

EPA Greenhouse Gas Reporting Program: Subpart RR 2022 Monitoring Report
40 CFR 98.446(f)(12)
March 2023

Facility Name: Red Trail Richardton Ethanol Broom Creek Storage Facility #1 (RTE #10 Well)

UIC Class VI Storage Facility Permit: NDAC Order No. 31453–31455

GHGRP ID: 530977

MRV Plan Approval Number: 1001157-1

MRV Plan Approval Date: April 12, 2022

Summary of Monitoring Efforts

40 CFR 98.446(f)(12)(i) A narrative history of the monitoring efforts conducted over the previous calendar year, including a listing of all monitoring equipment that was operated, its period of operation, and any relevant tests or surveys that were conducted.

Red Trail Energy, LLC (RTE) began injection of CO₂ into the Broom Creek formation via well RTE #10 on June 16, 2022. Since injection began, RTE recorded operations data in accordance with the approved Monitoring, Reporting and Verification (MRV) Plan, including quarterly CO₂ stream sampling and analysis, near-continuous mass flow metering of the CO₂ stream, near-continuous recording of downhole temperature and pressure in the RTE #10 and RTE #10.2 wells, DTS/DAS fiber line monitoring of the flowline and injection/monitoring wells, near-continuous monitoring of the annular pressure between the well tubing and casing, quarterly corrosion coupon sampling and analysis, annual groundwater sampling and analysis, seasonal soil gas sampling and analysis, monitoring CO₂ leak detection equipment, passive seismic monitoring, and performing modeling work verified with injection operations data to demonstrate the predicted extent of the CO₂ plume and associated pressure front in the storage reservoir.

Analysis of monitoring data collected within the Active Monitoring Area (AMA) in 2022 revealed no evidence of surface or subsurface leakage of the CO₂ stream. Alarms and shut-off devices were active and operating normally during this time, and no emergency shut-off triggering event occurred. Initial analysis of the monitoring data used to track the CO₂ plume and pressure front is consistent with preliminary reservoir modeling expectations.

Updates to the Monitoring Program

40 CFR 98.446(f)(12)(ii) A description of any changes to the monitoring program that you concluded were not material changes warranting submission of a revised MRV plan under § 98.448(d).

Section 6.0 of the approved MRV Plan states that mass of CO₂ injected (CO_{2i}) will be measured using a volumetric flow meter and reported using Equation RR-5. RTE installed and currently operates a mass flow meter at the RTE #10 wellhead to measure the flow of CO₂ injected into the storage reservoir. Therefore, RTE will follow the requirements of 40 CFR 98.443(c)(1) to calculate the annual mass of CO₂ injected using Equation RR-4.

Monitoring Anomalies and Resolution

40 CFR 98.446(f)(12)(iii) A narrative history of any monitoring anomalies that were detected in the previous calendar year and how they were investigated and resolved.

After the initial start of injection operations, it was discovered that monitoring data from flow meters and monitoring gauges were not being stored electronically. It should be noted that despite the lack of permanent data logging, these gauges were monitored in real-time by RTE operators through the distributed control system. The issue was quickly discovered and electronic data storage was implemented on July 27th, 2022.

Scheduled plant shutdowns and routine preventative maintenance, as well as unexpected mechanical and electrical outages, caused periodic disruptions of CO₂ injection activity. During these periods, annular pressure increased as the injection pressure decreased. Once injection resumed, annular pressure quickly normalized. RTE is currently working to design and install pressure regulation equipment to maintain annular pressure levels during periods of shutdown.

Leak Monitoring Results

40 CFR 98.446(f)(12)(iv) A description of any surface leakages of CO₂, including a discussion of all methodologies and technologies involved in detecting and quantifying the surface leakages and any assumptions and uncertainties involved in calculating the amount of CO₂ emitted.

Surface components of the injection system, including the aboveground portions of the CO₂ transport flowline and wellhead, were monitored throughout the year per the approved MRV Plan. Routine visual inspections were conducted along the flow line, CO₂ sensors and alarms were active, and DAS/DTS fiber data were continuously monitored for anomalies by system operators. No surface CO₂ leaks were observed or detected during the initial reporting period. Corrosion coupons were also sampled quarterly during this reporting period and no loss of mass or pitting were observed.

Three groundwater monitoring wells were sampled in the third quarter of 2022 and analysis results were consistent with expected baseline ranges. Seasonal soil gas samples were collected from two soil gas profile stations in 2022. Analysis showed that groundwater and soil gas measurements were consistent with expected seasonal values and no evidence of near-surface CO₂ leaks were observed.

RTE continued to collect direct and indirect data to monitor the CO₂ plume and pressure front within the storage reservoir. The observed pressure measurements in the storage reservoir are within the predicted ranges from the preliminary model simulations, demonstrating good overall conformance for the reporting period.

DTS/DAS strand data collected from the injection well during a scheduled shutdown period between October 2nd, 2022 and October 7th, 2022 were analyzed to confirm the integrity of the injection well casing and cement. Acoustic energy, slow strain and temperature profiles were examined to search for any potential anomalies. Third-party interpretation of the acoustic, strain and temperature data sets determined that mechanical failure of casing or cement was unlikely during this timeframe.

Continuous seismic data was analyzed from seismic stations currently deployed around the RTE #10 well to locate any potential seismic events. Analysis of the data through October 26, 2022 showed a single signal was detected, and upon visual inspection by a seismic analyst, it was determined to be an unknown noise source and was not locatable because of poor signal. Further inspection of the U.S. Geological Survey (USGS) Advanced National Seismic System (ANSS) catalog shows that no events were detected in the state of North Dakota for the time period reviewed. It should be noted that the detection threshold for the USGS ANSS system is Magnitude 2.5.