

Response to Comments for
Draft Modified Class VI Permit Issued to Archer Daniels Midland
(ADM)

United States Environmental Protection Agency
Region V
77 West Jackson Boulevard
Chicago, Illinois 60604

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INTRODUCTION

On November 8, 2016, the United States Environmental Protection Agency (EPA) issued a draft modified Class VI permit to authorize the injection of carbon dioxide for the purpose of geologic sequestration (permit no. IL-115-6A-0001) to Archer Daniels Midland (ADM) for its CCS#2 injection well and invited public comment. EPA issued the original permit in 2014.

Two parties submitted comments to EPA. These commenters are presented in Table 1.

This document is organized as follows.

- Section 1: Administrative/General Comments: comments including general introductory statements and comments that are “out of scope” for this permitting action.
- Section 2: Comments on SDWA and other Authorities: comments related to the jurisdiction of other authorities, e.g., real property law, the federal or Illinois Endangered Species Act, or the National Historic Preservation Act.
- Section 3: Technical Comments: comments on aspects of the draft modified permit that reflect Class VI rule requirements, e.g., related to Area of Review (AoR) delineation, well construction, or the geologic environment of the project.

Table 1: Commenters on ADM's draft Class VI permit modification

Jeffrey Sprague
Archer Daniels Midland

SECTION 1. ADMINISTRATIVE/GENERAL COMMENTS

#	Commenter	Comment Text	EPA Response
1	Jeffrey Sprague [2016]	<p>The full administrative record must be made available locally at USEPA’s designated information repository (Decatur Public Library).</p> <p>USEPA has only made available the draft modified permit and a fact sheet at the local information repository. Viewing the full administrative record (including raw data sets, relevant correspondence, revised model inputs, model output, etc.) is only possible by scheduling a time during shortened workday hours (9:00 AM – 4:00 PM) on a regular workday (Monday – Friday), and only by traveling to Chicago, Illinois (USEPA offices). When one considers that round-trip travel from Macon County (IL) to Chicago, IL is well in excess of 300 miles, that there are significant travel expenses associated with such travel, and that multiple trips would undoubtedly be necessary, it should be apparent that USEPA has absolutely no interest in providing the residents of Macon County with reasonable accommodation, and certainly not convenient access, to viewing the full administrative record. This arrangement is not acceptable. USEPA is effectively conducting a charade of seeking public input while severely limiting the ability of local individuals to access all potentially relevant information. This is not consistent with the intent of the statutory requirement for public notice and comment. If time and expense considerations are the basis for USEPA not providing the full administrative record at the local information repository, then the permit applicant/recipient (ADM) needs to provide the resources with which to rectify this situation and make the information available.</p>	<p>EPA made the Administrative Record (AR) for the draft modified permit available to the public at its Region 5 office located in Chicago. The AR index and documents identified in the index for the draft modification to the CCS #2 permit were also available for delivery to an interested party upon request either informally or via the Freedom of Information Act. There are 446 documents (totaling thousands of printed pages) identified in the Administrative Record Index for this permit modification. Given the complexity of the computational modeling (for delineation of the Area of Review) and the volume of associated data, certain files are stored on a dedicated electronic file system and require specific software to open in a readable form. Making such a volume of information available at the Decatur Public Library was not feasible given the volume and format of information associated with the project.</p> <p>In an effort to provide the information most relevant to this modification, a copy of the draft modified permit (including attachments), a fact sheet and a detailed table of all permit modifications made since 2014 were at the Decatur Public Library for public viewing. These files were also made available online at: https://www.epa.gov/uic/proposed-permit-modification-adm-class-vi-well-decatur-ill.</p> <p>EPA took numerous steps to let people know about and comment on the draft permit modification. EPA’s actions exceeded what the Agency was required to do under the public notice and comment requirements in 40 CFR 124. The regulations at 40 C.F.R. 124.10(d)(vi) require only that EPA provide physical access to the record and do not require the permitting authority to provide copies to interested parties or make the permitting record</p>

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			<p>available online. See <i>In re City of Taunton</i>, NPDES Appeal No. 15-08, 2016 EPA App. LEXIS 25, *45 (EAB May 3, 2016); <i>In re Energy Answers Arecibo, LLC</i>, PSD Appeal Nos. 13-05 through 13-09, 2014 EPA App. LEXIS 11, *101 (EAB March 25, 2014); and <i>In re J & L Specialty Products Corporation</i>, 5 E.A.D. 31, 81 (EAB 1994)(holding that the regulations at 40 CFR 124.10(d)(vi) contemplate making the administrative record available and open for public inspection, <i>not mailing in its entirety to interested persons.</i>)(Emphasis added). EPA elected to create an information repository in Decatur and, in addition, post the permit materials on EPA’s website. Please see the paragraph immediately above, the AR for the final permit decision, and the response to comment 2, below.</p>
2	Jeffrey Sprague [2016]	<p>This commenter requests an extension of the public comment period to 120 days in order to obtain the necessary time to conduct a thorough review of the full administrative record.</p> <p>USEPA has taken well over a year’s time to prepare the draft amended permit. It is incomprehensible that a 30 day public review and comment period, which would include the hardship of traveling to Chicago to review the full administrative record, would be sufficient time for a full-time employed individual with normal obligations to provide more than just a cursory response on the amended permit. Clearly, a 30 day comment period is woefully insufficient. It also seems more than coincidental that USEPA has scheduled the public comment period to coincide with the end of the year holiday period, just when outside obligations seem to multiply.</p>	<p>The regulations at 40 CFR 124.10 “Public Notice of Permit Actions and Public Comment Period” require EPA to public notice a draft permit action for at least 30 days. The 34-day comment period for this draft modification is in compliance with the regulations at 40 CFR 124.10. No other individuals have asked for an extension of the comment period, and ADM is the only other party that commented on the draft modification.</p> <p>The public comment period for the draft modification opened on November 10 and closed on December 14, 2016. EPA held a public hearing on the draft modification in Decatur on December 13, 2016. The timing of EPA’s draft decision and the associated comment period coincided with EPA’s receipt of complete information from the permittee and completion of our analysis. The timing reflects a commitment to making timely permitting decisions while fully considering the information submitted to ensure a protective decision.</p> <p>EPA’s decision on the length of the public comment period is commensurate with the scope of changes made since the permit</p>

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			<p>was issued in 2014 and the level of public interest in the initial permits for this project. EPA’s assessment of the level of public interest is based on multiple interactions with the Decatur community. The interactions included, but were not limited to, outreach that targeted gathering places and civic organizations in Decatur, an EPA organized “open house” during the permit application phase, two prior public comment periods, two additional “open house” events, and two prior public hearings that focused on draft permits for the CCS #2 and CCS #1 wells. The regulations at 40 CFR 124 do not require EPA to engage in such informal outreach in a community, and do not require EPA to hold open house events. The regulations require public hearings when a significant degree of public interest is demonstrated based on written requests, or at the Water Division Director’s discretion. Since the permit for CCS #2 was issued in 2014, EPA has received no inquiries on the injection wells from any parties other than the applicant and did not anticipate heightened public interest or comment for this draft permit modification. Nonetheless, EPA elected to hold a comment period which included a public hearing without waiting for a request from the public to allow an additional opportunity for public input.</p>
3	ADM [2016]	<p>I did find a minor discrepancy in the Attachment B (AoR) first sentence on B12 should read:</p> <p><i>ADM used the Nicot method to calculate the pressure differential based on an injection depth of -6,628 ft KB and a lowermost USDW depth of approximately -3,450 ft KB. The results yield an estimate of approximately 62.2 psi (0.43 MPa).</i></p>	<p>EPA acknowledges this typographical error and has amended Attachment B of the permit to reflect this change.</p>

SECTION 2. SDWA/OTHER AUTHORITIES

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4	Jeffrey Sprague [2016]	<p>The draft amended permit does not contain any provisions consistent with Illinois Real Property Law for compensating local land owners whose property overlies the projected extent of the subsurface carbon dioxide (CO₂) plume and pressure front. Whether out of ignorance, willful disregard, or by conscious design, USEPA is, in effect, colluding to violate Illinois civil law by issuing a permit without such provisions. Illinois case law follows the American Jurisprudence treatise (63C Am. Jur. 2d Property) regarding ownership of the pore space of the geologic formation receiving the injected CO₂ and to pore space for which the injected fluid subsequently migrates. Quoting in pertinent part from Section 12 (regarding land):</p> <p>“The word ‘land’ includes not only the soil, but everything attached to it . . .” It goes on to say that “the title to land extends downward from the surface to the center of the earth and upward indefinitely to the heavens, so that whatever is in a direct line between the surface of any land and the center of the earth, whether it is rock, soil, or water, belongs to the owner of the surface, who may use it for his or her own purpose.”</p> <p>USEPA’s Fact Sheet at the information repository shows the modified geographical extent of the subsurface CO₂ plume and pressure front. With time, the CO₂ plume and pressure front will extend to areas for which ADM does not have surface land ownership rights. USEPA has not addressed in the draft amended permit the fundamental legal question of whether ADM has the mineral rights (“pore rights”) that would allow them to conduct subsurface injection when the CO₂ plume and pressure front extends to areas directly</p>	<p>EPA clarifies that property/land ownership rights, mineral rights and pore space ownership are outside the scope of this permit action and EPA’s authority under the Safe Drinking Water Act.</p> <p>For clarity, Section A of the permit states that “issuance of this permit does not convey property rights of any sort or any exclusive privilege; nor does it authorize any injury to persons or property, any invasion of other private rights, or any infringement of State of local laws or regulations.” Property rights issues are outside of EPA jurisdiction and are governed by legal principles other than the UIC regulations. See also 40 CFR 144.35 and <i>In re Bear Lake Props.</i>, 15 E.A.D. 630 (EAB 2012), <i>In re Am. Soda, LLP</i>, 9 E.A.D. (EAB 2000), and <i>In re Envotech, L.P.</i>, 6 E.A.D. 260, 286 (EAB 1996) (“[T]he SDWA ... and the UIC regulations ... establish the <i>only</i> criteria that EPA may use in deciding whether to grant or deny an application for a UIC permit.”), <i>In re Columbia Gas Transmission Company</i>, 2 E.A.D. 347, 348 (EAB 1987) (the Region is not required to take ownership of land into account when acting on a UIC permit application).</p>

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		below the ground surface where ADM doesn't have surface land ownership. In the absence of these mineral rights, a permit cannot be issued.	
5	Jeffrey Sprague [2016]	<p>USEPA has violated the federal Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.) by failing to consult with the U.S. Fish & Wildlife Service (FWS) regarding the potential impact to threatened and endangered species resulting from issuance of the amended draft permit.</p> <p>The USEPA must consult with FWS on "any action authorized, funded, or carried out" that falls within the embrace of the ESA. The full text of the relevant portion of the statute (Section 7.(a)(2)) reads as follows:</p> <p>"Each federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency (hereinafter in this section referred to as an "agency action") is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary, after consultation as appropriate with affected states, to be critical, unless such agency has been granted an exemption for such action by the Committee pursuant to Subsection (h) of this section. In fulfilling the requirement of this paragraph each agency shall use the best scientific and commercial data available."</p>	<p>In approving ADM's initial permit in 2014, EPA received sufficient information from ADM regarding the company's analysis of potential project impacts on species and habitats. EPA determined that there would be no effect on listed species, or critical habitat. No formal consultation was required with FWS, since EPA determined the proposed action would have no effect on any federally-listed species, or critical habitat. See <i>In re Indeck-Elwood, LLC</i>, 13 E.A.D. 126, 196 n.134 (EAB 2006); see also <i>In re Phelps Dodge Corp. Verde Valley Ranch Dev.</i>, 10 E.A.D. 460, 486 (EAB 2002) ("if an agency decides its proposed action will have no effect...the section 7 process ends").</p> <p>EPA received recent reports from ADM confirming that well construction activities authorized by the 2014 permit had been completed at the site. EPA inspectors have also visited the site twice and witnessed that all well construction activities had been completed. Thus, EPA determined that the proposed modifications are only administrative in nature, and the proposed modifications will not affect any listed species, or critical habitat and will only impact the permitted injection zone between 5,553 feet and 7,043 feet below the ground surface. AR #424 documents this determination.</p>
6	Jeffrey Sprague [2016]	USEPA has violated the National Historic Preservation Act (Public Law 89-665; 54 U.S.C. 300101 et seq.) and potentially the Illinois State Agency Historic Resources Preservation Act [20 ILCS 3420] by failing to consult with the Illinois State Historic Preservation Officer regarding the impacts of the	EPA received reports from the permittee confirming that well construction activities had already taken place at the site as authorized by the 2014 permit. EPA inspectors have also visited the site twice and witnessed that all well construction activities had been completed. Thus, EPA determined that the proposed modifications are only administrative in nature, and the proposed

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		<p>proposed amended permit on national and state historic sites that are present in the area.</p> <p>There is no indication that USEPA conducted a Section 106 review process, as required under the National Historic Preservation Act. There is no documentation indicating that details of the draft amended permit have been outlined to the State Historic Preservation Officer at the Illinois Historic Preservation Agency(IHPA). USEPA has not identified historic properties and what effects, if any, activities covered under the draft amended permit may have on historic properties. There is no evidence that the applicant (ADM) received a Letter of Compliance from IHPA stating that no historic properties are expected to be affected by the proposed CCS Well #2 activities.</p>	<p>modifications will not affect any historic properties and will only impact the permitted injection zone between 5,553 feet and 7,043 feet below the ground surface. AR #424 documents this determination.</p> <p>Additionally, EPA received a letter from the Illinois Historic Preservation Agency (IHPA) during the comment period in response to the EPA public notice. The IHPA stated in its letter of December 13, 2016 (AR #487) that no historic properties are affected.</p>
7	Jeffrey Sprague [2016]	<p>The Illinois Endangered Species Protection Act [520 ILCS 10/11 (b)] and the Illinois Natural Areas Preservation Act [525 ILCS 30/17] require that state agencies and local governments consult with the Illinois Department of Natural Resources (IDNR) whenever they will “authorize, fund, or perform” actions which alter environmental conditions. Neither the Illinois State Geological Survey (under the auspices of the University of Illinois) nor the Macon County Board (county government) have undertaken this consultation with IDNR. These entities have or should have exercised at least peripheral involvement in authorizing, funding, or performing actions associated with CCS Well #2 activities.</p> <p>An evaluation of the impacts of this permitting action on the essential habitats of state listed species [Title 17 Illinois Administrative Code Part 1010 and Part 1050] and on Illinois Natural Areas Inventory (INAI) sites by either of these entities in consultation with IDNR has not been conducted as required by state law.</p>	<p>EPA clarifies that comments on the actions and responsibilities of other State agencies and local governments (i.e., Illinois State Geological Survey and the Macon County Board) are outside the scope of this EPA action.</p>

SECTION 3. TECHNICAL COMMENTS

#	Commenter	Comment Text	EPA Response
8	Jeffrey Sprague [2016]	<p>The draft modified permit identifies changes to the reservoir model inputs (the result of updated petrophysical information obtained from drilling and testing the well) and to the modeling results that form the basis of USEPA's revised Area of Review (AoR). The proprietary (Schlumberger) model--ECLIPSE 300 (v 2011.2) reservoir simulator with the CO2STORE module---which was used by USEPA to delineate the maximum extent of the plume and pressure front, must be made readily available by USEPA to the public, at little or no expense, to allow for independent evaluation of the modeling methodology and results.</p> <p>The public cannot adequately respond to the modeling results, nor to the choices made by USEPA regarding modeling assumptions, data inputs, and model implementation without having access to the model itself.</p> <p>Though the model inputs would certainly be part of the administrative record, the software to run those inputs is certainly not. The UIC Branch of USEPA's Water Division needs to immediately adopt the practice of USEPA's Air and Radiation Division of making readily available the modeling software that is acceptable for permitting and other regulatory applications. The general public cannot and should not be expected to accept on faith USEPA's modeling methodology and results without being provided the software and data to independently corroborate or refute those procedures and findings. If there are licensing or cost considerations that are the basis for USEPA not making the software readily available then, once again, the permit</p>	<p>EPA conducted its evaluation of the AoR modeling effort using STOMP, a multi-fluid subsurface flow and transport simulator developed by the Pacific Northwest National Laboratory (PNNL). The STOMP-CO2 and STOMP-CO2e simulators were designed specifically to investigate geologic sequestration of CO₂ in deep saline reservoirs such as the Mt. Simon. The permit applicant, ADM, used Schlumberger's ECLIPSE simulator referenced by the commenter. Please see the responses to comments 9 and 12 for further information on the modeling approach and regulatory requirements.</p> <p>The commenter's suggestion that the UIC Branch of EPA's Water Division which implements regulations under authority of the Safe Drinking Water Act should adopt practices of the Air and Radiation Division (which implements regulations under the Clean Air Act and other authorities) is misguided. The two programs' approaches are not analogous.</p> <p>Under the Clean Air Act, Congress mandated that EPA's Office of Air and Radiation ensure "consistency and encouraged the standardization of model applications" (see 40 CFR 51) by regulation. In support of this mandate and the associated regulations, EPA's Office of Air and Radiation made certain modeling software available online. Much of the modeling conducted under the Clean Air Act involves simplified situations of a steady state, single source, inert pollutant.</p> <p>In contrast, the Safe Drinking Water Act does not mandate the use of specific software. Furthermore, EPA's Office of Water - UIC Program intentionally developed the Class VI regulations to afford</p>

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		<p>applicant/recipient (ADM) needs to provide the resources to remedy the situation.</p>	<p>each permit applicant/owner or operator the flexibility to select an appropriate computational modeling approach for delineating the Area of Review “that accounts for the physical and chemical properties of all phases of the injected carbon dioxide stream and is based on available site characterization, monitoring and operational data” (40 CFR 146.84). Computational modeling of Class VI projects is complex, multi-phase, and consists of potentially multi-source scenarios which can include millions of nodes (data points) that often require supercomputing capabilities.</p> <p>There are various computational approaches that a permit applicant can choose depending on site and project specific factors such as geology and operational design. Considering continuous advances in this area of science, EPA thought it appropriate to ensure that owners or operators have sufficient flexibility to adequately identify the area with increased risks to USDWs using the most current and compliant modeling approach. This approach also ensures that as technologies advance, new, innovative technologies that meet the regulations can be applied at Class VI projects. EPA adds that it is not required to provide a temporary license for the software or provide members of the public an opportunity to conduct their own simulations.</p> <p>In its evaluation, EPA assessed ADM’s computational approach (including the specific software used); conceptual/geologic model and its consistency with formation testing results; constitutive relations; model boundaries; maximum injection pressure; and all other model inputs. This assessment was conducted to ensure that the modeling effort meets the requirements of the Class VI Rule and that the model accurately reflects the available site characterization data as well as the pre-operational logging and</p>

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			<p>testing results. The report “ADM CCS2 Memo to the Record - AoR” (AR #433) documents this evaluation, including the model inputs and the results of EPA’s evaluation. The report is part of the administrative record for the draft permitting and remains available upon request. As a result of this assessment, EPA confirmed that ADM’s model is based upon a reasonably constructed and applied approach.</p>
9	Jeffrey Sprague [2016] 2 nd comment email	<p>1.) The draft permit was amended, in part, as a result of a significant change in the delineation of the Area of Review (AoR). This change highlights the inherent uncertainty in the assumptions and inputs to the model simulations determining the maximum extent of the CO2 plume and pressure front. The permit applicant (ADM) has not rigorously addressed the uncertainty associated with the new extent of the AoR. In the absence of an uncertainty analysis, the basis for the new AoR is technically deficient. The current depiction of the AoR may or may not be a reasonably accurate portrayal. What is certainly clear is that more information needs to be provided.</p>	<p>Pursuant to requirements at 40 CFR 146.82(c) and in compliance with specific permit conditions (see Section Q of the permit), the permit applicant conducted additional tests (i.e., logging, sampling and testing) to gather site-specific information, updated their model to reflect this new information, which included a range of simulations including a base case simulation and sensitivity/uncertainty analyses, and submitted the information to EPA. This re-evaluation meets the Class VI requirements and is designed to reduce uncertainty by ensuring that site-specific information is considered and integrated into the permit prior to EPA issuing authorization to inject.</p> <p>A detailed description of the information submitted, ADM’s approach, and EPA’s analysis are documented in “ADM CCS2 Memo to the Record - AoR” (AR #433), a report which remains available upon request. Additionally, EPA notes that the following files in the Administrative Record were evaluated for the purpose of making an affirmative, conservative decision on the final AoR that addresses uncertainties and ensures that USDWs are not endangered: AR #40, AR #46, AR #47, AR #48, AR #49, AR #50, AR #51, AR #52, AR #53, AR #54, AR #55, AR #56, AR #57, AR #58, AR #59, AR #60, AR #61, AR #62, AR #63, AR #64, AR #65, AR #66, AR #67, AR #68, AR #75, AR #76, AR #79, AR #80, AR #81, AR #82, AR #83 , AR #98, AR #99, AR #100, AR #101, AR #102, AR #103, AR #104, AR #105, AR #106, AR #107, AR # 113, AR #117, AR #298, AR</p>

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			<p data-bbox="1184 269 1986 370">#299, AR #300, AR #301, AR #302, AR #303, AR #304, AR #305, AR #358, AR #359, AR #360, AR #361, AR #362, AR #363, AR #364, AR #369, AR #398, AR #408, AR #433, and AR #436.</p> <p data-bbox="1184 410 1986 797">The EPA's evaluations confirmed that the base case simulation (which is the final, permitted AoR) was developed using a conservative approach and utilizing site-specific data where available. Sensitivity analyses were also conducted by ADM and evaluated by EPA addressing a set of site-specific model inputs, including porosity, permeability, residual saturation values, and endpoint relative permeabilities, among other things. As a result of this assessment, EPA confirmed that the final AoR was delineated adequately per 40 CFR 146.84, based on the results of the base case simulation which was sufficiently conservative so as to address uncertainties and ensure that USDWs are not endangered.</p> <p data-bbox="1184 837 1986 1117">Additionally, EPA acknowledges that while there is an inherent level of uncertainty in the early stages of any injection project, this uncertainty will diminish as operational and post-injection monitoring data is collected and the model is validated. The Class VI regulations were designed to continuously ensure USDW protection, accommodate and reduce uncertainty, and manage risk of USDW endangerment over time as a comprehensive suite of monitoring data becomes available.</p> <p data-bbox="1184 1157 1986 1401">Specific measures and permit conditions designed to reduce uncertainty over time include: a robust testing and monitoring approach during injection and post-injection (i.e., monitoring wells both in the Mt. Simon formation and shallower formations to track the CO2 plume and pressure in the subsurface; the use of passive and active seismic monitoring to aid in CO2 plume tracking); reevaluation of the AoR at least every five years to integrate new,</p>

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			<p>site-specific information into the model to improve predictions of system behavior; and, regulatory requirements (40 CFR 146.84(e)) and permit conditions at Section G.2 that require unscheduled reevaluation of the AoR if monitoring and operational conditions warrant.</p>
10	<p>Jeffrey Sprague [2016]</p>	<p>USEPA has identified a large number of oil and gas wells within the AoR, ten of which “are located within approximately 2.4 km (1.5 miles) of the injection well location”. Unfortunately, USEPA is silent on the prospect of potential endangerment to Underground Sources of Drinking Water (USDWs) from these and other wells associated with oil and gas extraction through high volume horizontal hydraulic fracturing of the Eau Claire Formation (confining zone to the Mt. Simon injection reservoir), the Ordovician Maquoketa Formation, and/or the Devonian New Albany Shale.</p> <p>The Hydraulic Fracturing Regulatory Act (Public Act 098-0022) provides for high volume fluid hydraulic fracturing in Illinois. The draft amended permit provides no assurances that the injected CO₂ will not migrate to USDWs as a result of induced fractures from potential hydraulic fracturing in area wells. A risk mitigation strategy needs to be incorporated into the amended permit.</p>	<p>In evaluating wells that could potentially serve as conduits for fluid movement, EPA searched Illinois State Geological Survey’s online Illinois Oil and Gas Resources (ILOIL) database. Of the ILOIL well records in the AoR, the maximum identified total depth was 2,970 feet, which is more than 4,000 feet above the injection zone and more than 2,200 feet above the confining zone (the Eau Claire). EPA found no evidence that any of these wells penetrate the confining zone; therefore, there is no evidence that any wells were used in hydraulic fracturing operations of the Eau Claire confining zone formation. EPA has no evidence that there has been any hydraulic fracturing in the Maquoketa or New Albany formations that would compromise the integrity of the confining zone (Eau Claire) within the AoR, therefore supporting the conclusion that USDWs remain protected. EPA’s evaluation of wells in the Area of Review is documented in AR #408.</p> <p>While the available data sets do not provide information about potential future hydraulic fracturing operations, EPA works with regulatory agencies in the State of Illinois (e.g., one of the research partners on this project is the Illinois State Geological Survey) to identify any potential activities related to injection and oil and gas production that may affect, or be affected by, the Class VI operation. These activities include: other injection activities that could interact with the carbon dioxide plume and pressure front; drilling or other activities associated with oil and gas exploration that may reveal new information about the geology of the area; or</p>

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			<p>land use changes that could affect water needs or bring resources/populations into the AoR of the Class VI project.</p> <p>ADM will monitor the site in accordance with the Testing and Monitoring Plan (Attachment C of the permit). The monitoring approach outlined in the Plan would detect any carbon dioxide or fluid movement via fractures. In the unlikely event that any fractures would form in subsurface formations at the project site as a result of hydraulic fracturing activities or another cause, the Emergency and Remedial Response Plan (Attachment F of the permit; AR #488) provides for expeditious responses to any adverse event, including fluid (e.g. brine) leakage to a USDW or carbon dioxide leakage to a USDW or the surface.</p>
11	Jeffrey Sprague [2016] 2 nd comment email	<p>Within the supporting attachments to the draft permit, it is noted that the bottom of the well bore is cemented back many feet out of concern for contact of the injection fluids with the preCambrian granite. The text, however, is silent as to specifically why there is this concern. Additionally, it is not known if this same concern is held for the Argenta Formation, which immediately underlies the injection zone in the Mt. Simon Formation (Lower Zone), Unit A (Note: The text fails to provide any information on the lithologic and petrophysical characteristics of the Argenta Formation).</p>	<p>EPA confirms that Attachment G of the permit states “The injection well has approximately 80 feet of cement above the casing shoe to prevent injection fluid from coming in contact with the Precambrian granite basement.” The permit does not contain the phrase introduced by the commenter: “out of concern for.” As such, EPA cannot directly respond to the comment of whether or not “this same concern is held for the Argenta Formation.” The permit defines the injection zone as the Mount Simon formation between 5,553 feet and 7,043 feet below ground surface. The cement placed within the bottom of the well casing ensures that the injectate is only emplaced within the permitted injection zone via the casing perforations.</p> <p>The Argenta Formation to which the commenter refers (and which is identified in Attachment G to the permit on page G3), is a relatively newly discovered/differentiated unit (circa 2014-2015) and has not yet been formally recognized. The permittee’s submittals in compliance with 40 CFR 146.82(c) reference it as</p>

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			<p>both “Argenta” and “pre-Mt. Simon” (e.g., AR #27; AR #29) and use these terms interchangeably. In ADM’s submittals, the pre-Mt. Simon is characterized by significantly lower porosity and permeability than the overlying Mt. Simon Sandstone. The applicant’s model, consisting of 148 vertical layers (each with specific geologic and hydrologic properties), captures these characteristics in its lower four layers. Those lower four layers correspond to the relevant depths accounting for the existence of this formation in the delineation of the project AoR.</p> <p>EPA appreciates the comment as it allows us the opportunity to further clarify the terminology used. Based on communication with the Illinois State Geologic Survey, EPA confirmed that the Argenta Formation has not yet been officially recognized as a separate formation (which occurs through a formal process governed by the International Stratigraphic Code). In response to this comment and to ensure clarity and consistency, Attachments B, C, D, E and G (the five permit attachments that make reference to either the “Argenta” or the “pre-Mt. Simon”) have been updated to reference the “pre-Mt. Simon.” Additionally, a sentence was added to page B4 of Attachment B on the lithologic and petrophysical characteristics of the subject formation based on information submitted by ADM in AR #29.</p>
12	Jeffrey Sprague [2016]	<p>The petrophysical data obtained from the construction and pre-injection testing of the CCS #2 Well has overlooked or ignored the presence and potential migration of interstitial, authigenic clays during perforation, injection, and stimulation.</p> <p>The potential pore space occlusion and permeability reduction would dramatically change the results of the</p>	<p>EPA disagrees that information gathered during construction and pre-injection testing of the CCS#2 well was overlooked or ignored. The regulations at 40 CFR 146.82 require the owner or operator to submit to EPA and EPA to evaluate, formation testing and logging and testing data and information on CO₂ compatibility to confirm that a suitable geologic system exists with injection and confining zones that meet the requirements of 40 CFR 146.83. The permittee complied with the requirements to collect and submit</p>

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		<p>reservoir plume simulations, but more importantly, would change the expected CO₂ injection volumes.</p> <p>USEPA has indicated that the basal 600 feet of the Mt. Simon Sandstone is the “target injection zone”. It is described as an arkosic sandstone with abundant secondary porosity due to feldspar dissolution. USEPA needs to conduct a thorough assessment of the composition and quantities of clay mineral assemblages in the injection zone from available core, cuttings, and wireline logs, and supplement this with additional analyses (e.g., x-ray diffraction) as necessary to better characterize expected reservoir behavior.</p>	<p>the required information and the EPA considered this information in the context of ensuring protection of Underground Sources of Drinking Water at the CCS#2 project to inform this permitting action. EPA documented this evaluation in the AoR report (AR # 433).</p> <p>Additionally, EPA clarifies that pursuant to requirements at 40 CFR 146.82 and 146.87, the well has already been constructed, perforated, and tested. During perforation and testing, the permittee and its consultants did not observe indications of pore space occlusion or permeability reduction. Additionally, the CCS#1 injection well project operated by ADM, which injected nearly 1 million metric tons of CO₂ into the Mt. Simon over three years, behaved as predicted. No pore space occlusion and/or permeability reduction were observed at CCS#1, located approximately 0.7 miles from CCS#2. There are currently no plans to conduct stimulation at CCS#2 that could affect interstitial authigenic clays (see Attachment I of the permit; AR #488).</p> <p>Observations during CCS#2 perforation and testing, information submitted in compliance with 40 CFR 146.82(c), and operations at CCS#1 provide strong support to conclude that potential migration of interstitial, authigenic clays will not result in pore space occlusion or permeability reduction.</p> <p>The commenter’s statement that injection at CCS#2 will occur at the basal 600 feet of the well is not correct. The CCS#2 well is perforated from 6,630 to 6,825 feet below ground surface (See Attachment G of the permit).</p> <p>From a theoretical perspective, EPA concurs that pore space occlusion or permeability reduction are possibilities in certain</p>

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			<p>geologic settings (although not observed at CCS#1) and that there is an inherent level of uncertainty in early stages of any injection project. EPA affirms that such uncertainty is addressed by both the CCS#2 permit and the Class VI requirements:</p> <ul style="list-style-type: none"> • The permit establishes a Maximum Injection Pressure (Attachment A of the permit; AR #488) which limits the injection pressure regardless of any difference between the measured and operational permeabilities in order to ensure USDW protection; • The technologies deployed for purposes of testing and monitoring of the plume and pressure front within the AoR (see Attachments C and E of the permit, the Testing and Monitoring Plan and the Post-Injection Site Care and Site Closure Plan) were proposed and approved to ensure that site-specific information is collected during both the injection and the post-injection site care phases to confirm project behavior. These results can be compared against predictions and be used to identify any deviations and to refine predictions and reduce uncertainty over time; • The Class VI Rule was designed to anticipate and accommodate operational changes over time. Specifically, the Class VI Rule (40 CFR 146.84(b)), requires that the AoR and Corrective Action Plan (Attachment B of the permit; AR #488) include: “(2)(i) a description of the minimum fixed frequency not to exceed five years at which the owner or operator proposes to reevaluate the area of review; and (ii) the monitoring and operational conditions that would warrant a reevaluation of the area of review prior to the next scheduled reevaluation as determined by the minimum fixed frequency. . .”;

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			<ul style="list-style-type: none"> Attachment B of the permit (AR #488) contains the CCS#2-specific conditions that would warrant an AoR reevaluation (see <i>Triggers for AoR Reevaluation Prior to the Next Scheduled Reevaluation</i> on pages B21 and B22). Pressure is one of the CCS#2-specific triggers identified in Attachment B. One would reasonably expect that where pores are occluded or permeability reduced, both injection pressure and formation pressure would indicate behavior outside of predicted/anticipated ranges but not necessarily outside of permitted ranges. This last point is of great importance. The UIC Program’s authority under the Safe Drinking Water Act is USDW protection. It is possible that a change in porosity or permeability may reduce the amount of CO₂ that can be sequestered but such reduction may pose no endangerment to USDWs. In such circumstances, reevaluations of the AoR, which are required every five years or when other conditions warrant it (see page B20 of Attachment B), pursuant to 40 CFR 146.84(b)(2)(i), would account for and facilitate project modifications that address the changes (e.g., changes in the Testing or Monitoring Plan or Post-Injection Site Care and Site Closure Plan). <p>EPA affirms that the permit conditions address the theoretical scenario presented by the commenter. The permit would be equally protective if, as some studies indicate, the injection of anhydrous carbon dioxide were to have the effect of shrinking clay minerals by removing trapped water molecules, theoretically increasing porosity and permeability (see e.g., <i>Clay interaction with liquid and supercritical CO₂: The relevance of electrical and capillary forces</i> by Espinoza and Santamarina (2012); International Journal of Greenhouse Gas Control).</p>

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			<p>EPA has worked to ensure USDW protection at the project site, while acknowledging and addressing uncertainty, by including protective permit conditions and requirements which will monitor the project continuously and reevaluate the AoR at a fixed frequency, or when certain conditions identified in the permit indicate the need for a reevaluation.</p>

In accordance with 40 CFR 124.19(a), any person who filed comments on the draft permit modification or participated in the public hearing on the modification may petition the EAB to review any condition of the final permit modification decision. Additionally, any person who failed to file comments or failed to participate in the public hearing on the draft permit modification may petition for administrative review of any permit conditions reopened for modification during the public comment period and set forth in the final permit modification decision, but only to the extent that those final permit conditions reflect changes from the proposed draft permit modification. Any petition shall identify the contested permit condition or other specific challenge to the permit decision and clearly set forth, with legal and factual support, petitioner's contentions why the permit decision should be reviewed, as well as a demonstration that any issue raised in the petition was raised previously during the public comment period (to the extent required), if the permit issuer has responded to an issue previously raised, and an explanation of why the permit issuer's response to comments was inadequate as required by 40 CFR 124.19(a)(4).

If you wish to request an administrative review, documents in EAB proceedings may be filed by mail (either through the U.S. Postal Service ("USPS") or a non-USPS carrier), hand-delivery, or electronically. The EAB does not accept notices of appeal, petitions for review, or briefs submitted by facsimile. All submissions in proceedings before the EAB may be filed electronically, subject to any appropriate conditions and limitations imposed by the EAB. To view the Board's Standing Orders concerning electronic filing, click on the "Standing Orders" link on the Board's website at www.epa.gov/eab. All documents that are sent through the USPS, except by USPS Express Mail, must be addressed to the EAB's mailing address, which is: Clerk of the Board, U.S. Environmental Protection Agency, Environmental Appeals Board, 1200 Pennsylvania Avenue, NW, Mail Code 1103M, Washington, D.C. 20460-0001. Documents that are hand-carried in person or that are delivered via courier or a non-USPS carrier such as UPS or Federal Express must be delivered to: Clerk of the Board, United States Environmental Protection Agency, Environmental Appeals Board, 1201 Constitution Avenue, NW, WJC East Building, Room 3334, Washington, D.C. 20004.

A petition for review of any condition of a UIC permit decision must be filed with the EAB within 30 days after EPA serves notice of the issuance of the final permit decision. 40 CFR 124.19(a)(3). When EPA serves the notice by mail, service is deemed to be completed when the notice is placed in the mail, not when it is received. However, to compensate for the delay caused by mailing, the 30-day deadline for filing a petition is extended by three days if the final permit decision being appealed was served on the petitioner by mail. 40 CFR 124.20(d). Petitions are deemed filed when they are received by the Clerk of the Board at the address specified for the appropriate method of delivery. 40 CFR 124.19(a)(3) and 40 CFR 124.19(i). The request will be timely if received within the time period described above. For this request to be valid, it must conform to the requirements of 40 CFR 124.19. A copy of these requirements is enclosed. The regulations are also available electronically at <http://www.gpo.gov/fdsys/pkg/CFR-2013-title40-vol23/pdf/CFR-2013-title40-vol23-sec124-19.pdf> This request for review must be made prior to seeking judicial review of any permit decision. Additional information regarding petitions for review may be found in the Environmental Appeals Board Practice Manual (August 2013) and A Citizen's Guide to EPA's Environmental Appeals Board, both of which are available at http://yosemite.epa.gov/oa/EAB_Web_Docket.nsf/General+Information/Environmental+Appeals+Board+Guidance+Documents?OpenDocument

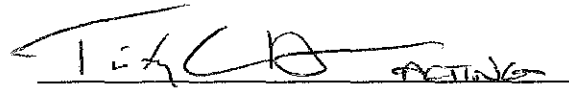
The EAB may also decide on its own initiative to review any condition of a UIC permit decision for which review is available under 40 CFR 124.19(a). The EAB must act within 30 days of the service date of notice of the Regional Administrator's action. Within a reasonable

time following the filing of the petition for review, the EAB shall issue an order either granting or denying the petition for review. To the extent review is denied, the conditions of the final permit decision become final agency action when a final permit decision is issued by the EPA pursuant to 40 CFR 124.19(l).

Final Permit

The final permit modification and Response to Comments document are available for viewing at the Decatur Public Library, 130 N. Franklin Street, Decatur, Illinois.

Please contact Andrew Greenhagen of my staff at (312) 353-7648, or via email at greenhagen.andrew@epa.gov if you have any questions about the Archer Daniels Midland injection well permit.



Christopher Korleski
Director, Water Division
U.S. Environmental Protection Agency
Region 5

Date 1/19/2017