

CarbonSAFE Eos: Developing Commercial Sequestration for Southern Colorado (FE0032342)

Phase III, Site Characterization and Permitting
Estimated Q3 2024 start, duration 36 months total

Prime: Colorado School of Mines: Manika Prasad (PI), Jessica Smith, Yu-Shu Wu

Partners: Carbon America: Chris Cassle (PI) and team

LANL: Bailian Chen, Prashant Sharan, Ting Chen, and team

Seismic Science LLC: Jyoti Behura

Contact: mprasad@mines.edu

U.S. Department of Energy
National Energy Technology Laboratory
FOA 2711
August 6, 2024



SEISMIC SCIENCE

Project Leads



Principal Investigator

Manika Prasad

- Project management
- Rock physics and Geomechanics (formation seal integrity)
 - Reservoir Imaging
- Reservoir Modeling and Simulation
- Community Benefits



Principal Investigator

Chris Cassle

- Project Management
 - Data acquisition
- Class VI Permit Development
- Storage Field Development Plan
 - Business and Financial Plans
 - Pipeline FEED study
 - NEPA EIV



Project Leads



Organization Lead

Bailian Chen

- CO₂ Source Feasibility Study
 - Capture Technology Study
- Class VI permit development support
 - Storage Field Development Plan
 - Pipeline FEED study
 - NEPA

SEISMIC SCIENCE



Organization Lead

Jyoti Behura

- 3D Seismic Data Imaging
- Reflection full-waveform inversion (FWI)
- Least-squares reverse-time migration (LSRTM)

Project Overview



COLORADO SCHOOL OF
MINES

**Carbon
America**



Los Alamos
NATIONAL LABORATORY

SEISMIC SCIENCE



CarbonSAFE Eos: Developing Commercial Sequestration for Southern Colorado

Project goal to characterize a sequestration fairway for commercial storage hub operations, incorporating two-way engagement and consent-based siting principles in a “Made in Colorado” project.

Prime Recipient: Colorado School of Mines (Mines)

Key Personnel: Manika Prasad (PI), Yu-Shu Wu & Jessica Smith, Mines
Chris Cassle, Carbon America
Bailian Chen, LANL
Jyoti Behura, SSL

Requested Funds: \$32,671,554

Cost Share: \$8,167,888

Total Project Cost: \$40,839,442

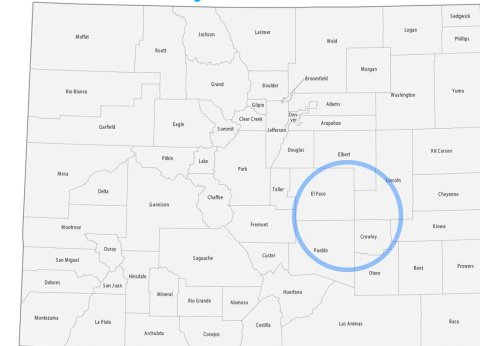
CO₂ Storage / Technology Summary

- Collect seismic, magnetic, and stratigraphic test well data at two potential sites to prove up sequestration fairway.
- Sequestration targets include >150 feet of high porosity sand / carbonates and multiple zones with potential for high CO₂ injectivity per well.
- Limited surface challenges identified.
- CarbonSAFE funding was requested for additional seismic acquisition, two test wells, and detailed site characterization.

Intended Impacts

- Decarbonization of existing industry and plug-and-play storage site for a community-supported new industry (direct air capture, hydrogen, sustainable aviation fuel, etc.).
- Showcase Pueblo as a low-carbon ecosystem community.
- Demonstration of two-way engagement and incorporation of landowner feedback for development planning.

Project Location



Note: all Objectives, Locations, Participants, Approach, Scope, Community Benefits, etc. are merely proposed and are still being negotiated with DOE

Joint Technical & Social Objectives

Objectives

- a) Prove up two anchor locations to establish a **sequestration fairway** with the potential to offer the **most cost-effective solution for industrial facilities to accelerate CO₂ emission reduction goals**
- b) Incorporate **2-way engagement** and stakeholder feedback for development and planning of a **long-term commercial sequestration hub in support of sustainable economic and social development goals**

Site Location Example: Chico Basin Ranch



Planned Activities

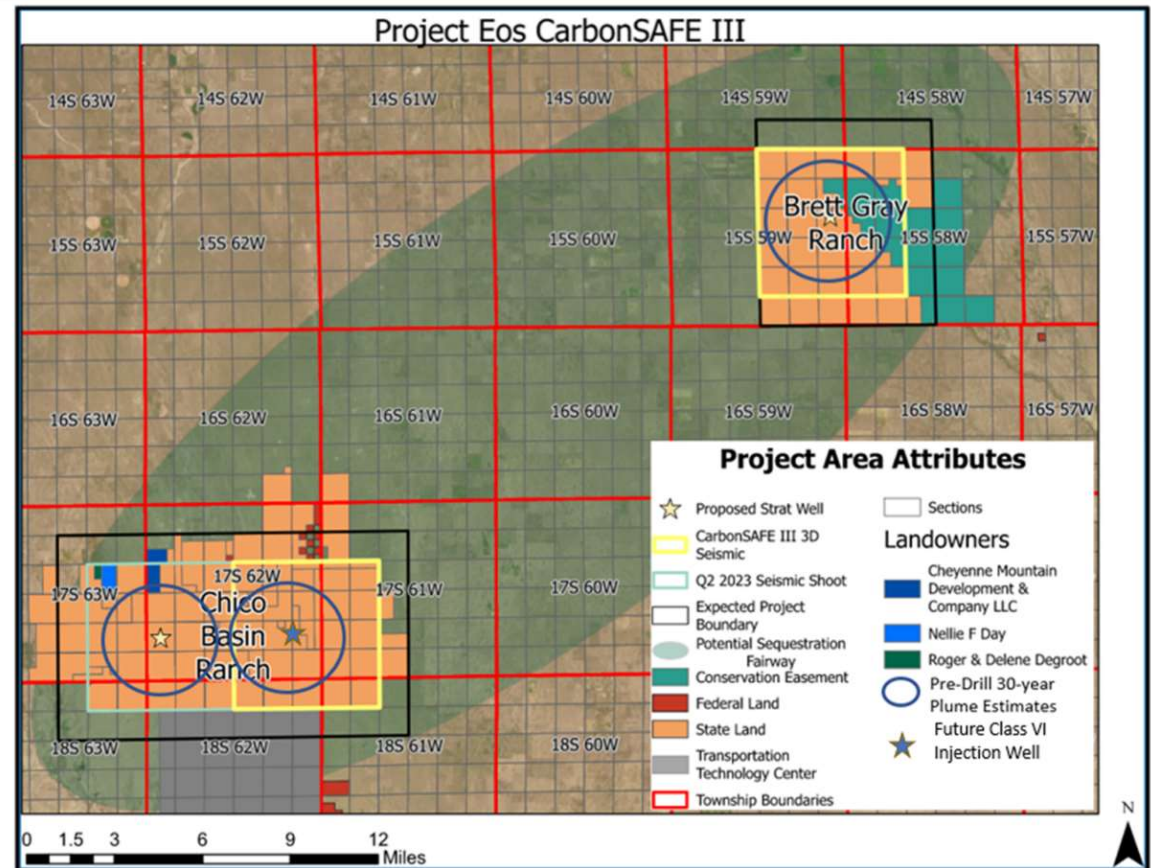
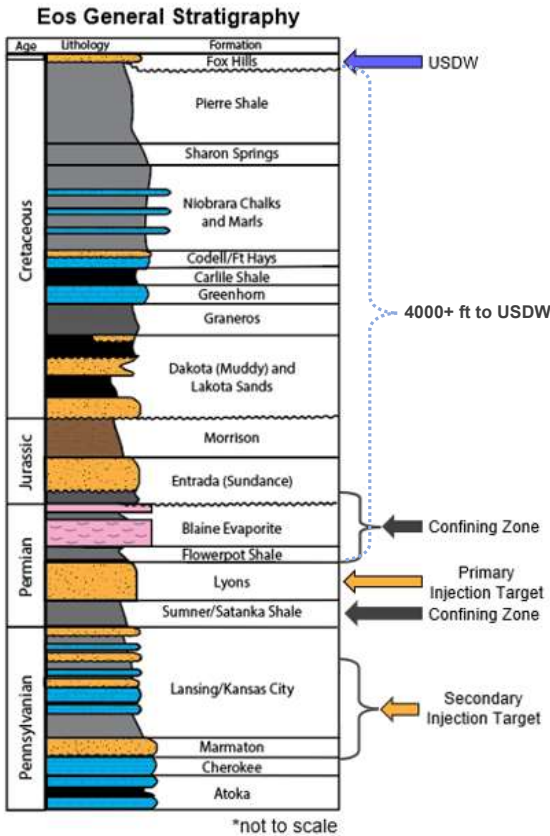
- Detailed sequestration data collection and modeling:
 - **2 science wells:** test and model content & quality of sequestration targets.
 - **3D seismic data:** show shape of reservoir and lack of faults.
 - **Aeromagnetic survey:** identify undocumented wells / leakage pathways.
- Develop & submit **two Class VI injection-well permit applications** (contingent on data results) to commence multi-year permitting timeline inclusive of public engagement with notices and predictions of performance for 100+ years.
- **Community benefits plans:** Justice40 (directing benefits to underserved / disadvantaged communities), quality jobs, community engagement, diversity, equity, inclusion, and accessibility.
- Detailed studies of **capture systems** and **pipeline (FEED)** options.
- National Environmental Protection Act (**NEPA**) Environmental Information Volume.
- Progress **commercial agreements** and complete **storage field development plan** to define initial operations

Note: all Objectives, Locations, Participants, Approach, Scope, Community Benefits, etc. are merely proposed and are still being negotiated with DOE

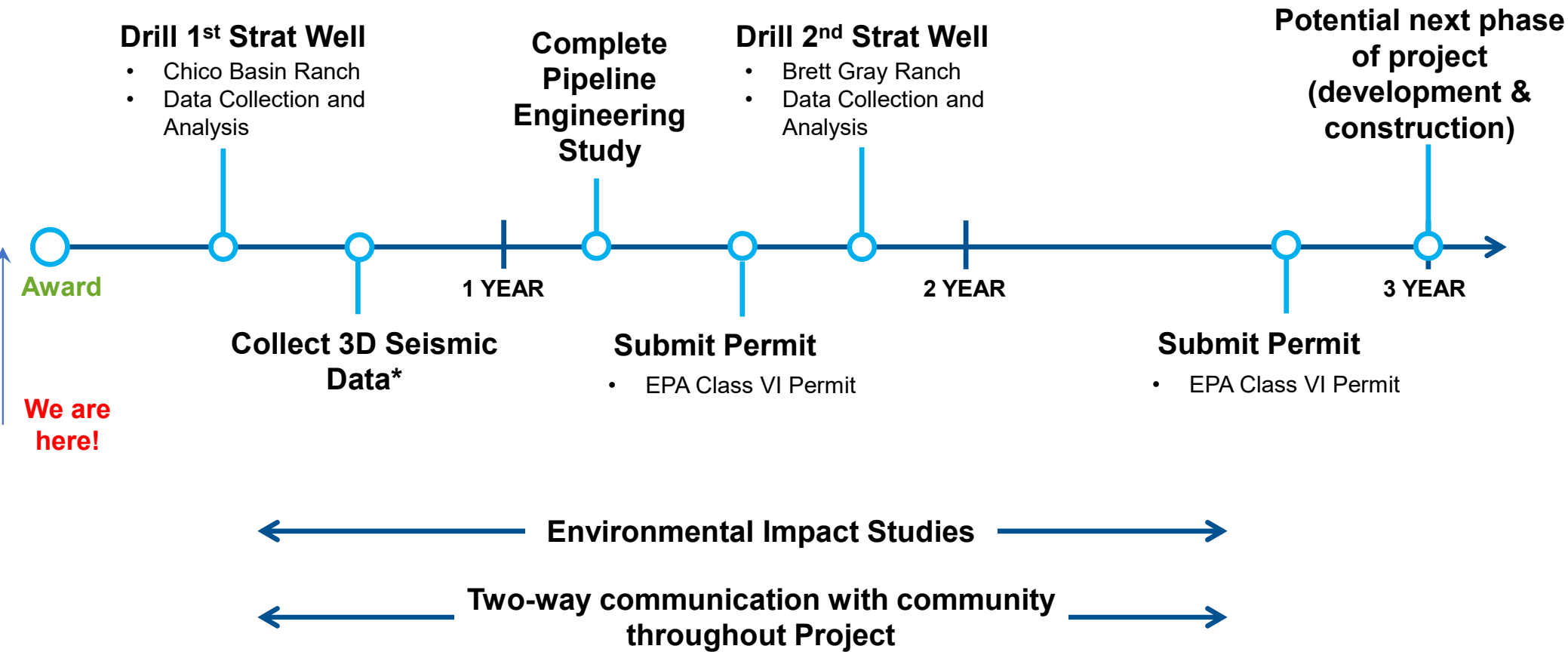


Geologic Summary

- Objective: Test Lyons formation plus two injection targets with potential for large storage capacity (Lansing/KC & Marmarton)
- Favorable reservoir properties in all three formations
- Limited legacy data availability due to low oil and gas prospectivity in the area



Project Schedule



* pending seasonal delay that may be triggered by final contract date

Note: all Objectives, Locations, Participants, Approach, Scope, Community Benefits, etc. are merely proposed and are still being negotiated with DOE



Community Benefits Plan

Goal: To become the model of successful community relations for Carbon Capture and Storage (CCS) projects on a national scale

Specific goals

- Establish a strong, mutually beneficial relationship between the project team and community through two-way feedback and consent-based siting principles
- Improve and document benefits to the surrounding communities, which have strong links to fossil fuels and experience economic and environmental burdens
- Create opportunities for K-16 students in the Pueblo region to engage with our project and learn about career opportunities in the field

Preparing for project launch

- Engaged all lessees at intended sequestration site, including The Nature Conservancy Colorado Chapter to plan activities adjacent to conservation easement
- Presented Eos overview to community leaders at Action Colorado Annual meeting and Energy Summit
- Social science underway and meeting with various community groups to inform Advisory Committee

State Stakeholders



- Executed exploration lease with Colorado State Land Board
- Sens. Bennet, Hickenlooper supporting multiple Carbon America efforts
- Collaborating with Colorado Energy Office and across D and R offices to advance multiple aspects of carbon management legislation
- State regulating agencies briefed and engaged

Local Stakeholders



- Briefed Pueblo City Council Jan, Sept 23
- Engaged Action Colorado, a political action organization of 22 SE Colorado counties, highly supportive of the benefits of CCS and making further introductions
- Engaged county officials and commissioners
- Advancing stakeholder register and making local connections
- Joint outreach planning with local sources

Next Steps

Project:

- Sign award (assistance) agreement and subaward agreements
- PMP & Risk Register update
- 3D Seismic acquisition
- Aeromagnetic survey
- Drill, core, and log first stratigraphic well
- Set up Industry Advisory Board
- Continue social science research:
 - Fieldwork to create a higher-resolution stakeholder analysis
 - Begin creating the Justice40 assessment tool

Post Project / Scale-up potential:

- Proceed to the construction phase (CarbonSAFE Phase IV)
- Pending landowner feedback, scale at existing sites or extend to additional location
- Foundations of a broader platform for the Pueblo region to think about energy futures
- Vision to create a destination for CCS learning and training

Chico Basin Ranch 3-D seismic acquisition

