

**Part 98 Mandatory Greenhouse Gas Reporting**  
Subpart RR – Geologic Sequestration of Carbon Dioxide

**Annual Monitoring Report**

Reporting Period: January 1 – December 31, 2023

*Archer Daniels Midland Company (ADM)*  
*Decatur Corn Processing Plant*  
*4666 Faries Parkway*  
*Decatur, Illinois 62526*

March 28, 2024

40 CFR Part 98, Section 446, Paragraph (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.

**ADM is operating under a Monitoring, Reporting, and Verification (MRV) Plan CCS2 for carbon capture and sequestration at its ADM Decatur location. The plan lists several monitoring efforts with associated monitoring equipment and its period of operation. This includes PFDs at the compression facility and the injection wellhead along with monitoring gauges and instrumentation. It also lists tests and/or surveys that must be conducted in the previous calendar year. The monitoring and testing efforts conducted over the previous calendar year include:**

- **Continuous monitoring of injection pressure, annulus pressure, and temperature monitoring at the injection well;**
- **Groundwater quality monitoring in the local drinking water strata, the lowermost underground source of drinking water (USDW), and the strata immediately above the Eau Claire confining zone;**
- **External mechanical integrity testing (MIT);**
- **Plume and pressure front monitoring in the Mt. Simon using direct and indirect methods (i.e., brine geochemical monitoring, 4D timelapse seismic interpretation).**

**ADM began injection of carbon dioxide on April 7, 2017 and has continued to operate the monitoring equipment for the duration of injection. ADM utilizes equipment that is recommended by the manufacturers of the equipment for this particular operation and the equipment is calibrated and maintained based on the manufacturer's recommendations. The methodologies utilized for mechanical integrity testing and plume and pressure front monitoring have been approved by the United States Environmental Protection Agency (USEPA).**

- (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).

**ADM has reviewed the MRV Plan and is updating it based on plume front delineation revisions and various leakage pathways identified in the reporting year. The updated MRV Plan will be submitted as required in the Electronic Greenhouse Gas Reporting Tool (e-GGRT).**

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

**There were no new anomalies that directly affected emissions of carbon dioxide. However, there were intermittent monitoring data obtained from a single verification well (VW#2) instrument, which started on September 14, 2020. ADM initiated a workover operation to retrieve the completion from the VW#2 well in June 2023, and is currently working on the recovery and replacement plans of the malfunctioning completion. This does not materially affect our ability to monitor injection activities because ADM maintains contemporaneous monitors for the injection well. Specifically, current site above-zone and in-zone monitoring are continuing using VW#1 gauges.**

- (iv) A description of any surface leakages of CO<sub>2</sub>, 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 CO<sub>2</sub> emitted.

**ADM detected leakage of CO<sub>2</sub> from components associated with the Illinois Industrial Carbon Capture and Sequestration (IL-ICCS) project in the previous calendar year. A listing of both unplanned and planned (maintenance) emissions are listed below:**

- 1. In Q1 of 2023, a planned chemical stimulation activity was conducted at CCS#2 to remove material fouling in the perforated interval and restore the well's injectivity. A surface flowmeter was used during these operations and the mass of CO<sub>2</sub> vented was estimated to be 75.2 metric tons\*.**
- 2. ADM conducted two planned backflow operations in CCS#2, which resulted in a total of 229 metric tons\* of CO<sub>2</sub> vented into the atmosphere. The method used to calculate these emissions was Crane No. 410 - Flow of Compressible Fluids.**
- 3. A planned VW#2 well workover operation to retrieve the completion assembly also resulted in venting of CO<sub>2</sub> from the verification well. A total of 37.2 metric tons\*\* of CO<sub>2</sub> was vented during these operations. The well is now plugged, and the Mt. Simon injection zone is isolated so there is no active CO<sub>2</sub> release from this well. These estimates include calculations based on volume of CO<sub>2</sub> observed at the separator where instrumentation is available. For estimating venting on days with no surface instrumentation, we assumed a similar gas column being vented as was observed when we had available instrumentation.**
- 4. At CCS#2, the crown valve was observed to be leaking after well operations on 06/15/2023. This was interpreted to be likely a leak through the valve stem packing. Without using direct measurement techniques to calibrate, an accurate estimate of the leak is difficult to calculate. For**

- estimation, we used the method identified by Aweimer and Bouzid (2018) to first calculate the permeation leak and then scaling for total leak based on observations from lab scale experiments. Further, Monte Carlo simulation was used to obtain a distribution of emissions by perturbing the model unknowns, given their wide range of uncertainty. Using the average emission value from the simulations, a total of 232.9 metric tons\* of CO<sub>2</sub> is estimated to have been vented through the leak assuming that the gate valve has been leaking ever since it was last identified to be not leaking.
5. ADM utilized a Velocicalc 9565 analyzer with 982 probe to physically monitor the components (i.e., valves, connectors, etc.) on the injection system in 2019. The highest concentrations that were recorded on a sample set of components were used to calculate total emissions. These values were entered into an equation, which included total component counts to calculate total fugitive emissions. As no EPA methodology exists for estimating these CO<sub>2</sub> emissions, ADM used the EPA Emissions Estimation Protocol for Petroleum Refineries Leak Rates for Synthetic Organic Chemical Manufacturing Industry (SOCMI), which estimates Total Organic Content (TOC) rather than CO<sub>2</sub>. The total amount of CO<sub>2</sub> leakage based on this methodology was calculated to be 0.71 metric tons\*. These emissions were calculated in 2019 and will be used to estimate emissions in subsequent years as the operating conditions have not changed from year to year. Furthermore, no additional visual leaks were observed during the monthly inspections required by the monitoring plan.
  6. VW#2 was bled down to depressurize as part of well activities such as sampling in June 2023 and slickline operations in October 2023. As we cannot directly calculate the vented quantity, we can use the estimate from VW#2 workover operations and use the gas column estimate of 7.2 metric tons\*\* as estimated CO<sub>2</sub> vented during these operations.

\*CO<sub>2FI</sub> = Total annual CO<sub>2</sub> mass emitted (metric tons) from equipment leaks and vented emissions of CO<sub>2</sub> from equipment located on the surface between the flow meter used to measure injection quantity and the injection wellhead, for which a calculation procedure is provided in subpart W of this part.

\*\*CO<sub>2</sub>. = Total annual CO<sub>2</sub> mass emitted (metric tons) by surface leakage in the reporting year.