Underground Injection Control – Class VI Permit Application for

High West CCS Project
Spoonbill No. 001 to 005

St. Charles and Jefferson Parishes, Louisiana

INTRODUCTION

Prepared for High West Sequestration LLC
Denver, Colorado

By
Lonquist Sequestration, LLC
Austin, Texas

March 2025

SECTION 0 – INTRODUCTION

TABLE OF CONTENTS

Figures

Tables

Project Overview

High West Sequestration LLC (High West), a subsidiary of BKV Corporation's (BKV) dCarbon Ventures, is planning to develop an integrated carbon capture and storage (CCS) project in St. Charles and Jefferson Parishes, Louisiana. This project is designed to accommodate geologic sequestration for owners of industrial and power facilities seeking to transition to low-carbon energy and other products. BKV dCarbon Ventures is a CCS project management company that develops, designs, builds, owns, and operates carbon capture, transport, and storage projects in multiple states within the United States. High West owns and operates the planned High West CCS Project for which this application is submitted. The High West team members have extensive experience in the diverse skills required to develop and operate a full-scale CCS project—including wellbore management, drilling operations, midstream operations, site design, monitoring and reporting, regulatory approvals, gathering and processing, fluid transportation, and geologic injection of various waste streams. Dedicated CCS represents meaningful physical reductions in CO_2 emissions to dramatically decrease what has been described as Scope 1, 2, and 3 emissions, illustrated in Figure 0-1.

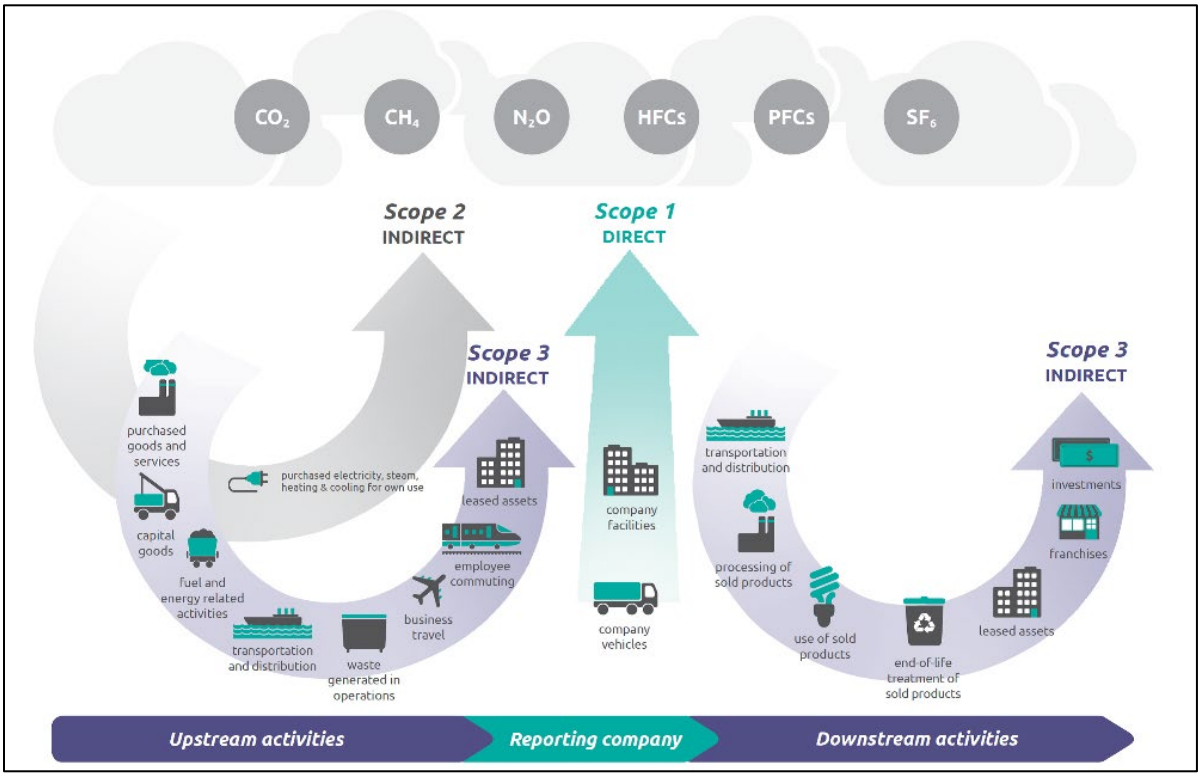

Figure 0-1 – Emission Sources[1]

The High West CCS Project is being developed to permanently sequester anthropogenic CO_2 in a secure geologic storage interval, with CO_2 sourced from various emitters in the region. High West

[1] Greenhouse Gas Protocol, "Corporate Value Chain (Scope 3) Standard," Standards, https://ghgprotocol.org/corporate-value-chain-scope-3-standard.

is in conversations with industrial emitters within a 50-mile (mi) radius of the High West CCS Project. High West is in various stages of contact, discussions, and negotiations with a number of these emitters, and plans to use multiple wells at the storage site to accommodate the captured CO_2 volumes. The extensive screening process undertaken for the project site resulted in a location that meets Underground Injection Control (UIC) requirements with no existing wellbores in the CO_2 plume storage area, an injection interval with requisite and appropriate reservoir properties, and substantial sealing zones. The sequestration site is also relatively near the existing CO_2 pipeline infrastructure to accommodate the economic delivery of sourced CO_2 volumes to the project.

This permit application is for drilling, completing, operating, and monitoring five Class VI CCS wells located in St. Charles Parish. High West's leased acreage covers part of St. Charles and Jefferson Parishes, as shown in Figure 0-2. Additional injection wells may be pursued in the future to increase CO_2 injection into the High West CCS Project site. The injection wells are designed to meet the requirements of American Petroleum Institute (API) 1171, along with the regulatory requirements outlined in LAC43: XVII **§3617**.

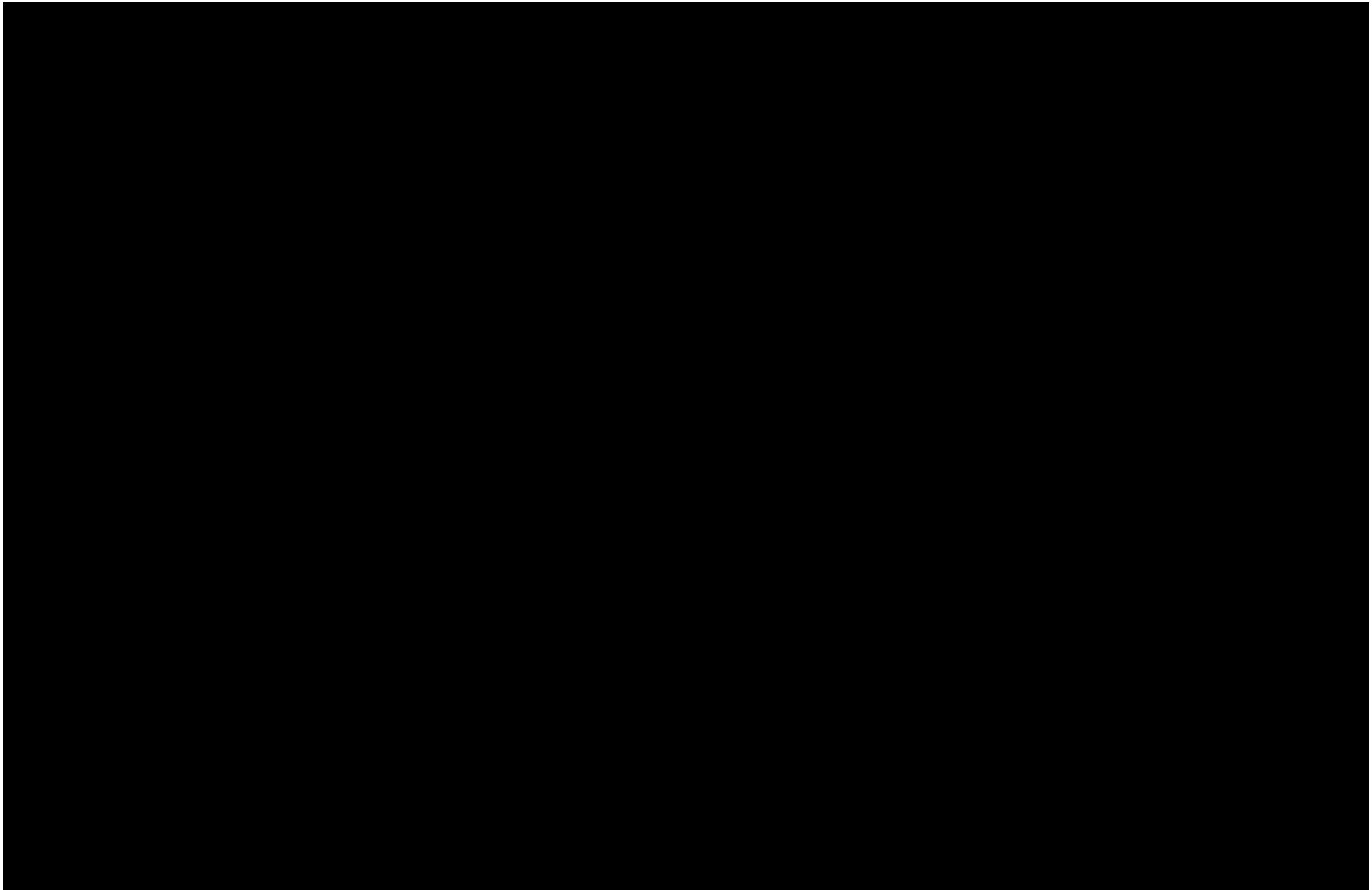

Figure 0-2 – Project Overview Map

The injection wells will inject CO_2 into the upper and middle Miocene sand formations. These sand beds were deposited in sequences with alternating, interbedded shales that offer vertical compartmentalization of the injection horizons. These sand and shale sequences are Miocene in age and found predominantly throughout the Gulf Coast of Texas, Louisiana, and Mississippi.

The well site was selected due to its favorable location within the Gulf Coast depositional environment in southeast Louisiana, as shown in Figure 0-3. This location has a combined 3,800 feet (ft) gross interval of upper and middle Miocene sands within the injection zone. The sands have porosities ranging from 0.01% to 35.6% and permeability ranging from 0 millidarcies (mD) to 1,221 mD, thereby making it a suitable interval for CO_2 storage. *Section 1 – Site Characterization* of this permit application details the geology and reservoir characterization of this project.

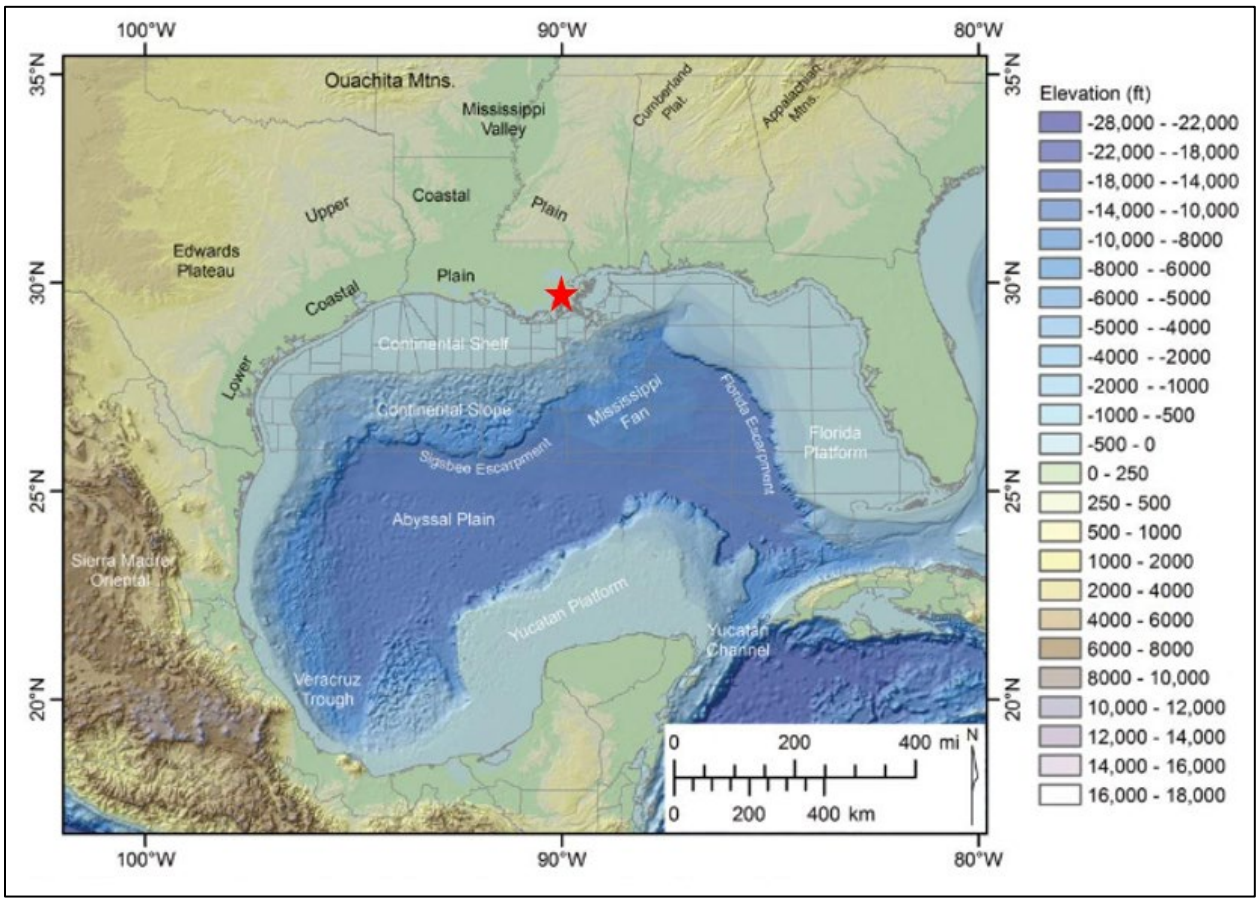

Figure 0-3 – Location of High West CCS Project (indicated by the red star) within the Northern Gulf of Mexico Basin (Snedden and Galloway, 2019)

By injecting an estimated total of 10 MMT/yr of CO_2, High West supports the world's carbon-reduction efforts by removing the equivalent of approximately 2,333,000 gasoline-powered passenger vehicles each year.[2]

Project Key Attributes

- Each High West CCS Project injection well is designed **to inject approximately 1.5 to 2.5 MMT/yr of CO_2** with the entire project goal of permanently sequestering more than **200 MMT of CO_2 during the life of the project (20 years).**
- The wells will be located **near various CO_2 and natural gas pipelines**, some of which can transport CO_2 in a supercritical (i.e., dense phase) state.
- The Miocene sands comprising the injection interval are thick, interbedded, well-known sand and shale sequences throughout the Gulf Coast, with **high porosity and permeability to sequester CO_2.**
- The lower seal will be Middle Miocene shales of the Cibicides Opima biostratigraphic zone, and Miocene-age shales. The upper seal is proposed to be the Discorbis 12-Texularia L biostraticgraphic zone, which is an Upper Miocene shale and has approximately 500 ft of net thickness. These confining zones have very low permeability, thereby creating a **robust structural seal to CO_2 movement**.
- **No artificial penetrations** are contained in the AOR thus eliminating a potential leak path for CO_2 to escape the confining unit.

Pore Space Agreement Discussion

The area of the High West CCS Project is leased from the State of Louisiana, Louisiana Department of Wildlife & Fisheries, and Louisiana Wildlife & Fisheries Commission as enacted by their authorized agent, the Louisiana State Mineral and Energy Board

Table 0-1 – Pore Space Owners

	Address
State of Louisiana	Louisiana State Mineral and Energy Board P.O. Box 2827 Baton Rouge, LA 70821-2827
Louisiana Department of Wildlife & Fisheries	
Louisiana Wildlife & Fisheries Commission	

[2] EPA, "Greenhouse Gas Equivalencies Calculator," Energy and the Environment, Greenhouse Gas Equivalencies Calculator | US EPA (accessed January 2024).

Proposed CO_2 Sequestration System Discussion

The High West CCS Project will access supercritical CO_2 from a pipeline located near the project. Because of its proximity to the high-pressure pipelines, the surface facility for this project is expected to be minimal. Flow-line distribution infrastructure to the wells will be installed along with compression, treating, and dehydration equipment, as needed.

Injectate Information

The High West CCS Project sequestration wells are designed to inject 1.5 to 2.5 MMT/yr per well for 20 years across multiple injection intervals. In total, a 3,800-ft perforated interval in the Upper and Middle Miocene sand formations will act as the injection and storage interval.

The injectate stream will be delivered from the source to the High West CCS Project Site through a newly constructed transportation pipeline, conforming to required pipeline specifications. The injectate will consist of a minimum of 95% CO_2 and is expected to comprise the following:

Table 0-2 – Injectate Major Components

Component	Value (Mole %)
CO_2	>95%
Water	No free water and no more than 30 lb/MMscf) (vapor phase)
Temperature	No more than 125°F or less than 65°F
Nitrogen	< 4%
Hydrogen	< 1%
Argon	< 1%
Methane	< 5%
CO	< 4,250 ppm by weight
Oxygen	0
Liquids	Free of liquids at delivery conditions and no condensed liquids downstream

Site Suitability

The chosen surface location selection ensures that the CO_2 plume remains contained within controlled pore space and avoids critical interaction with subsurface geologic features found within the vicinity of the project. Figure 0-4 shows an aerial view of the surface site for the High West CCS Project.

Figure 0-4 – Map of High West CCS Project Location highlighting the Spoonbill injection wells and the monitoring wells. The blue outline represents the property boundary. The red line represents the 3D seismic survey. The black outline is the CO_2 plume extent and the magenta line is the critical pressure front.

In compliance with regulations, an evaluation of the proposed site assessed factors including:

- Location of the proposed project site
- Consideration of the project area relative to federal sites/buildings/facilities, etc.
- Artificial penetrations in the project area
- Any existing faults or fractures in the project area based on seismic analysis or geophysical well log characterization
- Flood zone
- Existing infrastructure, surface, and subsurface mines or quarries
- State or federal subsurface clean-up sites within the project area
- Drinking water in the project area
- Any other site-related issues

The results of this site assessment make up the content of this permit application.

Summary

The High West CCS Project includes five CO_2 sequestration wells planned in the project area. These wells are designed to accommodate an injection rate of approximately 1.5 to 2.5 MMT/yr for 20 years.

This permit application includes a detailed assessment of the overall geologic environment (*Section 1 – Site Characterization*) and the resulting plume model and simulation results (*Section 2 – Plume Model*) used to determine the aerial extent of the plume and the resulting AOR. As detailed in *Section 3 – Area of Review and Corrective Action Plan*, the AOR for the High West CCS Project has no artificial penetrations and therefore will need no corrective action. Well design and construction plans that take into consideration the needs of the project, modeling results, and requirements to ensure the protection of the USDWs are detailed in *Section 4 – Engineering Design and Operating Strategy*.

To ensure that the CO_2 plume is being monitored during the life of the project, a detailed Testing and Monitoring Plan is provided in *Section 5 – Testing and Monitoring Plan*. The plan consists of (1) an above-confining-zone monitoring well, (2) two USDW monitoring well, and (3) the use of fiber optics in conjunction with vertical seismic profile (VSP) technology to monitor the growth of the CO_2 plume during the life of the project.

The proposed High West CCS Project addresses all the requirements for a Class VI sequestration well. This well is ideally located to sequester significant amounts of CO_2 with minimal impact to the surface and surrounding communities.

Higher resolution versions of the following maps are found in *Appendix A:*

- Appendix A-1 Project Overview Map
- Appendix A-2 Project Overview Aerial Map
- Appendix A-3 Injection Well Plats
- Appendix A-4 Pore Space Owner – Landowner Map
- Appendix A-5 Pore Space Owner – Landowner List
- Appendix A-6 Topographic Map

References

Snedden, J. W. and Galloway, W. (2019). The Gulf of Mexico Sedimentary Basin. *Cambridge University Press*.

Required Administrative Information

General Application Information

Injection Well Information (NAD 27):

Well Name	Surface Latitude	Surface Longitude	Bottomhole Latitude	Bottomhole Longitude
Spoonbill No. 001	29.84455422	-90.28050546	29.84458546	-90.28097813
Spoonbill No. 002	29.84456291	-90.27987449	29.84458153	-90.27941194
Spoonbill No. 003	29.84455169	-90.28019004	29.84389187	-90.28019700
Spoonbill No. 004	29.84457919	-90.28018975	29.84457919	-90.28018975
Spoonbill No. 005	29.84458171	-90.28050517	29.84526620	-90.28018274

Applicant:

Name	High West Sequestration LLC
Address	1200 17th Street, Suite 2100 Denver, CO 80202
Facility contact	Lauren Read Vice President, High West Sequestration LLC (720) 375-9680 laurenread@bkvcorp.com
Ownership Status	Limited Liability Company
Entity Status	Private

Standard Industrial Classification (SIC) Codes:

- 4925 – Mixed, Manufactured, or Liquified Petroleum Gas Production and/or Distribution
- 4953 – Refuse Systems (nonhazardous waste-disposal sites)

This facility is not located on federal or tribal lands.

Additional Permits

Table 0-3 – Additional Required Permits

Agency	Permit and Authorization	Anticipated Filing Date	Anticipated Receipt Date	Status
	Coastal Use Permit	TBD	TBD	In Progress