



Washington County, Colorado

PROJECT OVERVIEW AND DATA COLLECTION SUMMARY

The proposed Yuma and Sterling Ethanol Carbon Capture and Storage (CCS) project would capture 350,000 metric tons of carbon dioxide emissions annually and store it in a geologic formation over 4,000 feet underground.

In April of 2023, Carbon America drilled a geologic sampling well to scientifically validate a proposed underground storage site on Colorado State Lands about 10 miles southwest of the Yuma plant. The 25-day drilling operation collected three primary forms of data – well logs, core samples and fluid samples – which are analyzed by independent laboratories to determine if the CO₂ injection site meets EPA standards.



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25

Days of operation

5120

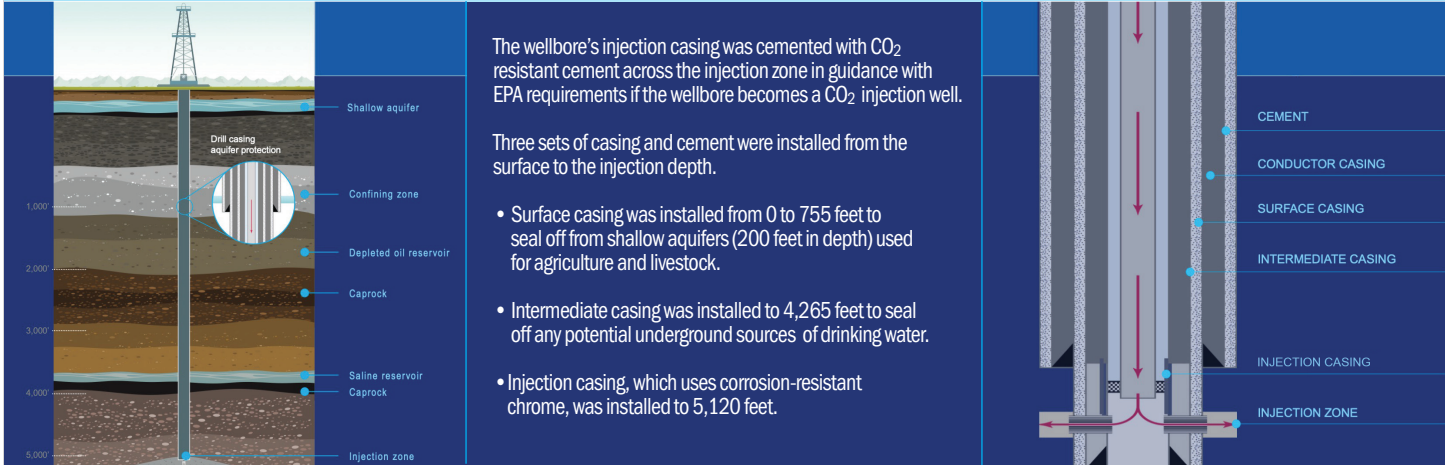
Total depth in feet

0

Number of injuries

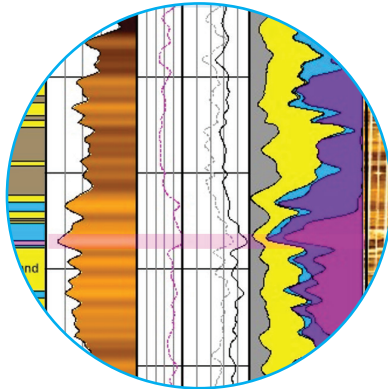
HOW DRILLING IS PERFORMED FOR A GEOLOGIC SAMPLING WELL

A drilling rig is used to drill a geologic sequestration well with an injection option. The Denova well has a 17.5-inch surface open hole in which a 13.5-inch casing was run to total depth of 5,120 feet. Several smaller diameter holes were drilled in the intermediate section. The wellbore is sealed from underground water aquifers with a series of steel casing and cement barriers.



RESERVOIR CHARACTERIZATION AND GEOLOGICAL EVALUATION

A series of tools are lowered into the wellbore to collect geological data of the proposed CO₂ injection site. The collected data is being analyzed by several independent laboratories with results expected by the end of 2023. Preliminary results validate the site for CO₂ injection and proceeding with EPA permitting.



Well Logs

Elemental detectors and imaging tools are used to characterize geologic layers, water quality and to evaluate the presence of fractures or faults in the cap layers to confirm the trapping of CO₂. Log data is used to detect natural stresses on the rock that have the potential to create induced seismicity.



Core Samples

A special drill bit extracts physical rock samples in a cylinder shape. Core samples are used to characterize the ability of CO₂ to spread within the storage layer and whether the cap layer will stop CO₂ from rising to the surface. Once collected, rock strength and chemical makeup are also determined to test how the CO₂ will interact and mineralize after being injected.



Fluid Samples

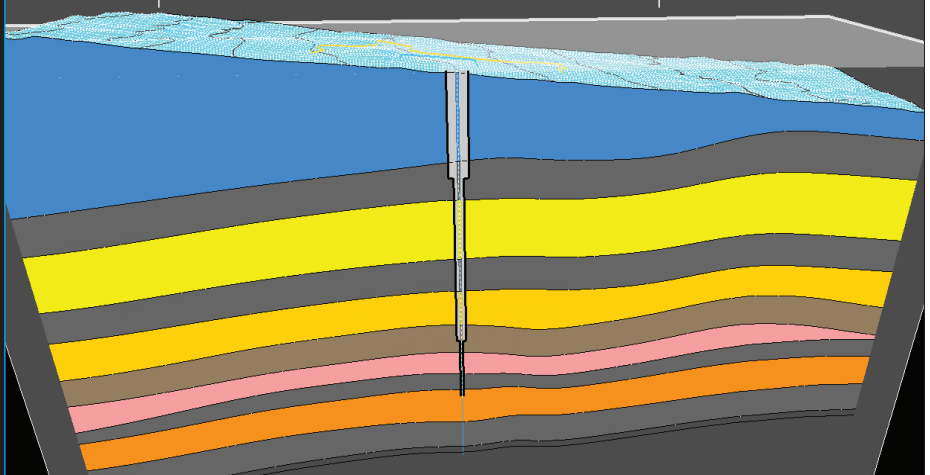
Samples are collected from each water bearing zone to determine the quality of the water within the rock layers. Water chemistry is analyzed, including salinity (the salt content) and total dissolved solids (TDS). The EPA considers a TDS of 10,000 mg/l or more unsuitable for future drinking water. The samples also create a baseline for future monitoring programs.

EPA CLASS VI WELL REQUIREMENTS

The injection of carbon dioxide (CO₂) into deep rock formations is regulated by the EPA's Class VI well requirements, which are designed to protect underground sources of drinking water (USDWs) and are more stringent than permits for hazardous material injection. Preliminary data, which is being analyzed by third-party laboratories, met the requirements for Class VI permitting. Carbon America expects to submit its 1,500-page Class VI application by spring 2024. A high-level summary is below.

Classification	EPA Specification	Result
WATER QUALITY Fluid in injection zone is considered too salty by EPA for drinking water use.	Aquifers with total dissolved solids (TDS) of 10,000 mg/l or higher deemed undrinkable.	☑
FAULTS AND FRACTURES Injecting CO ₂ will not cause earthquakes and there are no leakage pathways.	No observed faults or fractures within the injection zone or confining zone.	☑
CAP ROCK Will trap CO ₂ and keep it from rising to the surface.	Layer of impermeable rock overlaying injection zone.	☑
INJECTION ZONE CO ₂ will fill the permeable reservoir rock and be permanently trapped in the storage zone.	Space between sandstone grains for CO ₂ storage.	☑
AQUIFER PROTECTION Classification and protection of aquifers by well casing and confining rock layers between lowest fresh aquifer and injection zone.	Injection well with multiple layers of casing to protect lowest USDW.	☑

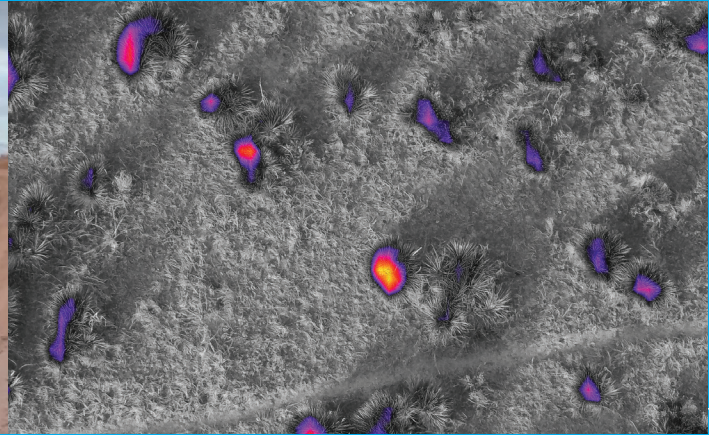
A three-dimensional (3D) geological model is an evidence-based spatial computer representation of the Earth's subsurface geology. Geologists use 3D models to measure the depth and characterize the details of each rock layer.



GREATER PRAIRIE CHICKEN FIELD STUDY

Carbon America performs extensive environmental scoping for every project. For the Denova strat well, this included partnering with Colorado Parks and Wildlife (CPW) to conduct the first ever drone survey for the Greater Prairie Chicken on private property that CPW had not previously accessed.

Using infrared drone cameras, the entire project area was surveyed remotely, as to not disturb the male prairie chickens, which create a “dance circle” during breeding season to attract a female. The heat registrations on the image below are normal for sun reflection on plants. The survey confirmed the project site was not in the prairie chicken’s habitat zone.



DRILL PAD RECLAMATION

After drilling operations are completed and the drill rig has been removed from the site, Carbon America contractors performed several reclamation projects to restore the habitat surrounding the drill pad. Activities included:

- Preserving all topsoil disturbed during drilling operations
 - Temporarily cap the wellhead
- Fencing around the well pad to protect cattle grazing
 - Reseeding to restore natural vegetation

