0001

Publish Date: September 19, 2024

How to Comment

EPA is neither requesting nor accepting comments on this public notice. It is for informational purposes only.

Summary

On September 19, EPA took action to protect underground sources of drinking water by issuing a proposed enforcement order to Archer Daniels Midland Co. for alleged violations of the Safe Drinking Water Act related to the company's carbon sequestration injection project in Decatur, Illinois.

EPA alleges the company violated its Class VI Underground Injection Control permit when injected fluid migrated into an unauthorized zone roughly 5,000 feet deep.

The proposed order will require ADM to take compliance measures at its well, including implementing provisions of the permit's emergency and remedial response plan. These measures include identification and implementation of remedial actions. The order also requires a comprehensive evaluation of the fluid migration and that the company take the necessary steps to address the alleged violations.

The information that EPA has reviewed does not suggest any threat to drinking water in the area. Nearby public water systems draw from the Lake Decatur reservoir or use wells less than 110-feet deep. The fluid movement happened at approximately 5,000 feet below ground level. This means the underground drinking water source is separated from the fluid by almost a vertical mile and that it is protected by layers of rock. Public water systems in the area will continue to monitor and report on contaminants regulated under the Safe Drinking Water Act and have been advised to monitor and track secondary water quality criteria, such as taste and odor.

Important Information about the Public Comment Process

The EPA comment period closed on Oct. 21, 2024.

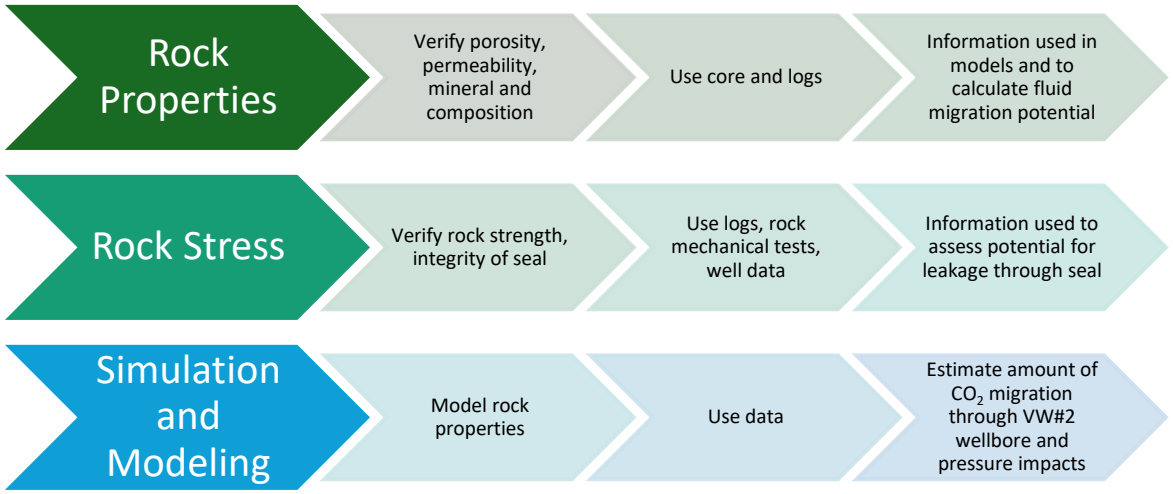
https://www.epa.gov/il/adm-geologic-sequestration-well-proposed-order-sdwa-05-2025-0001

For all actions, see USEPA Docket SWA-05-2025-0001

ADM Monitoring and Well Developments

- ADM worked closely with USEPA
- Conducted additional analyses, assessments, and modeling
- Submitted and agreed upon plan for recompleting VW2 and VW1
- Separate monitoring wells with single zone completions
  - VW1 monitors below the primary seal in the Mt. Simon Sandstone
  - VW2 monitors above the primary seal in the Ironton-Galesville
- Agreed to add another set of deep monitoring wells to Decatur site
  - VW3A and B expected to be online Q3 2026
- Submitted and agreed upon
  - Updated monitoring plan
  - Updated emergency and remediation plan
- Objective is to ensure extra barriers and safety are in place for downhole completions
- No changes to injection wells necessary
- ADM restarted injection August 29, 2025

Assessment Results



Early action

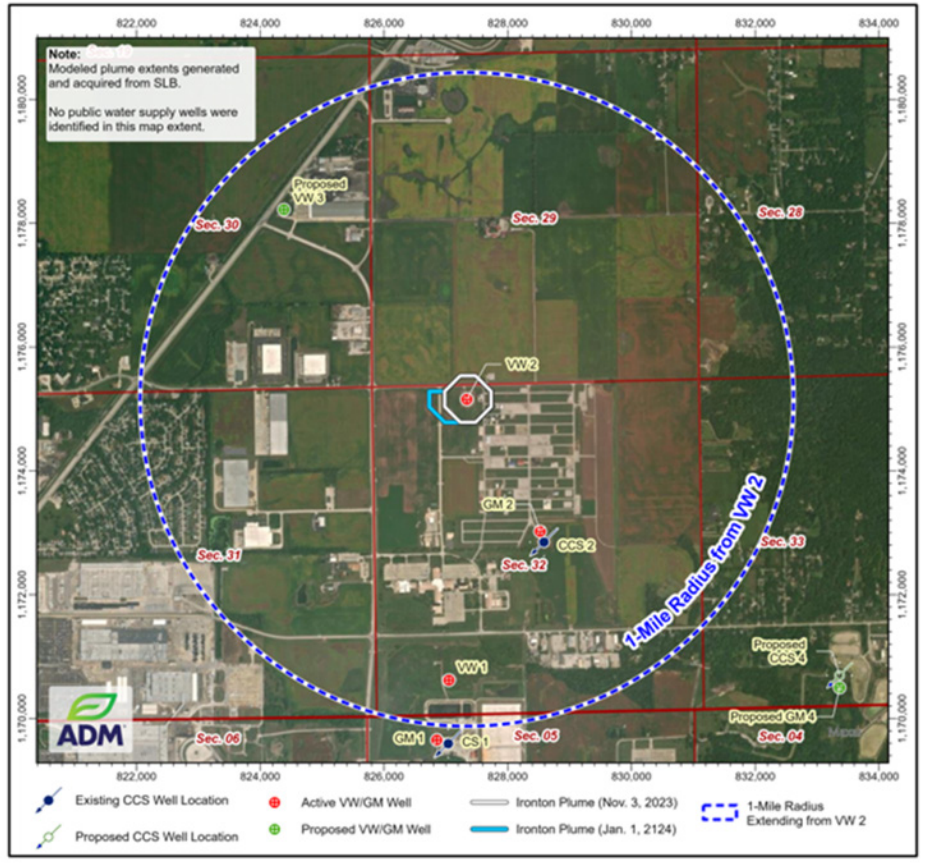
ADM paused injection and proactively assessed project infrastructure in alignment with AOC

CCS1 and CCS2 – No loss of mechanical integrity or functionality

VW1 – Well Integrity Assessment

- Well acoustics indicated the potential for fluid migration in VW1
  - EPA and stakeholders notified within 24 hours
  - Took fluid sample and identified brine with Mt Simon characteristics in Ironton-Galesville
  - No CO_2 present in sample

Assessment Results



VW2 - Fluid Migration Assessment

- Estimated **amount of CO_2** migration to Ironton-Galesville Fm (~5,000’ depth):
  between 2,670 and 3,940 metric tons
- **Vertical migration** in Ironton-Galesville Fm is negligible; **will remain in lower half** below 4,960’ after 100 years
- **Horizontal migration** in Ironton-Galesville Fm **will remain close to the well**; current radius is ~510’ and will only extend to 540’ after 100 years

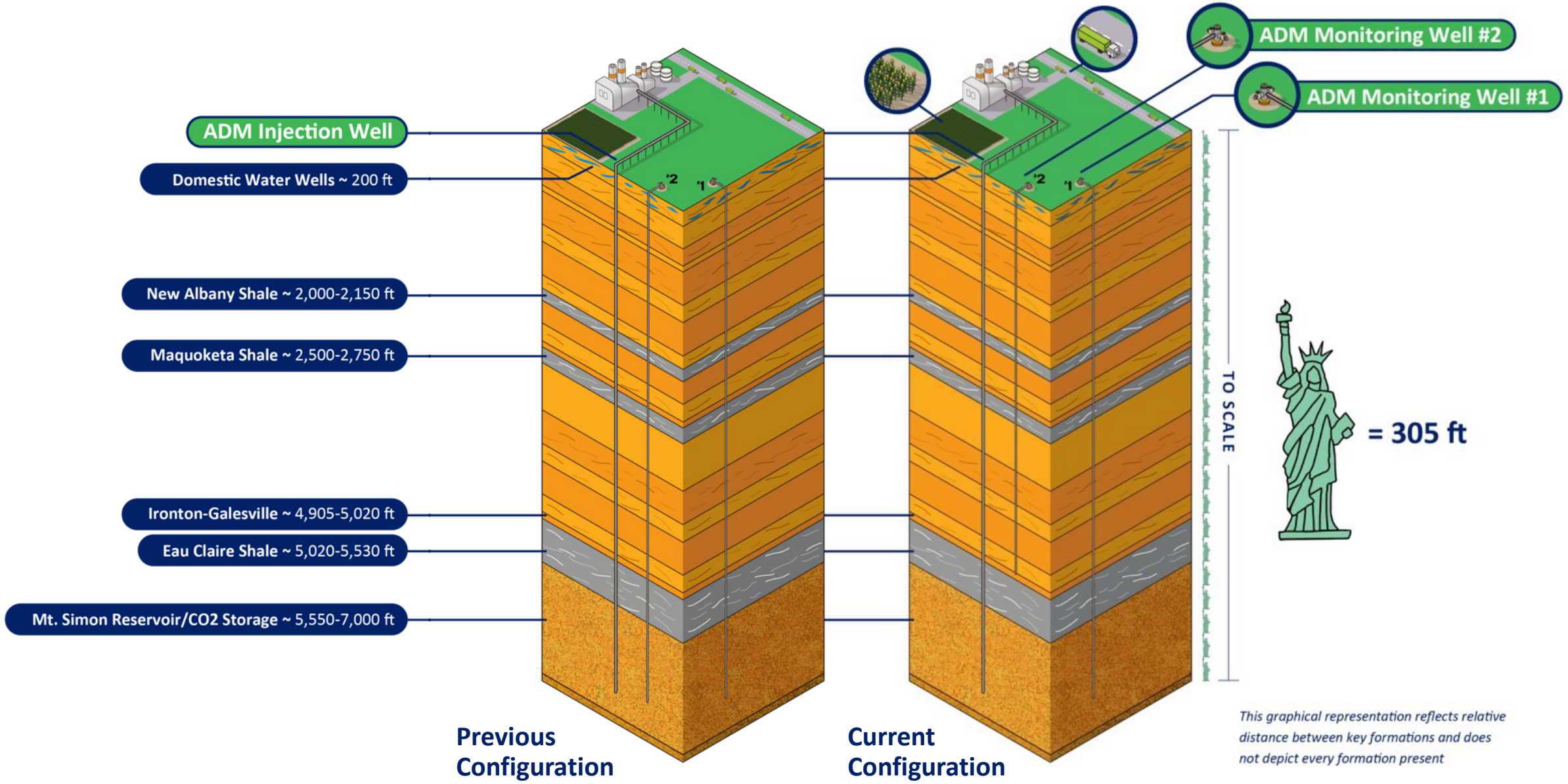
Area of Review – Secondary Seal Assessment

- Analysis of well records for wells with possible access to Maquoketa
- No identified wells within 1 mile radius of VW2 and modeled plume (shown in white and blue)
- ADM VW2 is the only well within plume or pressure front associated with CO_2 and was recompleted to monitor migrated fluid.

Alternative Monitoring Plan Outline

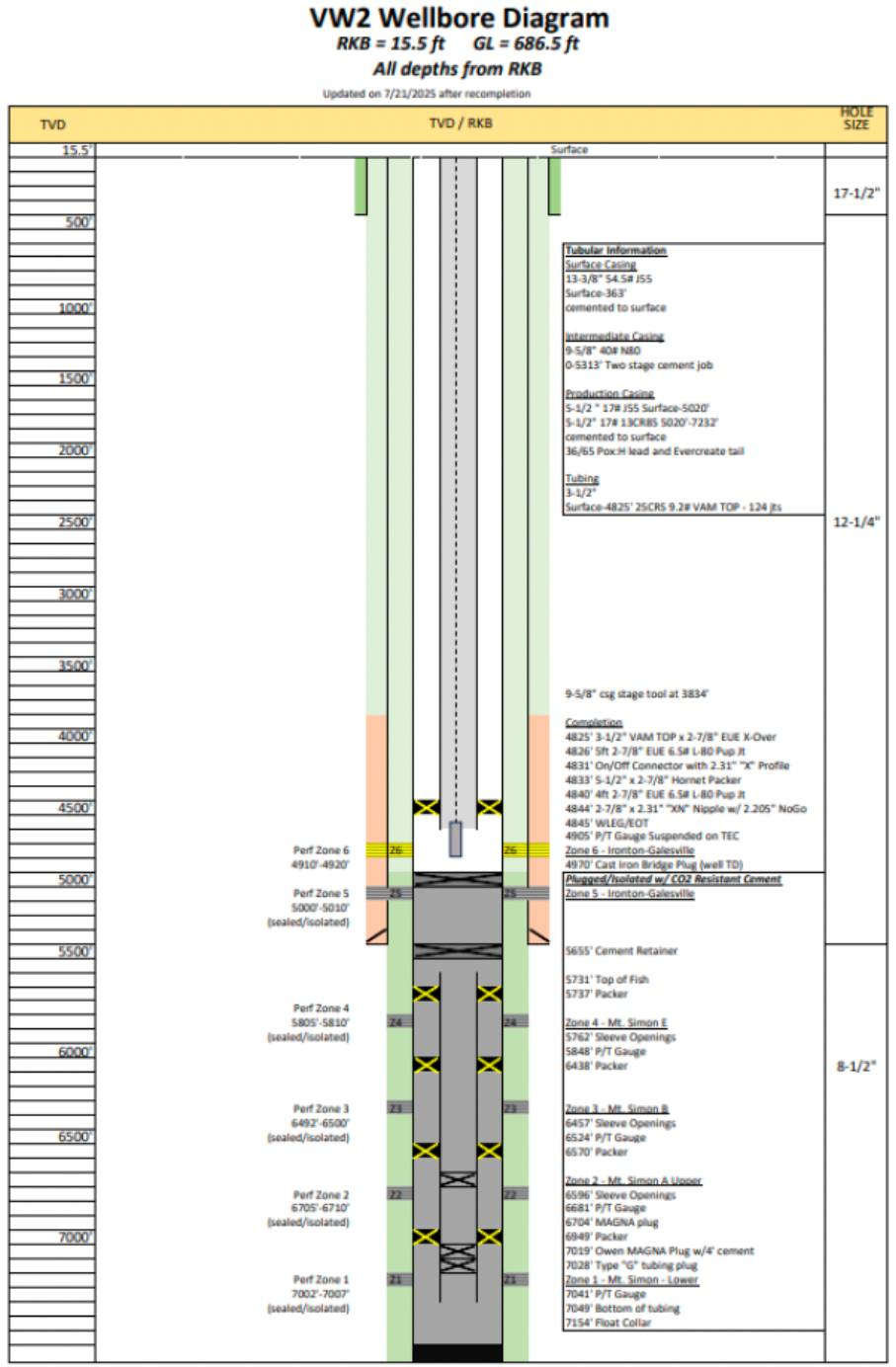
- Background information provided
- Well integrity evaluation information provided
- Proposed criteria for restarting of injection
- Recompletion and demonstration of mechanical integrity
- Alternative monitoring plan(s)
- Proposed VW1 well recompletion
- Proposed VW2 well recompletion
- Discussion of materials selection and corrosion control

ADM CCS Well Geology



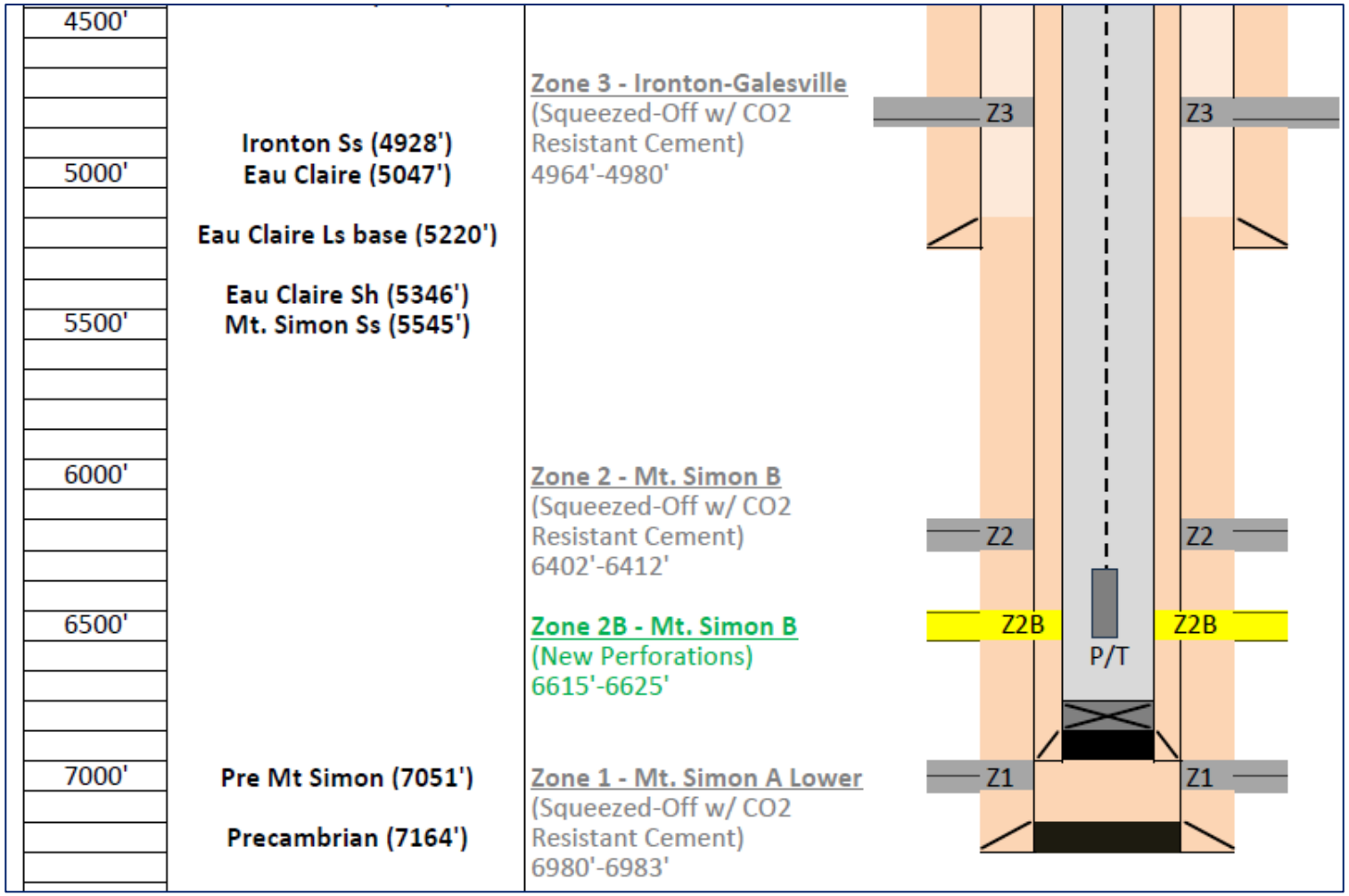
VW2 Recompletion

- Recompleted to monitoring above confining zone only
- Part of tubing unretrievable and left downhole
- Squeezed cement into existing perforations in the lower Ironton-Galesville and isolated the bottom of the well up to 4970’ with CO_2 resistant cement and a permanent bridge plug
- Installed new 25CRS tubing with Ni-coated packer
- New perforated interval: Ironton-Galesville Z6 (4910’-4920’)
- Retrievable P/T gauge suspended on TEC (~4905’) not fixed to tubing
- Permanent cast iron bridge plug @ new TD (4970’)



VW1 Recompletion

- Recompleted to monitor injection zone only
- All perforations (Z1-Z3) squeezed off with CO_2 resistant cement
- New perforated interval: (Z2B) in Mt. Simon B (6615’-6625’)
- Alloy G3 tubing cemented in place to surface with CO_2 resistant cement
- Retrievable P/T gauge suspended on TEC (~6615’) not fixed to tubing
- Permanent Bridge Plug (6724’)



Summary of Public Comments

- Expressed concern over CO_2 sequestration, environmental/health impacts, seismicity, and potential risks to drinking water supplies
- Call for additional analysis and monitoring
  - **More frequent reporting, modeling**
  - **Failure analysis and studies on corrosion-proof materials, 13Chrome**
  - **Third-party monitoring**
- Call for site-specific infrastructure changes
- Call for increased transparency
  - **Data on volume, composition, location of migrated fluid, timeline of migration, status of migration, how volumes are calculated**
- Requested actions
  - **Suspension or moratorium on EPA Class VI program, no new permits should be issued**
  - **Fines/penalties, disincentives to “cover up” activities, withholding or return of tax credits**
  - **Cease injection**
- General and Out-of-Scope comments

Restart

- Monitored downhole pressure during downtime
- Maintained downhole pressure above native pressure during downtime without intervention
  - Ensured integrity of injection well
- Injection zone returned to baseline pressure profile very quickly
- Operation returned to full rate within a few weeks
- October was one Decatur’s highest volume injection months ever

Key Learnings from Illinois Experience

Initial Learnings

- Storage of CO_2 is safe, viable, and important for climate mitigation strategies
- Geology critical key factor
- Baseline environmental assessments are necessary
- Simplicity is key success factor
- Regulatory framework is in place to ensure safe storage
- Scientific and engineering require alignment with policy
- Pilot and demonstration projects provide critical insights

Recent Regulatory Insights

- Demonstration of the rigor and robust regulatory framework to protect USDWs
- Multi-zonal monitoring may create migration pathways
- VW1 and VW2 originally for research and development demonstrations and have provided important insights
- VW1 and VW2 developed using best available technology at the time wells were designed 13Chrome considered appropriate for construction
- Continued engagement and dialogue with regulator is critical
- Continued transparent stakeholder engagement important

CCS Community Learning Events

- Self-paced expo style engagement
- Access to knowledgeable experts
- Showcase National Sequestration Education Building
- Answer questions

ADM's CCS Journey Continues…

Coming soon to Decatur:

- Natural gas cogeneration with post-combustion capture and sequestration
- New CO_2 capture value chains and modes of transport
- Novel CO_2 utilization projects
- Expanded sequestration capacity

ADM, Super6 Carbon Announce Plans to Produce CDR Credits in Decatur

CHICAGO—ADM (NYSE: ADM) and Super6 Carbon, Inc. (Super6 Carbon) signed a non-binding memorandum of understanding to produce high-quality carbon dioxide removal (CDR) credits through the permanent storage of captured carbon dioxide (CO_2) at ADM's carbon capture and storage (CCS) site in Decatur, Illinois.

Super6 Carbon develops engineered CDR projects and builds the carbon infrastructure required for permanent CO_2 storage. The company focuses on credit

Google backs US gas power plant with carbon capture for Midwest data centers

By Laila Kearney

October 23, 2025 1:39 PM CDT · Updated October 23, 2025

Reuters

Questions

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