Response to Comments on
Draft Class VI Permits Issued to the
FutureGen Industrial Alliance

United States Environmental Protection Agency

Region V

77 West Jackson Boulevard

Chicago, Illinois 60604

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INTRODUCTION

On March 31, 2014, the United States Environmental Protection Agency (EPA) issued draft Class VI permits to inject carbon dioxide for the purpose of geologic sequestration (permit numbers IL-137-6A-0001, IL-137-6A-0002, IL-137-6A-0003, and IL-137-6A-0004) to the FutureGen Industrial Alliance, Inc. (FutureGen), and invited public comment.

Twenty-nine (29) parties submitted comments to EPA, either in writing or during a public hearing held on May 7, 2014 (or both). These commenters are presented in Table 1. This document categorizes the public comments submitted on the draft Class VI permits and includes EPA's responses to those comments, although there is some overlap between the categories and the responses.

This document is organized as follows.

- Section 1: General and Out of Scope Comments: comments including general introductory statements and comments that are "out of scope" for these permitting actions.
- Section 2: General Comments: comments generally supporting or opposing the draft permit actions or about the permitting process; geologic sequestration; the geology of the FutureGen site; and general permit conditions.
- Section 3: Area of Review (AoR) and Corrective Action Comments: comments on the size of the AoR and the modeling approach used to delineate the AoR; AoR reevaluations; wells in the AoR; Part G of the draft permit; and Attachment B.
- Section 4: Financial Responsibility Comments: comments on cost estimates for the covered activities; the financial instruments used; Part H of the draft permit; and Attachment H.
- Section 5: Construction and Pre-Injection Testing Comments: comments on the injection well components (e.g., casing/cement and tubing/packer); pre-injection logs and tests to be performed; Parts I and J of the draft permit; and Attachment G.
- Section 6: Operations Comments: comments on Part K of the draft permit (e.g., injection pressure limitations); and Attachment A.
- Section 7: Testing and Monitoring Comments: comments on the testing and monitoring activities (e.g., mechanical integrity testing, ground water monitoring, and plume and pressure front tracking) in Part M of the draft permit; Attachment C; and the quality assurance and surveillance plan for testing and monitoring activities.
- Section 8: Plugging and Post-Injection Site Care Comments: comments on post-injection monitoring; the post-injection site care timeframe; the non-endangerment demonstration; site closure activities; Part O of the draft permit; and Attachments D and E.
- Section 9: Emergency and Remedial Response Comments: comments on Part P of the draft permit; Attachment F; and induced seismicity.

Table 1: Commenters on the FutureGen draft Class VI permits

American Coalition for Clean Coal Electricity, Coal Utilization Research Council, Edison Electric Institute, Illinois Coal Association, National Mining Association (NMA), National Rural Electric Cooperative Association
Betty Niemann
Bradley Zeller
Carl Hankel
Central Iowa Building & Construction Trades Council (CIBCTC)
ClearStack Combustion Corporation
Danny Little
Ed Shaw
Elizabeth Rigor
FutureGen Industrial Alliance, Inc. (FutureGen)
Global Carbon Capture and Storage (CCS) Institute
ILL Coal Association
Illinois Chamber of Commerce
Illinois Department of Commerce and Economic Opportunity (DCEO)
International Brotherhood of Boilermakers Local 363
International Brotherhood of Electrical Workers (IBEW) Local 193
Jacksonville Regional Economic Development Corporation (EDC)
Karen Shaw
Laborers' International Union of North America (LIUNA)
Leinberger & Critchelow families
Lillian Korous
Marc Landers
Mick Mcintyre
Natural Resources Defense Council (NRDC), Clean Air Task Force, and Sierra Club
Pipefitters Local 137
Robert J. Finley
U.S. Carbon Sequestration Council (CSC)
US Fish and Wildlife Service
Wilmot McCutchen

SECTION 1. GENERAL AND OUT OF SCOPE COMMENTS

EPA regulations at 40 C.F.R. Parts 144 and 146 state the requirements and standards that a permit applicant must meet to have an Underground Injection Control (UIC) permit application approved. Those regulations define the general scope of EPA's authority and review process. Federal regulations require EPA to briefly describe and respond to significant comments received on UIC permits.

EPA received numerous general comments and comments directed at matters outside the scope of the UIC Program's purview. EPA acknowledges the submittal of these comments and clarifies that because they raise matters that are not addressed by the UIC regulations and are outside the scope of the UIC permit process, EPA does not respond to them specifically in this document.

The comments falling into the "out of scope" category focus on topics including: job creation and economic benefits of the project; cost of the project; general support for or non-specific opposition to the project; the Department of Energy's process, decisions and Environmental Impact Assessment; approvals and processes of other regulatory programs; climate change; the power plant; the pipeline; other Carbon Capture and Storage projects; other Geologic Sequestration projects (e.g., the Archer Daniels Midland project); neutral statements of fact; background information on the commenters or the project; pore space ownership; mineral rights; eminent domain; takings; land owner compensation; natural gas storage operations; and general introductory statements to specific concerns. These general comments are listed below without response. Specific comments that address topics that are relevant to this permitting decision, with responses, follow in subsequent sections.

Although EPA is not responding to general statements of support and opposition to the permit individually, it did consider them in making the decision to issue final permits.

#	Commenter	Comment Text
1	Boilermakers Local 363	I'm here to speak in favor of the permits on behalf of myself and our members. Our primary work is in power plants and power generation facilities and we believe not only the jobs that will be created during construction and the direct and indirect jobs that will be created will be more permanent jobs after construction are important, but also the ramifications of this power plant and the carbon capture technology that could spread to other plants and keep our industry viable for many years. And I think it should also be noted when talking about the jobs that a lot of our living is made during, what we refer to as the outage season. When we do periodic maintenance on these power plants. And so there will be -- I think the job numbers are low because we will be back to service the facility on a fairly regular basis. And those are jobs that haven't been talked about today, but they're very important to myself and our members because that's how we make our living. We, you know, we aren't scientists. We have read, we're well-read on the carbon capture and we do believe that the Environmental Protection Agency and FutureGen Alliance has our -- has protected us and looked out for our best interest. So, again, we're in favor of moving this forward.
2	Bradley Zeller	I'm here to briefly discuss the economic and environmental impact of the FutureGen 2.0 project. Specifically, the sequestration site and it's what we're here for today and the ground water. But economically the project itself is a 1.6 billion dollar impact for our economy. That's the actual construction cost. To put that in layman's terms, we are a board of review for the county. I'm looking back. I should be -- but anyway, to put this in perspective the County of Morgan has a 500-million dollar EAV. That's our total tax base that we base all of our taxes. For our school district, the county, all the taxing body which is equivalent to a 1.5-billion dollar value. 500 million is one-third of our fair market value. Now, there's roads and hospitals and things out of that EAV, but that's 1.5 billion total value of Morgan County. This is bringing in 1.6 billion dollars to the county, which is more than the county is worth in total. An independent study by the University of Illinois projects a 12-billion dollar impact to the community over the next 20 years; 12 billion dollars to the county that's worth 1.5 billion. I think that's going to have a huge effect - 1650 temporary jobs, 650 permanent jobs.
3	CIBCTC	Hi, my name is Paul Moore, M-o-o-r-e, and I'm the president from the Central Illinois Building and Construction Trades Council. This council is made up of the skilled craft who will build this project. We whole-heartedly support FutureGen for the following reasons: The importance of a carbon capturing system, which is widely used as an essential technology in the effort to address climate change concerns. This system offers the potential to largely eliminate the CO_2 emissions associated with power plants, cement plants, refineries and other stationary industrial sources. Also, the educational value that FutureGen 2.0 will gain with worldwide attention by being one of the first near

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		single zero emissions commercial scale coal-fueled power plant that is fully integrated with underground carbon capture and storage, and will prove out that the integration of the power plant, CO_2 pipeline, CO_2 storage site result will to be used to develop additional projects in Illinois, the United States, and possibly around the world. ... It is the same CO_2 that would be released into the atmosphere. There is also community support for this project with an open dialogue between the building trades, FutureGen Alliance and the citizens board, and most importantly is job creation for Morgan and surrounding counties. Thank you.
4	Danny Little	I would like to express my support for the Morgan County CO_2 storage facility and the FutureGen ll Project in general.
5	DCEO	In addition to FutureGen ... which will capture and store more than 20 Million Metric Tons of C02 ...Archer, Daniels Midland in Decatur is fast one of the nation's first large scale CCS projects… …This project, in a constructive manner, takes clean coal technology to the next level by capturing Carbon Dioxide and permanently storing it underground, greatly reducing the emission footprint for a coal fired power plant. FutureGen type coal projects, along with the great strides made in increasing America's renewable energy portfolio, goes a long way in meeting an “all of the above" domestic energy portfolio strategy. The FutureGen 2.0 oxy-combustion retrofit, coal to electricity with 90% interest of the carbon capture and storage project is in the best citizens of the United States. In the end, I hope that everyone understands that FutureGen is a well-planned, world-class effort to demonstrate technology that can make a difference in reducing the emissions of greenhouse gases I thank all of you for your time and interest in Future Gen 2.0.
6	Ed Shaw	Please approve this project! Let Illinois be first in this new technology. We need the jobs and the tax base!
7	Global CCS Institute	Commercial demonstration of carbon capture and storage (CCS) technology is an essential step towards wide-scale global deployment needed to address climate change at least cost. Every first-mover CCS project, including FutureGen 2.0, will provide the learnings necessary to move the technology forward and realise its full potential. It is within this context that the Global CCS Institute urges the U.S. Environmental Protection Agency to expedite its final approval for the FutureGen 2.0 Class VI underground injection control permit.

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8	IBEW Local 193	My name is Glenn Baugh. Last name is B-a-u-g-h. I'm the business manager of IBEW Local 193 in Springfield, Illinois. We represent a little over 300 electrical workers and we're ready to start this project and build this project. I won't be redundant with all the technical information that's been presented before me, but I would like to sum it up if I could. This is the first for a near zero emissions coal-fueled power plant. And this project when finished will be viewed and visited by the world, putting Jacksonville and Meredosia, Illinois in the spotlight. It will bring jobs and revenue to an area at a time when jobs are limited. And I believe from the folks that spoke before me, as well as the EPA who has looked at this hard, that the homework's been done and it's time to move forward and grant these permits. Thank you.
9	ILL Coal Association	The Illinois Coal Association supports the FutureGen Alliance 2.0 Underground Injection Control Class VI permit. The FutureGen project is important to the development of clean coal technology, and the Illinois Coal Association has been an active supporter since this project was first announced in 2003. I didn't make a mistake there. It's 2003. Yes, that was 11 years ago. And that's part of our frustration; it's taken 11 years to get to this point. And we still don't have steel in the ground. We're not being able to learn yet from deployment technology, clean coal technology that's going to be able to use coal. Even the technology has changed from the zero emissions, free-standing power plant in Mattoon to retrofitting existing power plants with the oxy-combustion technology. We accept that. Kind of grudgingly but, and it wasn't your choice to do that. I know. But we'd rather be building free standing-power plants. This project is very important to the State of Illinois as coal is an abundant resource here.
10	ILL Coal Association	This landmark draft permit is integral to the advancement of CCS technology for future use in the United States and around the world. While the Department of Energy, which issued it's record -- a decision for financial support as you know of this project in January has had several pilot projects designed to capture and store CO_2. It is time to scale up the technology to commercial size on coal-fueled power plants that will be fully integrated with geologic storage. The lessons learned from this first of its kind project will be key to the wide-spread commercialization of CCS technologies. On behalf of the Illinois Coal Association, I urge final approval of the permit without delay to enable the FutureGen 2.0 project to move forward. Thank you.

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11	Illinois Chamber of Commerce	On behalf of the Illinois Chamber of Commerce and its members, we respectfully ask the US EPA to issue the final Class VI UIC permits for FutureGen 2.0. We do so for the following reasons: Importance of FutureGen 2.0 and of CCS The Obama Administration and the US EPA have both talked about the importance of carbon capture and sequestration (CCS) as a way to keep coal in our existing energy mix while decreasing the amount of greenhouse gas emissions in the atmosphere. As we all know, CCS is not currently a proven technology on a commercial scale and for it to become one we need projects like FutureGen 2.0 to be successful and they need permits to sequester carbon dioxide to confirm the process. Since CCS offers the potential to largely eliminate the carbon dioxide emissions associated with power plants, cement plants, refineries and other stationary industrial sources, we think it prudent to provide the necessary permits to allow a commercial-scale CCS project in southern Illinois.
12	Illinois Chamber of Commerce	So many more reasons There are a plethora of additional reasons why you should issue the final permits, but please know that the Illinois Chamber looks at these projects with great interest and we hope the US EPA will grant the necessary permits so FutureGen 2.0 can become a reality and a success for the industry and our environment.

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13	Jacksonville Regional EDC	My name is Terry Denison and I am President of the Jacksonville REGIONAL Economic Development Corporation. We are a professional, non-profit organization whose objective is to retain, create and recruit job opportunities for residents of our region. One of these opportunities is FutureGen 2.0 and the many benefits associated with it. In today's economic environment, it is tough to attract new businesses to Morgan and Scott Counties, but we've had the good fortune to attract several companies recently, and FutureGen is among them. FutureGen represents an excellent opportunity to give the community an economic shot-in-the- arm. According to the recent University of Illinois FutureGen 2.0 Economic Impact Study Report, during the construction phase of FutureGen, the project is likely to generate as many as 683 direct jobs (452 jobs for the power plant and 231 for the C02 pipeline and storage site) and 1,610 total jobs (direct and indirect jobs) for the State of Illinois in 2015, the second year of the construction phase (Phase III). Many of those jobs, by the nature of construction, will be short term. As the project matures and goes into full operation starting in 2018, the number of direct jobs for Morgan County is estimated to be 118 (91 for the power plant, 27 for the C02 pipeline and storage site). The number of total jobs (direct and indirect jobs) is estimated to be 181. In the long-term, FutureGen will produce increased tax revenues and help replace the jobs lost as a result of the closure of the Meredosia power plant in 2011.Speaking of Meredosia, we are already seeing the economic benefits of FutureGen in Meredosia. When the Meredosia Power Plant ceased generating power in December of 2011, the County faced the potential loss of more than $500,000 per year in property taxes. Most of the money goes to the Meredosia school district and without those funds the school district would be facing an uncertain financial future. However, with the FutureGen project's active maintenance of the plant and preparations for future construction, those property taxes continue to be paid. That makes a very real financial difference to the County and our schools. And lastly, over 50% of the power delivered by rural electric cooperatives nationwide is coal based. So, coal is important to rural America. However, with ever-tightening environmental regulations, we need new technology to make coal cleaner. FutureGen is a great opportunity to demonstrate clean coal technology. Recently our office had the honor and pleasure of hosting and visiting with former New Jersey Governor and U.S.E.P.A. Administrator-Christine Todd Whitman. As Ms. Whitman stated - "Alternative energy sources are not going to replace coal as the main producer of electricity!" And, electrical demand is going to increase greatly in the next few years. "Coal is and will be very important to our economy." So let's build this plant and the pipeline and protect the coal power rural America needs.
14	Karen Shaw	This method appears to be a safe way of containing emissions of carbon dioxide. Let's let Illinois be the leader - for once - instead of the follower - per usual.

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15	LIUNA	And as was previously mentioned this project -- we support the approval of the permits. That's my -- what I wanted to say. But as it was previously mentioned this project stands to create over 1600, as someone called part, or temporary jobs. Those temporary jobs aren't just temporary jobs. They're construction jobs. And when people talk about construction jobs as if they're temporary, I guess, in one sense they are temporary in that construction by its very nature is temporary. You either build something or you tear something down. So all construction jobs by their very nature are temporary. However, construction careers are permanent. This is the kind of project, particularly in the State of Illinois and in this area where construction unemployment is nearing 50 percent. It can carry over these men and women through two or three, maybe four seasons to help the next set of projects get going. They help more private investment get to take off. They help the state and federal government invest more in infrastructure. These are the kind of projects we need. The 600 permanent jobs stand to be good family supporting jobs. We encourage the EPA to approve the permits, issue the final permits. Not just for the construction and the economic benefit, but also what this can do for the area in terms of research, because this will be a pilot plan as everyone has suggested in terms of research and development in this area. So I encourage the EPA to approve the project, approve the permit. On behalf of the Laborers' International Union of North America, our employers, and signatory contractors, I encourage the EPA to approve it. Thanks.
16	Marc Landers	I truly believe FutureGen would support the ongoing and future use of the nation's abundant coal reserves in a manner that addresses both the aging power production and environmental concerns. As a nation and as a community we have an opportunity to develop technologies that utilize the abundant resources our State has. One of them happens to be lots of coal. While keeping environmental -- while keeping environmental concerns up front and as a number one priority we can move these technologies and processes forward so our sons and daughters will have the opportunity to raise their sons and daughters with a safe, reliable environmentally responsible power supplies. All the while shoring up our local economy and putting Illinois residents to work. I'm very much in favor of moving this permitting process forward and letting the men and women of Central Illinois show the world what an educated well-trained work force can achieve. This country did not put men on the moon by sitting on our hands. Let's put that same spirit of progress and innovation behind FutureGen and the proud residents of Morgan County. Together we can develop these processes in a safe environmentally responsible manner and set a standard for the rest of the power industry worldwide.

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17	NMA	The members of our respective organizations are writing in support of the FutureGen 2.0 Project and applaud EPA for issuing the first draft Class VI underground injection control permit under Title 40 of the Code of Federal Regulations. This landmark draft permit is not only integral to the advancement and success of the FutureGen 2.0 Project, but the advancement of carbon capture and storage (CCS) technology for future use in the U.S. and around the world. While the U.S. Department of Energy has several pilot projects designed to capture and store carbon dioxide, it is time to scale up the technology to commercial size on coal-fueled power plants that will be fully integrated with geologic storage. The lessons learned from this first of its kind project will be key in the effort to adequately demonstrate CCS integrated with commercial-scale electricity production and the ultimate commercialization of CCS technologies. We urge final approval of the permit without delay to enable the FutureGen 2.0 Project to move forward on schedule.
18	NRDC	Sierra Club and NRDC have significant concerns about the FutureGen 2.0 project; in particular with regard to discrepancies between how the project is described to the public and the way it is has been permitted to date. While the Club and NRDC are concerned that the FutureGen 2.0 project's permits to date allow for serious air and water impacts, the Club and NRDC recognize the importance of getting the first Class VI UIC permits issued properly under the law and thus join in the comments below. **B. Comments** ***General comments*** These permit applications are significant, in that they represent the first effort to permit a CO_2 sequestration project using EPA's December 2010 Safe Drinking Water Act Underground Injection Control Program ("UIC") Class VI rules. Precedents may be set, with respect to what applicants look to in submitting in future applications. And through this review, EPA sends an important message about how it intends to implement the UIC Class VI regulations. At the outset, we commend the Applicant for compiling an application that is clear and that attempts to address most of the requirements of Class VI in a considered manner. While we may have questions or suggestions with respect to specific parts of the application, overall we are encouraged by the approach taken in evaluating and operating the site, as well as the conciseness with which information is presented. We do list a number of technical points below for EPA's consideration and resolution, and we can see a clear pathway forward for the issuance of the injection permits under consideration here, as we believe that our comments can be readily addressed by the Applicant and EPA. We support this effort, and hope that it can be the

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		precursor to more opportunities to permanently remove carbon pollution from the atmosphere and sequester it safely in the deep subsurface.
19	Pipefitters Local 137	I'm a member of the Pipefitters Local 137 out of Springfield, but I live in Jacksonville. And everybody's talking about the impact on Morgan County. Well, what about the counties around Morgan County? When we built that power house they was from Brown County, Pike County, all around. They wasn't all just from Morgan County. And it's going to help the people of Meredosia because they'll be buying groceries there, they'll fill their cars up with gas when they come to work or when they leave. So I think this is an impact on the whole community. West Central Illinois total. Not just Morgan County.
20	US Fish and Wildlife Service	The Service does not have any comments at this time on the draft permits.
21	Plumbers & Steamfitters Local 137	I am John Haines Business Manager of the Plumbers & Steamfitters Local 137 I represent 950 hard working families in Central Illinois. Our Association has Jurisdiction of the Future Gen Project and the CO_2 pipeline. We believe that the technology has been proven and that the future of the coal industry in Illinois hinges on this project. Our members will strive to make this project a complete success in hope that the Global energy market will utilize this technology and help reduce their carbon footprint. Local 137 is fully committed and supports this project 100%.
22	Robert J. Finley	I am writing in support of the FutureGen Alliance 2.0 Underground Injection Control (UIC) Class VI permit which will allow the drilling of four injection wells whose purpose is to demonstrate carbon storage in the Mt. Simon Sandstone in western Illinois. The FutureGen endeavor is an important one in terms of understanding the ability to safely and effectively store carbon dioxide within the geological framework rather than allow emissions to the atmosphere. International bodies, such as the International Energy Agency and the Intergovernmental Panel on Climate Change, have repeatedly recognized carbon sequestration as an essential technology to manage carbon dioxide emissions and reduce the hazards posed by climate change.
23	Robert J. Finley	I summary, I find the proposed activities under the FutureGen 2.0 draft Class VI permit to be well thought out and comprehensive. The proposed activities will advance understanding of carbon storage as a key technology to mitigate climate change impacts while protecting underground sources of drinking water in Illinois, my state of residence. I urge the US EPA to grant the final permit and authorize injection as proposed by the applicant.

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24	Betty Niemann	I believe people like to eat. I know we need power but we also need to eat. Now, this is my main concern for tonight, is the fact that we do have a responsibility for the future. Not only with clean air and clean water, but we also have to protect our resources for the future. And those resources are not only our coal but our water and I find that the oxy-combustion method used by FutureGen uses a lot more coal and we will run out of it faster if this is deployed as a widespread technology. FutureGen is not the first sequestration power-generated plant. It's the first oxy-combustion. Edwardsport, Indiana has a facility that is to produce greater than 500 megawatts of energy. However, it was supposed to be a CCS technology but the "S" dropped out when the Mount Simon Sandstone couldn't support it. The next one that is almost operational is Kemper down in Mississippi. Both of these plants uses less coal for their carbon capture than the FutureGen project. So I'm hoping that FutureGen is a one-of-its-kind, because if we need to go widespread CCS deployment we need to also use our coal wisely. Thank you very much.
25	Betty Niemann	I am against the USEPA Region 5 granting this permit or certification for several reasons all of which are based upon scientifically questioning the information contained within the applications and subsequent FutureGen submissions.
26	Betty Niemann	Please deny this permit. It is not needed. If a cost-benefit analysis were run on the FutureGen project, the increased cost of the project versus the impact on the atmospheric CO_2 reduction, adding in the extra amount of coal to drive this oxy-combustion method for CCS and the contamination of future potential water sources, is this project cost effective for climate change mitigation? I feel that the answer is NO! ...and the permits should be denied. The initial emphasis of this project based upon the EPA regulations is that it was for CO_2 for climate mitigation. When Bush pulled the funding, and in order to justify the project again, the emphasis became job production which is how I believe this has been spinned by the media and the climate mitigation has taken a back seat to job creation.
27	Elizabeth Rigor	I am writing this to let you know that I am opposed to the sequestration of CO_2 under Illinois farmland in Morgan County, Illinois. I do not believe that pumping supercritical CO_2 into the Mt. Simon formation is a way to eliminate it from the atmosphere because some people believe that CO_2 causes climate change. Out of sight, out of mind, therefore it doesn't exist however isn't this polluting the land? By the way, I do not believe that CO_2 clauses climate change nor that the sequestration of CO_2 is safe. … Please do not grant FutureGen its permits.

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28	Lillian Korous	I have long been disturbed by this project, hoping it would go away. To spend resources on an experimental project using a coal fired electric plant is poor judgment. Coal plants are a dying technology that is very polluting and restarting such a plant is counterintuitive. Coal is an outdated source of energy and coal-fired power plants are the dirtiest sources of energy in use today. After reading the Illinois EPA website for the start- up, I learned that, other than CO_2, the increases in emissions with the proposed plant would exceed the significant emission thresholds for a major project under PSD rules. "Limits are established for the emissions of pollutants from this plant to ensure that the project is not subject to the federal PSD rules." Our local paper mentioned that coal to be used would be high sulfur. It seems all the emphasis is on capturing CO_2 which undoubtedly contributes to the green- house effect but does not cause asthma, allergies, lung problems, acid rain and polluted water which other emissions cause and are present from every coal –fired power plant. CO_2 capture is the star of Future Gen 2.0, but pity the nearby inhabitants who have enjoyed a clear atmosphere during the facility shutdown, but who will now be affected by dirty air again. Using coal for energy has devastating environmental impacts during every point in its life cycle. Mining coal from the ground damages lands, water, and air. Transporting by trucks and diesel train adds air emissions and dust dispersal. The new oxy-combustion boiler will need 25% more coal than a traditional air boiler, thereby adding the increased emissions and impacts mentioned above. Coal ash is another huge contributor to pollution of the countryside.
29	CSC	We commend EPA on the issuance of these draft permits for public comment and on the work that has been undertaken to process these first of a kind permit drafts.
30	DCEO	Projects of this type are complex and have many moving actions at the same time. A lot has been accomplished in a very short time. I would like to commend the citizens of Jacksonville and Meredosia, their elected officials and the citizens of Morgan County and their county board members for their support, their patience and their enthusiasm of FutureGen 2.0. As the first Class VI well application the US EPA has taken to a hearing, I am aware of the scrutiny that the permitting process, testimony and your responses will receive. The state of Illinois has worked with the FutureGen Alliance and the US DOE to insure best practices have been used since the first stages of the FutureGen project. After reviewing the criteria used by the US EPA to evaluate the technical and project specific information, I am confident that the US EPA's efforts to evaluate all available information to reach the decision to issue this draft permit was comprehensive and accountable to the people of the state of Illinois.
31	FutureGen	The Alliance certainly welcomes the opportunity to come talk again about the FutureGen project and its importance to Jacksonville, to Morgan County and to Illinois, as well as to the nation. We also want to thank EPA for their

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		sustained effort to review our very detailed application for the underground injection control permit. They spent a year looking at the information we provided, asking us questions, reviewing our answers to their questions. It was a long very slog on their part and we appreciate all of their efforts.
32	FutureGen	The project involves retrofitting the Meredosia Energy unit -- Meredosia Energy Center in Meredosia with oxy-combustion technology. This will allow us to capture carbon dioxide, transport it in an underground pipeline and inject it deep underground in a site in northeastern Morgan County. The project will capture and permanently store 90 percent of the CO_2 emissions that -- CO_2 that would normally be emitted from coal fuel in the Meredosia Energy Center. We've made great progress on the project to date. We have received construction permits, air and water construction permits from Illinois Environmental Protection Agency for the construction of the Meredosia Energy Center. We have had our pipeline approved by the Illinois Commerce Commission. We have done the significant design work and will be getting final design. And the Department of Energy has completed its environmental impact statement process where it analyzed in detail potential environmental impacts of the project as a whole and it concluded that there were no significant environmental impacts.
33	FutureGen	Supporting documentation involves the description of the geology, as well as construction operation plan, a monitoring plan, and assurances that the Alliance would maintain financial responsibility for the project as a whole for the life of the project.
34	Color Art Integrated Interiors	I read the article and think it is a creative approach to this important issue. We certainly must do something to reduce the carbon release into the atmosphere. Would the 1.1 mil metric tons be enough to make any kind of a difference? … It seems reasonable that in 20 or more years we may have a better options for dealing with this off gas. Would like to know more but like the creative thinking on how to reduce green house gasses in the short term.
35	Illinois Chamber of Commerce	You've done this before. As you know, there is a CCS pilot project going on in Decatur, Illinois where carbon dioxide from ADM's facilities is being sequestered. The pilot project is about 80% complete with almost 800,000 metric tons of carbon already sequestered. DOE has seven pilot demonstration carbon dioxide storage sites around the country, including this one in Central Illinois. These pilot projects have proven that CO_2 storage can be done safely.
36	McCutchen	By 2035 the EIA forecasts annual US CO_2 emissions of 6.32 billion metric tons, 38% of which (2.40 billion) will be from coal plants alone. To put that in perspective, consider that in Texas the huge Permian Basin oil field's current annual enhanced oil recovery (EOR) demand is only 7 million tons of CO_2, about the output of a single 1 GW coal-fired power plant. See this article from POWER magazine at http://www.powermag.com/carbon-control-the-long-

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		road-ahead/. Clearly, EOR in depleted oil and gas reservoirs can't handle the expected volume of CO_2 that must be stored each year just from power generation. The only other potentially available pore space, once we set aside the tiny capacity of depleted reservoirs, coal beds, and dry formations, is in deep saline formations. Although deep saline formations have lots of pore space, i.e. spaces between grains in the rock, the pores in the rock are full of brine. Deep saline formations are not empty tanks, but full tanks. Moving the brine out and the CO_2 in may well be impossible at the scale of billions of tons each year. We hear a lot about the 25 years of successful experience with EOR, but it is the extrapolation of this EOR experience to permanent CO_2 storage in deep saline formations that is at issue because there are not enough depleted reservoirs to accommodate the tremendous volumes of CO_2 going to permanent storage. So EOR in depleted reservoirs (empty tanks) is immaterial. Once injected into the formation, the CO_2 would have to be securely contained there. This fundamental point seems to have been overlooked. In 2010, a sobering article appeared in the referenced Journal of Petroleum Science and Engineering (70:123-130), authored by two distinguished full professors, Christine Ehlig-Economides and Michael J. Economides. Here's a quote from the abstract: "Published reports on the potential for sequestration fail to address the necessity of storing CO_2 in a closed system. The lifetime emissions from just one large coal-fired power plant would displace water equal to the size of a giant oil field (4.1 billion oil barrels), as USGS research geologist Robert Burruss pointed out in his testimony to Congress in 2008. Work would be required to lift all of that brine to the surface to make way for the tremendous volume of CO_2. That work would presumably come from combustion of fossil fuels, adding to the CO_2 emissions. Will the energy for CCS create more CO_2 than it stores?
37	Betty Niemann	I also wish to point out that the farmers in Morgan County in the area of the natural gas storage deposit in the St. Peter Sandstone Formation are experiencing leakage… President Obama has said that one event does not make a trend…. By the way, I found it unscientific for FutureGen to select Morgan County as its carbon storage site without drilling characterization wells in the other two areas. It seems to me that cost has driven FutureGen to take the path of least expense.
38	Betty Niemann	At the public hearing on 7 May 2014, FutureGen said that it had received permission from the Illinois Commerce Commission on the Pipeline. Under ICC Docket number 13-0252, FutureGen received "conditional permission" for the pipeline based upon FutureGen securing all the permits before construction. i Under ICC Docket 14-0177 (Illinois Public Utilities Act Compliance) pages 16 through18 of the Final Order discusses the Underground Injection Control Permit from the USEPA

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		ii FutureGen has also been granted "conditional permission" on 13 May 2014 for the pipeline and sequestration of the CO_2. The Climate Change Argument: First, let us take a trip back to 1970 and the first Earth Day. Those of you younger than 50 years old in this room will not remember the doomsday predictions made by notables of that era. The greatest of these predictions is that the earth is cooling and the world is tumbling to the next ice age. Here we are 44 years later making a doomsday prediction of the exact opposite and that this global warming is based upon anthropogenic CO_2 production. I believe that CO_2 does not cause global warming nor that climate change is caused by man. I base this on what my family experienced after a move to the island of Bahrain in 1992 just after the first Gulf War. Kuwait, just north and slightly west of Bahrain, was "on fire" so to say with the huge number of oil wells burning after the war. Each burning well produced over 450 ppm of CO_2 at the well head. Yet, Bahrain did not experience high temperatures. Instead, Bahrain had two of the coldest and wettest winters since the early thirties. This cooling and extra rain was attributed to the smoke pall from the oil well fires covering the Arabian Gulf and preventing the waters in the Gulf from warming. The cool Gulf waters prevented the land from warming during the cooler months. The smoke provided condensation nuclei thereby causing increased amounts of rain and flooding. To me, this firsthand experience leads me to conclude that the any global warming is not caused by CO_2 but by solar radiation. If my conclusion is true, then the climate scientists should be able to document temperature increases over barren land compared to land that is not barren. Carbon Capture and Sequestration has been touted to be the "technology to mitigate CO_2". Yet, Gina McCarthy of the USEPA said that its new rules to mitigate CO_2 levels and therefore climate change will have negligible effects or impact on CO_2 levels and therefore climate change in a House Subcommittee on Energy and Power under the Energy and Commerce Committee on 18 September 2013. I might add that DOE Secretary Moniz was also present at this same meeting. In a testimony by Mr. Ed Whitfield from Kentucky, chairman of the subcommittee, he stated that human CO_2 production amounts to only 3.75% of 30 gigatons of the total CO_2 output of 800 gigatons.

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		iii If human activity is only 3.75%, then just how much of this 3.75% is due to coal fired power generation. Mr. McKinley of West Virginia also reports in this same House Subcommittee hearing that (in lines from 2258 to 2266): "we can say over 40 years there has been almost no increase in temperature, very slight. In fact, the CO_2 levels even with the increased greenhouse CO_2 level emissions, the Arctic ice has actually increased by 60 percent... Also that Antarctica is expanding. But more importantly, this report coming out of the United Nations, the IPCC report coming up is saying that most experts, most experts believe by 2083, and 70 years, the benefits of climate change will still outweigh the harm." iv Mr. McKinley goes on to say, "Let's put this in perspective. Hypothetically, let's assume that all coal-fired generation in America were curtailed, all coal-fired generation were curtailed. According to the United Nations and the IPCC, this would reduce the CO_2 levels of the globe by merely 2/10 of 1 percent by ridding all coal-fired power in the United States. The Administration also needs to remind people, as you heard from the chairman in his opening remarks, that manmade problems, if we could, only represent 4 percent of all the emissions of the globe. Natural emissions represent 96 percent. So as a result, this Administration is, by virtue of this stream of job-killing regulations, is putting our Nation at risk all in the idea of clinging to the notion that cutting 2/10 of 1 percent is going to save the world environment." v To further emphasize the impact, I have calculated the number in parts per million per year that the atmosphere will be reduced by 1 metric ton of CO_2 by the FutureGen project and this is 0.00047 ppm. FutureGen 2.0's sequestration is projected to reduce the amount of CO_2 by 1.1 million metric tons of CO_2 per year for 20 years or a total of 22 million metric tons if the project's estimates are correct. Therefore: 1.1 metric tons stored per year x 0.00047 = 0.0005 ppm per year or 0.01 ppm total for the 20 years of the project if my calculations are correct. There is more discussion on later in this comment paper. There is another way to look at the amount of CO_2 in the project. The USEPA website on CCS purports that a 500 MWe coal fired power plant produces 3 million metric tons of CO_2. vi According to FutureGen's copyrighted Conservation Plan

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		vii, the designed maximum output of the Meredosia Energy Center is 168 MWe but will have only a net of 99MWe. In order to equate the net output of the FutureGen power plant with the typical 500 MWe then we need to multiple FutureGen's data by 5 which means that the 1.1 million tons becomes 5.5 million tons of CO_2 produced by FutureGen to be sequestered which is 2.5 million more metric tons produced by the FutureGen project than the output of the typical 500 MEe power plant. This extra 2.5 million metric ton amounts to a loss or energy penalty of 83%. This means 83% more coal will have to be utilized by FutureGen for the oxy-combustion capture of CO_2. This is a waste of our coal resources and will cause the world to use its coal reserves faster than normal. Then if we compare the oxy-combustion FutureGen project with the Kemper IGCC CCS project in Mississippi and the Edwardsport IGCC CCS project in Indiana against the USEPA's 500MWe typical plant, as to CO_2 output and energy penalty, we will find that the FutureGen oxy- combustion project produces more CO_2 and has a higher energy penalty than the IGCC projects. *Capture is rate to be 65% ** Edwardsport will emit 4 million metric tons into the atmosphere as the site was not geologically suitable for sequestration. From this chart, it appears that of the two methods of capturing the CO_2, IGCC and oxy- combustion, the oxy-combustion carries the largest energy penalty and therefore is not energy efficient. This inefficiency goes against the thrust of energy efficiency in the White House Energy Policy. Climate Progress reported on an update of a Harvard Study on the true cost of coal. They summarized that CCS, to mitigate CO_2, is costly and carries numerous health and environmental risks, which would be multiplied if carried out on a widespread deployment. ix If this is the case, then why such a thrust for Carbon Capture and Sequestration IF CO_2 is not the cause of global warming or climate change? CCS has been called a scam by more than one entity. In addition, in 2011, the thrust for CCS was THIS IS the TECHNOLOGY to mitigate climate change. Now, in 2014, after Gina McCarty has testified at a House Subcommittee hearing on Energy that the EPA regulations which tout CCS for climate change mitigation will have negligible effect to curb climate change. (This is also stated in the Final DOE/EIS 0460 but is buried in the Appendices.) So now the spin is that CCS becomes a "bridging" technology for energy and climate change.

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		Since this FutureGen project was started in 2003, to me, there have been so many permutations on the facts, that it is hard to know what the true facts are given. My husband, his nephews, and his cousins have not had what other property owners have had when dealing with FutureGen. The decision to participate in FutureGen was not offered to them but was made for them without seeking their opinion on the matter by a trustee for a family trust. Hence, they are very concerned about the project and the ramifications to the farmland.
39	Betty Niemann	3. Land Deformation and Effects on Agricultural Land: (Also see discussion of the number of gallons of CO_2 below.) … The Agricultural Mitigation Agreement did not address this possibility nor inform the Farm Bureau nor the farmers that this might happen. Farmers have drainage tile under their land and is FutureGen prepared to continually repair this drainage tile during and after the project ends?
40	Betty Niemann	I would like to add that the Gulf Oil spill that happened in April of 2011 was an estimated spill of only 210 million gallons of oil. In one year, FutureGen is to inject 1.83 times as much supercritical CO_2 into the Mt. Simon layer under Morgan County.
41	Betty Niemann	Comments from the Final DOE/EIS-0460 **b. CO_2 Mitigation:** (1) The amount of CO_2 mitigated by the FutureGen 2.0 project to the atmosphere is negligible. (2) DOE does recognize this fact but it is buried on page I-41 Response 2-06.* *Page I-41 of the DOE/EIS-0460 (in Volume II) contains the DOE's response to my question concerning my comments about the 0.00047 ppm. The response is marked 2-06 to my comments also marked 2-06. The response is: "DOE acknowledges that the direct contribution of any single coal-fueled power plant equipped with carbon capture and storage to reducing worldwide atmospheric concentration of CO_2 would be negligible and the incremental impacts on global climate change cannot be determined effectively. Therefore, DOE considered the impacts of CO_2 emissions on global climate to be a subject for cumulative impact analysis addressed in Section 4.3, Potential Cumulative Impacts of the Draft EIS. As stated on page 4.3-25 of the Draft EIS, "These reductions in emissions alone would not appreciably reduce global concentrations of GHG emissions. However, these emissions changes would incrementally affect (reduce) the atmosphere's concentration of GHGs, and, in combination with past and future emissions from all other sources, contribute incrementally to future change in atmospheric

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		concentrations of GHGs." As stated under Climate and Greenhouse Gases in Table 4.3-3 of the Draft EIS, "the successful implementation of the project may lead to widespread acceptance and deployment of oxy-combustion technology with geologic storage of CO_2, thus fostering a beneficial long-term reduction in the rate of CO_2 emissions from power plants across the United States." DOE agrees with the scientific community that the cumulative effects of CO_2 emissions on global climate change cannot be ignored, which is why the agency is participating in the FutureGen 2.0 Project and continues to fund other demonstration projects involving carbon capture and storage. Please refer to DOE's response to Comment 14-01 for further discussion on this topic." (3) Because the CO_2 is mitigated in this project at a negligible rate, the DOE shifts the CO_2 negligible impact from the draft EIS to its position in the Final EIS to considering "potential cumulative impact" using the buzz word of "incremental" impact upon which to make its decision. **(4) This shift of position to "potential cumulative incremental impact" is tantamount to twisting the results to support the desired outcome in my opinion** (5) Using that same position in 3 above, the Final EIS does not take into the account of the incremental (potential cumulative impact) of increase CO_2 stored under pressure in the Earth during widespread deployment. Risks of the FutureGen Project: Page **8** of **10** for a 30 year project as first conceptualized. FutureGen 2.0 is forging ahead acquiring property rights/non-reversible options even through there is a lawsuit filed on the ICC's decision. IF FutureGen goes bust, and it could, the losers will be the landowners who were coerced, duped, misled by omission (my opinions and conclusions) to give up their property rights which if FutureGen 2.0 does go bust could be sold (for money) and not given or sold back to the landowners - all for a CO_2 mitigation of 0.00047 ppm per year. Again, in my opinion, the Final EIS conclusions are based upon incomplete impact analyses; i.e.: education and research center impacts upon the community as FutureGen requested 5 acres of the city park which is used by the community and the area requested contains beautiful trees, and the socioeconomic impact to the landowners if FutureGen fails as there are NO provisions in options and agreements for restoring property rights back to the owners if the project fails, and the failure to acknowledge that CO_2 may not be the factor to cause climate change/global warming or that research is biased only to prove climate change/global warming existence to name a few. There are other studies that also indicate doubts about and risks associated with FutureGen 2.0: o In 2009, the Government Accounting Office prepared a report entitled "*CLEAN COAL DOE Should Prepare a Comprehensive Analysis of the Relative Costs, Benefits, and Risks of a Range of Options for FutureGen*", which discusses the FutureGen Mattoon Project before Mattoon backed out of the project.

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		o In 2012, the Congressional Budget Office published a report entitled "*Federal Efforts to Reduce the Cost of Capturing and Storing Carbon Dioxide*" which has one conclusion on page i: "CBO's analysis suggests that unless the federal government adopts policies that encourage or require utilities to generate electricity with fewer greenhouse gas emissions, the projected high cost of using CCS technology means that DOE's current program for developing CCS is unlikely to do much to support widespread use of the technology." o On April 3, 2013, Peter Folger, of the Congressional Research Service, published a report entitled, "FutureGen, A Brief History and Issues for Congress". In it there are questions raised about the success of such a project and cites rising costs. It does not, however, quote the costs touted by Exelon, in its letter to Senator Durbin, of $3-4.5 billion which must be borne by the Illinois rate payers and taxpayers.
42	Betty Niemann	I have looked at the ADM applications for Class VI wells that were applied for in 2011 and so far there has not been a public hearing scheduled for either of the well applications.
43	Carl Hankel	It is shameful to see that an agency that is supposed to protect the public is wasting money on "carbon sequestration" to "protect" us against "global warming" which does not exist except in the minds of kleptocrats and scientists who have consistently changed their bogus data to support their "proof" of something that isn't proven and only exists as a consensus statement among those who stand to profit from continual hysteria. The EPA needs to divest itself from junk science and focus on things that really matter, like water pollution and particulate air pollution.
44	ClearStack Power LLC	Here is an excerpt from a paper written by a National Oceanic and Atmospheric Administration (NOAA) meteorologist; "Climate models used for estimating effects of increases in greenhouse gases show substantial increases in water vapor as the globe warms and this increased moisture would further increase the warming." However, this meteorologist along with the International Panel on Climate Change (IPCC) crowd got it backwards about water vapor and CO_2 -- they cool the earth like all other gases in our atmosphere! The amount of CO_2 from man is a mouse milk quantity compared to nature's emissions. If we eliminated worldwide, all man-made CO_2 emissions, we would go back to the level we had in January 2005. It was slightly warmer (about 0.1 °C) in January 2005 than it was in January 2011. The US EPA regulating man-made CO_2 is orders of magnitude beyond stupid. The man-made CO_2 being generated in the United States in 2010 that contributes to the CO_2 concentration in the atmosphere is 16.4% of the worldwide man-made total and that calculates to be (11.5*0.164) = 1.9 ppmv. The CO_2 release from Medieval warming has caused CO_2 in the atmosphere to rise some 2 ppmv per year from 1993 to 2011. So if you eliminated all man-made CO_2 from the U.S. today, next year at this time it would be the same as this year before the CO_2 emissions were stopped.

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45	ILL Coal Association	And low cost energy from coal has been the backbone of our nation's economy since the Industrial Revolution. Illinois is the Saudi Arabia of coal. In fact, the energy content from our coal is greater than the energy content of the oil from Saudi Arabia and Kuwait combined. So we believe coal must be part of America's energy mix in the future. This project will allow coal to be part of the all of the above energy strategy that's been getting quite a bit of attention lately. It's very disappointing to us that another part of your agency, U.S. EPA, continues to propose emission limits on carbon dioxide that cannot be met with the current technologies. Last year EPA announced standards for new power plants that can only be met by FutureGen-type technologies. And next month the standards for existing plants will be proposed. Is there any reason for me to be optimistic about how those standards will effect coal? This process is getting the cart before the horse. Carbon limits for coal can only be met by a technology that isn't even under construction yet for project FutureGen. If coal is supposed to be part of our future energy base, then this doesn't make sense to me, the process. The coal industry had a consistent request for several years, defer or postpone the imposition of carbon limits on power plants until commercially proven carbon capture and storage technology, CCS, is available. Doing otherwise will result in significantly higher electricity costs that will have a negative economic impact on this State, the region and the nation. That's why FutureGen is so important and needs to move forward now.
46	Illinois Chamber of Commerce	Pipelines make sense. One of the major differences between the Decatur and FutureGen 2.0 proposals is that the FutureGen 2.0 project will transport the carbon dioxide thirty miles via pipeline. Carbon dioxide is non-corrosive and non-flammable and since pipelines are safe in general and there are more than 4,500 miles of pipelines carrying carbon in the U.S., we are glad this mode of transportation is being used.
47	Leinberger & Critchelow families	The Permit is deficient in fundamental respects. …. The project involves the injection of millions of tons of carbon dioxide (1.1 million metric tons per year for 20 years) into an area where persons reside and private property is located. See AR # 16. Carbon dioxide is lethal to humans, animals and vegetation in the compressed liquid form that will be piped and injected underground.2 Carbon dioxide is a supercritical fluid at temperatures greater than 31.1 degrees Celsius and 7.38 MPa. See Alexandra B. Klass & Elizabeth J. Wilson, Climate Change, Carbon Sequestration, and Property Rights, 2010 U. Ill. L. Rev. 363, 428 (2010) (citing CRC Handbook of Chemistry and Physics 6-39 (David R. Lide ed., 88th ed. 2008)), attached in Exhibit 3. "When released, supercritical CO_2 depressurizes into a gas and has the potential to asphyxiate humans at high concentrations, among other possible adverse health effects." Jeffrey W. Moore, The Potential Law of on-Shore Geologic Sequestration of CO_2 Captured from Coal-Fired Power Plants, 28 Energy L.J. 443,

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		470 (2007) (citing Eric J. Beckman, Supercritical and Near-Critical CO_2 in Green Chemical Synthesis and Processing, 28 J. of Supercritical Fluids 121, 123 (2003)), attached in Exhibit 3. EPA recognized the unique risks to underground sources of drinking water ("USDW") associated with geologic sequestration ("GS") in its Final rule, stating, "Large CO_2 injection volumes associated with GS, the buoyant and mobile nature of the injectate, the potential presence of impurities in the CO_2 stream, and its corrosivity in the presence of water could pose risks to USDWs…recognizing that an improperly managed GS project has the potential to endanger USDWs…the properties (of CO_2), as well as the large volumes that may be injected for GS result in several unique challenges for protection of USDWs in the vicinity of GS sites from endangerment." See 75 FR 77230, Section II.A. (3), AR# 330. FN2: The draft Permit and application have little to no discussion on the impact of the 30 miles of piping (and the related connection area where the piping meets the UIC well) on the aquifer closest to the surface (Drinking Water Aquifer).
48	Lillian Korous	FutureGen does not consider who will be responsible for covering possible escalating costs of FutureGen 2.0. Carbon capture and sequestration have a history of exceeding costs. The first FutureGen project was abandoned in 2010 due to increased expenses. Mississippi Power Company's Kemper IGCC plant costs had doubled throughout the course of the project. Most of Kemper's $4 billion price tag will be paid by ratepayers in economically depressed communities of color in Mississippi. The State of Illinois has bound its utilities to purchase electricity from FutureGen 2.0 for 20 years, without any commitment regarding the rates that will be charged to customers. Why? This is a huge blunder or a huge sell-out.
49	Lillian Korous	The last topic is the building of a large "show place" facility featuring the FutureGen 2.0 project, including a visitor and research center, training facility and an arts center. The building is to be built on a 5 acre site in Jacksonville, Illinois' Community Park. Mature trees will be cut down and space will be subtracted from various established activities traditionally held at the park. FutureGen 2.0 already has office space in Jacksonville's downtown square. I believe this is a huge waste of money, better designated for the actual project, PARTICULARLY WHEN PROJECTS LIKE THIS GO OVER BUDGET. The visitor center at the Park smacks of ingratiation. It looks to me that the arts center is an add-on to appease the public for the unnecessary industrial move-in in our green Community Park.
50	Robert J. Finley	The development of UIC Class VI requirements by the US EPA has been an important milestone in allowing demonstration and testing of carbon sequestration while assuring protection of underground sources of drinking water. These requirements are extensive and, in my judgment, highly protective of underground water resources.

SECTION 2. GENERAL COMMENTS

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1	Bradley Zeller	Now, the environmental impacts of the sequestration, it is CO_2. It's carbon and oxygen and I see nothing toxic about either one of those elements. They're burying it 5,000 feet below the ground. The displacement value is equivalent to a dime in a bathtub. So there's not much of a factor. There's not going to be any heaving. We naturally have natural gas pockets in our county that people are using as wells for heating sources and things of that nature. Nobody's worried about them breaking out of their natural cavities. We currently have Panhandle Eastern which is storing natural gas in east south central Morgan County in a natural geological dome that they're storing over there. There have been no environmental impacts from that process either. Our well water is surface water. Our water comes from the top down. It does not come from the earth up. Just a quick story on myself. My oldest son is 30 years old. We didn't have city water at that time. We still have our shallow well, which is 18 feet deep. The deepest well in Morgan County that supplies Morgan County is 90 foot deep. But I have been more of a culprit to contaminating my well than FutureGen will by my farming practices, because it failed because of my trace values were too high in my own well. In summary, I'd like to say I have confidence in the science. Love the opportunity to come into Morgan County a clean energy site of the world and am excited about the fact that we did something to help with the global warming weather issues. Thank you.	The Mt. Simon formation, which will receive the CO_2, is thousands of feet below the ground surface (between 3,785 and 4,432 feet) at the FutureGen site, and contains porous spaces to accept and store the CO_2; it is beneath the Lombard and Proviso Members of the Eau Claire Formation which is a confining layer of rock that will trap the CO_2 and act as a natural barrier to leakage. The CO_2 will be injected through technically engineered wells with multiple barriers designed to isolate the injectate in the well and protect formations outside the well materials. FutureGen's permits comply with the tailored requirements in the Class VI Rule that specifically address the unique nature of CO_2 Geologic Sequestration (GS) and focus on ensuring protection of underground sources of drinking water (USDWs) and human health where geologic sequestration is occurring.

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2	CIBCTC	It will also be a safe system as C02 is non corrosive and nonflammable. The CO_2 that will be transported in the pipeline and injected underground for permanent storage.	The Mt. Simon formation, which will receive the CO_2, is thousands of feet below the ground surface (between 3,785 and 4,432 feet) at the FutureGen site, and contains porous spaces to accept and store the CO_2. Based on local and regional geologic study and testing, EPA has determined that the Mt. Simon is sufficiently laterally extensive and porous to allow it to safely receive the volume of CO_2 FutureGen plans to inject.
3	DCEO	We offer some of the best sequestration geology anywhere. The Mt. Simon Sandstone, in this case, is a large-capacity porous rock layer filled with briny water.	The Mt. Simon formation, which will receive the CO_2, is thousands of feet below the ground surface (between 3,785 and 4,432 feet) at the FutureGen site, and contains porous spaces to accept and store the CO_2. Based on local and regional geologic study and testing, EPA has determined that the Mt. Simon is sufficiently laterally extensive and porous to allow it to safely receive the volume of CO_2 FutureGen plans to inject.
4	Illinois Chamber of Commerce	The rocks are good! Illinois geology has been rigorously studied by independent scientists and is ideal for carbon dioxide storage because the porosity, permeability, depth and the presence of an impermeable caprock all contribute to the ability to safely store it. The FutureGen Alliance has proven through geologic testing and engineering studies that the Morgan County site is highly suitable for CO_2 storage.	The Mt. Simon formation, which will receive the CO_2, is thousands of feet below the ground surface (between 3,785 and 4,432 feet) at the FutureGen site, and contains porous spaces to accept and store the CO_2. Based on local and regional geologic study and testing, EPA has determined that the Mt. Simon is sufficiently laterally extensive and porous to allow it to safely receive the volume of CO_2 FutureGen plans to inject. The suitability of the site is based on evaluation of extensive information about the proposed site, including the geological, geomechanical, hydrogeological, and geochemical properties of the injection and confining zones; local hydrogeology; geochemistry; and seismic history in the context of the planned injection operation.

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5	Betty Niemann	Most of you know that I'm against granting the permits for the underground injection well. And just recently as of Sunday a thought occurred to me, the Houston Chronicle reported Brazoria County, Texas, which is south of Houston, is going to use the saline aquifer and pump out the saline and apply desalination to fulfil their water requirements in a drought situation. So as the U.S. EPA is over the drinking water, what plans do you have for the future if the doomsday predictions are that we are going to end up in drought and we will have to seek other ways for water? The Mount Simon sandstone is a saline aquifer. It's large and could possibly be a water source with the desalination as a result of its being pumped out to produce fresh water for this water and for agriculture.	The UIC requirements, including the Class VI Rule, are designed to protect USDWs, which are defined by the regulations (under Safe Drinking Water Act (SDWA) authority) as ground water formations containing less than 10,000 parts per million (ppm) of total dissolved solids (TDS). Based on this definition, the Mt. Simon is not considered a USDW as it has a salinity of 47,500 ppm TDS (as measured in samples taken from the FutureGen stratigraphic test well). Therefore, injection into that formation, with appropriate protective measures as outlined in the rule and implemented in the permits, is allowable under SDWA and the UIC regulations. This comment did not request, and does not require, a change to the draft permits.
6	Elizabeth Rigor	The USEPA should study all the ramifications of the injected CO_2 in the geological formations beneath Illinois farmland. Solving CO_2 so called GHG pollution by contaminating the geology is not actually ridding the world of the CO_2.	FutureGen's permits comply with the tailored requirements in the Class VI Rule that specifically address the unique nature of CO_2 GS and focus on ensuring protection of USDWs and human health where geologic sequestration is occurring. The suitability of the site is based on evaluation of extensive information about the proposed site, including the geological, geomechanical, hydrogeological, and geochemical properties of the injection and confining zones; local hydrogeology; geochemistry; and seismic history in the context of the planned injection operation.
7	Betty Niemann	I do not believe that FutureGen has been transparent in the release of information about this project and can cite instances from which I based my beliefs.	FutureGen submitted—and EPA reviewed—all information required in the Class VI rule. All of the information that FutureGen submitted to EPA and that EPA considered in its permitting decision is available to the public as part of the administrative

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			record for this permitting process. Much of the information is available through EPA's website and at the document repositories.
8	Betty Niemann	Since FutureGen's application was made in 2013, all of a sudden there seems to be a public hearing scheduled. Why the rush? Was Region 5 pressured or urged to speed up the Class VI applications? With the Illinois Commerce Commission on 13-0252, FutureGen urged the commission to grant a conditional approval pending that FutureGen obtains all the necessary permits and also urged the commission to grant limited power of eminent domain for the pipeline even though FutureGen does not have all the permits thereby depriving landowners due process of the law of right to ownership. FutureGen cited economic hardship of having to meet ARRA deadlines of 30 Sept. 2015 if it does not have the ICC approval. Did FutureGen apply this same tactic with Region 5?	The FutureGen public hearing was scheduled to take place during the public comment period for the draft permit(s) pursuant to Part 124 of the Code of Federal Regulations to ensure that the public has opportunity to provide input. EPA performed an extensive review of the detailed geologic and operational information in FutureGen's permit application. The review team included geologists, geochemists, hydrogeologists, modelers, and well engineers who are familiar with the geology of Illinois and the UIC requirements. Throughout this review, EPA requested and FutureGen provided additional information as needed to ensure that the permit determination was based on appropriate information and that the permit conditions will ensure protection of USDWs from endangerment. EPA proceeded with the draft permit decisions once it had completed its review and permit drafting. FutureGen has made EPA aware of the ARRA [American Recovery and Reinvestment Act] deadlines, but EPA has been clear in communicating to FutureGen that EPA would not proceed with any regulatory decisions until the record was complete and EPA could determine whether all permitting requirements in the regulations had been met. While the other permits the commenter mentions are out of the scope of the UIC regulations, EPA clarifies that, under Part A of the Class VI permit, the FutureGen Alliance may not commence injection until it meets all other necessary regulatory requirements.
9	CSC	Our interest, and our reason for commenting on these draft permits, is directed at the potential precedents being established for these draft FutureGen permits and all future	EPA will not make the suggested changes. FutureGen is responsible to comply with both the permit requirement and the regulatory requirement upon which it is based.

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		Class VI permits that may be issued by EPA Region 5, other EPA regions and state primacy programs. We want to make sure that the permits, the conditions contained therein, and the plans approved as part of permits are consistent with the regulatory requirements and designed to assist with full understanding of the requirements and safeguards of Class VI permits. Our comments are designed to improve the clarity and accuracy of these Class VI permits. To begin, we commend EPA for the very important and fundamental recognition in Section A of the draft permits that "[f]or purposes of enforcement, compliance with this permit during its term constitutes compliance with Part C of the Safe Drinking Water Act (SDWA)". This is a fundamental tenant of virtually every EPA permitting program. Permit applicants are called upon to submit their plans and proposals for complying with the regulatory permit requirements that have been promulgated by EPA based on the underlying legislative mandates enacted by the U.S. Congress to achieve specific statutory objectives. In this case, the permit applications provide for compliance with the UIC program requirements promulgated by EPA pursuant to the Safe Drinking Water Act (SDWA) to protect underground sources of drinking water (USDW) from endangerment consistent with the mandate of that statute. As EPA has recognized in numerous provisions of the draft permit, the approved application, the required plans, and the individualized permit conditions provide for compliance with the promulgated regulatory requirements of the Class VI UIC program. That is why compliance with the final permit "constitutes compliance with Part C of the SDWA". For example, Section M(3) of the draft permit states: "This monitoring shall be performed as described in the Testing and Monitoring Plan to meet the requirements of 40	Some of the specific permit references identified by the commenter are discussed and responded to in more detail elsewhere in the response to comments document. However, as a general matter, the permits are intended as a roadmap to identify the relevant requirements and obligations of FutureGen. In some cases, the relevant regulatory provisions for operational details can be relatively lengthy and technical, so that the permit language may summarize those requirements and provide reference to the regulatory details rather than copying them in their entirety. This makes the permits more reader-friendly and easy to follow. Incorporating the additional details by reference does not create any conflict or confusion between the terms of the permit and the regulations. By issuing final permits containing the language as presented in the draft permits, EPA approves the plans as presented. However, EPA also recognizes that site-specific conditions encountered during drilling, operating and monitoring may present the need to alter any of the project plans, at which time FutureGen may propose to the Director changes in the plan. Any such changes would result in a permit modification –which, depending on the nature of any changes, could warrant an additional public notice and comment period. EPA anticipates that the plans will be regularly reviewed and revised as required by the Class VI regulations. Reference to the relevant regulatory provisions provides clarity on the standards against which any revisions will be judged.

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		CFR 146.90(b).” This is an excellent recognition of the process whereby, the applicant has submitted a Testing and Monitoring Plan that provides for satisfying the requirements of the UIC Class VI regulations in section 40 CFR 146.90(b) and EPA has approved the plan and the permit because it meets those requirements. Accordingly, compliance with the Testing and monitoring Plan of this permit during its term will constitute compliance with the section 146.90(b) requirements as noted by the permit condition in sections M(3) of the draft permits. Unfortunately, other conditions in the draft permits that also reference regulatory provisions are too loosely worded and give the inappropriate impression that the permittee must take some further steps—beyond complying with the permit and the approved incorporated plans—to meet the regulatory requirements. For example, Section G(1) of the draft permits states: “The permittee shall maintain and comply with the approved Area of Review and Corrective Action Plan (Attachment B of this permit) which is an enforceable condition of this permit **and shall meet the requirements of 40 CFR 146.84**.” This wording is inappropriate because maintaining and complying with “the approved Area of Review and Corrective Action Plan (Attachment B of this permit) which is an enforceable condition of this permit” will be entirely sufficient to meet the requirements of 40 CFR 146.84. EPA makes that determination when it issues the permit and approves the plan as part of that permit. No further action is necessary; therefore the inclusion of the words “and shall meet the requirements of 40 CFR 146.84” is both unnecessary and inappropriately confusing. It would be acceptable to use wording similar to that in Section M(3) and say “to meet” rather than “and shall meet” but given the reference to the plan being an enforceable condition of the	

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		permit, that is unnecessary and may potentially be confusing. There are a number of other places in the draft permits where loose—and potentially contradictory language (that is, language that would contradict section A)—is used. The attached detailed comments identify these provisions and provide specific recommendations of alternative language. The problem identified with the potential conflict created by referencing both permit conditions and regulatory provisions is exacerbated by the frequent repetition of regulatory requirements throughout the draft permits. This is an unusual departure from past approaches in UIC permits. For example, Class IH permits issued by EPA Region 5 have included conditions for post-closure plans that say: "The permittee has submitted a plan for post-closure maintenance and monitoring, which is included in Part III(B) of this permit. This plan includes the information required by Section 146.72(a) and demonstrates how each of the applicable requirements of Section 146.72(a) will be met. The obligation to implement the post-closure plan survives the termination of this permit or the cessation of injection activities." This excellent language provides a very straightforward explanation of how the submitted plan, which has been reviewed and approved by EPA, provides for compliance with the regulatory requirements and becomes an enforceable part of the permit. A similar approach could easily be used for each of the required plans included in the Class VI permits and would provide a clearer understanding of how the plans function in providing for compliance with the regulatory requirements as part of the Class VI permit.	

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10	Leinberger & Critchelow families	Strict adherence to the applicable UIC regulations is imperative. … Pursuant to Section 1421 of the Safe Drinking Water Act (AR # 18, 477), the purpose of the of the Underground Injection Control Program is to prevent underground injection which endangers drinking water sources 42 U.S.C. 300h (b)(1). The UIC regulations must prevent contamination of drinking water and prevent the movement of fluids containing contaminants that "otherwise adversely affect human health." *In re NE Hub Partners, L.P.*, 7 E.A.D. 561, 567 (1998) (*citing* 40 C.F.R. § 144.12(a)). Due to the deficiencies in the materials submitted to EPA, FutureGen has not met this standard and the resulting draft Permit is based on erroneous findings.	FutureGen's permits comply with the tailored requirements in the Class VI Rule that specifically address the unique nature of CO_2 GS and focus on ensuring protection of USDWs and human health where geologic sequestration is occurring. Suitability is based on evaluation of extensive information about the proposed site, including the geological, geomechanical, hydrogeological, and geochemical properties of the injection and confining zones; local hydrogeology; geochemistry; and seismic history in the context of the planned injection operation. FutureGen submitted—and EPA reviewed—all of the information required in the Class VI rule to demonstrate that the site meets the geologic siting, AoR, construction, and financial responsibility requirements for injection of CO_2 that does not endanger USDWs. EPA found that the final documents on which the FutureGen permit decisions were based were sufficient to meet regulatory standards.
11	Leinberger & Critchelow families	A. FutureGen Caused Movement of Fluid into Underground Sources of Drinking Water Already before construction, FutureGen has allowed the movement of contaminated fluid into underground sources of drinking water. In October 2011, FutureGen drilled a deep stratigraphic well to support the evaluation of the carbon storage location. The stratigraphic well is approximately 1 mile east of the intended injection site, at longitude 90.05228W, latitude 39.8067N. The drilling ceased in December 2011. See Supporting Documentation, 2.1.3, AR# 1, 2. At that same time, water pumped from one of the Critchelow's wells turned a yellowish/brown color for approximately one month. See Critchelow Declaration, Ex. 5. The Critchelows use the well water for washing and drinking,	Drilling and construction of the stratigraphic test well occurred under a permit issued by the Illinois Department of Natural Resources (IDNR). Such drilling and construction is not under EPA's jurisdiction. EPA contacted the IDNR and found that there were no complaints of well contamination registered in Morgan County during the drilling of the stratigraphic test well. The information provided by the commenter is not detailed enough to provide any direct correlation between drilling and construction of the stratigraphic test well and the issues with the Critchelow well. EPA has no reason to expect that the well would have been hydraulically connected to the FutureGen well. Inquiries with the State have not resulted in any information about this alleged incident. EPA is willing to require that Future Gen provide advance notice to the Critchelows when the well construction is scheduled,

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		yet were unable to do so when it was so discolored. Moreover, the drilling caused the water in the well to overflow. Id. The discoloration and pressure impacts to the Critchelow's well only ceased when the drilling ceased. The water in the well has never changed colors or overflowed in the 25 years the Critchelows have lived on their property. Id. The discoloration and pressure impacts of the drilling of the stratigraphic well were in clear violation of the mandates of the SDWA and the underlying regulations. Specifically, Section 144.12(a) of the general requirements for underground injection wells states: No owner or operator shall construct, operate, maintain, convert, plug, abandon or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR part 142 *or may otherwise adversely affect the health of persons*. **The applicant for a permit shall have the burden of showing that the requirements of this paragraph are met** (emphasis added). By causing the Critchelow's well to overflow and the water in the well to be discolored, FutureGen has already failed in its burden of showing that it has not constructed and operated an injection activity that allows the movement of fluid into underground sources of drinking water or adversely affects the health of persons. The proposed injection well in the draft Permit will be about a mile closer to the Critchelow Property than the stratigraphic well. FutureGen has not conducted an investigation or provided any explanation for the impact on the Critchelow well. See also, Ex. 1, para. 6 (Price report). Under its discretionary authority, the Director should require FutureGen to investigate this impact and refrain from issuing	so that they can see whether their well shows any impacts. If any impacts are observed, it would trigger actions under the corrective action plan. As proposed in the draft permit and contained in Attachment F of EPA's final permit, the Emergency and Remedial Response Plan identifies potential adverse incidents that will be watched for during the construction period, including movement of brine between formations during drilling. The Plan identifies response actions to be taken to mitigate any potential endangerment of USDWs.

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		the Permit until the issues presented, including probable impacts to wells in the Survey Area and Area of Review, are resolved.	
12	Leinberger & Critchelow families	The Director of the EPA Region V Water Division ("Director") should use her discretion to require additional information regarding the project, as necessary, in order to properly assess the Permit. See, e.g. 40 CFR §146.82(a)(21), 146.84(c)(2).	EPA geologists, geochemists, hydrogeologists, modelers, and well engineers who are familiar with the geology of Illinois and the UIC requirements performed an extensive review of the detailed geologic and operational information in FutureGen's permit application. Throughout this review, EPA requested and FutureGen provided additional information as needed to ensure that the permit determinations were based on appropriate information and that the permit conditions will ensure protection of USDWs from endangerment. The extensive information in the administrative record is sufficient to assess the portion of the project subject to UIC permitting. The permits and the regulations clearly provide that additional information will be developed throughout the construction and operation of the wells, and that the permits will be reviewed and revised to reflect newly developed information.
13	CSC	Provision: Page 1 **Text of Draft Permit:** as characterized in the permit application and the administrative record as a liquid, **References:** **Proposed Revision:** as characterized in the permit application and the administrative record as a liquid, supercritical **Comment:** A supercritical fluid is not a liquid. It is a supercritical fluid having properties of a gas.	The permit language provides assurance that the permit is applicable in the event that a change in phase occurs in the CO_2 stream. Therefore, the permit language has not been modified based upon this comment.

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14	FutureGen	The depth interval of the injection zone may change based on site specific data at the CO_2 injection location. The Alliance suggests changing the last part of the first sentence to read: at depths between approximately 3785 feet and 4432 feet below ground surface, with actual depths based on site-specific data, upon the express condition that the permittee meet the restrictions set forth herein.	To the extent that small deviations to the planned depths are identified after the wells are constructed and surveyed, those corrections can be made through the minor modification process identified in 40 C.F.R. § 144.41. Therefore, the permit language has not been modified based upon this comment.
15	FutureGen	In the second to last sentence, The Alliance suggests the following wording regarding the confining zone: The designated confining zone for this injection well is identified as the upper part of the Eau Claire Formation formed by the upper part of the Lombard Member and the Proviso Member.	EPA changed the text as requested to provide greater clarity and specificity regarding the names of the geologic formations at issue.
16	Color Art Integrated Interiors	Obviously safety is the next important question. How can we be sure that this carbon dioxide will not escape up through the ground or contaminate our water/other below the surface?	The Mt. Simon formation, which will receive the CO_2, is thousands of feet below the ground surface (between 3,785 and 4,432 feet) at the FutureGen site, and contains porous spaces to accept and store the CO_2; it is beneath the Lombard and Proviso Members of the Eau Claire Formation which is a confining layer of rock that will act as a natural barrier to leakage. The CO_2 will be injected through technically engineered wells with multiple barriers designed to isolate the injectate in the well and protect formations outside the well materials. After injection begins and throughout the life of the project, FutureGen will implement an EPA-approved Testing and Monitoring Plan that includes monitoring of the CO_2, the well, ground water quality, and the position of the carbon dioxide plume and pressure front. FutureGen and EPA will review the monitoring and operational data. If, based on the results of such monitoring,

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			there is reason to believe that the project is posing a risk to USDWs, human health and the environment, there are permit conditions that require FutureGen to cease injection and implement its Emergency and Remedial Response Plan. This comment did not request, and does not require, a change to the draft permits.
17	Lillian Korous	Another concern regards the permanence of CO_2 storage schemes. Improper storage or long term monitoring could lead to health risks to nearby populations, harm agriculture, create pressure changes causing ground heave, and even trigger seismic events. Safe and permanent storage cannot be guaranteed and even low leakage rates would undermine any climate mitigation effect. This is not a tried and tested process. In 1986 a large leakage of naturally sequestered CO_2 rose from Lake Nyos in Cameroon and asphyxiated 1,700 people. While the CO_2 had been sequestered naturally, the event could be evidence for the potentially catastrophic effects of sequestering carbon artificially. Local residents fear a potentially dangerous CO_2 leak and the lack of adequate evacuation procedures. Is future long term monitoring or a financial assurance plan to insure the long term stability of the CO_2 sequestration addressed?	FutureGen's permits comply with the tailored requirements in the Class VI Rule that specifically address the unique nature of CO_2 GS and focus on ensuring protection of USDWs and human health where geologic sequestration is occurring. Suitability is based on evaluation of extensive information about the proposed site, including the geological, geomechanical, hydrogeological, and geochemical properties of the injection and confining zones; local hydrogeology; geochemistry; and seismic history in the context of the planned injection operation. Based on an evaluation of this information, EPA determined that the FutureGen site is suitable to receive and store the anticipated volume of CO_2 without endangering USDWs. The FutureGen site has little in common with the physical setting or mechanism that resulted in the release of naturally-occurring CO_2 trapped at the bottom of Lake Nyos, a stratified tropical lake that suddenly overturned through a process known as "limnic eruption." No injection was associated with this event. The Mt. Simon formation, which will receive the CO_2, is thousands of feet below the ground surface (between 3,785 and 4,432 feet) at the FutureGen site, and contains porous spaces to accept and store the CO_2; it is beneath the Eau Claire Formation which is a confining layer of rock that will act as a natural barrier to leakage.

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			After injection begins and throughout the life of the project, FutureGen will implement a testing and monitoring plan that includes monitoring of the CO_2, the well, ground water quality, and the position of the carbon dioxide plume and pressure front. FutureGen and EPA will review the monitoring and operational data. If, based on the results of such monitoring, there is reason to believe that the project is posing a risk to USDWs, human health and the environment, there are permit conditions that require FutureGen to cease injection and implement its Emergency and Remedial Response Plan. The permits and the regulations require FutureGen to have financial assurance in place for the entire life of the project. See Part H of the Permits and 40 C.F.R. §146.85(a)(2). EPA also understands that under Chapter 20 of the Illinois Compiled Statutes, Section 1108, the State of Illinois assumes certain liabilities and long-term stewardship obligations associated with the injected carbon dioxide.
18	McCutchen	What will be done with all of that brine once it is extracted? Reverse osmosis reject brine (brine concentrate) is classified as "industrial waste" by the EPA, and the extracted deep saline brine will be even saltier (up to 463,000 ppm). Disposal of reverse osmosis reject brine is already a limiting factor in desalination deployment, and this will be a much bigger and saltier waste stream. You can't just dump it, so where will that deep saline brine go to make way for the tremendous volumes of CO_2 that will replace it deep underground? If the plan is to hammer the supercritical, buoyant CO_2 into the saline formation in order to force the water to flow elsewhere underground, will that even be possible against the tremendous pressure at the depth required to maintain supercriticality? Will the displaced brine flow up to pollute fresh water supplies or	The Mt. Simon formation, which will receive the CO_2, is thousands of feet below the ground surface (between 3,785 and 4,432 feet) at the FutureGen site, and contains porous spaces to accept and store the proposed volumes of CO_2; it is beneath the Lombard and Proviso Members of the Eau Claire Formation which is a confining layer of rock that will act as a natural barrier to leakage. Within the subsurface the native brines will be displaced by CO_2, but remain in subsurface (i.e., it will not be produced). EPA has determined that the Mt. Simon is sufficiently extensive and porous to allow it to receive the volume of CO_2 FutureGen plans to inject without excessive pressure buildup that could allow fluid movement outside of the injection zone or allow fractures to propagate in the confining zone.

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		increase soil salinity, leading to famine? Will the hydraulic hammering of pumping CO_2 fracture the sealing formation, leading eventually to a disaster like Lake Nyos in 1986, where 1,700 people died from asphyxiation when CO_2 erupted from underground? If a CO_2 plume does escape from the sealing formation, what can be done about it?	Additionally, the permit conditions limit the injection pressure to less than 90% of fracture pressure, to provide further assurance that excessive pressure buildup will not occur; this will be confirmed through testing and monitoring and periodic re-modeling of the carbon dioxide plume and pressure front throughout the life of the project. The FutureGen site has little in common with the physical setting or mechanism that resulted in the release of naturally-occurring CO_2 trapped at the bottom of Lake Nyos, a stratified tropical lake that suddenly overturned through a process known as "limnic eruption." In response to the question regarding CO_2 escaping from the sealing formation, the Class VI permit is structured in a manner to reduce this risk –from siting, construction, operation through to post-injection site care. This is of principal importance. In the unlikely event that CO_2 were to be detected outside the injection zone through a suite of EPA-approved monitoring techniques incorporated in the Testing and Monitoring Plan of the permit, FutureGen would be required to implement the Emergency and Remedial Response Plan, an enforceable part of the Class VI permit, which outlines the protocol to be implemented under specific circumstances (e.g., migration of CO_2 out of the permitted injection zone) including the process and actions to be implemented to shut in the injection well(s), mitigate risks, and communicate with EPA, other relevant authorities, and the public.
19	Betty Niemann	f. There is a growth fault in the Mt. Simon layer, according to a private conversation *with* the FutureGen Geologist at the Public Hearing on 7 May 2014. Also, he said that there were transgressive sequences. I am not a geologist, but what I read is that these types of formations can lead to ways for the supercritical CO_2 to migrate upward. xv Has the geology of	FutureGen submitted and EPA evaluated information on the presence of faults and fractures in the area of the site to identify whether any pathways for fluid movement to USDWs exist. Based on the results of seismic surveys and an evaluation of the local and regional geology (based on maps and cross sections submitted by the permit applicant and additional information referenced by

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		the sequestration site been thoroughly mapped and potential upward pathways identified if any?	EPA), EPA determined that no transmissive faults or fractures that may interfere with containment of the CO_2 exist in the confining zone. Information on EPA's evaluation is available in multiple documents in the Administrative Record including but not limited to: "Induced Seismicity Evaluation Using the EPA-Developed Decision Model" and the "FutureGen Alliance Class VI Injection Project: Evaluation of Area of Review Delineation and Corrective Action." Additionally, the permit conditions limit the injection pressure to less than 90% of the fracture pressure of the Mt. Simon formation to prevent the creation of fractures.
20	Betty Niemann	Seismic Monitoring Identification of Subsurface Structural Features: Seismic monitoring data indicate the possible presence of a fault or fracture near the CO_2 injection zone in the sedimentary cover or in the basement (concentration of microearthquakes of M<<1 in elongated clusters). The Testing and Monitoring Plan provides extended information about the microseismic monitoring network. Action: The cause of the indicated microseismicity patterns will be evaluated. In conjunction, various operational parameters will be tested using the computational model to determine if the microseismic activity can be controlled to acceptable levels. xx I recognize the input of Dr, McBridexxi in that he states "however it cannot be definitively determined that there are no faults in the Morgan County data." The website www.energyjustice.net/coal/igcc states that CO_2 is a more permanent storing of the gas and and it must be stored without leaking for thousands of years. "We have been unable to safely store solid and liquid radioactive wastes for	FutureGen submitted and EPA evaluated information characterizing the seismic history of the region. The nearest seismic event to the proposed FutureGen project site was reported to have occurred in July 1909 (equivalent to a Magnitude 4.8) approximately 28 miles north of the site. EPA also evaluated extensive site characterization information and injection well operational data –including site-specific information on the local and regional geology, the presence of faults and fractures and computational modeling analyses of plume and pressure front behavior over the project duration and determined that the project poses a low risk of inducing felt seismic events. Documentation of EPA's evaluation and assessment are included in but not limited to the: "Induced Seismicity Evaluation Using the EPA-Developed Decision Model" and the "FutureGen Alliance Class VI Injection Project: Evaluation of Area of Review Delineation and Corrective Action." As noted above, EPA determined that no transmissive faults or fractures exist in the Eau Claire Formation (the confining zone). Additionally, FutureGen's permit limits the injection pressure to below 90% of the fracture pressure in the Mt. Simon formation;

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		50-60 years with out leakage. It's unlikely that we will be able to store a significant part of the world's 28 billion metric tons of CO_2 gas emitted every year without leakage problems."xxii	this pressure limitation is designed to reduce the potential for inducing any seismic events. It is based on the fracture pressure of the injection zone, which will be confirmed during pre-injection testing of the injection and confining zones at the well sites (which FutureGen must perform prior to commencing injection). As additional information becomes available, that calculated value may change. To the extent new information indicates that the current value in Attachment A exceeds at 90 percent of the fracture pressure of the injection zone(s), the maximum injection pressure would be reduced to assure compliance with the regulatory standard in 40 C.F.R. § 146.88(a) and protection of USDWs. Also, throughout the life of the project, FutureGen will monitor for induced and naturally occurring seismic events using five passive seismic monitoring stations. Should a seismic event occur, the Emergency and Remedial Response Plan outlines the protocol to be implemented (based on a range of Magnitudes and attributes of the event), including the process and actions to be implemented to shut in the injection well(s), mitigate risks, and communicate with EPA, other relevant authorities, and the public.
		From what I have seen in the applications and the questions asked by the USEPA for further information, is this sequestration site based upon literature values and the assumption that it will work as a reservoir for supercritical CO_2? An assumption must be scientifically tested with samples and geologic testing, mapping, and such. I believe that IF FutureGen has based this entire project on the fact that the literature states this geologic formation can be a reservoir for CO_2 and not conducted a thorough geologic analysis of the formation, then the permits should be denied until such time all parameters are thoroughly studied and the geologic formation information is verified by an independent geophysical engineer.	It is important to note that CO_2 and radionuclides behave differently in the subsurface; the Class VI rule requirements—and FutureGen's permits— specifically address the unique nature of CO_2 GS and address the risks that EPA determined that CO_2 injection may pose to USDWs. In response to statements and comments regarding the permit application information evaluated by EPA prior to issuing these draft permit decisions, EPA clarifies that FutureGen complied with the requirements at 40 C.F.R. § 146.82(a). For compliance with these requirements, site specific information, information from

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		The ILBD (Illinois Basin Decatur) Project, in my opinion has a lot more research and facts about the Mt. Simon formation and the geology of the Illinois Basin and from which valid determination on CO_2 sequestration can be made. This research should be applied to FutureGen as a comparison to see if the geology and the Mt. Simon formation are consistent with the findings in the Decatur area for proper CO_2 sequestration. If there are any anomalies between the two, then I feel the FutureGen site should be further examined and studied or the permit is denied based on insufficient data. … There have been studies in the geology of the CO_2 Storage Area and these are NOT discussed in great detail in the Geology section of the EIS 460D document. The findings of these studies may have an impact on the CO_2 storage area which may or may not be transferred through the layers to the surface.	natural analogues and literature values may be presented to inform a draft permit decision. Prior to commencing injection, FutureGen must perform pre-injection testing of the injection and confining zones at the well sites. Specifically, FutureGen must conduct well log analyses and take cores of the injection zone and confining system; sample formation fluids from the injection zone (and record the physical and chemical characteristics of the formation fluids such as fluid temperature, pH, conductivity, reservoir pressure, and static fluid level); determine the fracture pressure and other physical and chemical characteristics of the injection and confining zones; and perform tests to verify the hydrogeologic characteristics of the injection zone. If necessary to protect USDWs, based on the results of this testing, the permit conditions or project plans will be revised. Any such changes would result in a permit modification – which, depending on the nature of any changes, could warrant an additional public notice and comment period. Additionally, at least once every 5 years, FutureGen must re-run the computational models to verify that the CO_2 is moving through the subsurface as predicted; if any divergence from predictions is detected (through this modeling or based on any site information), EPA will as necessary modify the permit conditions. While the examples cited by the commenter (including the ADM site) provide information about the ability of reservoirs to receive and confine CO_2, EPA clarifies that the permit determinations were based on an evaluation of site-specific information about the FutureGen site documented in the administrative record.
21	Betty Niemann	d. "The biggest risk associated with this acid plume is the long term effects on geological features (primarily cap rocks) and abandon wells…"xxx "Leakage of the acidic brine through damaged cap rocks, and/or corroded rock-cement	CO_2 in the presence of water is mildly acidic. To address this, FutureGen evaluated all of the wells in the AoR to verify that any penetrating the confining zone are adequately constructed or plugged with CO_2-compatible materials. The materials and cement

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		and casing cement interfaces, pre-existing or abandoned wells, can cause contamination of the adjacent also stressed by Dr. Sally Benson (see remediation below) in that the acid plume as it migrates upwards into a potable aquifer may cause the release of heavy metals into the drinking water thereby contaminating the drinking water. The pressures that the supercritical CO_2 must be pumped into subsurface reservoirs are substantial and the added fluid must displace ambient fluid as the (CO_2) propagates throughout the reservoir. xxxii One such study is the study concerning the reactivity of the Eau Claire and Mt. Simon interface. For instance "CO_2–brine–caprock reaction would lead to modification of the pore geometry and effective permeability" and "Recent hydrological modeling of pressure build-up and cap rock permeability indicates that, moderate brine migration through the caprock can be beneficial in terms of relief of pressure build -up in the reservoir and geomechanical stresses to the sealing caprock (Zhou et al., 2008; Benson and Chabora, 2009; Zhou and Birkholzer, 2011). However, the geochemical consequences of the brine migration through cap rock have not been explored." xxxiii This could mean that the CO_2 can leach upwards through the cap rock and over time to the surface. In my opinion, there is not just enough information known with the Eau Claire/Mt. Simon interface in the Illinois Basin to provide a true picture for safe storage of CO_2. Another study on CO_2 storage which finds there are considerable uncertainties in modeling of the CO_2 over time. xxxiv This is discussed by Mike Bickle and Niko Kampman. xxxv	in injection and monitoring wells at the site will be constructed to be compatible with fluids with which the materials may be expected to come into contact, including the CO_2 and formation fluids and be able to maintain integrity over the life of the project. EPA will evaluate the quality of the wells and materials before authorizing FutureGen to inject any CO_2. The Mt. Simon and lower Eau Claire formations (the injection zone) are separated from the lowest USDWs by approximately 1800 feet of rock. Based on extensive, site-specific geologic information and modeling, EPA has determined that neither the CO_2 nor any formation fluids will migrate out of the injection zone or endanger USDWs. As described above, injection pressures will be limited to prevent fracturing of the confining zone and the site will be extensively monitored throughout the life of the project to confirm USDW protection from endangerment.

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22	Betty Niemann	Additional Concerns come from my comments on the Draft DOE/EIS-060 on 21 May 2013: Possible Geologic Impact of 385 million gallons of supercritical CO_2 per year: As I said at the public hearing on the draft EIS, the 1.1 million metric tons of CO_2 sequestered in Morgan County will approximately be 385,000,000 (385 million) gallons per year injected under Morgan County's prime farmland. This, I do believe, will have a major impact to the land environment.	Based on the extensive geologic information evaluated by EPA to inform its permit decision, the FutureGen site is not expected to endanger USDWs or impact the land surface. FutureGen will, as part of their approved Testing and Monitoring Plan, use a combination of five permanently located tiltmeters in combination with monthly Differential Interferometric Synthetic Aperture Radar (DInSAR) surveys and Global Positioning System (GPS) readings to verify the absence of surface deformation.
23	Betty Niemann	I have also used British Geological Survey publication of Andy Chadwick's chart 3 Site Screening, Ranking and Selection from page 25 of the "Best Practice for the Storage of CO_2 in Saline Aquifers" to compare the FutureGen data with the Positive Indicators just to see if the injection and storage site meets the Best Practice Criteria. The FutureGen data (in same measurement terms) has a depth of 1315m, reservoir thickness of 156m, porosity varies within the EIS-0460D is 20.42%, and the permeability is horizontal 3.10E+02 and the vertical permeability is 1.55E+02. Grain density is 2.65 and Compressibility is 3.7E-10. I am just a housewife with a chemistry and biology (hence scientific) background trying to understand injecting supercritical CO_2 into the Mt Simon layer of sandstone. FutureGen's injection interval is only 7 meters thick which is under the Best Practice reservoir thickness. This bothers me very much as there seems from the EIS data that there the Mt.Simon layer is not uniform but has 17 different layers so to speak. I find the FutureGen's salinity not within the perameters of the Best Practice criteria at 47.5 grams per liter. However it does seem	EPA's determination that the Mt. Simon formation is suitable to receive and store the anticipated volume of CO_2 without endangering USDWs is based on an evaluation of the site-specific information in the permit application against the requirements of the Class VI rule that specifically address the unique nature of CO_2 GS and address the risks that EPA determined may pose to USDWs. The permits are based on the risks identified in and addressed by the Class VI Rule developed by EPA, rather than the best practices document that the commenter cites; for example, protection is afforded to USDWs as defined in the UIC regulations (10,000 TDS) and not the less conservative salinity level cited in the best practices document. EPA based its permit determinations on the site-specific information in the Class VI permit application, and not the descriptions of the site in the EIS; the information in the permit application is the most recent and site-specific available, and is more relevant to evaluating risk to USDWs than the information in the EIS. Suitability is based on evaluation of extensive information about the proposed site, including the geological, geomechanical,

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		to be within the requirements of the USEPA. The discussion on page 3.4-8 of the DOE/EIS-0460 on the Mt. Simon Formation (Injection Zone), to me, is a text book cut and paste discussion that contains nonspecific information to the FutureGen project. Words like "This suggests that the formation exhibits characteristics, such as sufficient permeability and porosity, which make it suitable for long-term gas storage." are most unsettling and not reassuring as this statement makes an assumptions and not Morgan County site specific conclusions. I also wish to point out that it seems that most data has been extrapolated from the gas storage wells and field in Illinois for this project. Gas has different properties than semi-liquid carbon dioxide. You cannot just "plug and play the data" and say they are the same. … So If the CO_2 does migrate upwards into the St. Peter Formation, there is great potential for leakage into the atmosphere. It really seems to me that the Morgan County Carbon Storage Area has not been properly mapped and characterized and that a lot of the assumptions made for the site have been made from literature research or general descriptions about the Mt. Simon Formation that are not site specific. One characterization well, with core samples from wells outside the carbon storage area does not make a good characterization of the geologic formation of the Morgan County Injection site.	hydrogeological, and geochemical properties of the injection and confining zones; local hydrogeology; geochemistry; and seismic history in the context of the planned injection operation. This evaluation is augmented by computational modeling of the extent of the carbon dioxide plume and pressure front that accounts for all phases of the injected CO_2 stream and incorporates site-specific geologic, geochemical and geomechanical properties of the injection and confining zones and operational information. The data on which the model is based are specific to the FutureGen site and CO_2 movement in the subsurface and has not been extrapolated from natural gas storage. Additionally, prior to commencing injection, FutureGen must perform pre-injection testing of the injection and confining zones at the well sites. Specifically, FutureGen must conduct well log analyses and take cores of the injection zone and confining system; sample formation fluids from the injection zone (and record the physical and chemical characteristics of the formation fluids such as fluid temperature, pH, conductivity, reservoir pressure, and static fluid level); determine the fracture pressure and other physical and chemical characteristics of the injection and confining zones; and perform tests to verify the hydrogeologic characteristics of the injection zone. If necessary to protect USDWs, based on the results of this testing, the permit conditions or project plans will be revised. See Part Q.4 of the permits. After injection begins and throughout the life of the project, FutureGen will implement a Testing and Monitoring Plan that includes monitoring of the CO_2, the well, ground water quality, and the position of the carbon dioxide plume and pressure front. FutureGen and EPA will review the monitoring and operational data. If, based on this, there is reason to believe that USDWs are endangered, FutureGen must cease injection and implement its

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			Emergency and Remedial Response Plan. See Part P.2 of the permits. Additionally, at least once every 5 years, FutureGen must re-run the computational models to verify that the CO_2 is moving through the subsurface as predicted; if any divergence from predictions is detected (through this modeling or based on any site information), EPA will as necessary modify the permit conditions. See Part G of the permits.
24	Betty Niemann	Mike Bickle and Niko Kampman from the University of Cambridge in the United Kingdom state in their article, "Lessons in carbon storage from geological analogues" that "…we can constrain the nature and rates of the processes governing the fate of CO_2 in geological storage reservoirs. Interpreting these observations fully, requires understanding the hydrology of the settings, invariably complex where multiphase flows are involved."xli Given this, will FutureGen have on staff qualified person or person(s) on site to understand the injection process? If not, then the project should be scrubbed.	The permits require a qualified operator to be on site. The Emergency and Remedial Response Plan (part of the Class VI permits) identifies many of the FutureGen staff associated with the project. Additionally, EPA staff who reviewed the permit application and will review data generated over the life of the project include geologists, geochemists, hydrogeologists, modelers, and well engineers who are familiar with the geology of Illinois, the UIC requirements and injection operations.
25	Leinberger & Critchelow families	FutureGen is also required to provide information on geologic structure, including any known or suspect faults and fractures that may transect the confining zones in the Area of Review and a determination that they would not interfere with containment, and provide information on the seismic history including the presence and depth of seismic sources and a determination that the seismicity would not interfere with containment. See 40 CFR §146.82, AR # 18. FutureGen admits that the data provided on faults in the area of the injection well is inconclusive such that the Director has little information on which to rely. See Ex. 1, para 5 (Price report). Further, although the size of the Area of Review has been	FutureGen submitted and EPA evaluated information characterizing the seismic history of the region. The nearest event to the proposed FutureGen project site was reported to have occurred in July 1909 (equivalent to a Magnitude 4.8) approximately 28 miles north of the site. EPA also independently evaluated extensive site characterization information and injection well operational data–including information on the presence of faults and fractures and computational modeling analyses of plume and pressure front behavior over the project duration and determined that the project poses a low risk of inducing felt seismic events.

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		increased since the filing of FutureGen's permit application, FutureGen failed to then include the larger Area of Review in its assessment of the seismic data. Id. Finally, in light of the much larger Area of Review, the Director should also require additional analysis of the threat and resulting impact of a large earthquake in the general area, since this storage facility will persist for the long term.4 See In re Stonehaven Energy Mgmt, LLC (UIC Appeal No. 12-02, EAB March 28, 2013) (Region III failed to adequately support and explain its conclusion that earthquakes were not a risk for the UIC activity). FN4: The New Madrid Fault is located in the Midwest and runs through a portion of southern Illinois. See Facts About The New Madrid Seismic Zone, Missouri Department of Natural Resources, located at https://www.dnr.mo.gov/geology/geosrv/geores/techbulletin1.htm. According to the U.S. Geological Survey ("USGS"), there is an appreciable risk of a major earthquake affecting west central Illinois. Earthquake Hazard In The New Madrid Seismic Zone Remains A Concern, p. 2 (USGS 2009), located at http://pubs.usgs.gov/fs/2009/3071/pdf/FS09-3071.pdf. The USGS's 2008 National Seismic Map accords FutureGen's injection site a significant possibility of an earthquake. USGS National Seismic Map, p. 1 (USGS 2008), located at http://pubs.usgs.gov/fs/2008/3018/pdf/FS08-3018_508.pdf. Due to geology, earthquakes in the Midwest affect a larger area. "Due to the harder, colder, drier and less fractured nature of the rocks in the earth's crust in the central United States, earthquakes in this region shake and damage an area approximately 20 times larger than earthquakes in California and most other active seismic areas." See Facts About The New Madrid Seismic Zone, Missouri Department of Natural Resources, located at	Additionally, FutureGen's permits limit the injection pressure to below 90% of the fracture pressure in the injection zone; this pressure limitation is designed to reduce the potential for inducing any seismic events. Also, throughout the life of the project, FutureGen will monitor for induced and naturally occurring seismic events using five passive seismic monitoring stations. FutureGen will also monitor the position of the carbon dioxide plume and pressure front. Should a seismic event occur, the Emergency and Remedial Response Plan outlines the protocol to be implemented (based on a range of Magnitudes and attributes of the event), including the process and actions to be implemented to shut in the injection well(s), mitigate risks, and communicate with EPA, other relevant authorities, and the public. There is no indication that the CO_2 plume and pressure front will impact the New Madrid Seismic Zone. The maximum extent of the pressure front that was used to calculate the AoR, (defined as the maximum extent of the 10 psi contour), is predicted to extend approximately 25 miles from the injection site to the south and east. Both the New Madrid Seismic Zone (extending southwest from Cairo, IL through the central Mississippi Valley) and the Wabash Valley Seismic Zone (along the Illinois/Indiana border in southeastern Illinois and southwestern Indiana) are located well outside of this boundary, where there will be no measurable pressure effects from the injection project and so no likelihood of inducing seismicity at those locations. Documentation of EPA's analysis of the Area of Review/Site Characterization information is captured in a report in the Administrative Record for this permitting action. Additionally, included in the Administrative Record for this permitting action is a

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		https://www.dnr.mo.gov/geology/geosrv/geores/techbulletin1.htm. These articles are attached as combined Exhibit 6.	report documenting EPA's analysis of seismic information related to the FutureGen sites to inform draft permit decisions. EPA believes that its evaluation provides the documentation of its investigation to determine that there is no evidence of significant seismic activity in the well area. Also, EPA documents its review of the geologic data to confirm that there are no transmissive faults that intersect the confining zone or could be influenced by the intended zone of injection. That evaluation and the underlying data are part of the record available to the public. EPA therefore believes its evaluation is consistent with EPA protocols and with the EAB's discussion in *In re Stonehaven Energy Mgmt, LLC* (UIC Appeal No. 12-02, EAB March 28, 2013).
26	Betty Niemann	g. What is the thickness of the injection zone. At the time of the DOE/EIS-0460, it was said to be a 23 foot thick layer. Can this 23 foot layer assimilate four injection wells and 1.1million metric tons of pressurized supercritical CO_2 per year? The ADM sequestration project has only managed to inject 750,000 tons over a three year period into a similar geologic formation.	The Mt. Simon formation (the injection zone) is 565 feet thick at the nearby stratigraphic well. The 23 foot thick injection interval that the commenter cites from the DOE/EIS-0460 is only one layer within the larger injection zone. Based on local and regional geologic study and testing, EPA has determined that the Mt. Simon is sufficiently laterally extensive and porous to allow it to receive the volume of CO_2 FutureGen plans to inject without excessive pressure buildup that could allow fluid movement outside of the injection zone or fractures to propagate in the confining zone. After injection begins and throughout the life of the project, FutureGen will implement a Testing and Monitoring Plan that includes monitoring of the CO_2, the well, ground water quality, and the position of the carbon dioxide plume and pressure front. FutureGen and EPA will review the monitoring and operational data. If, based on this, there is reason to believe that USDWs are endangered, FutureGen must cease injection and implement its Emergency and Remedial Response Plan. See Part P.2 of the permits.

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27	Betty Niemann	1. Contamination of future water sources: a. Brazoria County in Texas announced in 4 May 2014 Houston Chronicle that it is planning to use brine drawn from saline aquifers beneath its county and the desalination process to produce clean water due to the extreme drought. Now, if in the far future, Illinois farmers would be required to draw brine from saline aquifers of the Mt. Simon layers for the same reason, will the CO_2 injected into the Mt. Simon layer prevent the farmers/cities from obtaining fresh water? b. Brazoria County's study may seem far away from Illinois but in researching this comment, I discovered a study prepared under contract with The Department of the Interior , Office of Saline Water by the Illinois State Water Survey, University of Illinois in 1973.x This study is entitled "FEASIBILITY STUDY ON DESALTING BRACKISH WATER FROM THE MT. SIMON AQUIFER IN NORTHEASTERN ILLINOIS". In 1973, there was enough of a concern for fresh water that the saline aquifer of Mt. Simon was studied to apply desalination technology to the brine from the aquifer to produce fresh water for Chicago. c. In 2011, when FutureGen targeted land held in trust for my husband and his nephews and cousins, I studied the CCS process. I uncovered a document that I cannot locate now that contained a study which indicated that the Mattoon FutureGen project would not contaminate the drinking water of Chicago. d. This Underground Injection Control Class VI permit is designed to protect fresh or drinking water. How can the USEPA justify contaminating the saline aquifer in the Mt.	The UIC requirements, including the Class VI Rule, are designed to protect USDWs, which are defined by the regulations (under SDWA authority) as ground water formations containing less than 10,000 ppm TDS. Based on this definition, the Mt. Simon is not considered a USDW, as it has a salinity of 47,500 ppm TDS (as measured in samples taken from the FutureGen stratigraphic test well). Therefore, injection into that formation, with appropriate protective measures as outlined in the Class VI Rule and implemented in the permits, is allowable under SDWA and the UIC regulations. In response to the comment about the impact of pumping water from the Mt. Simon, the current computational modeling accounts for all planned operations within the injection zone, which currently includes injection activities only. If future plans were made to produce water from the injection zone, such changes would trigger a required reevaluation of the AoR including updating the modeling to account for the changes and, if necessary, revision of the permit and associated project plans. Any such changes would result in a permit modification –which, depending on the nature of any changes, could warrant an additional public notice and comment period.

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		Simon layer with supercritical CO_2 when the Mt. Simon aquifer has the potential to provide future fresh water which using modern desalination processes could be used for drinking and/or agricultural uses in drought conditions? e. The FutureGen project is for the here and now, but in the future many years from now, if the saline aquifer is tapped as a water source, then there are forces that need to be addressed in FutureGen's UIC Class VI application which are not included in their applications. The models of the CO_2 plume are for a static in situ CO_2 reservoir. As the brine for fresh water desalination is pumped from the aquifer, then there may be forces come into play that may change the CO_2 plume. For example, if Springfield, Illinois decides to obtain its water supply from the Mt. Simon saline aquifer, what will happen to the shape of the CO_2 plume and the pressure ban? This should be studied for all UIC Class VI applications especially if there is to be wide spread deployment of CCS in saline aquifers. I feel that if the presence of CO_2 prevents the creation of fresh water from saline aquifers, then FutureGen has contaminated the saline aquifer and has prevented the creation of fresh water.	
28	Betty Niemann	e. In the second response to questions raised of FutureGen by the USEPA Region 5, FutureGen makes the following statement: "At the FutureGen site there are many potential thief zones between the injection reservoir (Mt. Simon Sandstone and Elmhurst) and the lowermost USDW (St. Peter Sandstone) that could justify the use of the proposed analysis. The results of the analysis will be prepared in January 2014	Based on the extensive, site-specific, geologic information generated by FutureGen and evaluated by EPA, there is no indication that any pathways for fluid movement to USDWs or drinking water sources exists. This determination is based on an evaluation of information about the proposed site, including the geological, geomechanical,

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		describing the model, input parameters, and results of this analysis." xiv Does this mean there are areas of possible paths of leakage from the reservoir to the St. Peter Sandstone layer which serves as a drinking water reservoir? Where are the results of this analysis?	hydrogeological, and geochemical properties of the injection and confining zones; local hydrogeology; and geochemistry. This will be confirmed through pre-injection testing of the injection and confining zones at the well sites. Specifically, FutureGen must conduct well log analyses and take cores of the injection zone and confining system; determine the fracture pressure and other physical and chemical characteristics of the injection and confining zones; and perform tests to verify the hydrogeologic characteristics of the injection zone. If necessary to protect USDWs, based on the results of this testing, the permit conditions or project plans will be revised. See Part Q.4 of the permits. The reference to "thief zones" does not mean that there are known or existing potential paths of leakage from the reservoir to the St. Peter Sandstone. Rather, the assumption of "thief zones" is a conservative approach used for modeling purposes and was made to better understand the various paths of CO_2 migration if CO_2 were to leave the injection zone. The results of this modeling analysis are included in the Administrative Record for this permit action. EPA clarifies that this more conservative and protective approach including consideration of "thief zones" was required of the permit applicant in their final modelling assumptions to ensure an understanding of geologic system behavior.
29	Betty Niemann	2. Possible Leakage of CO_2 from the Mt. Simon Layer and ground water contamination: a. There have been extensive studies by the USEPA in the ADM and Illinois Basin Decatur (ILBD) CCS processes. xi Reading the second reference caused some concern with me. There are several tasks under this study but my concern is with Task 4 which had this concern over the Eau Claire cap	FutureGen provided and EPA reviewed information on geochemistry, hydrogeochemistry, and the mineral and chemical composition of the injection formation and native fluids. No endangerment to USDWs as a result of mineralization or geochemical reactions is anticipated at FutureGen based on this extensive geologic study. Additionally, prior to commencing injection, FutureGen must perform pre-injection testing of the injection and confining zones

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		rock intregrity: "The Eau Claire Shale experiments indicate the possibility of some degree of chemical reactivity when exposed to supercritical CO_2 at reservoir conditions; however, because the changes in pre- and post-reaction geochemistry and rock texture were so small, it was difficult to quantify the magnitude of this reactivity, the rate at which it was occurring and its effect on porosity, permeability, and overall competency of the Eau Claire shale to serve as a cap rock." Have the core samples from the characterization/stratrigraphic well been tested as in the study at ADM in Decatur? If not why not? As a corollary on this, there is a question raised about the broaching of the drinking water near the Archer Daniel Midland sequestration site. xii I believe that since the ADM sequestration project occurs within the same geologic formation in the Illinois Basin, lessons from the ADM project can be learned an applied to the FutureGen project. In my opinion, this possible broach of the drinking water should be thoroughly investigated and if anything is learned applied to the FutureGen project before FutureGen's permits are granted.	at the well sites. Specifically, FutureGen must conduct well log analyses and take cores of the injection zone and confining system and sample formation fluids from the Mt. Simon formation (and record the physical and chemical characteristics of the formation fluids such as fluid temperature, pH, conductivity, reservoir pressure, and static fluid level). See Parts J and Q.4 of the permits. If necessary to protect USDWs, based on the results of this testing, the permit conditions or project plans will be revised. Any such changes would result in a permit modification –which, depending on the nature of any changes, could warrant an additional public notice and comment period. Because EPA is currently the permitting authority nationally, for all Class VI projects, any lessons learned at any Class VI projects will be applied, as appropriate, to these sites or future projects. The FutureGen permit determinations, however, are based on site-specific information generated at the FutureGen site.
30	Betty Niemann	a. What precisely is the surface flux/land deformation farmers can expect in the land over the injection wells Since nothing is removed from the deep subsurface, it stands to reason that the land above the injection zone will swell due to the 385 million gallons of supercritical CO_2 injected into the deep subsurface per year or 7.7 billion gallons over the 20 year life of the project.	No surface deformation is anticipated at the site; the Mt. Simon formation is thousands of feet below the surface, overlain by multiple layers of rock. In addition, the Mt. Simon is sufficiently laterally extensive and porous to allow it to receive the volume of CO_2 FutureGen plans to inject without excessive pressure buildup. FutureGen will, as part of their approved Testing and Monitoring Plan, use a combination of 5 permanently located tiltmeters in

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			combination with monthly DInSAR surveys and GPS readings to verify the absence of surface deformation.
31	Leinberger & Critchelow families	The Director should use her discretion pursuant to regulation to require information to establish that the Drinking Water Aquifer will not be impacted.	EPA performed an extensive review of the detailed geologic and operational information in FutureGen's permit application. Throughout this review, EPA requested and FutureGen provided additional information as needed to ensure that the permit determination was based on appropriate information and that the permit conditions would be sufficient to ensure protection of USDWs from endangerment. Additionally, the permits require FutureGen to construct and operate a number of wells and monitoring systems designed to ensure compliance with UIC requirements and protect USDWs.
32	Betty Niemann	There seem to be some inconsistencies with the Public Hearing for FutureGen's UIC Class VI Public Hearing. This EPA page http://www.epa.gov/region5/newsevents/index.html says the public hearing will be on 6 May 2014. Clicking the link: http://www.epa.gov/region5/water/uic/futuregen/index.htm indicates in the chart that Hold Public Hearing is 7 May 2014. Which date is the correct date? Also, I should be on the list to receive Class VI notifications, but as of yet, have not received this notice.	The public hearing was held on May 7, 2014. The website was updated to address this inaccuracy 43 days before the end of the public comment period and 35 days before the hearing. EPA has not heard from any party that indicated it missed the hearing due to confusion over the date. EPA has added the commenter to the Class VI notification list. The mailing list was used to make electronic notifications on April 2, 2014. The FutureGen draft permit public notice is governed by and was fully compliant with Part 124 of the Code of Federal Regulations. Indeed, EPA extended the public comment period beyond the baseline period provided for in the regulations.

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		Also, I would really like to see LARGE official public notices in the public notice section of the classifieds in the local newspapers and not little bitty ones as the Illinois Commerce Committee just did. To me, there has not been adequate public notice on many of the public hearings for FutureGen.	
33	FutureGen	*The CO_2 injection well coordinates in EPA's draft FutureGen UIC Class VI Permit Cover Letter and Attachments for each of the injection wells is the injection point location described in FG-RPT-017, Revision 1 (May 2013). These same coordinates are used for all of the 4 injection wells throughout the FutureGen permitting documentation. Because the currently planned CO_2 injection wells' locations and their mid-point location are to the NW of the stated location, the Alliance suggests the following wording and footnote throughout the permitting documentation for the injection well locations:* *(If using one set of coordinates for **all** CO_2 injection wells' permit documentation…)* **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80104°N and 90.07517°W [1] Actual injection well location will be surveyed after injection well construction. *(If using the planned coordinates of the **individual** CO_2 injection wells in each well's permit documentation…)* (Well#1) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80111°N and 90.07491°W [1] Actual injection well location will be surveyed after injection well construction. (Well#2) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-	The first page of each permit and the first page of each attachment have been updated to reflect the proposed location of the well to which the documents apply. Additionally, the location of each injection well is indicated as where the wells are intended to be placed. Small deviations in location(s) are corrected through minor permit modifications of the final permits once the well(s) are drilled.

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		9W; 39.80097°N and 90.07491°W [1] Actual injection well location will be surveyed after injection well construction. (Well#3) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80097°N and 90.07544°W [1] Actual injection well location will be surveyed after injection well construction. (Well#4) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80111°N and 90.07544°W [1] Actual injection well location will be surveyed after injection well construction.	
34	CSC	**Provision:** A **Text of Draft Permit:** For purposes of enforcement, compliance with this permit during its term constitutes compliance with Part C of the Safe Drinking Water Act (SDWA). **References:** **Proposed Revision:** **Comment:** We commend EPA for including this very important and fundamental provision. This is a fundamental tenant of virtually every EPA permitting program. Unfortunately, some of the language in other conditions appears inconsistent with this provision.	FutureGen's permits comply with the tailored requirements in the Class VI Rule that specifically address the unique nature of CO_2 GS and focus on ensuring protection of USDWs, human health and the environment where geologic sequestration is occurring. This comment did not request, and does not require, a change to the draft permits.
35	Leinberger & Critchelow families	*Due to the high level of potential risk to USDW, EPA must make every effort to strictly adhere to UIC regulations and the Director should use her discretion to obtain sufficient information to ensure that the project will not adversely impact drinking water in Morgan County or otherwise adversely affect human health or the environment.*	FutureGen's permits comply with the tailored requirements in the Class VI Rule that specifically address the unique nature of CO_2 GS and focus on ensuring protection of USDWs, human health and the environment where geologic sequestration is occurring. The permits require FutureGen to construct and operate a number of wells and monitoring systems designed to ensure compliance with UIC requirements and protect USDWs. The permit requirements

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			are designed to ensure safe injection and extensive monitoring to ensure safe containment of injected fluids. The suitability of the site is based on EPA's independent evaluation of extensive information about the proposed site, including the geological, geomechanical, hydrogeological, and geochemical properties of the injection and confining zones; local hydrogeology; geochemistry; and seismic history in the context of the planned injection operation.

SECTION 3. AREA OF REVIEW (AOR) AND CORRECTIVE ACTION COMMENTS

#	Commenter	Comment Text	EPA Response
1	Betty Niemann	To reiterate my oral comments, Faye Liu's et al research on Coupled Reactive Flow and Transport Modeling of CO_2 Sequestration in the Mt. Simon sandstone formation, Midwest U.S.A. (2011) xxvii which discusses long term risk assessment of the acidic plume: a. Acid plume forms from the interaction between brine and the supercritical CO_2 (CO_2 dissolution) in the storage layer and could persist for a long time even after the complete dissolution of CO_2. Replenishment of the upstream ground water flow (brine movement) through the storage sandstone facilitates the spread of the CO_2 plume and promotes and replenishes the geomechanical reactions.	40 C.F.R. §146.83 establishes the minimum criteria for siting. A permit applicant may choose the site they wish to propose. EPA will issue a permit for that site if the application meets all regulatory requirements. FutureGen must demonstrate that the location is a suitable geologic system, comprising: (1) An injection zone(s) of sufficient areal extent, thickness, porosity, and permeability to receive the total anticipated volume of the carbon dioxide stream; and (2) Confining zone(s) free of transmissive faults or fractures and of sufficient areal extent and integrity to contain the injected carbon dioxide stream and displaced formation fluids and allow injection at proposed maximum pressures and volumes without initiating or propagating fractures in the confining zone(s).

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		b. "The acidic brine will continuously migrate and react with minerals in the storage formation, dissolving and precipitating minerals and altering porosity and permeability." xxviii c. "Our simulations indicate the **prolonged existence** of an acidic brine plume, which suggests drinking water aquifers and potential releases at land surface." xxxi This last concern is long term risk assessment should transfer from the primary risk of (buoyant) CO_2 leakage to secondary risk of acidic plume leakage after all the CO_2 is dissolved."	Beyond those criteria, the site characterization, geochemical evaluation, and AoR modeling data submitted by the FutureGen Alliance demonstrates that the Morgan County CO_2 storage site is a suitable geologic system for long term CO_2 storage and the confining zones have sufficient extent and integrity to contain the injected CO_2 (including dissolved CO_2) and displaced formation fluids. Analyses of hydraulic heads and salinities of the different formations indicate that the ground water within the St. Peter and Mount Simon bedrock aquifers is physically isolated from each other indicating that supercritical or dissolved CO_2 along with brine will be contained in the Mount Simon hydrogeologic unit and will not pose any risks to USDWs. Under the permits, the plume and pressure front will be regularly monitored. (See Part M.8 of the permits.) This will continue even after well closure, until FutureGen has demonstrated that the project no longer poses any endangerment to USDWs. (See Part O.6 of the permits.)
2	CSC	**Provision:** G(1) **Text of Draft Permit:** The permittee shall maintain and comply with the approved Area of Review and Corrective Action Plan (Attachment B of this permit) which is an enforceable condition of this permit and shall meet the requirements of 40 CFR 146.84. **References:** **Proposed Revision:**The permittee shall maintain and comply with the approved Area of Review and Corrective Action Plan (Attachment B of this permit) which is an enforceable condition of this permit. ~~and shall~~ meets the requirements of 40 CFR 146.84. --OR— The permittee has submitted an Area of Review and	As a general matter the UIC permit is intended as a roadmap to identify the relevant requirements and obligations of FutureGen. The relevant regulatory provisions for delineating the AoR are relatively lengthy and technical, so that the permit language may summarize those requirements and provide reference to the regulatory details rather than copying them in their entirety. This makes the permit more reader-friendly and easy to follow. Incorporating the additional details by reference does not create any conflict or confusion between the terms of the permit and the regulations. In addition, 40 C.F.R. §146.84(b) makes it clear that FutureGen is responsible to comply with both the permit requirement and the regulatory requirement upon which it is based. For Class VI wells, EPA anticipates that the AoR must be reevaluated periodically during

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		Corrective Action Plan, which is included in Attachment B of this permit. This plan includes the information required by Section 146.84 and demonstrates how each of the applicable requirements of Section 146.84 will be met. **Comment:** Complying with the approved Area of Review and Corrective Action Plan does ipso facto meet the requirements of 40 CFR 146.84. There is not a requirement to comply with the approved plan and –in addition—comply with some other interpretation of the requirements of 146.84. By issuing this permit, EPA has determined that compliance with the Area of Review and Corrective Action Plan during the term of the permit constitutes compliance with 146.84.	the lifetime of the geologic sequestration project [40 C.F.R. § 146.84(b) and (e) and Section G of the Permits]. Reference to the relevant regulatory provisions provides clarity on the standards against which any revisions will be judged. By issuing final permits containing the language as presented in the draft permits, EPA approves the AoR and Corrective Action Plan as presented. However, EPA also recognizes that site-specific conditions encountered during drilling, or monitoring and operational conditions, may present the need to alter the AoR and Corrective Action Plan, at which time FutureGen may propose to the Director changes in the plan. Any such changes would result in a permit modification—which, depending on the nature of any changes, could warrant an additional public notice and comment period, as provided in 40 C.F.R. Part 144. Therefore, EPA will not make the suggested changes to the permits.
3	FutureGen	*The reference point for units of depth varies throughout Attachment B for all injection wells. Both "ft KB" (15 instances in text and 2 instances in tables), "ft bgs" (5 instances in text,), "ft below ground surface" (1 instance in text), and "ft GS" (2 instances in figures and 1 instance in a table) are used.* *The Alliance suggests using depth below ground surface (bgs) for depth units. The reference point for ft KB is 14 ft above ground surface. Recalculating KB-referenced depths would change the following depths:*	EPA agrees that this change would provide consistency and clarity in the plan and made these suggested revisions to the permits submitted by FutureGen. EPA has verified that all of the revised depths are accurate with the exception of depth referenced on page 12, paragraph 2, line 2. This depth was changed to 4,180 ft bgs.
4	FutureGen	*On pages 15 and 16, Table 1, column 2, all depths are actually ft KB, not ft GS. Recalculating KB-referenced depths would change the following depths to ft bgs in column 2 of Table 1:*	EPA agrees that this change would provide consistency and clarity in the plan and made these suggested revisions to the permits submitted by FutureGen. EPA has verified that all of the revised depths are accurate.
5	FutureGen	*The CO_2 injection well coordinates in EPA's draft FutureGen UIC Class VI Permit Cover Letter and Attachments for each of the injection wells is the injection*	EPA has revised the first page of each permit and the first page of each permit attachment to reflect the accurate proposed location for each of the wells. To the extent that small deviations to the planned

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		point location described in FG-RPT-017, Revision 1 (May 2013). These same coordinates are used for all of the 4 injection wells throughout the FutureGen permitting documentation. Because the currently planned CO_2 *injection wells' locations and their mid-point location are to the NW of the stated location, the Alliance suggests the following wording and footnote throughout the permitting documentation for the injection well locations: (If using one set of coordinates for* ***all*** CO_2 *injection wells' permit documentation…)* **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80104°N and 90.07517°W [1] Actual injection well location will be surveyed after injection well construction. *(If using the planned coordinates of the* ***individual*** CO_2 *injection wells in each well's permit documentation…)* (Well#1) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80111°N and 90.07491°W [1] Actual injection well location will be surveyed after injection well construction. (Well#2) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80097°N and 90.07491°W [1] Actual injection well location will be surveyed after injection well construction. (Well#3) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80097°N and 90.07544°W [1] Actual injection well location will be surveyed after injection well construction. (Well#4) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-	locations are identified after the wells are constructed and surveyed, those corrections can be made through the minor modification process identified in 40 C.F.R. § 144.41.

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		9W; 39.80111°N and 90.07544°W [1] Actual injection well location will be surveyed after injection well construction.	
6	Leinberger & Critchelow families	12) <u>Inaccurate information provided on Whitlock graphic log</u> Information provided on the Whitlock graphic (Figure 3.30, Page 3.47, Supporting Documentation) is inaccurate. FutureGen indicates that the well was reworked and completed as an observation well in 1997. Completion information available from the ISGS indicates that the well was indeed converted to an observation well in 1997 but no reworking was conducted. Perforations in the Potosi and Oneota Formations which the FutureGen graphic indicates occurred in 1997 actually occurred in 1965. R*equested Change/Action: Figure 3.30 needs to be revised to correct the inaccuracies.*	EPA requested records on the Whitlock #7-15 from both the Illinois State Geological Survey (ISGS) and the IDNR to help clarify this issue. EPA finds that the perforations in the Oneota formation existed as early as 1967 and the perforations in the Potosi formation existed as early as 1987. While the date on which the perforations were completed was not listed accurately in the permit application, this information does not influence the safety of the proposed project nor the permitting decision. Currently, the Whitlock #7-15 well is constructed and plugged back in a manner that prevents the likelihood of pressure from the FutureGen project displacing fluids up the well. Therefore, the permit language has not been modified based upon this comment.
7	Robert J. Finley	The use of four (instrumented) horizontal injection wells will give a unique plume shape, and together with the two deep wells proposed for pressure/temperature monitoring and three deep wells proposed for cased-hole logging, should give new insight into plume development. While such data are being gathered, the existence of the injection well instrumentation and the drilling of the five monitoring wells will be highly protective of underground water resources. The pressure front position can be readily modeled from this extensive data set, and as a result reservoir simulation models may be updated to monitor the Injectate and evaluate pre-injection modeling. Such models are important to understand carbon dioxide distribution and to guide appropriate environmental monitoring.	EPA agrees with the commenter that the reservoir simulation models used for predicting plume and pressure front evolution during a proposed project are instrumental in delineating the AoR and supporting the development of effective strategies for testing and monitoring. Reevaluation of these models throughout the project based on the monitoring data collected is necessary and critical to support project decisions and ensure the protection of USDWs. See Part G of the permits.

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8	Betty Niemann	In the EIS-0460D, there was little discussion of the CO_2 storage area when it came to calculating the capacity of the storage area. From above: In 2010 Jacksonville, Tuscola, City of Vandalia, and Christian County vied for the new location of the FutureGen project after Coles Together pulled out of the Mattoon project when the DOE pulled the funding, the Request for Site Proposal Dated 25 October 2010 and amended on 11 November 2010 by FutureGen indicated initially 1000 acres. Morgan County residents were first told that 1000 acres would be needed so when landowners first committed to the storage area by signing options, they were under the impression that the storage area was to be 1000 acres. A letter, dated 10 March 2011, from the Trustee who committed 400 acres of one Family Farm Trust Property plus another 200 acres also held in the same trust document to a 2nd beneficiary for a total of 600 of 1000 acres states 2500 acres will be needed for carbon storage. Reading the EIS 460D, the storage area has not yet be identified and yet the EIS 460D discusses a 5300 acre study area for the storage area. FutureGen, when the announcing the geological results, did nothing to dispel the 1000 acre for the storage acre size. Hence, there are probably people who still think of the storage area as 1000 acres until they read the draft EIS 460D. In April of this year, Ken Humphries gave a presentation at West Virginia University that indicated a Carbon Storage Area of 8000 acres. I am quite certain that the farmers in This carbon storage area and Morgan County citizens are not aware of this increase in the number of acres in the storage area. My question is what is the correct number	Results of the AoR delineation modeling submitted by the FutureGen Alliance demonstrate that the Morgan County CO_2 storage site is a suitable geologic system for long-term CO_2 storage with sufficient storage capacity that can receive and store the planned injected amount of CO_2 without endangering USDWs and the confining zones have sufficient extent and integrity to contain the injected CO_2 (including dissolved CO_2) and displaced formation fluids. The plume area was estimated by the Alliance to be 6.35 mi^2 (about 4 acres) at the end of injection period. EPA's independent modeling assessment resulted in a plume area of 6.46 mi^2, thereby confirming and agreeing with the Alliance's modeling result. However, to account for any risks associated with pressures due to injection, EPA conservatively defined the pressure front by the maximum extent of the 10 psi contour at 60 years which yields an area of 1,814 mi^2 for the AoR (Figure 15 of Attachment B). This information has been presented to the public as part of the permitting process. FutureGen will continue to develop, and EPA will continue to review, information concerning the plume and the storage area. This will occur before, during and after injection, and the collected information will be available to the public. (See Parts G, J, M, and O of the permits.) If the newly developed information requires modifications to the permit (including the plans), it may also warrant an additional public notice and comment as provided in 40 C.F.R. Part 144. The permit language has not been modified based on this comment.

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		of acres in the carbon storage area? It is very important that the storage area be correctly assessed as to size and storage capacity. xxxvii xxxviii With the Mt. Simon sandstone layer not as deep in Morgan County as it was in Coles County (Mattoon), the 1000 acre estimate for size should be reevaluated. Applicants and the public should have been informed during the application process if the RFP 1000 acres were not going to be adequate and the public should have been informed in my opinion	
9	Leinberger & Critchelow families	***3.) FutureGen should provide maps of the extent of the dissolved-phase plume (Permit Section: Attachment B, p.B37/46).*** The "CO_2 plume" plotted on maps in the permit application is missing a significant portion of the injected CO_2 mass. According to FutureGen modeling, 20 percent of the injected CO_2 occurs in the dissolved phase at the end of the simulation period, and the remaining 80 percent occurs in the supercritical phase (FutureGen, 2013, p. 3-27). For the purpose of the FutureGen permit application, the 'CO_2 plume' is defined as 99 percent of the supercritical CO_2 mass (FutureGen, 2013, p.3-25), and does not include the dissolved phase. Therefore, the FutureGen 'plume' includes only 99 percent of 80 percent (equal to 79 percent) of the total injected mass. The dissolved-phase plume likely extends much farther horizontally than the plotted 'plume maps.' The presence of dissolved-phase CO_2 poses potential risks to groundwater, including geochemical changes and potential leaching of inorganic constituents. For this reason, the extent of the projected dissolved-phase plume should be clear to EPA and stakeholders.	Pursuant to the Class VI Rule, which EPA developed to address the unique risks of CO_2 injection for GS, the boundaries of the AoR, where the GS project may cause endangerment to USDWs, are required to be determined based on the predicted maximum extent of the separate-phase plume and pressure front over the lifetime of the project and the entire timeframe of the model simulations. One hundred percent of the CO_2 was modeled, but the CO_2 plume plotted on maps is the surface expression of 99% of the CO_2 injected. This was done due to difficulties in representing very low concentrations of supercritical CO_2 at the margins of the modeled plume. Supercritical CO_2 is more buoyant than the very salty formation fluids and therefore extra care must be taken to ensure that the CO_2 is contained within the injection formations permanently. However, the AoR extends much further than the plume of supercritical CO_2 and EPA evaluated the potential for not only supercritical CO_2, but also native brines with and without dissolved CO_2. The Rule, and the permits, provide for periodic reevaluation of the AoR to incorporate monitoring and operational data and verify that the CO_2 plume and the associated area of elevated pressure are moving as predicted within the subsurface. See 75 Fed. Reg. 77248-49 (Dec. 10, 2010).

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		FutureGen should submit maps of the extent of the dissolved-phase CO_2 plume overlaid with the supercritical plume, the pressure boundary that defines the AoR, model boundaries, and the proposed FutureGen monitoring network.	Once CO_2 dissolution occurs, it results in less CO_2 that is subject to the buoyant forces that may cause endangerment to USDWs. Although the dissolved CO_2 may alter the geochemistry of fluids in the injection zone, it is unlikely that these changes would increase the possibility of leakage out of the injection zone. Therefore, contrary to the commenter's indication, dissolution of CO_2 generally reduces potential risks to groundwater and EPA therefore did not separately require the delineation of the dissolved CO_2 phase. Dissolution is, in fact, a trapping mechanism, reducing the risk for endangerment to USDWs as long as the storage site is suitable for the containment of the brine with dissolved CO_2. To ensure the protection of USDWs and to account for any risks of brine migration via a potential pathway caused by pressure increase in the injection formation, EPA conservatively defined the pressure front by the maximum extent of the 10 psi contour at 60 years which yields an area of 1,814 mi^2 for the AoR (given in Figure 15 of Attachment B). An assessment of any potential leakage pathways within this area was conducted. Furthermore, the Alliance analyzed the hydraulic heads and salinities of different formations, which indicate that the ground water within the St. Peter and Mount Simon bedrock aquifers is physically isolated from each other. FutureGen did supply maps and figures of the information requested by the commenter with the exception of the surface expression of the dissolved phase of the CO_2. Since EPA does not consider that information would result in any additional requirements in a permit, EPA will not ask FutureGen to supply it. FutureGen will continue to develop, and EPA will continue to review, information concerning the plume and the storage area. This will occur before, during and after injection, and the collected information will be available to the public. (See Parts G, J, M, and O of the permits.) If the newly developed information requires

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			modifications to the permit (including the plans), it may also warrant an additional public notice and comment as provided in 40 C.F.R. Part 144. The permit language has not been modified based on this comment.
10	Leinberger & Critchelow families	***4.) FutureGen should include 100 percent of the supercritical CO_2 mass in their delineation of the supercritical plume (Permit Section: Attachment B, p.B37/46).*** FutureGen's inclusion of only 99 percent of the total supercritical mass in the 'plume boundary' is not consistent with EPA guidance, which states that the extent of the supercritical mass should be delineated, not the extent of 99 percent of the supercritical mass (U.S. EPA, 2013a, p.45/83). FutureGen's "VIMPA" analysis (FutureGen, 2013, p.3-37) effectively removes the thin leading edge of the supercritical plume from their delineation. FutureGen should re-delineate the supercritical CO_2 plume to include 100 percent of the supercritical mass, such that it is clear to EPA and all stakeholders the complete projected horizontal extent of supercritical CO_2.	EPA, in its independent analysis, evaluated the change in areal coverage based on different definitions of the plume (i.e., 99% or 100% of the mass of separate phase CO_2). The difference in areal coverage between 99% or 100% of separate phase CO_2 mass was found to be very minimal and by issuing final permits based on the AoR delineated by a minimum of 10 psi pressure differential (relative to the initial pressure distribution within the injection formation), EPA determined that the project addresses all risks to USDWs, including risks associated with 100% of the total separate-phase CO_2 mass. Therefore, although FutureGen modeled all of the CO_2, they showed a prediction of the extent of 99% of the separate phase CO_2. Sensitivity analyses as well as subsequent modeling further undermine the value of attempting to exactly define a plume based on a single 100% delineation. EPA disagrees with the commenter's claim that the plume depiction is inconsistent with EPA guidance. The citation referenced refers to the "maximum extent" of the CO_2 plume and pressure front over the injection and post-injection time frames. One hundred percent of the CO_2 was modeled, but the CO_2 plume plotted on maps is the surface expression of 99% of the CO_2 injected. This was done due to difficulties in representing (and the limited value of representing) very low concentrations of supercritical CO_2 at the margins of the modeled plume. EPA therefore believes that the existing plume depiction is a reasonable representation of the maximum extent of the supercritical CO_2.

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			In response to comments and concerns regarding the approved AoR, EPA clarifies that additional site information will be collected under the pre-operational testing requirements within the Class VI Rule and the AoR will be reassessed based on the new data, as described under 40 C.F.R. § 146.82(c), prior to injection. Any changes in the model and/or the AoR would result in a permit modification – which, depending on the nature of changes, could warrant an additional public notice and comment as provided by 40 C.F.R. Part 144. Furthermore, the AoR delineation and the predicted extent of the supercritical CO_2 plume will be reevaluated periodically over the life of the project in order to incorporate testing and monitoring data into the model to ensure protection of USDWs from endangerment. See Part G of the permits. The permit language has not been modified based on this comment.
11	Leinberger & Critchelow families	When properly modeled to address these factors, the projected CO_2 plume will be significantly larger than currently identified in the draft Permit. See Ex. 2, paras. 1-6 (Schnaar report). In fact, FutureGen's own modeling sensitivity analysis resulted in a plume 120% larger in size. See Ex. 2, para. 1 and Figure 1. Dr. Schnaar, in Figure 1 of his expert report, shows the impact of the 120% plume, and explains that the 120% size is a *minimum* size for the projected plume given the deficiencies of the model. Id. Further, the 120% minimum projected plume size does not account for the significant differences in injection rates and well construction amongst the injection wells. Id at para 10. Thus, at an absolute minimum, the plume should be designated in the draft Permit as 120% larger than currently modeled. The Director should also require that FutureGen provide additional information concerning the horizontal lateral injection wells. The injection wells are pointed towards	The Class VI regulations were developed to address any risks to USDWs associated with CO_2 injection for GS and the AoR is delineated to cover the area where endangerment may occur. As described in response to comment #8 above, based on its independent analysis of the plume and pressure front of the proposed project and with due consideration given to the risk of endangerment to USDWs, EPA approved the delineation of the AoR based on a pressure differential which extends well beyond the plume. Therefore, a CO_2 plume based upon the most conservative analyses did not result in EPA evaluating the risks differently or changing permit conditions. Additionally, depictions of the results of sensitivity analyses can be misleading. Plume depictions should represent the applicant's and Agency's best estimate of where the supercritical CO_2 will be at a certain point in time. This will allow the comparison of observations and predictions and can then confirm, or show a need for revision of, the previous model.

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		the Critchelow Property and Leinberger Property. See Ex. 2, para. 10 (Schnaar report); draft Permit, p. B41. Yet, the size of the projected plume in the direction of the Properties is barely larger than the size of the plume in the directions where no lateral injection wells are directed. Additional information is necessary to justify this projected extent and configuration of the plume.	In addition, EPA collected detailed information about the directional injection wells as part of its independent evaluation of the AoR delineation modeling. This information, for each well, included: the coordinates of the injection well's trajectory; the depths for the screened intervals; the mass rate of injection; the fracture gradient and the maximum injection pressure, as well as the elevation corresponding to this pressure and a description of how these values were calculated; the composition of injectate; and the injection schedule. This information was applied to the model developed for the independent evaluation. The results from EPA's evaluation confirmed the observed plume development submitted by FutureGen as it is depicted in the AoR and Corrective Action Plan. By issuing final permits, EPA approved these results and does not believe further information at this point is necessary on the injection wells. In response to comments and concerns regarding the approved AoR, EPA clarifies that additional site information will be collected under the pre-operational testing requirements within the Class VI Rule and the AoR will be reassessed based on the new data, as described under 40 C.F.R. § 146.82(c), prior to injection. Any changes in the model and/or the AoR would result in a permit modification under 40 C.F.R. Part 144 – which, depending on the nature of changes, could warrant an additional public notice and comment. The regulations, and the permits, also provide for periodic reevaluation of the AoR over the life of the project to incorporate monitoring and operational data and verify that the CO_2 plume and the associated area of elevated pressure are moving as predicted within the subsurface to ensure protection of USDWs from endangerment. See 75 Fed. Reg. 77248-49 (Dec. 10, 2010) and Part G of the permits. The permit language has not been modified based on this comment.

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12	Leinberger & Critchelow families	G. EPA Should Address Policy Considerations Resulting from an Increased Plume Size Section A of the draft Permit states: "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." Despite this statement, by allowing the draft Permit to proceed in its current state, EPA is establishing a policy through which it is authorizing a trespass and/or a regulatory taking of property. Although FutureGen has obtained the pore space ownership rights within various properties directly impacted by the CO_2 plume as modeled, FutureGen has not executed an option to acquire such rights from properties impacted by a larger plume, including the Critchelow Property or Leinberger Property. See Leinberger Declaration, Ex. 4, para. 5. As described above, using reasonable bounding values, FutureGen's modeling resulted in a plume 120% larger than identified on Figure 12. According to the expert, this 120% is the minimum size of the CO_2 plume and the plume is expected to be even larger than the 120% given the many errors in the plume model. See Ex. 2 (Schnaar report). Even the 120% larger plume size impacts many additional properties in the area, including the entire Critchelow Property and portions of the Leinberger Property. The Director, through her discretionary authority and as an important policy matter, should require FutureGen to establish that it is not impacting additional properties through the projected CO_2 plume or the pressure front created by that plume, and that it has the appropriate pore space ownership rights. Although EPA generally	As EPA's "Geologic Sequestration of Carbon Dioxide: Underground Injection Control (UIC) Program Class VI Well Area of Review Evaluation and Corrective Action Guidance" (May 2013) states at p. 2, [T]he purpose of the AoR and corrective action requirements of the Class VI Rule is to ensure that the areas potentially impacted by a proposed GS operation are delineated, all wells that need corrective action receive it, and that this process is updated throughout the injection project. While the details of all of the requirements are presented in later sections of this guidance, the basic requirements that owners or operators of GS projects must meet include: • Prepare, maintain, and comply with an AoR and Corrective Action Plan that includes all of the required elements of the plan [40 C.F.R. § 146.84(b)]; • Delineate the AoR using computational modeling and identify all wells that require corrective action [40 C.F.R. § 146.84(c)]; • Perform all required corrective action on wells in the AoR [40 C.F.R. § 146.84(d)]; • Reevaluate the AoR throughout the life of the project [40 C.F.R. § 146.84(e)]; • Ensure that the Emergency and Remedial Response Plan and financial responsibility demonstration account for the most recently approved AoR [40 C.F.R. § 146.84(f)]; and • Retain modeling inputs and data used to support AoR reevaluations for 10 years [40 C.F.R. § 146.84(g)]. As the comment notes, Section A of the permits clearly 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 C.F.R. §144.35.

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		does not include individual property rights in its permit review, EPA is required to determine the extent of the CO_2 plume, and has previously sought information from FutureGen regarding pore space rights. See December 10, 2013 Response to Comments, p. 2/41, AR # 4 (EPA requests information re "sensitive areas" and FutureGen explains that "sensitive areas" are properties to which the project has not acquired pore space rights. These properties were avoided by orienting the horizontal legs of the injection wells.") FutureGen should not be permitted to present an inaccurate approach to its model and projected plume simply to allow it to avoid having to purchase options for pore space on impacted properties. FutureGen must establish that additional "sensitive areas" are not impacted by a more likely and larger plume. The location of the CO_2 plume directly impacts the analysis of whether there is sufficient monitoring and whether underground drinking water supplies are endangered due to the location of the plume, which are squarely within the permit review. Without information confirming that these additional "sensitive areas" are not impacted by the larger projected plume, the Director is allowing FutureGen to trespass, and thus subjecting itself to potential liability. A person can be liable for trespass for an intrusion by a third party if he acts with knowledge that his conduct will, with a substantial degree of certainty, result in the intrusion, or aids, abets or directs the commission of the trespass. Sak v. CitiMortgage, Inc., 940 F.Supp.2d 802, 804 (N.D.Ill. 2013), citing Dietz v. Ill. Bell Tel. Co., 154 Ill.App.3d 554, 107 Ill.Dec. 360, 507 N.E.2d 24, 26.9 Here, the EPA's actions with regards to allowing the project to proceed with an under sized plume model will result in the	As described in the response to comment #11, the Class VI regulations were developed to address any risks to USDWs associated with CO_2 injection for GS and the AoR is delineated to cover the area where endangerment may occur. As described in response to comment #8 above, based on its independent analysis of the plume and pressure front of the proposed project and with due consideration given to the risk of endangerment to USDWs, EPA approved the delineation of the AoR based on a pressure differential which extends well beyond the plume. Regarding the comment that "EPA…has previously sought information from FutureGen regarding pore space rights" EPA clarifies that requests for additional information made of FutureGen during the permit application review process regarding "sensitive areas" were merely requests for clarification of the term "sensitive areas." EPA was not delving into the issue of pore space rights or ownership based on this clarifying line of inquiry. EPA's decisions regarding the final AoR were made based on geologic and operation information and not on pore space or property rights. In response to comments and concerns regarding the approved AoR, EPA clarifies that additional site information will be collected under the pre-operational testing requirements within the Class VI Rule and the AoR will be reassessed based on the new data, as described under 40 C.F.R. § 146.82(c), prior to injection. Any changes in the model and/or the AoR would result in a permit modification – which, depending on the nature of changes, could warrant an additional public notice and comment as provided in 40 C.F.R. Part 144. Furthermore, the regulations, and the permits, also provide for periodic reevaluation of the AoR over the life of the project to incorporate monitoring and operational data and verify that the CO_2 plume and the associated area of elevated pressure are moving as predicted within the subsurface to ensure protection of USDWs from

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		intrusion on the Critchelow Property and Leinberger Property (as well as others) and the potential to adversely affect human health. In other words, the EPA is aiding and abetting the commission of a trespass that impacts human health. This is a significant policy issue that warrants EPA consideration prior to issuing the permit. Similarly, by permitting a Class VI underground injection well that will have a projected plume at a minimum 120% greater than the projected model, and thus allowing the plume to enter onto other sensitive areas including the Critchelow Property and Leinberger Property, the EPA is "taking" the properties for a public purpose without just compensation. U.S. Const. amend. V, Lingle v. Chevron, 544 U.S. 528, 543, 125 S.Ct. 2074, (2005) ("The Takings Clause presupposes government interference with one's property rights in pursuit of a public purpose"). While a typical taking involves a government appropriating some interest in a person's property for the use of the government, a private party taking may be attributable to the government.10 Here, the U.S. is giving FutureGen a billion dollars to construct a power plant, a 30-mile pipeline, and a carbon sequestration well. See www.futurealliance.org/faqs/. In fact, the U.S. is the primary source of funding for the project, contributing 60% of the funds required for the project. See "Feds pledge $1 billion to FutureGen 2.0 in Morgan County," State Journal Register, January 16, 2014, attached as Exhibit 7. Importantly, this billion dollar grant is not described as a "loan," signifying that FutureGen would have to repay the U.S., but instead the U.S. states it is "providing" the money appropriated under the American Recovery and Reinvestment Act. See 79 FR 3577; Record of Decision and Floodplain Statement of	endangerment. See 75 Fed. Reg. 77248-49 (Dec. 10, 2010) and Part G of the permits. The permit language has not been modified based on this comment.

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		Findings for the FutureGen 2.0 Project; January 22, 2014, attached as Exhibit 8. By permitting an undersized plume, EPA will allow FutureGen to appropriate additional "sensitive areas," including the Critchelow Property and Leinberger Property, without just compensation. This constitutes a taking. EPA should not engage in a policy of supporting a private party taking another person's property for the public use, especially when that use is high risk and has the potential to impact human health. It cannot be EPA's policy to knowingly allow the undersized plume in the Permit that would result in a trespass or a taking. The policy issue can easily be avoided by ensuring that FutureGen has the adequate pore-storage ownership agreements in place to account for a more realistic plume size, before the Permit is granted. In the alternative, the Director should require FutureGen to submit additional information to establish that the increased plume size will not impact additional properties and will not impact human health.	
13	NRDC	5. In the model, Applicant used values for residual aqueous saturation, Srw, lower than the values in published literature. As the Applicant notes, "[…] using a lower Srw value for the injection zone will possibly result in a somewhat smaller predicted CO_2 plume size and a smaller spatial extent of the pressure front compared to using a higher value of Srw." EPA should require the Applicant to provide an estimate of the difference in the extent of the plume and pressure front using the more conservative values for Srw in the published literature, unless better site-specific data are obtained.	EPA, in its evaluation of the AoR modeling submitted for these permits, considered the impact of residual aqueous saturation values on the predicted plume and pressure front developments. The values selected by the FutureGen Alliance along with other parameters used in the capillary pressure-saturation function (a total of three) were obtained by fitting mercury intrusion-capillary pressure data from the Manlove gas storage site in Champaign County, IL. This approach provided an advantage of deriving consistent parameter values that are fitted using the same original and complete data set from the region rather than values taken from different sources and perhaps from incomplete data sets. In addition, the values reported for residual aqueous saturation in the literature reviewed showed wide range with some uncertainty. Furthermore, the Webb

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			extension used for the capillary pressure-saturation functions employed in the AoR delineation modeling also helped mitigating the effects of selected residual aqueous saturation values. Although FutureGen modeled all of the CO_2, the model presented a prediction of the extent of 99% of the separate phase CO_2. Sensitivity analyses as well as subsequent modeling further undermine the value of attempting to exactly define a plume based on a single 100% delineation. Following a detailed evaluation, by issuing final permits, EPA approved the values selected (by the FutureGen Alliance) for this parameter and the approach used by FutureGen. EPA also clarifies that additional site specific information will be collected under the pre-operational testing requirements within the Class VI Rule and the AoR will be reassessed based on the new data, as described under 40 C.F.R. § 146.82(c), prior to injection. Any changes in the model and/or the AoR would result in a permit modification – which, depending on the nature of changes, could warrant an additional public notice and comment as provided in 40 C.F.R. Part 144. Furthermore, the regulations, and the permits, also provide for periodic reevaluation of the AoR over the life of the project to incorporate monitoring and operational data and verify that the CO_2 plume and the associated area of elevated pressure are moving as predicted within the subsurface to ensure protection of USDWs from endangerment. See 75 Fed. Reg. 77248-49 (Dec. 10, 2010) and Part G of the permits. The permit language has not been modified based on this comment.
14	FutureGen	*Section: Wells within the Survey Area* *This section, as written, is confusing. It is suggested to replace text on page B31 with the following:* ***Wells within the Survey Area*** A detailed survey was completed over a 25 mi^2 (65 km^2)	EPA agrees that this clarification is appropriate and helpful, so the requested change was made. In response to comments, EPA has also conducted an extensive review of the entire AoR. After obtaining and reviewing information from the ISGS database, EPA has determined that there are 6,110 wells within the entire AoR. Of those wells,

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		area, termed the "Survey Area." This area is centered on the proposed injection location (labeled as "Injection Site") and encompasses the predicted maximum extent of the CO_2 plume (Figure 12). Wells, surface bodies of water and other pertinent surface features, administrative boundaries, and roads within the Survey Area are shown in Figure 12. There are no subsurface cleanup sites, mines, quarries, or Tribal lands within this area. The Survey Area is near the center of the AoR (Figure 15). A total of 129 wells are located within the Survey Area. However, no well but the FutureGen Alliance's stratigraphic well penetrates the injection zone (Mount Simon Sandstone and the lower Eau Claire [Elmhurst Sandstone Member and lower portion of the Lombard Member]), the confining zone (Upper portion of Lombard Member and Proviso Member of the Eau Claire Formation), or the secondary confining zone (Franconia Dolomite). Shallow domestic water wells with depths of less than 50 ft (15 m) are the most common well type within the Survey Area. Five slightly deeper water wells were identified that range in depths from 110 ft (33 m) to 405 ft (123 m). Other wells include stratigraphic test holes, coal test holes, and oil and gas wells. Twenty four of the 129 wells in the Survey Area are identified with only a general location (center of a section) in the ISWS database. These wells are included in Table 9 but are not shown on the map. A general survey of the AoR outside the Survey Area was conducted by reference of publicly available information. Maps of existing water wells, oil and gas wells, miscellaneous wells, coal mines, surface water, and geologic structures were submitted to complete the	three wells (including the FutureGen Alliance's stratigraphic well) penetrate the confining zone (Upper portion of Lombard Member and Proviso Member of the Eau Claire Formation). Of those wells, one is plugged, and the other is located 16 miles from the injection site. It is anticipated that this location would receive only increased pressure, if anything, and that such effects would not occur until after injection proceeded for a significant time. This well would be monitored under the corrective action plan and during regular reviews of the AoR and corrective action plan under Part G of the permits, it could also be considered for plugging. Only the FutureGen Alliance's stratigraphic well penetrates the injection zone within the AoR boundary. Other oil and gas wells within the AoR may extend deeper than typical residential wells, but ISGS data indicate that with the two exceptions noted above, they do not extend through the confining zone.

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		permit requirements. There are 4,386 water wells and 740 oil and gas wells within the AoR, but only two of these penetrate the confining zone. These two wells identified in the AoR are approximately 16 miles from the injection site, but they are adequately plugged.	
15	FutureGen	*All wells in Table 9 are in the AoR that is defined by the 10 psi contour of the aqueous pressure differential.* *Please delete the right-most column of Table 9 on page B33.*	EPA agrees that this column is unnecessary and this correction is appropriate and consistent with the rest of the Plan, so the requested change was made.
16	FutureGen	Page B37, Figure 12 *Please change the text under the legend to:* Several water wells are identified only with a general location (section, township and range) in the ISWS database. Those wells are not shown on the map, but are included in Table 9. Wells outside the Survey Area are not shown. The well ID number next to the well symbol on the map refers to the Map ID in Table 9.	EPA agrees that this correction is more accurate, and is appropriate and consistent with the rest of the Plan. The requested was made.
17	FutureGen	*Page B40, Par. 2* *1st four words under Pressure Front Delineation:* *Please add* "Figure" *between "in" and "16".*	EPA agrees that this typographical error should be corrected. The requested change was made.
18	FutureGen	*Page B42, Par. 1* *entence 1: Please replace "a range of numerical solutions (Table 13)" with:* three other simplified "open conduit" approaches (Table 13).	EPA agrees that the other approaches considered for AoR delineation represent more than just "numerical solutions," so that the provision should be changed. However, the description of them as "simplified open conduit approaches" may be too narrow as well. Therefore, EPA changed the language on page B42 "…a range of numerical solutions (Table 13)…" to "…a range of other approaches (Table 13)…" This change is incorporated into the final permits.
19	FutureGen	*Page B43, Par. 1* *The existing paragraph:* *"Pressure delineated AoR* *Acknowledging that each approach is an approximation with a set of assumptions, that there are applicable*	EPA agrees that this clarification is appropriate and helpful, so the requested change was made, except that in the last sentence containing "…the maximum extent of the 10 psi contour of pressure differential during the life of the project life (60 years) as shown in Figure 15" the language was changed to "…the maximum extent of

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		components of a number of the approaches considered, and with a focus on adopting a conservative, protective approach for the pressure-delineated AoR, the FutureGen Alliance, in consultation with EPA, delineated the AoR as the maximum extent of the 10 psi contour of pressure differential during the life of the project life (60 years) as shown in Figure 15." *Should be replaced with the following:* Pressure delineated AoR Each of the pressure front analysis methodologies evaluated by the FutureGen Alliance (Table 13) are mathematical approximations applicable under prescribed conditions and subjected to simplifying assumptions. The simplified critical pressure calculations based on the open conduit concept are not applicable under site conditions because the ambient conditions in the lowermost USDW at the FutureGen site are under-pressured relative to the reservoir. Although the open conduit approaches are not strictly applicable under FutureGen site conditions, results from these conservative and protective approaches were used by EPA to delineate the pressure front AoR as the maximum extent of the 10 psi contour *of pressure differential* during the life of the project life (60 years), as shown in Figure 15.	the 10 psi contour of pressure differential during the life of the project, which occurs 60 years after injection commences and is shown in Figure 15." This makes it clearer that under the model, the maximum extent of the psi contour occurs after 60 years, not that the project life is 60 years.
20	FutureGen	*Page B7, Par. 3* *Conceptual Model Domain:* *This description of the model layers is not correct.* *Please replace the first paragraph in the Conceptual Model Domain section with these 3 paragraphs:* A stratigraphic conceptual model of the geologic layers from the Precambrian basement to ground surface was constructed using the EarthVision® software package.	EPA agrees that this more accurate and complete description of the model layers is helpful and appropriate, so the requested change was made.

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		The geologic setting and site characterization data described in the Underground Injection Control (UIC) Permit Supporting Documentation and later in this section were the basis for the Morgan County CO_2 storage site computational model. Borehole data from the FutureGen 2.0 stratigraphic well and data from regional boreholes and published regional contour maps were used as input data (Figure 4, step 1). There is a regional dip of approximately 0.25 degrees in the east-southeast direction (Figure 4, step 2). To define the numerical model domain, an expanded 100- by 100-mi conceptual model was constructed to represent units below the Potosi dolomite interval, including the formations of Franconia, Ironton, Eau Claire (Proviso, Lombard, and Elmhurst), and Mount Simon. Each of these formation layers was further divided into multiple sub-layers based on the data from the stratigraphic well. The elevations of Franconia top, Mount Simon top, and Mount Simon Bottom were determined by EarthVision® based on borehole data and regional contour maps. The elevations of the interfaces between sub-layers were determined by the three bounding surfaces from EarthVision® and the stratigraphic well to make up the boundary-fitted stratigraphic layers of the computational model. The numerical model grid in the horizontal directions was designed to have constant grid spacing with higher resolution in the area influenced by the CO_2 injection (3-mi by 3-mi area), with increasingly larger grid spacing moving out toward the domain boundaries.	
21	FutureGen	*Page B11* *Line 6: <u>Please change</u> "because K_h could not be …" <u>to</u>* "because K_v could not be …"	EPA agrees that this typographical error should be corrected. The requested change was made.

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22	FutureGen	*Page B13* *Line 7: Please change "numerical model grid" to* "numerical model layers"	EPA agrees that this clarification is appropriate and more accurate, so the requested change was made.
23	FutureGen	*Table 3* *The values for Kv/Kh applied to model layers the Elmhurst Layer 5, 3 and 1 are incorrect. They should be* **0.1** *(not 0.4).*	EPA agrees that these typographical errors should be corrected to reflect the actual values used. The requested changes was made.
24	FutureGen	*Page B23* *Please replace "The first value (3.71E-10 Pa^{-1}) has been used for sands that are compressible because of the presence of porosity. The second value (7.42E-10 Pa^{-1}) is assigned for all other rocks that are less compressible (dolomite, limestone, shale, and rhyolite)" with:* The first value (3.71E-10 Pa^{-1}) has been used for sandstone. The second value (7.42E-10 Pa^{-1}) is assigned for all other rocks.	The commenter has not provided any basis or explanation for this change. The existing language in the plan is accurate. Therefore, EPA will not make any changes to the permits based on this comment.
25	FutureGen	*Page B23* *Line 3: Please change "to overcome capillary and interfacial forces …" to* "to overcome the capillary force …".	EPA agrees that the rephrasing uses more accepted terminology. The suggested change is incorporated into the final permits.
26	FutureGen	*Page B25* *Line 10: Please change "72 mN/m" to* "70 mN/m"	There is no justification in the documents submitted to EPA to support this revision. Therefore, EPA will not change the permits in response to this comment.
27	FutureGen	*Page B29* *Line 6: Please change "injecting" to* "injection"	EPA agrees that this typographical error should be corrected. The requested change was made.
28	FutureGen	*Page B30* *Line 7: Please change "200 ft (61 m) deep" to* "200 ft (61 m) depth"	EPA agrees that this correction is appropriate, and the requested change was made to the permits.
29	FutureGen	*Page B38* *Line 13: The elevation of the top of the open interval that is used in the model is -3220 ft (not -3231 as stated). This elevation is based on the elevation at the injection site.*	EPA agrees that this correction is appropriate and consistent with the rest of the Plan, so the requested change was made.

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		Please change "elevation of -3,231 ft" to "elevation of -3,220 ft"	
30	FutureGen	*Page B42* *LBNL should be replaced by published reference.* *Please replace "LBNL non conservative" with:* Cihan (2011)	EPA agrees that this correction is appropriate and consistent with the rest of the Plan, so the requested change was made.
31	FutureGen	*Page B42* *The "LBNL conservative" approach was not evaluated by the Alliance.* *Unless EPA did an independent evaluation, it should be deleted.* *If retained, LBNL conservative should be replaced with:* Cihan (2011) conservative	EPA evaluated using the Cihan (2011) approach but did not utilize that approach when delineating the AoR. Following review by EPA, the citation of "LBNL Conservative" was changed to "Cihan (2011) Conservative" in the final permits.
32	Leinberger & Critchelow families	B. The Geologic Formation Data is Incomplete The draft Permit includes a finding that "The permittee has demonstrated to the satisfaction of the Director that the well is in an area with suitable geology in accordance with the requirements at 40 C.F.R. §146.83. See draft Permit, section I. As described in the attached Expert Report of Daniel J. Price, Exhibit 1, there are a number of inadequacies in FutureGen's assessment of the geology of the area. FutureGen has not provided sufficient information concerning permeability values, and has not provided information concerning the potential change in hydraulic head based on the pressure change induced by injection into the Mt. Simon Sandstone. See Ex. 1, paras. 1-3. FutureGen should provide additional discussion that demonstrates the pressure change induced by injection into the Mt. Simon would not be great enough to allow brine migration and impact underground sources of drinking water. Significantly, the geologic data shows that there is a regional "dip" in the formation that is not	Following a detailed, independent evaluation, by issuing final permits, EPA approved the permeability values used by the FutureGen in the model, and the demonstration that the planned operation will not endanger USDWs due to induced pressures. The intrinsic permeability values were estimated based on site-specific data including geophysical wireline surveys and, where available, laboratory measurements of rotary side-wall cores (SWCs), core plugs from the whole core intervals, hydrologic tests (including wireline Modular Formation Dynamic Tester), and packer tests. These values were further assessed by a set of sensitivity analyses by FutureGen. EPA also conducted an independent modeling of the AoR and a separate set of sensitivity analyses confirming FutureGen results, which is documented in the Administrative Record. EPA, as the commenter suggests, did a comprehensive and accurate search of the AoR to determine if any natural or manmade conduits existed that might be pathways for flow into USDWs. This was done to address concerns similar to those of the commenter that increases in hydraulic head due to injection could displace deep formation

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		reflected in the Permit analysis. See Ex. 1, para. 4. These data points have the potential to impact the results of the model of the CO_2 plume and should be more accurately discussed and, as set forth below, incorporated into the CO_2 model as part of its sensitivity analysis.	fluids into USDWs. This is discussed in EPA's response to comment 14 of this section. EPA determined that the project as proposed and the permit conditions address these risks. To demonstrate that the injection operation will not endanger USDWs, FutureGen submitted flux rate and cumulative flux values for CO_2 and brine for the evaluation of flows based on pressure change induced by the injection. Their evaluations indicated zero CO_2 flux across the east, west, north, and south of 4x4 mi^2 and 8x8 mi^2 areas around the injection location. Also, CO_2 flux across the top of Proviso unit also indicated no leakage. The delineation of the AoR is based upon the modeling of pressure effects in the Mt. Simon formation which is done to evaluate risks of displacing brine upwards into USDWs. EPA reviewed those calculations and found them to be reasonable. EPA also collected detailed model domain data and evaluated it to confirm that the regional dip was appropriately implemented in the geological and numerical model by the Alliance. The regional dip was accounted for in the numerical modeling conducted for the AoR delineation. See also Response to Comment #20. EPA also clarifies that additional site information will be collected under the pre-operational testing requirements within the Class VI Rule and the AoR will be reassessed based on the new data, as described under 40 C.F.R. § 146.82(c), prior to injection. Any changes in the model and/or the AoR would result in a permit modification – which, depending on the nature of changes, could warrant an additional public notice and comment, as provided in 40 C.F.R. Part 144. Furthermore, the regulations, and the permits, provide for periodic reevaluation of the AoR over the life of the project to incorporate monitoring and operational data and verify that the CO_2 plume and the associated area of elevated pressure are moving as predicted within the subsurface to ensure protection of USDWs from

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			endangerment. See 75 Fed. Reg. 77248-49 (Dec. 10, 2010) and Parts G and Q of the permits. The permit language has not been modified based on this comment.
33	Leinberger & Critchelow families	C. <u>The Plume Size is Materially Understated and Incorrectly Configured</u> The model predicting the projected lateral and vertical migration of the CO_2, as required under 40 C.F.R. §146.84(c)(1), has resulted in a projected plume size that is materially understated. As described in the attached Expert Report of Dr. Gregory Schnaar, Exhibit 2, there are several issues have resulted in the under sizing of the CO_2 plume, including: -FutureGen failed to follow EPA Guidance to use maximum-risk scenario simulation and conservative input parameter values; -The carbon dioxide plume on maps in the permit application Supporting Documentation do not include the complete modeled extent of the injected carbon dioxide; -The grid-cell blocks used in the model are too large, resulting in a smaller plume; -FutureGen's modeling sensitivity analysis is inadequate, and does not provide for a full understanding of potential model under-prediction of carbon dioxide plume and pressure-front extent; and -FutureGen's model assumption of no regional or local flow gradient in the injection zone is not valid and may have a significant impact on model results.	The Class VI regulations are developed to address any risks to USDWs associated with CO_2 injection for GS and the AoR is delineated to cover the area where endangerment may occur. EPA, in its independent evaluation, ensured that the data used in the model for delineating AoR were consistent with the site characterization data, and conservatively selected and based on measurements conducted at or near the site; and the model assumptions were reasonable. Sensitivity analyses were conducted by both the FutureGen and EPA to understand the effects of certain parameters. EPA used conservative input parameters in its sensitivity analyses creating maximum risk scenarios. The large AoR beyond the variations in predicted plume dimensions was evaluated for potential leakage pathways. Refer also to EPA's response to comment #10 of this section on how EPA evaluated the complete extent of CO_2 proposed to be injected by FutureGen. Flow gradient data for the Mt. Simon formation is scarce but "high" rates on the order of 1 to 2 cm per year would mean that during the 50 years of proposed post injection period, the plume would be shifted by 3 feet or less. This is trivial considering other forces considered by the models [Gupta and Bair, 1997; Mehnert, phone conversation 2014]. By issuing final permits containing the language as presented in the draft permits and based on the AoR delineated by a minimum of 10 psi pressure differential (relative to the initial pressure distribution), EPA approved the appropriateness of the modeling approach and that the project addresses all risks to USDWs.

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			EPA concluded that the AoR modeling and delineation were sufficiently conservative and consistent with EPA guidance. EPA also clarifies that additional site information will be collected under the pre-operational testing requirements within the Class VI Rule and the AoR will be reassessed based on the new data, as described under 40 C.F.R. § 146.82(c), prior to injection. Any changes in the model and/or the AoR would result in a permit modification – which, depending on the nature of changes, could warrant an additional public notice and comment, as provided in 40 C.F.R. Part 144. Furthermore, the regulations, and the permits, also provide for periodic reevaluation of the AoR over the life of the project to incorporate monitoring and operational data and verify that the CO_2 plume and the associated area of elevated pressure are moving as predicted within the subsurface to ensure protection of USDWs from endangerment. See 75 Fed. Reg. 77248-49 (Dec. 10, 2010) and Parts G and Q of the permits. See also responses to comments #9 and #10 on the extent of the plume; #39 on the grid sizes. The permit language has not been modified based on this comment.
34	Leinberger & Critchelow families	The Director is authorized to request additional information and should require that FutureGen fully address the undersizing of the plume and to explain why injection well length and injection rates have little to no influence on the lateral configuration of the plume and pressure front around the injection wells. Without this information, the Director is accepting a plume analysis that is poorly documented and potentially erroneous.	EPA conducted independent modeling of the AoR and additional sensitivity analyses [Evaluation of Area of Review Delineation Modeling, Critical Pressure and Corrective Action: FutureGen Alliance Class VI Injection Project Prepared to Support U.S. EPA Region 5 Permitting Decisions; March 2014] to confirm that the delineated AoR covers the area where endangerment may occur. The AoR is delineated based on a pressure differential which extends well beyond the plume. By issuing final permits based on the AoR delineated by a minimum of 10 psi pressure differential (relative to the initial pressure distribution within the injection formation), EPA confirmed that the project and the modeling addresses all risks to USDWs.

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			EPA also clarifies that additional site information will be collected under the pre-operational testing requirements within the Class VI Rule and the AoR will be reassessed based on the new data, as described under 40 C.F.R. § 146.82(c), prior to injection. Any changes in the model and/or the AoR would result in a permit modification – which, depending on the nature of changes, could warrant an additional public notice and comment, as provided in 40 C.F.R. Part 144. Furthermore, the regulations, and the permits, also provide for periodic reevaluation of the AoR over the life of the project to incorporate monitoring and operational data and verify that the CO_2 plume and the associated area of elevated pressure are moving as predicted within the subsurface to ensure protection of USDWs from endangerment. See 75 Fed. Reg. 77248-49 (Dec. 10, 2010) and Parts G and Q of the permits. See response to comment #11 for additional information on injection wells. The permit language has not been modified based on this comment.
35	Leinberger & Critchelow families	**Geology and Hydrology** 1) <u>Permeability numbers utilized as inputs for the model are unable to be readily assessed.</u> In Section 2.1.3.1 (Injection Zone) of the Supporting Documentation (Administrative Record "AR" # 1, 2) and Page B11 of 46 of Attachment B: Area of Review and Corrective Action Plan (Attachment B) , the injection zone permeability measurements discussed included rotary side-wall cores and plugs from whole cores. The permeability ranges from these cores are described in the text but these results are not tabulated in a manner to allow for individual review as they were for the primary and secondary confining zones. As a result, the adequacy of these numbers for use in the model cannot be readily assessed. *Requested Change/Action: FutureGen should provide*	1- EPA collected additional detailed data on permeability values used in the model to support its independent assessment of the AoR modeling conducted by FutureGen [Evaluation of Area of Review Delineation Modeling, Critical Pressure and Corrective Action: FutureGen Alliance Class VI Injection Project Prepared to Support U.S. EPA Region 5 Permitting Decisions; March 2014]. EPA developed a separate model with these input parameters to assess their appropriateness and conducted additional sensitivity analyses. Therefore, EPA concluded that all necessary information on permeability values used for the injection zone was submitted by FutureGen. No further action is needed. 2- In its independent assessment, EPA evaluated the selection of model layers based on the site characterization information submitted by the Alliance (Figure 2.11, page 2.17 of permit application) and confirmed that the modeling inputs were

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		tabulated permeability ranges for the injection zone. 2) <u>Vertical/horizontal permeability averages</u> Table 3.3 on Page 3.9 of the Supporting Documentation provides lithology-specific permeability anisotropy averages that were utilized to assign a vertical permeability to each model layer. The Documentation does not provide a specific discussion regarding the decision process on how these lithology values were selected for each model layer other than stating that the lithology used to subdivide each stratigraphic layer of the model was deduced from wire line logs and core data. Additional discussion specifying the data and decision processes used to subdivide and assign lithology types to each model layer should be provided in order to allow for complete review. The literature-based permeability anisotropy values listed in Table 3.3 were used to assign vertical permeability (Kv) and horizontal permeability (Kh) to each layer of the model and are provided in Table 3.4 and the updated Table 3 of the March 2014 *Evaluation of Area of Review Delineation and Corrective Action* (AR # 296) to also include Kv/Kh ratios determined from core pairs (available for specific intervals) as provided in the response to request for additional information (summary of the Kv/Kh ratios applied to model layers). It appears the additional Kv/Kh ratio data was only provided in the updated table but was not utilized in the modeling. *Requested Change/Action: FutureGen should provide additional data with regard to how the Kv values were selected.* 3) <u>Hydraulic head differential between the Mt. Simon (injection zone) and overlying units.</u> a) FutureGen states that the upper unconsolidated Quaternary aquifer, which is the current source of	appropriate. EPA also confirmed that the Kv/Kh ratios are applied to each model layer. EPA's review is described in the Final FutureGen AoR Evaluation Report. No further action is needed. 3- a & b. Detailed modeling results submitted by FutureGen indicate no leakage of CO_2 into the upper unconsolidated Quaternary aquifer due to pressures induced by the injection (see also the response to comment #32). EPA's independent review reached the same conclusion in the previously mentioned report on the evaluation of the AoR. Furthermore, the AoR delineated by a minimum of 10 psi pressure differential (relative to the initial pressure distribution within the injection formation) covers the area in which USDWs may potentially be endangered and addresses all risks associated with the injection activity. Because of the potential for a conduit, EPA has done a comprehensive review of wells in the AoR and found only two wells outside of the project that penetrated the confining zone. One of those wells has been recently plugged and the other is plugged back, isolating the injection zone from overlying formations and is currently actively owned by a gas storage operations over 15 miles from the FutureGen project. In addition, further site information will be collected under the pre-operational testing requirements within the Class VI Rule and the AoR will be reassessed based on the new data, as described under 40 C.F.R. § 146.82(c), prior to injection. Any changes in the model and/or the AoR would result in a permit modification – which, depending on the nature of changes, could warrant an additional public notice and comment, as provided in 40 C.F.R. Part 144. Furthermore, the regulations, and the permits, also provide for periodic reevaluation of the AoR over the life of the project to incorporate monitoring and operational data and verify that the CO_2 plume and the associated area of elevated pressure are moving as predicted within the subsurface to ensure protection

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		drinking water for residential wells within the survey area, has a naturally higher hydraulic head than the Mt. Simon indicative of a downward-gradient (Page 2.48, Supporting Documentation). However, the potential change in hydraulic head based on the pressure change induced by injection into the Mt. Simon is not discussed in any detail. b) It is also noted a positive hydraulic head differential between the Mt. Simon Sandstone and the St. Peter Sandstone (Page 2.48, Supporting Documentation) indicating that vertical flow would be from the Mt. Simon to the St. Peter under natural conditions (prior to injection) if a conduit between the two units exists. *Requested Change/Action: FutureGen should provide additional discussion that demonstrates the pressure change induced by injection into the Mt. Simon would not be great enough to allow brine migration to the shallow surficial underground source of drinking water (USDW) if a conduit does exist. In addition, the positive vertical head between the Mt. Simon and the St. Peter makes the need for a comprehensive and accurate well survey (refer to comment 6 below regarding adequacy of the well survey) over the expanded area of review (AoR) critical to ensure that no "potential" conduits exist that would breach both units and support the conclusion that there are no wells within the AoR that would require corrective action (AR #296).* 4) <u>Regional dip is not reflected in the modeled results.</u> Modeled results (Figures 3.22 and 3.23, Pages 3.32 through 3.35, Supporting Documentation and Appendix C of RAI #2) do not appear to be affected by the regional dip of the lithologic units. Although the dip of the injection and confining units is relatively minor (1% or less), some affect would be anticipated.	of USDWs from endangerment. See 75 Fed. Reg. 77248-49 (Dec. 10, 2010) and Parts G and Q of the permits. A corrective action plan is also in place to address any leakages or potential leakages identified through ongoing monitoring conducted under the permits. See Attachments B and C to the permits. No further action is needed. 4- In its independent assessment, EPA collected detailed model domain data and evaluated it to confirm that the regional dip was appropriately implemented in the geological and numerical model by the Alliance. No further action is needed. 5- EPA's review of induced seismicity potential included evaluation of extensive information about the proposed site, including the geological, geomechanical, hydrogeological, and geochemical properties of the injection and confining zones; local hydrogeology; geochemistry; and seismic history in the context of the planned injection operation. EPA reviewed FutureGen's seismic evaluation and performed its own evaluation. FutureGen submitted and EPA evaluated information on the presence of faults and fractures in the area of the site to identify whether any pathways for fluid movement to USDWs exist. Based on the results of seismic surveys and an evaluation of the local and regional geology (based on maps and cross sections submitted by the permit applicant and additional information referenced by EPA), EPA determined that no transmissive faults or fractures that may interfere with containment of the CO_2 exist in the confining zone through the entire AoR [Section 2 of FutureGen's permit application]. Additionally, a transmissive fault in the area would likely cause native pressure in the Mt. Simon to bleed off in relation to overlying formations which has not been observed. Information on EPA's evaluation is available in multiple documents in the Administrative Record including but not limited

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		Requested Change/Action: FutureGen should provide a discussion regarding the angle of dip used in the model and any affects the local/regional dip of the geologic strata may have on the movement of the sc CO_2 plume and the pressure differential front over time. 5) Quality of seismic data a) Seismic data for lines that FutureGen ran (L101 and L201) to assess faults and subsurface structure in the immediate area of the proposed injection well were very poor quality (Figures 2.15 and 2.16, Page 2.25 of Supporting Documentation). FutureGen obtained a second opinion of the interpretation [Dr. John McBride a former Illinois State Geologic Survey (ISGS) employee] and in his interpretation the presence of shallow faults could not completely be ruled out (Response to USEPA *Request for Additional Information #1* dated November 19, 2013 – RAI #1) b) The ISGS 120 mile long seismic reflective survey that was to shed some light on subsurface structures in the area reportedly showed no discernable faults west of Ashland, but again the quality was reportedly so poor such that reprocessing of the information was considered but rejected because it was thought that additional benefit in interpretation would not be obtained (RAI #1). c) None of the seismic data run to date in the immediate area of the proposed injection well is conclusive with regard to faults and subsurface structures in the area; FutureGen expanded the size of the AoR subsequent to the Supporting Documentation, but it does not appear that FutureGen has made an attempt to obtain any additional seismic data that may exist within the larger AoR. *Requested Change/Action: FutureGen should conduct a*	to: the "FutureGen Alliance Class VI Injection Project: Evaluation of Area of Review Delineation and Corrective Action" and "Induced Seismicity Evaluation Using the EPA-Developed Decision Model The FutureGen Alliance Project: Morgan County Class VI UIC Wells 1, 2, 3 and 4 (EPA Permit Numbers: IL-137-6A-0001, IL-137-6A-0002, IL-137-6A-0003 and IL-137-6A-0004)" (March 2014). The format and contents of this document are modeled after the "Injection-Induced Seismicity Decision Model" developed by EPA and state agencies with input from the United States Geological Survey, academic institutions, and other national seismicity experts. In response to comments and concerns regarding the approved AoR, EPA clarifies that additional site information will be collected under the pre-operational testing requirements within the Class VI Rule and the AoR will be reassessed based on the new data, as described under 40 C.F.R. § 146.82(c), prior to injection. Any changes in the model and/or the AoR would result in a permit modification – which, depending on the nature of changes, could warrant an additional public notice and comment, as provided in 40 C.F.R. Part 144. Furthermore, the regulations, and the permits, also provide for periodic reevaluation of the AoR over the life of the project to incorporate monitoring and operational data and verify that the CO_2 plume and the associated area of elevated pressure are moving as predicted within the subsurface to ensure protection of USDWs from endangerment. See 75 Fed. Reg. 77248-49 (Dec. 10, 2010) and Parts G and Q of the permits. The permit language has not been modified based on this comment.

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		new seismic survey in the area of the proposed injection to obtain better quality data and/or conduct additional research with regard to the availability of seismic data that may exist within the expanded AoR and provide the findings within the revised permit supporting documentation.	
36	Leinberger & Critchelow families	13) Mistake in modeled cross-sectional views Literature indicates and FutureGen states that the Mt. Simon and overlying strata dip to the southeast (Page 2.9, Supporting Documentation). However, the modeled cross-sectional views provided in Figure 3.23 of the Supporting Documentation show the formations dipping to the west (B'-B) and southwest (A'-A), respectively (pages 3.32 through 3.35), completely opposite of the east to southeast trend in the Illinois basin. Updated modeled cross-sectional views (Figure 3.22 A through E) provided in Appendix C of FutureGen's response to USEPA for additional information (Response to USEPA *Request for Additional Information #2* dated December 10, 2013) identifies the well bores by number which allows one to ascertain that the B'-B and A'-A designations are reversed and therefore the depicted dip is actually to the east and southeast. *Requested Change/Action: This labeling error needs to be corrected and the update figures re-submitted to avoid confusion during future reviews of the permit and supporting documentation.*	EPA reviewed the referenced permit application figure and agrees that it is mislabeled. This error in the figure does not reflect an error in the underlying modeling. Because the figure is not part of the permits, a revised figure is not needed to finalize the permits. This correction will be requested from FutureGen and any future documentation produced during the regular re-evaluations of the AoR and the model will make sure this error is not repeated. The commenter has not requested a change to the permits, and EPA will not change the permits in response to this comment.
37	Leinberger & Critchelow families	***2.) FutureGen should revise their modeling sensitivity analysis to account for all relevant parameters and incorporate reasonable scaling factors (Permit Section 3.1.10, p.3-41).*** FutureGen's modeling sensitivity analysis is inadequate, and does not provide for a full understanding of potential	EPA conducted an independent evaluation of the AoR modeling by developing a separate model to assess the reasonableness of the input parameters and the development of the plume/pressure front, and also ran additional sensitivity analyses (e.g., for residual aqueous saturation). This evaluation indicates that that the AoR delineated by

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		model under-prediction of CO_2 plume and pressure-front extent. Sensitivity analysis is the primary way to evaluate modeling uncertainty (U.S. EPA, 2013a, p.23/83). FutureGen's sensitivity analysis did not include varying of parameters that were based on literature values and/or prone to significant uncertainty, and are likely to have a large impact on model results (FutureGen, 2013, p.3-42). Additional parameters necessary for the sensitivity analysis include, but are not limited to the following: permeability-saturation relationships; capillary pressure-saturation relationships; anisotropy of intrinsic permeability; gas entry pressure; regional hydraulic gradient; and formation dip. As stated by FutureGen, they have selected a "parsimonious" set of parameters upon which to conduct the sensitivity analysis (FutureGen, 2013, p.3-41). This approach is not one that would, by design, rigorously evaluate model uncertainty resulting from data limitations, and provide a conservative estimate of plume migration. Additionally, scaling factors used in the existing sensitivity analysis are also too small given the range of possible input values (FutureGen, 2013, p.3-42). For example, estimates of intrinsic permeability for the Lower Mt. Simon varied by approximately a factor of 4.0 (i.e., 400 percent), for the wireline ELAN log testing and field hydraulic packer tests (FutureGen, 2013, p.3-6). However, the 'scaling factor' for testing the sensitivity of this parameter was only ±25 percent (FutureGen, 2013, p.3-42). FutureGen should revise the modeling sensitivity analysis to include all relevant model parameters, and larger scaling factors that reflect the true range of reasonable	a minimum pressure contour of 10 psi sufficiently covers the area in which USDWs may be endangered due to the injection activity. In response to comments and concerns regarding the approved AoR, EPA clarifies that additional site information will be collected under the pre-operational testing requirements within the Class VI Rule and the AoR will be reassessed based on the new data, as described under 40 C.F.R. § 146.82(c), prior to injection. Any changes in the model and/or the AoR would result in a permit modification – which, depending on the nature of changes, could warrant an additional public notice and comment, as provided in 40 C.F.R. Part 144. Furthermore, the regulations, and the permits, also provide for periodic reevaluation of the AoR over the life of the project to incorporate monitoring and operational data and verify that the CO_2 plume and the associated area of elevated pressure are moving as predicted within the subsurface to ensure protection of USDWs from endangerment. See 75 Fed. Reg. 77248-49 (Dec. 10, 2010) and Parts G and Q of the permits. As part of these future reevaluations of the model, EPA will consider additional parameters for consideration when performing additional sensitivity analyses. The permit language has not been modified based on this comment.

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		values (including a scaling factor of 400 percent for intrinsic permeability of the Lower Mt. Simon). Discussion should be added to justify the chosen values of the scaling factors.	
38	Leinberger & Critchelow families	***1.) FutureGen should revise plume and pressure-front delineations with maximum-risk scenario simulations and conservative input parameter values (Permit Section: Attachment B, p.B37/46).*** EPA modeling guidance states (U.S. EPA, 2013a, p.38/83): *The use of an a priori AoR delineation based on computational modeling predictions highlights the need for uncertainty and sensitivity analyses for the initial prediction. Conservative predictions will be needed prior to the commencement of injection and the availability of any site-specific data on carbon dioxide migration paths and rates. EPA recommends conducting sensitivity analyses as the principal evaluation tool for characterizing the most and least important sources of error in computational models (USEPA, 2003). Based on these results, maximum-risk scenario simulations can be conducted considering plume extent and pressure perturbation predictions that account for uncertainties in the model.* FutureGen modeling and AoR delineation is not consistent with this EPA modeling guidance. Using "reasonable bounding values" for input parameters, FutureGen's existing modeling sensitivity analysis resulted in a plume as much as 120 percent larger in size than their base case model runs (FutureGen, 2013, p.3-42, 3-43). I have included a map (Figure 1) with the FutureGen estimated supercritical CO_2 plume, and a plume area 120 percent larger. The 120- percent larger plume is likely *a minimum* for how much larger the FutureGen projected	EPA conducted an independent evaluation of the AoR modeling by developing a separate model to assess the reasonableness of the input parameters and the development of the plume/pressure front, and also ran additional sensitivity analyses (e.g., for residual aqueous saturation). This evaluation indicates that that the AoR delineated by a minimum pressure contour of 10 psi sufficiently covers the area in which USDWs may be endangered due to the injection activity. This issue has been responded to under comments #8, #9 and #11 above. In response to comments and concerns regarding the approved AoR, EPA clarifies that additional site information will be collected under the pre-operational testing requirements within the Class VI Rule and the AoR will be reassessed based on the new data, as described under 40 C.F.R. § 146.82(c), prior to injection. Any changes in the model and/or the AoR would result in a permit modification – which, depending on the nature of changes, could warrant an additional public notice and comment, as provided in 40 C.F.R. Part 144. Furthermore, the regulations, and the permits, also provide for periodic reevaluation of the AoR over the life of the project to incorporate monitoring and operational data and verify that the CO_2 plume and the associated area of elevated pressure are moving as predicted within the subsurface to ensure protection of USDWs from endangerment. See 75 Fed. Reg. 77248-49 (Dec. 10, 2010) and Parts G and Q of the permits. The permit language has not been modified based on this comment.

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		CO_2 plume should be given limitations in FutureGen's sensitivity analysis, and other FutureGen modeling limitations as discussed below. It is essential for FutureGen to provide a conservative estimate of the extent of the supercritical CO_2 plume in order to effectively manage project risk and design the site monitoring network. In my opinion, the plume as currently modeled is undersized and more likely than not to be greater than 120 percent larger when the model is run to include the appropriate conservative input parameter values. FutureGen should update plume and pressure-front delineation maps using maximum-risk scenario simulations, addressing each parameter that could significantly affect plume and pressure extent, and based on conservative parameter values determined through sensitivity analysis, consistent with EPA guidance as cited above.	
39	Leinberger & Critchelow families	***5.) FutureGen should demonstrate that model grid block sizes are sufficiently small (Permit Section: Attachment B, p.B37/46).*** AoR and CO_2 plume modeling is clearly impacted by overly large grid-cell spacing. It is likely that the modeled CO_2 plume would extend farther horizontally if the model used smaller grid-cell blocks. FutureGen's modeled CO_2 plume shows a 'stair-stepped' shape around the edges, with long 'flat' sections (e.g., FutureGen, 2014a, p.B37/46). The stair-stepped geometry is a sign that grid cell block sizes are too large. EPA's modeling guidance discusses limitations of using overly large grid cell blocks, including results from Yamamoto and Doughty (2009) demonstrating that grid refinement may have a substantial effect on overall simulated plume extent (U.S.	5. Yamamoto and Doughty (2009) indicate that coarse gridding in a vertical cross-section underestimates gravity override due to vertical mixing caused by numerical dispersion; as a result, the horizontal extent of the plume may be underestimated. It is unclear in the commenter's note if he/she refers to vertical or horizontal spacing. Nevertheless, the AoR delineated by a minimum pressure contour of 10 psi sufficiently covers the area in which USDWs may be endangered due to the injection activity. The commenter assumes that EPA relied only on FutureGen's modeling. The AoR delineation and the plume modeling (including grid size and spacing) was evaluated independently by EPA and is conservative and protective of USDWs and public health. 6. As a result of its independent evaluation of the model used for delineating AoR, EPA approved the approach for the assumption of

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		EPA, 2013a, p.21/83). FutureGen should demonstrate that grid cell blocks used in AoR modeling are adequately small through rigorous model testing, and present detailed results of this testing to EPA and stakeholders. If necessary, all modeling figures should be revised based on the finer grid mesh model. ***6.) FutureGen should incorporate regional hydraulic gradients into model simulations (Permit Section: Attachment B, p.B41/46).*** FutureGen's model assumption of no regional or local flow gradient in the injection zone is not valid and may have a significant impact on model results. FutureGen model simulations assume hydrostatic conditions and no regional or local flow conditions (FutureGen, 2014a, p.B30/46). However, regional hydrogeologic maps clearly show a regional hydraulic gradient at the project location (FutureGen, 2014a, p.B27/46). FutureGen model simulations should be conducted to test the assumption of no background gradient on plume and pressure-front migration. If this assumption is found to have an observable impact on model results, model simulations should be re-run considering a realistic regional gradient. ***7.) FutureGen should present critical pressure calculations for all USDWs (Permit Section: Attachment B, p.B40/46).*** FutureGen presents the results of pressure calculations for the lowermost USDW, but does not consider additional USDWs located above the proposed project (FutureGen, 2014a, p.40/46). FutureGen pressure calculations should be performed for all overlying USDWs, not only the lowermost USDW. If the critical pressure for	hydrostatic conditions within the injection zone by FutureGen, and the demonstration that final delineated AoR covers the area that USDWs may potentially be endangered due to the injection activity. As noted in EPA's response to comment 33 above, regional hydraulic gradients are trivial considering other forces considered by the models and including any estimations of them does not add to the value of the modeling. 7. EPA considers the delineation of the AoR by a minimum of 10 psi pressure increase to be a conservative approach to identify the area in which USDWs may be endangered due to injection activities (based upon EPA's previously referenced FutureGen AoR evaluation report). However, EPA also recognizes that site-specific conditions encountered during drilling may provide direct measurements of these parameters, at which time FutureGen may propose to the Director changes in the critical pressure estimation if warranted. Given that the deepest USDW is overlain by hundreds of feet of formations that are not only non-potable aquifers, but help isolate the deepest USDW from shallower USDWs, determining pressures from shallower USDWs will not affect EPA's determination of the AoR. 8. EPA approves of the assumption used by FutureGen that the impact of the amount of potential impurities in the injectate is negligible. 9. EPA's independent analysis of the AoR modeling indicated that the selected boundary conditions had no effects on the results. The 100 by 100 mile range is sufficiently large considering that at 25 miles (the approximate distance of the 10 psi contour), it took 20 years of injection and 40 years of post-injection to build up the additional 10 psi.

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		another USDW is found to be less than 10 psi, the AoR boundary should be re-delineated based on the smaller critical pressure value. ***8.) FutureGen should account for fluid impurities in computational modeling (Permit Section: Attachment B, p.B10/B46).*** FutureGen's model assumes fluid injectate is pure CO_2, while in reality it may have up to 3 percent impurities (FutureGen, 2014a, p. B10/46). Fluid transport properties may be impacted by the presence of impurities, and model simulations must be conducted to test the assumption of 100 percent pure CO_2. If accounting for fluid impurities has an observable impact on model results, the modeling should be updated to account for representative fluid properties. ***9.) FutureGen should provide detailed justification that model boundary conditions have no observable impact on modeling results (Permit Section Attachment B p.B31/46).*** FutureGen states the following in regards to Boundary Conditions of their model domain (FutureGen, 2014a, p.B31/46): "The lateral and top boundary conditions were set to hydrostatic pressure using the initial condition with the assumption that each of these boundaries is distance enough from the injection zone to have minimal to no effect on the CO 2 plume migration and pressure distribution." FutureGen, however, provides no basis for this important assumption. EPA's modeling guidance discusses the necessity of model testing to ensure that boundary conditions are set sufficient far to avoid numerical error (U.S. EPA, 2013a, p.37/83). Model testing should be presented to demonstrate that the model boundary conditions are sufficiently far from	10. EPA collected detailed information about the directional injection wells as part of its independent evaluation of the AoR delineation modeling. This information, for each well, included: the coordinates of injection well's trajectory; the depths of the screened intervals; the mass rate of injection; the fracture gradient and maximum injection pressure (along with the elevation corresponding to this pressure) and a description of how these values were calculated; the composition of injectate; and the injection schedule. This information was applied to the model developed for the independent evaluation. The results from EPA's evaluation confirmed the observed plume development submitted by FutureGen. By issuing final permits, EPA indicates approval of these results and does not believe further evaluation is necessary. In response to comments and concerns regarding the approved AoR, EPA clarifies that additional site information will be collected under the pre-operational testing requirements within the Class VI Rule and the AoR will be reassessed based on the new data, as described under 40 C.F.R. § 146.82(c), prior to injection. Any changes in the model and/or the AoR would result in a permit modification – which, depending on the nature of changes, could warrant an additional public notice and comment, as provided in 40 C.F.R. Part 144. Furthermore, the regulations, and the permits, also provide for periodic reevaluation of the AoR over the life of the project to incorporate monitoring and operational data and verify that the CO_2 plume and the associated area of elevated pressure are moving as predicted within the subsurface to ensure protection of USDWs from endangerment. See 75 Fed. Reg. 77248-49 (Dec. 10, 2010) and Parts G and Q of the permits. The permit language has not been modified based on this comment.

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		the injection point and projected pressure boundary as to not impact model results, especially in light of the more recently delineated AoR equal to 10 psi pressure increase. ***10.) FutureGen should provide explanation for the approximately symmetrical plume and pressure delineation based on their modeling given significant differences in injection rates and well construction amongst the four injection wells, and the regional formation dip (Permit Section: Attachment B, p.B37/46).*** FutureGen's modeled plume and pressure front delineations are approximately symmetrical in the horizontal plane around the four planned injection wells (FutureGen, 2014a, p.B41/46). However, the two horizontal injection wells directed towards the southwest (Well No. 3) and southeast (Well No. 2) include a significantly longer perforated interval (2,500 ft. versus 1,500 ft.) and larger injection rates (0.35 MMT/yr versus 0.19-0.21 MMT/yr) compared to the two wells directed towards the north. Additionally, the formation dips approximately 0.25 degrees in the east-southeast direction (FutureGen, 2014a, p. B7/46), which would be expected to cause preferential plume migration in the east-southeast direction. FutureGen should provide a narrative explanation for why formation dip, injection well length, and injection rates appear to have a minor influence on the lateral configuration of the plume and pressure front around the four injection wells.	
40	NRDC	2. The Applicant chose to represent the Franconia Formation portion of the secondary confining layer as a single, 172-foot-thick layer in the conceptual model. As such, this layer is assigned only one value each for	EPA approves of FutureGen's approach for including the Franconia Formation as a single layer. As the secondary confining zone, this formation does not receive any CO_2 fluxes based on the analyses conducted; therefore, more detailed evaluation of this formation is

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		porosity, vertical and horizontal permeability, grain density, and compressibility. This is unlikely to be representative of the actual hydrologic properties of this formation, and likely overstates its homogeneity. We recognize that the number of available data points was limited by the small number of available core samples and the fact that permeability in this formation is at or below the low end of the instrument limits for both wireline log and core sample analytic methods. However, this should not prevent the use of more detailed data for log- and core-derived hydrologic properties other than permeability. EPA should require more detailed modeling of the Franconia portion of the secondary confining zone to more accurately reflect real-world conditions, including if necessary a requirement to collect additional hydrologic data for the Franconia Formation as part of the logging, sampling, and testing program (40 CFR § 146.87 *et seq*).	not necessary at the moment. However, EPA also recognizes that site-specific conditions encountered during drilling may present the need to alter this decision, at which time FutureGen may propose to the Director changes in model and its results. Any such changes would result in a permit modification—which, depending on the nature of any changes, could warrant an additional public notice and comment period, as provided in 40 C.F.R. Part 144.
41	NRDC	3. The plan includes a number of parameters for which site-specific data were not available when the conceptual model was built, including: • Hydraulic fracturing tests and fracture pressure values; • Formation compressibility; • Capillary pressure; • Trapped gas saturation; • Gas entry pressure; • Hydrologic test data for the Elmhurst Sandstone, confining zones, and the upper part of the injection zone (lower part of the Lombard); and • Modular formation dynamics test data for the confining zone and upper part of the injection zone (lower part of the Lombard). In particular, site-specific data on formation fracture pressure for the injection and confining zones is crucial to	EPA considers the delineation of the AoR by a minimum of 10 psi pressure increase to be a conservative approach to address any uncertainty associated with the data used where site-specific measurements were not available. Based on the Class VI Rule, which EPA developed to address the unique risks of CO_2 injection for GS, FutureGen is required to conduct a pre-injection testing to collect site-specific information during the drilling of the injection well. EPA clarifies that under Part Q of the permits, this additional site information will be collected under the pre-operational testing requirements within the Class VI Rule and the AoR will be reassessed based on the new data, as described under 40 C.F.R. § 146.82(c), prior to injection. Any changes in the model and/or the AoR would result in a permit modification – which, depending on the nature of changes, could warrant an additional public notice and comment, as provided in 40 C.F.R. Part 144. Furthermore, the regulations, and the

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		safe operation of the injection wells. As discussed above, we understand that site-specific data will be collected when the injection wells are drilled. However, EPA and the Applicant have not provided a clear description of how the model will be updated once logging, sampling, and testing data become available. EPA should require this site-specific data to be collected as part of the logging, sampling, and testing program and that the conceptual model and that the AOR be revised to reflect this new data. The Applicant should describe how and when this data will be used to update the model. 4. In the model and simulation, injection is modeled through a well completed open-hole. However, the permit application states that the decision to complete the wells as either open-hole or cased- hole will not be made until after the wells are drilled and data is collected. EPA should require the model and simulation to be revised to reflect the actual completion configuration after the wells are drilled and completed but before injection begins.	permits, also provide for periodic reevaluation of the AoR over the life of the project to incorporate monitoring and operational data and verify that the CO_2 plume and the associated area of elevated pressure are moving as predicted within the subsurface to ensure protection of USDWs from endangerment. See 75 Fed. Reg. 77248-49 (Dec. 10, 2010) and Parts G and Q of the permits. The permit language includes the requested provisions and so has not been modified based on this comment.
42	NRDC	*Post Injection Site Care* 1. We are encouraged by the proposed Post-Injection Site Care and Site Closure ("PISC") Plan, which proposed to monitor the site through a variety of methods for fifty years after injection. At this point, we presume that the projected, largely isotropic, modeled evolution of the CO_2 plume and pressure front are due to the relative lack of site-specific data, which remains to be acquired during drilling and operation. However, it is likely that the actual development will not be symmetrical, and that the plume will develop in a manner or direction(s) that may render the currently proposed locations of the monitoring wells sub-optimal. The Applicant should discuss the probability	EPA clarifies that additional site information will be collected under the pre-operational testing requirements within the Class VI Rule and the AoR will be reassessed based on the new data, as described under 40 C.F.R. § 146.82(c), prior to injection. Any changes in the model and/or the AoR would result in a permit modification – which, depending on the nature of changes, could warrant an additional public notice and comment, as provided in 40 C.F.R. Part 144. Furthermore, the regulations, and the permits, also provide for periodic reevaluation of the AoR, testing and monitoring plan and PISC over the life of the project to incorporate monitoring and operational data and verify that the CO_2 plume and the associated area of elevated pressure are moving as predicted within the subsurface to ensure protection of USDWs from endangerment. See

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		of this happening and also the intended course of action for revisions to the PISC Plan but also the Testing and Monitoring Plan and AOR should this turn out be the case. EPA should require appropriate revisions to those and any other plans as needed in order to take into account of the latest and most complete information.	75 Fed. Reg. 77248-49, 77259-68 (Dec. 10, 2010) and Parts G, M, O and Q of the permits. The permit language has not been modified based on this comment.
43	CSC	**Provision:** G(2) **Text of Draft Permit:** 2. At the fixed frequency specified in the Area of Review and Corrective Action Plan, or more frequently when monitoring and operational conditions warrant, the permittee must reevaluate the area of review and perform corrective action in the manner specified in 40 CFR 146.84 and update the Area of Review and Corrective Action Plan or demonstrate to the Director that no update is needed. **References:** 146.84(b) The owner or operator of a Class VI well must prepare, maintain, and comply with a plan to delineate the area of review for a proposed geologic sequestration project, periodically reevaluate the delineation, and perform corrective action that meets the requirements of this section and is acceptable to the Director. The requirement to maintain and implement an approved plan is directly enforceable regardless of whether the requirement is a condition of the permit. As a part of the permit application for approval by the Director, the owner or operator must submit an area of review and corrective action plan that includes the following information: * * * *(2) A description of: (i) The minimum fixed frequency, not to exceed five years, at which the owneror operator proposes to reevaluate the area of review; (ii) The monitoring and operational conditions that would warrant a reevaluation of the area of review prior to the	As a general matter the UIC permit is intended as a roadmap to identify the relevant requirements and obligations of FutureGen. The relevant regulatory provisions are lengthier and more detailed so that the permit language may summarize those requirements and provide reference to the regulatory details rather than copying them in their entirety. This makes the permit more reader-friendly and easier to follow. EPA believes that incorporating additional details by reference does not create any conflict or confusion between the terms of the permit and the regulations. In addition, 40 C.F.R. §146.84(b) makes it clear that FutureGen is responsible to comply with both the permit requirement and the regulatory requirement upon which it is based. EPA has not made any change to the permits based on this comment.

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		next scheduled reevaluation as determined by the minimum fixed frequency **Proposed Revision:** 2. At the fixed frequency specified in the approved Area of Review and Corrective Action Plan (Attachment B of this permit), or more frequently when monitoring and operational conditions warrant as described in that plan, the permittee must reevaluate the area of review and perform corrective action in the manner specified in 40 CFR 146.84 and update the Area of Review and Corrective Action Plan or demonstrate to the Director that no update is needed. **Comment:** The plan itself is intended to spell out the frequency of review and the conditions that will trigger an earlier review. It is better to specify the fixed frequency or to use the same formula of "approved Area of Review and Corrective Action Plan (Attachment B of this permit)".	
44	CSC	**Provision:** G(3) **Text of Draft Permit:** 3. Following each AoR reevaluation or a demonstration that no evaluation is needed, the permittee shall submit the resultant information in an electronic format to the Director for review and approval of the AoR results. **References:** 146.84(e)(4) Submit an amended area of review and corrective action plan or demonstrate to the Director through monitoring data and modeling results that no amendment to the area of review and corrective action plan is needed. Any amendments to the area of review and corrective action plan must be approved by the Director, must be incorporated into the permit, and are subject to the permit modification requirements at §§ 144.39 or 144.41 of this chapter, as appropriate. **Proposed Revision:** G.3. Following each AoR reevaluation ~~or a demonstration that no evaluation is needed~~, the	As a general matter the UIC permit is intended as a roadmap to identify the relevant requirements and obligations of FutureGen. The relevant regulatory provisions are lengthier and more detailed so that the permit language may summarize those requirements and provide reference to the regulatory details rather than copying them in their entirety. This makes the permit more reader-friendly and easy to follow. EPA believes that incorporating additional details by reference does not create any conflict or confusion between the terms of the permit and the regulations. In addition, 40 C.F.R. §146.84(b) makes it clear that FutureGen is responsible to comply with both the permit requirement and the regulatory requirement upon which it is based. EPA has not made any change to the permits based on this comment.

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		permittee shall submit either the ~~resultant information~~ updated area of review and corrective action plan in an electronic format to the Director for review and approval of the AoR results, or a demonstration that no update is needed. **Comment:** The language in the draft permit is awkwardly worded and the reference to "resultant information" is potentially open-ended. The regulation requires the permittee to submit either an amended plan or a demonstration that amendment is unnecessary.	
45	FutureGen	*Page B44, Item 4* *Action, first line: Please change "calculated pressures" to* "observed pressures"	EPA agrees that this correction is more accurate, and is appropriate and consistent with the rest of the Plan. The requested change was made.
46	NRDC	6. The proposed composition of the CO_2 stream to be injected appears reasonable. However, higher concentrations of impurities could lead to adverse effects, from added toxicity in the event of leakage, to loss of injectivity due to precipitation. We suggest that EPA and the Applicant add material changes in the chemical or physical characteristics of the CO_2 injection stream to the list triggers that may necessitate a reevaluation of the AOR.	Part G.2 of the permits states "At the fixed frequency specified in the Area of Review and Corrective Action Plan, or more frequently when monitoring and operational conditions warrant, the permittee must reevaluate the area of review and perform corrective action in the manner specified in 40 C.F.R. § 146.84 and update the Area of Review and Corrective Action Plan or demonstrate to the Director that no update is needed." This language provides EPA with the flexibility to require AoR re-evaluation based on material changes in the injection stream. Nothing in Attachment B of the permits constrains that flexibility. Therefore, EPA has not made any change to the permits based on this comment.
47	Betty Niemann	The EIS 460D overlaid the oil and gas well maps from the ISGS but did not include any water wells in the overlay. ALL of these are potential sources for CO_2 leaks from the storage area.	Numerous water and oil/gas wells in the area are significantly shallower than either the injection or primary confining formations and are unlikely to be "potential sources for CO_2 leaks from the storage area." Various monitoring wells required under the permits will monitor formations deeper than most of these wells and EPA will evaluate data from these wells throughout the life of the project to ensure that shallower wells do not become leakage pathways.
48	Betty Niemann	As above, there is the potential for leakage through wells. In Volume I, Page 3.4-13 is Figure	In addition to evaluating FutureGen's review of the area wells, EPA completed its own independent review of well records at the ISGS.

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		3.4-4 Oil, Gas, and Gas Storage Wells in the Underground Injection Control Survey Area. This figure does not represent all ground penetrations by wells. There is this map from the ISGS: From the Illinois State Geological Survey Prairie Research Institute there are many more wells indicated than shown in Figure 3.4-4. The red areas indicate gas fields south of the CO_2 Storage Area. Each well may indicate a potential source for CO_2 leakage. These are identified in the EIS. Water Wells from the ISGSxl : Note the Carbon Storage Area (Primarily 16N 9W Section 25) has a major sand and gravel aquifer beneath the surface which, if the CO_2 migrates upwards, has a potential for large potable water contamination.	EPA looked at the 6,110 wells within the AoR. EPA did not find any improperly constructed artificial penetrations that reach the confining zone. Regarding the "major sand and gravel aquifer," the permit application was reviewed to determine the safety of the project in protecting all USDWs. The proposed project should not impact USDWs and extensive monitoring is being required to confirm that. Therefore, the permit language has not been modified based upon this comment.
49	Leinberger & Critchelow families	The Parties own property located within the Area of Review of the FutureGen UIC project. The Critchelow Family's property is approximately four acres and is located at 1760 Bluegrass Road in Jacksonville, Illinois ("Critchelow Property"). The Critchelow Property is located directly on the edge of the CO_2 plume modeled by FutureGen. See Permit map Figure 12, modified to show Critchelow and Leinberger Properties and wells, attached to the Declaration of Karl Leinberger, Exhibit 4. The Critchelow Family has a water well on their property, which the family uses for drinking and washing. The well is not identified in the Permit materials. 3 The Critchelow Family has lived on their property and used the well water for over 25 years. See Declaration of William Critchelow, attached as Exhibit 5.	In addition to evaluating FutureGen's review of the area wells, EPA completed its own independent review of well records at the Illinois State Geological Survey. EPA looked at the 6,110 wells within the AoR, as documented in the Administrative Record. EPA did not find any improperly constructed artificial penetrations that reach the confining zone. It is true that, by their nature, the State's large private well databases may be inaccurate or out of date to some extent. However, the productive aquifers that are generally used for drinking water supplies in the AoR and beyond are generally shallow (less than a couple of hundred feet deep), and so are many hundreds of feet above the confining zones and injection zones for this project. Given that there are no known private water wells in the AoR that are deep enough to be of concern and given known hydrogeologic information

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		The members and trusts of the Leinberger family own approximately 1,285 acres within the Area of Review ("Leinberger Property"). Portions of the Leinberger Property are on the edge of the CO_2 plume identified by FutureGen, with the remaining parcels very close to the CO_2 modeled plume. See Attachment A to Leinberger Declaration, Ex. 4. The draft permit for FutureGen's project identifies only one water well located on Leinberger Property. This water well is identified as Map ID Number 58. See Permit, Table 9, p. B34. There are two other water wells located on Leinberger Property. Neither of those two water wells is identified in the draft Permit. See Leinberger Declaration, Ex. 4, paras 9-10. The Leinberger Property also has many oil and gas wells on their Property and within the Area of Review that are either mis-identified or not identified at all in the draft Permit. The draft Permit properly identifies only one oil/gas well (#118). The oil/gas wells identified as Map ID Numbers 116 and 119 appear to be located on Leinberger Property, but are misidentified in Table 9 on page B35 of the draft Permit as belonging to other owners. There are 17 non-producing oil/gas wells located on Leinberger Property that are reflected in the Illinois State Geological Survey ("ISGS") database, but are not reflected in FutureGen's draft Permit in Table 9 or Figure 12 on pages B33-B37. See Ex. 4, paras 6-8. There are also two non-producing natural gas wells located on Leinberger Property that are not reflected in the draft permit nor in the ISGS database. Id. One old natural gas well is located within 0.3 miles of FutureGen's projected carbon dioxide plume. The second old natural gas well is approximately 0.7 miles from the projected plume. Id. FN3: In fact, the Critchelows appear to have water two	of the area, EPA believes that there is no concern of any unknown private water wells that would penetrate the confining zone. Oil and gas wells in the region are also shallow in relation to the injection and confining zones of this project. Therefore, even if an oil and gas well was drilled that the ISGS did not know about, it would likely be much too shallow to pose a threat of leakage outside of the injection formation.

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		wells on their property, neither of which is identified by FutureGen. See Leinberger Declaration, attached as Exhibit 4.	
50	Leinberger & Critchelow families	D. Inaccurate Well Identification and Information Under the Class VI regulations, FutureGen must account for all wells in the Area of Review and must provide *any other information the Director may require*. 40 C.F.R. §146.82(a)(4) (emphasis added). EPA Guidance instructs permit applicants that resident interviews and well surveys may be used to identify area wells. See UIC Program Class VI Well Area of Review Evaluation and Corrective Action Guidance, Section 4, AR# 439. There is no indication that FutureGen performed a complete investigation of wells, especially after the Area of Review was enlarged subsequent to the permit application. Although FutureGen identifies the wells within the new Area of Review, it does not provide details or locations of those wells. See Ex. 1, paras. 6, 7 (Price report). As a result, the draft Permit fails to identify or mis-identifies the wells located in the project areas. 5 The FutureGen draft Permit does not account for the Critchelow or Leinberger private wells, and, as noted above, it appears the Critchelow well was impacted by FutureGen's drilling activities. Given the much larger Area of Review, and the possibility that some of the water wells in the area could penetrate the confining zones, the Director should require a more thorough and aggressive approach, pursuant to recommendations of EPA Guidance, to identifying potential water wells based on updated modeling results. FN5: See In re Bear Lake Properties, LLC, 42 ELR 41361 (2012) (Class II well) (EAB remanded a permit where the	In addition to evaluating FutureGen's review of the area wells, EPA completed its own independent review of well records at ISGS. These records identified 6,110 wells in the AoR. EPA examined the information on well depths and only two wells were deep enough to warrant investigation. Of those wells, two wells (besides the FutureGen's stratigraphic well) penetrate the confining zone (Upper portion of Lombard Member and Proviso Member of the Eau Claire Formation). Of those wells, one is plugged, and the other is located 16 miles from the injection site. It is anticipated that this location would receive only increased pressure, if anything, and that such effects would not occur until after injection proceeded for a significant time EPA did not find any improperly constructed artificial penetrations that reach the confining zone. Given that there are no known private water wells in the AoR that are deep enough to be of concern and given known hydrogeologic information of the area, EPA believes that there is no concern of any unknown private water wells that would penetrate the confining zone. Therefore, the permit language has not been modified based upon this comment.

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		Region did not adequately demonstrate that it surveyed all of the drinking water wells in the Area of Review).	
51	Leinberger & Critchelow families	There are two wells located with the expanded Area of Review that penetrate the primary confining zone, and therefore could provide a potential preferential pathway between the injection zone and shallow USDW aquifers. See draft Permit, p. B3. FutureGen states that both wells are believed to have been sufficiently plugged and recompleted, but there does not appear to be any supporting documentation verifying that these wells are plugged as required. See Ex. 1, para. 8 (Price report). Without complete data on area wells, the draft Permit discussion of well identification and information is based on significant errors in fact.	Plugging of well Criswell #1-16 was completed on June 16, 2014. A plugging and abandonment form (OG-6) was filed at the appropriate regulatory agency (Illinois Department of Natural Resources) after an IDNR inspector visited the site on June 18. The second deep well (Whitlock # 7-15) is located roughly 16 miles from the injection site. Under the permits, the plume and pressure front will be regularly monitored. To the extent that the Whitlock well or any other wells identified or installed in the future may require corrective action (such as plugging), it can be addressed under the corrective action plan. See Attachment B and Attachment C.
52	Leinberger & Critchelow families	**Wells Within the Survey Area** 6) <u>The adequacy of the well survey within the AoR is incomplete.</u> a) The Class VI Rule requires potential Class VI injection well owners or operators to identify all artificial penetrations located within the delineated AoR, including active and abandoned wells and underground mines, that may penetrate the confining zone and provide a description of each well's type, construction, date drilled, location, depth and, if applicable, the record of plugging and/or completion and any additional information the UIC Program Director may require [40 CFR 146.84(c)(2)]. b) FutureGen appears to have restricted their well search to only public records; the ISGS database for oil and gas wells in the area and the Illinois State Water Survey (ISWS) database for water wells. These surveys are incomplete as not all historic water wells or oil and gas wells have been recorded with the state. c) FutureGen acknowledges the potential for private	In addition to evaluating FutureGen's review of the area wells, EPA completed its own independent review of well records at ISGS. EPA looked at the 6,110 wells within the AoR. EPA did not find any improperly constructed artificial penetrations that reach the confining zone. A tabulation of all the wells identified in the AoR is in the Administrative Record. EPA's May 2013 guidance only *suggests* options like "site reconnaissance, review of aerial and satellite imagery and geophysical surveys," but these are not required nor always appropriate. Given that there are no known private water wells in the AoR that are deep enough to be of concern and given known hydrogeologic information of the area, EPA believes that there is no concern of any unknown private water wells that would penetrate the confining zone. Drilling and construction of the stratigraphic test well occurred under a permit issued by the IDNR. EPA contacted the IDNR and found that there were no complaints of well contamination registered in

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		water supply wells to have been left out of their survey results as they state on the footnote for Figure S.4 (March 2013 submittal) many of the 63 residences shown on the map may have unregistered wells. This point is illustrated by those wells identified and not identified on the Leinberger farm which has three water wells within the 25 square mile survey area, of which only one was identified. The same holds true for oil and gas wells in the area. There are two old natural gas wells located on Leinberger property that are within the survey area that were not identified, as well as 17 oil/gas wells on the Leinberger property that are located just outside the original 25 square mile survey area, but well within the expanded AoR. d) Reportedly when FutureGen drilled the characterization/stratigraphic well, the water in a nearby water well at the Critchelow's residence turned yellow and the well overflowed. The well was not one of the wells identified in the ISWS well search and no information on the completion specifics was known by the property owner. The Supporting Documentation does not provide a geologic or hydrogeologic reason that could explain why the drilling of the stratigraphic well could have caused this observed event. The Critchelow's property is located just south of the sc CO_2 plume boundary along Blue Grass Road, approximately 0.6 miles south of Negus Road. e) Given the number of private residences within the 25 square mile survey area and the known fact that many water wells and oil and gas wells were not identified, a more aggressive approach to identifying potential wells in the area should have been considered. USEPA produced a guidance document in May 2013 that identifies the	Morgan County during the drilling of the stratigraphic test well. The information provided by the commenter is not detailed enough to provide any direct correlation between drilling and construction of the stratigraphic test well and the issues with the Critchelow well. EPA has no reason to expect that the Critchelow well would have been hydraulically connected to the FutureGen well. Inquiries with the State have not resulted in any information about this alleged incident. EPA ask that FutureGen provide advance notice to the Critchelows when the well construction is scheduled, so that they can see whether their well shows any impacts. If any impacts are observed, it would trigger actions under the corrective action plan. As provided in Attachment F of permits, the Emergency and Remedial Response Plan identifies potential adverse incidents that will be watched for during the construction period, including movement of brine between formations during drilling. Potential response options were identified in that Plan to be able to mitigate any potential endangerment of USDWs. Plugging of well Criswell #1-16 was completed on June 16, 2014. A plugging and abandonment form (OG-6) was filed at the appropriate regulatory agency (Illinois Department of Natural Resources) after an IDNR inspector visited the site on June 18. The January 2014 Battelle report titled A*nalysis of Impacts on Lowermost USDW from Focused Leakage of Brine from Plugged and Abandoned or Poorly Constructed Wells at the FutureGen 2.0 Site* was not based on analysis of the actual construction or plugging at the site. As noted above, the Criswell #1-16 has been plugged and should not pose a threat to USDWs. The Whitlock #7-15 well is currently owned by a private entity. The Whitlock well is currently operated as a monitoring well by the gas storage operator and is under the jurisdiction of the IDNR. EPA finds that the Whitlock well

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		following stages for well investigation within the AoR in addition to historical research of public records: site reconnaissance, review of aerial and satellite imagery and geophysical surveys. These were not performed. *Requested Change/Action: FutureGen should conduct a site reconnaissance or door-to-door survey to assist in identifying wells in at least the 25 square mile survey area if not the entire expanded AoR. The wells identified should be added to the figures and tables of the supporting documentation.* 7) <u>Wells identified within the expanded AoR have not been described.</u> Though revised Attachment B to the draft Permit (dated March 31, 2014) does address the number of wells within the newly defined larger AoR (4,386 water wells and 740 oil and gas wells), the well data provided in Table 9 and Figure 12 of Attachment B only provides descriptions for and mapped locations of those wells within the 25 square mile survey area. Revised maps depicting all of these well locations as well as coal mines and surface water body features were provided to the USEPA via email dated March 15, 2014, but no description (tabulated information) regarding the wells was provided. In accordance with 40 CFR 146.84(c)(2), "Using methods approved by the UIC Program Director, identify all penetrations, including active and abandoned wells and underground mines, in the AoR that may penetrate the confining zone(s). Provide a description of each well's type, construction, date drilled, location, depth, record of plugging and/ or completion, and any additional information the UIC Program Director may require." This information should have been provided. *Requested Change/Action: FutureGen should provide a*	has construction that is appropriate to ensure protection of USDWs. These wells will be regularly assessed under the permits and corrective action will be required if it is determined to be necessary to protect USDWs. Therefore, the permit language has not been modified based upon this comment.

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		tabulated description of the well data for all the wells identified in the expanded AoR as required. 8) Wells that penetrate the injection zone a) There are two wells located with the expanded AoR that penetrate the primary confining zone and therefore could provide a potential preferential pathway between the injection zone and shallow USDW aquifers. These wells are located at the Waverly Storage Field, an active natural-gas storage facility located approximately 16 miles south-southeast of the proposed injection well. The primary storage reservoir at the Waverly Storage Field is the St. Peter Sandstone. However, these two test wells were drilled deeper into the Mt. Simon Sandstone. The two wells are identified as the Criswell #1-16 (API #121370034900) and Whitlock #7-15 (API #121370034601) (Page 3.46, Supporting Documentation). FutureGen states that both wells are believed to have been sufficiently plugged and recompleted and therefore no longer provide a preferential migration pathway from the injection zone to shallower USDWs. They go on to conclude therefore that no direct monitoring and/or corrective action will be performed (Page 3.46, Supporting Documentation and AR #296). b) FutureGen provides a discussion of the recompletion activities for these two wells on generic completion diagrams (Figures 2.15 and 2.16, Page 2.25, Supporting Documentation). ENVIRON reviewed the completion logs for these wells obtained from the ISGS and FutureGen's depiction for the Criswell well appears accurate (plug and cap installed in 1978); however, information provided on the Whitlock graphic (Figure 3.30, Page 3.47, Supporting Documentation) is inaccurate (well was not reworked in 1997 and the cement plug dates back to 1965).	

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		c) In January of 2014, Battelle produced a report on behalf of FutureGen titled *Analysis of Impacts on Lowermost USDW from Focused Leakage of Brine from Plugged and Abandoned or Poorly Constructed Wells at the FutureGen 2.0 Site* (AR #464) to assess the potential for brine migration at the two wells nearest the proposed injection wells that breach the Mt. Simon caprock. The two wells they assessed are the Criswell well mentioned above and the FutureGen stratigraphic well FGA #1. The simulation results indicated small volumes of brine leakage into the lowermost USDW at both well locations. *Requested Change/Action: Based on the age of the plug and 5 feet thick hydromite cap (36 years) in the Criswell well, the age of the cement plug in the Whitlock well (49 years) and the fact that FutureGen's own simulations indicated that small volumes of brine leakage into the St. Peter Sandstone would occur, FutureGen should directly monitor both the Whitlock and Criswell wells and perform corrective action as appropriate.*	
53	Leinberger & Critchelow families	14) Mistake on Figure 2.32 Page 2.50 of the Supporting Documentation states, "The map in Figure 2.32 shows the locations of four proposed injection wells for which permits are being sought." The four proposed injection well locations are not depicted on Figure 2.32. *Requested Change/Action: Figure 2.32 needs to be modified to show the location of the four proposed injection wells*	EPA reviewed the referenced permit application figure and agrees that it is mislabeled. This error in the figure does not reflect an error in the underlying modeling. Because the figure is not part of the permits, a revised figure is not needed to finalize the permits. This correction will be requested from FutureGen and any future documentation produced during the regular re-evaluations of the AoR and the model will make sure this error is not repeated. The comment has not requested a change to the permits, and EPA will not change the permits in response to this comment.
54	NRDC	7. In the permit application, the Applicant indicates that drilling records reviews and "site walkthroughs" were performed to identify possible penetrations of the confining zone. The Applicant should provide additional details as to the exact methods that were used to identify	In addition to evaluating FutureGen's review of the area wells, EPA completed its own independent review of well records at ISGS and the Illinois State Water Survey. EPA looked at the 6,110 wells within the AoR. EPA did not find any improperly constructed artificial penetrations that reach the confining zone.

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		existing wells, including a more extensive discussion of the history of the site and any past uses to aid in determining whether other undocumented wells are likely to exist in the AOR. The Applicant must justify a decision to not deploy more advanced methods of locating undocumented wells, such as aeromagnetic surveys. Improperly constructed, maintained, and/or abandoned wells are one of the most likely pathways by which injected fluids may reach USDWs, as has been evidenced by surface leakage of CO_2 at oil fields such as Salt Creek in Wyoming. EPA must require the use of such methods prior to injection if it the current sources of information are not sufficiently trustworthy.	In addition, the permits include a regular monitoring program designed to identify any unknown or unanticipated pathways. See Part M of the permits and Attachment C. Therefore, the permit language has not been modified based upon this comment.
55	NRDC	2. The Applicant states that "[o]ther than the project and monitoring wells, other distant potential conduits for fluid movement, or leakage pathways within the AoR are adequately constructed and/or plugged. Based on this information, the potential for fluid movement through artificial penetrations of the confining formation does not present a risk of endangerment to any USDWs." Given that the sources of information are limited to publicly available records and site walkthroughs, we are concerned with this conclusion, especially given that the number of wells identified within the larger AOR is large and that these include 740 oil/gas wells (which are more likely to penetrate deeper). The Applicant should further discuss and justify such a conclusion. EPA should also evaluate whether to require further assessment and corrective action on known wells, and also whether to require the use of further methods to reveal unknown wells in the area.	In addition to evaluating FutureGen's review of the area wells, EPA completed its own independent review of well records at the ISGS and the Illinois State Water Survey. EPA looked at the 6,110 wells within the AoR. EPA did not find any improperly constructed artificial penetrations that reach the confining zone. Therefore, the permit language has not been modified based upon this comment.
56	McCutchen	"Our calculations suggest that the volume of liquid or supercritical CO_2 to be disposed cannot exceed more than	One of the underlying assumptions in the Ehling-Economides and Economides (E&E) 2010 paper is that the reservoir is a closed system.

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		about 1% of pore space. This will require from 5 to 20 times more underground reservoir volume than has been envisioned by many, and it renders geologic sequestration of CO_2 a profoundly non-feasible option for the management of CO_2 emissions." Profoundly non-feasible is a polite way of saying laughable. Curiously, the Ehlig-Economides paper, a peer-reviewed article authored by two prominent experts in petroleum engineering, was not among the references cited in the recent interagency report on CCS. So its optimism about sequestration may be based on ignorance. Cramming 2 billion tons a year into deep saline formations is a vain hope, with no test data. One known problem is pore space near the well clogging with the hoped-for mineralization and thus shutting off flow of CO_2 into the formation. The danger of saline intrusion into the groundwater and CO_2 plumes erupting and killing people must be weighed against the trivial benefit to global warming, which is the ostensible motivation for FutureGen. In EOR the flow is steady state and not intermittent because there is a production well that provides a path out of the formation and the flow is at constant pressure. The CO_2 dissolves in the oil and is recycled back into the reservoir after it is extracted. The depleted reservoir is like an empty tank, with flow in and out, i.e. an open system. All sequestration projects so far -- the "25 years of successful experience" -- are of this type, and they have been done because of the economic benefit to oil companies of capturing the CO_2 and injecting it back into the formation to scavenge oil from depleted reservoirs. Ehlig-Economides et al. challenge the steady state	The Mt. Simon formation is not a closed reservoir. Comments from the American Petroleum Institute (API) the Natural Resources Defense Council, Pacific Northwest National Laboratory (PNNL), Lawrence Berkeley National Laboratory, Edinburgh University and the Imperial College of London have all criticized many of the assumptions of the E&E paper. EPA is reluctant to evaluate or comment on arguments on the validity of CCS. The task of EPA was to determine if the proposed project meets the regulatory requirements and can be done in a safe manner. The complex numerical modeling submitted by FutureGen was evaluated and independently remodeled by EPA. That analysis demonstrates that the proposed project can inject the anticipated amount of CO_2 within the regulatory requirements and is protective of USDWs and human health and the environment. Extensive monitoring required by the regulations and the permit will be compared with modeling results to continuously evaluate the protectiveness of the project.

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		assumption underlying capacity calculations for deep saline formations: "models that assume a constant pressure outer boundary for reservoirs intended for CO_2 sequestration are missing the critical point that the reservoir pressure will build up under injection at constant rate. Instead of the 1-4% of bulk volume storability factor indicated prominently in the literature, which is based on erroneous steady state modeling, our finding is that CO_2 can occupy no more than 1% of the pore volume and likely as much as 100 times less." The steady state assumption is clearly not appropriate with respect to deep saline aquifers, where there exist no means for flow out of the formation, and injection would have to be against high pressure into a full tank, raising the pressure. Pumps to hammer in the supercritical CO_2 and displace the brine would produce pulsed, not steady, flow. As more CO_2 goes in, the pumps will have to work even harder against higher pressure. The density of the injected supercritical CO_2 is only 50-70% of the density of the saline water, (Burruss, p. 4) so sequestered CO_2 would be buoyant and would have to be physically trapped by caprock and lateral containment. Hydraulic fracturing of the sealing formation by high pressure (the fracture pressure of the sealing formation is >4200 psi), pulses during supercritical CO_2 injection might have disastrous consequences. Lateral leakage of buoyant supercritical CO_2 out of the sealing formation would also be a disaster because this high pressure bubble could find its way around the caprock and erupt at the surface, or into groundwater supplies. The CO_2 cannot dissolve in the brine or become carbonate quickly enough to mitigate the danger from leakage. When sequestration proponents expect the storage formations	

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		to leak enough to be classified as open systems, then there seems to be no point (other than EOR for the oil companies) of injecting CO_2 underground and it probably is safer to dump it in the atmosphere.	

SECTION 4. FINANCIAL RESPONSIBILITY COMMENTS

#	Commenter	Comment Text	EPA Response
1	Betty Niemann	Along with the remediation plan comes costs. These remediation costs must be paid by someone, entity, or alliance. What happens long after FutureGen has completed the project especially when well casings deteriorate due to the acid plume? Who will be in place to activate the remediation plan and from whence shall the money come? Ken Humphries has said that companies or alliances don't last and states do. So in light of his remark, will the State of Illinois have to remediate a leak? Will the State of Illinois have people in place for a rapid response? Better yet, will the State of Illinois have the monetary resources available for a rapid response? These are all the questions that will need to be answered and told to the landowners. The carbon storage landowners are "ground zero" for CO_2 damage and not the "strong community" supporters/stakeholders residing in the city of Jacksonville.	FutureGen will be released from its post-injection site care responsibilities only after a non-endangerment demonstration is made and the Director has approved the site closure (at 40 C.F.R. § 146.93), which is also the basis for releasing the owner or operator from financial responsibility (40 C.F.R. §146.85(b)(1)). FutureGen must also plug the wells in a manner that minimizes the risk of long-term failure. However, any remediation costs incurred in the very long term (i.e., after the non-endangerment determination and the release from post-injection site care responsibilities) is beyond the scope of the Class VI financial responsibility requirements and the UIC permitting process. Therefore, EPA will not make any changes to the permits based on this comment. EPA understands, however, that under Chapter 20 of the Illinois Compiled Statutes, Section 1108, the State of Illinois assumes certain liabilities and long-term stewardship obligations associated with the injected carbon dioxide.

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2	CSC	**Provision:** H(1) **Text of Draft Permit: 1. Financial Responsibility –** The permittee shall maintain financial responsibility and resources to meet the requirements of 40 CFR 146.85 and the conditions of this permit. Financial responsibility shall be maintained through all phases of the project. The approved financial assurance mechanisms are found in Attachment H and in the administrative record of this permit. The financial instrument(s) must be sufficient to cover the cost of: (a) Corrective action (that meets the requirements of 40 CFR 146.84); (b) Injection well plugging (that meets the requirements of 40 CFR 146.92); (c) Post injection site care and site closure (that meets the requirements of 40 CFR 146.93); (d) Emergency and remedial response (that meets the requirements of 40 CFR 146.94). **References:** **Proposed Revision: 1. Financial Responsibility –** The permittee shall maintain financial responsibility and resources to meet the requirements of 40 CFR 146.85 ~~and~~ in accordance with the conditions of this permit. ~~Financial responsibility shall be maintained through all phases of the project. The~~ and the approved financial assurance mechanisms ~~are found~~ in Attachment H and in the administrative record of this permit. Financial responsibility shall be maintained through all phases of the project. ~~The financial instrument(s) must be sufficient to cover the cost of:~~ ~~(a) Corrective action (that meets the requirements of 40~~	As a general matter, the UIC permit is intended as a roadmap to identify the relevant requirements and obligations of FutureGen. The relevant regulatory provisions for financial responsibility are relatively lengthy and technical, so the permit language may summarize those requirements and provide reference to the regulatory details rather than copying them in their entirety. This makes the permit more reader-friendly and easy to follow. Incorporating the additional details by reference does not create any conflict or confusion between the terms of the permit and the regulations. In addition, 40 C.F.R. §146.85(b) makes it clear that FutureGen is responsible to comply with both the permit requirement and the regulatory requirement upon which it is based. For Class VI wells, EPA anticipates that financial responsibility amounts and mechanisms will be regularly reviewed and revised in connection with the regular reviews of the AoR, corrective action plan, injection well plugging plan, Post Injection Site Care (PISC) and site closure plan, and Emergency and Remedial Response Plan (ERRP). See 75 Fed. Reg. 77271 (Dec. 10, 2010) and Section H of the Permits. Reference to the relevant regulatory provisions provides clarity on the standards against which any revisions will be judged. Therefore, EPA will not make the suggested changes to the permits.

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		~~CFR 146.84);~~ ~~(b) Injection well plugging (that meets the~~ ~~requirements of 40 CFR 146.92);~~ ~~(c) Post injection site care and site closure (that~~ ~~meets the requirements of 40 CFR 146.93);~~ ~~(d) Emergency and remedial response (that meets the requirements of 40 CFR 146.94).~~ --OR— The permittee has submitted the approved financial assurance mechanisms, which are included in Attachment H of this permit. These mechanisms include the information required by Section 146.85 and demonstrate how each of the applicable requirements of Section 146.85 will be met. **Comment:** These initial draft permits use a pattern of reciting the regulatory requirements and stating that these must be met without giving full recognition to the fact that issuing the permit constitutes a determination that the applicable regulatory requirements have been met through the application and the supporting materials. As noted in Section A of the permit, compliance with the approved Attachment H constitutes compliance with the recited provisions of the regulations. Yet, including those same provisions as permit conditions suggests that something beyond complying with the financial assurance mechanisms could be required, which is not the case.	

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3	FutureGen	*The CO_2 injection well coordinates in EPA's draft FutureGen UIC Class VI Permit Cover Letter and Attachments for each of the injection wells is the injection point location described in FG-RPT-017, Revision 1 (May 2013). These same coordinates are used for all of the 4 injection wells throughout the FutureGen permitting documentation. Because the currently planned CO_2 injection wells' locations and their mid-point location are to the NW of the stated location, the Alliance suggests the following wording and footnote throughout the permitting documentation for the injection well locations:* *(If using one set of coordinates for **all** CO_2 injection wells' permit documentation…)* **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80104°N and 90.07517°W [1] Actual injection well location will be surveyed after injection well construction. *(If using the planned coordinates of the **individual** CO_2 injection wells in each well's permit documentation…)* (Well#1) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80111°N and 90.07491°W [1] Actual injection well location will be surveyed after injection well construction. (Well#2) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80097°N and 90.07491°W [1] Actual injection well location will be surveyed after injection well construction. (Well#3) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80097°N and 90.07544°W	EPA has revised the first page of each permit and the first page of each permit attachment to reflect the accurate proposed location for each of the wells. To the extent that small deviations to the planned locations are identified after the wells are constructed and surveyed, those corrections can be made through the minor modification process identified in 40 C.F.R. §144.41.

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		[1] Actual injection well location will be surveyed after injection well construction. (Well#4) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80111°N and 90.07544°W [1] Actual injection well location will be surveyed after injection well construction.	
4	Leinberger & Critchelow families	F. The Financial Responsibility Provided For In The Draft Permit Is Deficient The draft Permit fails to accurately demonstrate financial assurance for the FutureGen Class VI project. The Class VI UIC rules broadly require financial responsibility related to the creation, operation and closure of a Class VI well. 40 C.F.R. §146.85. The financial responsibility "must be sufficient to address endangerment of underground sources of drinking water. 40 C.F.R. §146.85(a)(3). Thus, FutureGen must demonstrate and maintain financial responsibility sufficient to cover the cost of four categories: the corrective action, injection well plugging, post injection site care and site closure, and emergency and remedial response.6 40 C.F.R. §146.85(a)(2). Moreover, section 144.12(a) of the UIC regulations states that injection activity must be conducted in a manner that does not allow the movement of contaminants that may cause a violation of drinking water standards, or may otherwise adversely affect the health of persons.7 40 C.F.R. §144.12(a). Given the purpose of the SDWA in providing remedial protections, it would be inconsistent with the SDWA to narrowly construe the financial responsibilities set forth in §146.85(a). In addition to the language of the regulations, it is an important policy	Financial responsibility requirements for area properties and persons that may be adversely affected by the underground injection of CO_2 are within the scope of the Class VI rule only to the extent to which they apply to area properties and persons affected through endangerment of USDWs (see 40 C.F.R. §146.85(a)(3)). Based on a thorough review of FutureGen's cost estimates, EPA has determined that FutureGen has met the financial responsibility requirements of the Class VI Rule. The rule clearly defines which phases of the project must be covered by financial responsibility at 40 C.F.R. §146.85(a)(2). Furthermore, the rule explicitly states which costs the owner or operator must cover for each phase, as defined at 40 C.F.R. §§146.84, 146.92, 146.93, and 146.94. Any coverage for damages and risks beyond protection of USDWs and human health from contaminants injected into the wells cannot be a condition of a UIC permit. For these reasons, EPA will not make any changes to the draft permits based on this comment. EPA understands, however, that under Chapter 20 of the Illinois Compiled Statutes, Section 1108, the State of Illinois may address some of the risks beyond those addressed under the UIC permitting regulations.

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		consideration to ensure that area properties and persons are not adversely affected by the underground injection of CO_2. For this draft Permit, the financial responsibility is provided for *exclusively* by a trust fund funded with the following amounts: Activity: Performing Corrective Action on Deficient Wells in AoR Estimated Cost: $623,000 Activity: Plugging Injection Wells Estimated Cost: $2,723,000 Activity: Post-Injection Site Care Estimated Cost: $18,320,000 Activity: Site Closure Estimated Cost: $3,402,000 Activity: Emergency and Remedial Response (Pre-Injection) Estimated Cost: $6,100,000 Activity: Emergency and Remedial Response (Post-Injection) Estimated Cost: $20,600,000 FutureGen will not fully fund the trust before construction of the wells begins, but instead will pay into the trust in a phased approach, which is reflected in Table 2 of Attachment H of the draft Permit. The financial assurance provided for in Section H and Attachment H of the draft Permit is deficient because it does not reflect important policy considerations in connection with the UIC regulations and does not strictly adhere to the regulations, thus thwarting the purposes of the SDWA. FN6: The authorized financial instruments include trust funds, surety bonds, letter of credit and insurance. 40 C.F.R. §146.85(a)(1).	

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		FN7: 40 C.F.R. §144 applies to the UIC programs and should be read in conjunction with 40 C.F.R. §146. 40 C.F.R. §146.1(A).	
5	Leinberger & Critchelow families	4) The pay-in-period provisions should be eliminated, and instead, FutureGen should fully fund the Trust Fund before the project starts. At the very least, the pay-in-period should be reduced to the shortest time possible. This is equally true should FutureGen acquire an insurance policy for the emergency and remedial response financial assurance. Regardless, the final Permit should positively state that the Director approved the pay-in-period for the trust fund. 5) The final Permit should positively state that FutureGen may not terminate the financial assurance instruments until the Director approves the completed post-injection site care and site closure plan and approves site closure.	According to 40 C.F.R. §146.85(b), a financial instrument may be terminated upon several conditions, one of which is that the Director "approves the completed post-injection site care and site closure plan" and "approves site closure." However, the permit language should not restrict the Director's ability to approve the termination of an instrument to this condition alone. For example, FutureGen may seek to substitute one form of financial mechanism for another. If EPA approves such a substitution, termination of the superseded instrument would also be appropriate. According to 40 C.F.R. §146.85(f), a pay-in period for a trust fund is allowable if approved by the Director. EPA approved the pay-in structure identified in Attachment H of FutureGen's permits because it is sufficient to protect USDWs and because it minimizes the risk of instrument failure in the interim for the following reasons: 1. The first deposit in the proposed pay-in period – of $8.823 million -- will occur within seven days of final permit approval, which will occur before the permits become effective and, therefore, before well construction may begin. This requirement will ensure that the instrument is sufficiently funded during the entire construction phase. 2. Based on a review of the independent third-party cost estimates (Patrick Engineering, Appendix C of the permit application), EPA has determined that the initial deposit of $8.823 million is sufficient to cover risks associated with the potential need to address well plugging and/or Emergency and Remedial Response (E&RR) during the construction phase of the project. The phase-in approach is based on an evaluation of when financial risk will be incurred over the life of the project. The $6.1 million cost estimate would cover the

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			response to a catastrophic failure of the caprock, which was the costliest potential event identified. Such an occurrence is unlikely to occur even once injection proceeds, and caprock failure or other threats to USDW are highly unlikely to result from the mere act of constructing injection and monitoring wells. 3. The trust fund will be supplemented with an additional payment of $22.345 million within a year of the final permit issuance (or prior to any injection if injection is authorized by that point). Trust fund resources would be available for any of the activities requiring financial responsibility. The trust fund would then be fully funded with an additional $20.6 million within two years of final permit issuance, which EPA anticipates will occur prior to injection of CO_2. The full cost estimate is based on multiple potential events over a number of years. It is unlikely that multiple issues would arise, and especially unlikely that they would all arise at the very beginning of injection when the volume of sequestered CO_2 would be low. The two-year pay-in period is still shorter than the three-year period contemplated in the preamble to EPA's final class VI rules (see 75 Fed. Reg. 77271 (Dec. 10, 2010)); and its Underground Injection Control (UIC) Program Class VI Financial Responsibility Guidance, July 2011, p. 38. The final permits, which include Attachment H as an enforceable condition, require approval from the Director. Therefore, approval of the final permits constitutes approval by the Director of the pay-in period for the trust fund, as clarified by the changes described above. Therefore, EPA will not revise the permits in response to these comments.

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6	Leinberger & Critchelow families	iv. Improper Pay-in Period The draft Permit allows FutureGen to incrementally pay into the trust fund for each task. See Attachment H, Schedule C, entitled the "pay-in-periods." The Director should require that Future Gen fully fund the trust fund to ensure it has sufficient funds for the entire project. As the UIC Guidance Document states, "A fully funded trust fund or escrow account minimizes the risk of instrument failure. While longer pay-in periods reduce the up-front financial burden for the owner or operator, longer pay-in periods also increase the risk that the instrument will fail if the owner or operator cannot meet its obligations." See U.S. EPA Underground Injection Control (UIC) Program Class VI Financial Responsibility Guidance, July 2011 p. 23, AR# 438. As this is a first of its kind project, FutureGen should have all of the funds available to minimize the risk of instrument failure.8 Alternatively, the Director should shorten the pay-in-period to minimize the risk of instrument failure. Id. at 23. In particular, the incremental funding of the emergency and remedial response fund is too long. The draft Permit provides that FutureGen will only have $6.1 million in emergency response during the drilling period, and will add $20.6 million when it begins to inject CO_2. Because emergency and remedial response costs often have a large one-time cost, (see p. 23 of UIC Guidance Document), the Permit should require that FutureGen have all of its emergency and remedial response costs in the trust fund before drilling begins. Further, if the Director requires that FutureGen have an insurance policy for the emergency and remedial response financial assurance per the recommendation	See response to comment #5 immediately above for a response to this comment.

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		above, then the Insurance policy should be fully funded to account for an unexpected scenario that will have a large on-time cost. Id at 23.	
7	Leinberger & Critchelow families	v. The Draft Permit Improperly Authorizes the Trustee and FutureGen to terminate the Trust Fund Section 17 of the Trust Agreement in Attachment H of the draft Permit states that the trust is irrevocable and "shall continue until terminated by the Grantor and Trustee, with the concurrence of the EPA Water Division Director." This language is inconsistent with the regulations and should be revised. Under 40 C.F.R. §146.85(b)(1), the owner or operator must maintain financial responsibility and resources until the Director "approves the completed post-injection site care and site closure plan" and "approves site closure." To ensure that the draft Permit follows the requirements under the regulations, the Permit should explicitly state that the Trust Fund will not terminate until the Director approves the completed post-injection site care and site closure plan and approves the site closure. In light of the fact that this is a first-of-its-kind commercial-scale Class VI well, it is important that proper financial safeguards be in placeOnce.	According to 40 C.F.R. §146.85(b), a financial instrument may be terminated upon several conditions, one of which is that the Director "approves the completed post-injection site care and site closure plan" and "approves site closure." However, the permit language should not restrict the Director's ability to approve the termination of an instrument to this condition alone. For example, FutureGen may seek to substitute one form of financial mechanism for another. If EPA approves such a substitution, termination of the superseded instrument would also be appropriate. As to the specific language in the trust agreement, EPA believes it is adequate, as EPA would not concur in the termination of the trust agreement unless all regulatory conditions had been met. Therefore, EPA will not revise the permits in response to this comment.
8	FutureGen	*It should also be noted that, in Table 1 in Attachment H, EPA states that the Alliance's estimated cost of emergency and remedial response is $26.7 million. That is an estimate developed by EPA, not the Alliance. In addition, that amount assumes that multiple serious or catastrophic events occur over the life of the project, which is virtually impossible given the level of monitoring that will be conducted. In its application, the Alliance estimated the cost of groundwater cleanup*	FutureGen's independent third party cost estimate (by Patrick Engineering, Appendix C of the original permit application) estimated the cost of E&RR given one possible E&RR event (catastrophic failure of the caprock) at $6.1 million. However, EPA determined that this estimate was too low based on the range of costs provided by EPA's Cost Estimation Tool. EPA's Cost Estimation Tool is designed to provide an "acceptable range of costs" for GS financial responsibility activities using information from the permit application. The Cost Estimation Tool estimated costs for E&RR

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		in the event of a catastrophic failure of caprock (the worst possible emergency and remedial response action that would be necessary) as $6.1 million. However, the Alliance also stated its intention to acquire insurance in the amount of $100 million.	based on a scenario in which CO_2 moves into the USDW (which is generally the costliest event to remediate). EPA developed the revised cost estimate of $26.7 million based on the mid-range cost estimate for E&RR activities (see Exhibit B-2 of EPA's Summary of Financial Responsibility Estimates for FutureGen Based on Cost Estimation Tool Outputs, March 2014). As described in detail in this summary, the Cost Estimation Tool develops a cost estimate using conservative assumptions to provide for financial responsibility mechanisms that are sufficient to cover the costs of Emergency and Remedial Response as provided in 40 C.F.R. §146.85(a)(2)(iv). In particular, the Cost Estimation Tool looks at: 1) The costs of pump operations and maintenance to create a hydraulic barrier to protect USDWs 2) The costs of cement plugs and plug retainers to seal a well 3) The costs of a maintenance rig to repair a well 4) The costs to drill and run extraction wells to treat contaminated water from a USDW The Cost Estimation Tool conservatively assumes that all CO_2 injected could leak into the USDW. The FutureGen submission does not specify the amount of CO_2 assumed to leak into the USDW. The Cost Estimation Tool also assumes it will be necessary to stop injection for, establish a hydraulic barrier for, and chemically seal, all 4 wells. That would not necessarily be the case. FutureGen estimated that pump and treat activities would occur for 2 years, whereas the Cost Estimation Tool estimates that pump and treat activities may continue for anywhere between 2 and 30 years. The estimated years of operation provide the main difference between the mid-range cost estimate (which assumes 18 years) and the high-end cost estimate (which assumes 30 years). Those cost

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			estimates are inherently conservative because they are derived from Superfund groundwater remediation costs, although a GS well failure would not be expected to produce the same kinds of toxic contamination as found in a Superfund site. GS sites would be expected to use the same pump-and-treat techniques in case of contamination, but would likely require less complex (and so less costly) treatment than is assumed in the estimates. Especially because of the conservatism built into the Cost Estimation Tool assumptions, the proposed trust fund is sufficient to demonstrate financial responsibility, and EPA did not find it necessary to additionally fund the trust fund to the high-end estimate generated by the Cost Estimation Tool at this time. The cost estimates will be regularly reviewed, and revised as necessary, under the permits. EPA informed FutureGen that it had revised the ERRP cost estimate to $26.7 million and FutureGen agreed to provide financial responsibility for that amount through the trust fund already in place to provide financial responsibility for corrective action, well plugging, and post-injection site care and site closure. EPA's final E&RR cost estimate was revised upward by approximately $700,000 after FutureGen had completed a trust agreement for the $26.7 million figure. The subsequent revision was small enough that the trust agreement funding remains sufficient, especially because the cost estimates and financial responsibility mechanisms will be regularly revisited over the life of the project under Part H of the permits. Therefore, EPA will not revise the permits in response to this comment.

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9	Leinberger & Critchelow families	Even if FutureGen is allowed to use a trust fund for the emergency and remedial response, the amount is insufficient to account for and remedy all possible exigencies. Due to last minute changes regarding the emergency and remedial response financial assurance, the cost estimate is not based upon a detailed written estimate as required under the regulations.	In the permit application, FutureGen proposed to establish an insurance policy with a $10 million coverage limit for the pre-injection phase and to develop a policy with a $100 million coverage limit for the injection phase (to be submitted prior to the injection of CO_2). However, these policies would have also covered FutureGen's liabilities unrelated to financial responsibility. As described in more detail below in response to comment #11, because FutureGen's proposed insurance coverage included a number of elements beyond financial assurance for the ERRP and did not propose to initially cover the estimated post-injection ERRP costs, it is not clear what amount of coverage would have been dedicated to financial responsibility under the permits. Without an insurance policy clearly delineating the liability amount dedicated to financial responsibility for E&RR, EPA could not be certain that the insurance policy provided the protective conditions of coverage required by 40 C.F.R. §146.85(a)(4)(i). EPA informed FutureGen that it had revised the ERRP cost estimate to $26.7 million, and FutureGen agreed to provide financial responsibility for that amount through the trust fund already in place to provide financial responsibility for corrective action, well plugging, and post-injection site care and site closure. The trust fund approach provides full and certain coverage for the entire ERRP cost estimate. That cost estimate is calculated using conservative assumptions and will be regularly reassessed over the entire life of the project. As FutureGen notes, the estimate is sufficient to cover multiple serious or catastrophic events that occur over the life of the project, a circumstance that is unlikely given the level of monitoring that will be conducted. The revised estimate of $26.7 million was developed by using EPA's Cost Estimation Tool (see Exhibit B-2 of EPA's Summary of Financial

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			Responsibility Estimates for FutureGen Based on Cost Estimation Tool Outputs, March 2014). EPA's Cost Estimation Tool is designed to provide an "acceptable range of costs" for GS financial responsibility activities based on information submitted with a permit application. Because EPA's revised estimate falls within this range, EPA has determined that it is sufficient and does not find it necessary to additionally fund the trust fund to the high-end estimate generated by the Cost Estimation Tool at this time. Because the costs of any covered activities for a Class VI project will change over time, EPA will, over the life of the project, request revised cost estimates from FutureGen and modifications to the financial instruments if changes to any of the project plans increase the cost of those activities. See Part H. of the permits. If these revisions require modifications to the permits, they will go through the permit modification process described in 40 C.F.R. Part 144. As described in more detail in response to comment #8 above, the revised cost estimate was developed by EPA, using detailed cost information provided by FutureGen, and applying EPA's Cost Estimation Tool. The regulations do not require a cost estimate to break down costs into pre-injection and post-injection categories, and as described in response to comment #6 above, the approach used to establish funding of the trust account is conservative. In Appendix C of its permit application, FutureGen provided a written detailed cost estimate for E&RR from a third party (Patrick Engineering). This cost estimate provided details including a description of the project and engineering assumptions; a description of activities that are included for each phase identified at 40 C.F.R. § 146.85(a)(2); and the company's methodology for developing the cost estimates. The rule does not require that the third party provide working papers of the analysis or to provide separate costs for the injection and post-injection phases, and EPA

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			does not find them necessary to evaluate the cost estimates at this time. EPA considers the details provided in the cost estimate adequate to meet the requirements at 40 C.F.R. § 146.85(c) for the permit application. EPA anticipates that financial responsibility for any Class VI project will change over time. Over the course of the project, EPA will regularly require revised cost estimates from FutureGen and modifications to the financial instruments if changes to project plans identified at 40 C.F.R. § 146.85(a)(2) increase the cost of those activities. See Part H of the permits. These changes will go through the permit modification process described in 40 C.F.R. Part 144. The independent third-party cost estimates developed by Patrick Engineering were based on the best understanding of the project details at the time FutureGen submitted its permit application. EPA is not aware of additional wells in the larger AoR that are deep enough to potentially require corrective action. Additional information will be developed during construction and pre-injection testing and during the pre-injection review of the AoR required under Part Q.4 of the permits. EPA will require a new cost estimate if, based on information generated, there is reason to believe that the scope of corrective action is different than predicted in FutureGen's original plans. Any such changes will go through the permit modification process described in 40 C.F.R. Part 144. Therefore, EPA will not revise the permits in response to these comments.
10	Leinberger & Critchelow families	2) If FutureGen continues to use a trust fund for the emergency and remedial response cost estimate, the trust fund amount should increase to the high end cost estimate of $77.9 million presented in the March 2014 Estimate.	See response to comment #9 immediately above for a response to this comment.

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		3) The Director should require FutureGen to provide a written detailed estimate from third-parties regarding the emergency and remedial response for the injection and post-injection. The Director should require those detailed estimates to be supported with working papers showing the analysis for each item. The Director should also require FutureGen to increase the cost estimate for performing the corrective actions on deficient wells to accurately account for the increased Area of Review.	
11	Leinberger & Critchelow families	ii. Improper Reduction of The Emergency Response Estimate And Insufficient Amount The proposed $26.7 million for the emergency and remedial response for the entire project was improperly reduced from the originally proposed estimate and is insufficient to cover all possible risks and exigencies for this project. As stated above, FutureGen originally proposed to include a $100 million insurance policy with a term of 3 to 5 years for the emergency and remedial actions as well as various other insurance policies including Control of Well and General Liability insurance and Umbrella/Excess coverage. See Sections 9.4.2.2, 9.4.2.5 and App. D Supporting Documentation; FutureGen Response to U.S. EPA p. 4. Attachment H to the Permit does not provide for any insurance but instead states that there will be $26.7 million in the trust fund for the emergency and remedial response. This is a significant reduction in financial assurance for the multiple possible scenarios that may arise in an emergency. Instead of $100 million to cover all possible environmental risks, now there is a quarter of the coverage originally provided. This is clearly insufficient, particularly in light of the multiple unknowns involved in this first of its kind project. The Director has no basis	In the permit application, FutureGen proposed to establish an insurance policy with a $10 million coverage limit for the pre-injection phase and to develop a policy with a $100 million coverage limit for the injection phase (to be submitted prior to the injection of CO_2). However, these policies would have also covered FutureGen's liabilities unrelated to financial responsibility. As stated above, FutureGen originally proposed to include a $100 million insurance policy with a term of 3 to 5 years for the emergency and remedial actions as well as various other insurance policies including Control of Well and General Liability insurance and Umbrella/Excess coverage. See Sections 9.4.2.2, 9.4.2.5 and App. D Supporting Documentation; FutureGen Response to U.S. EPA p. 4. Because FutureGen's proposed insurance coverage included a number of elements beyond financial assurance for the ERRP and did not propose to initially cover the estimated post-injection ERRP costs, it is not clear what the actual amount of coverage would have been dedicated to financial responsibility under the permits. Without an insurance policy clearly delineating the liability amount dedicated to financial responsibility for E&RR, EPA could not be certain that the insurance policy provided the protective conditions of coverage required by 40 C.F.R. §146.85(a)(4)(i).

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		to approve this reduction and should require FutureGen, to obtain, prior to permit issuance, an insurance policy with coverage up to $100 million as originally proposed to cover the emergency and remedial response costs. In the event EPA allows FutureGen to use a trust fund for the emergency and remedial response financial assurance, the allocated amount should be significantly increased. The proposed $26.7 million is an insufficient amount for the emergency and remedial response costs. In the March 2014 Estimate, FutureGen states that the range of estimates for the emergency and remedial response costs are from $14.7 million to $77.9 million, and the proposed $26.7 million is the middle range of the estimated costs. See March 2014 Estimate, p. 8. The largest gap between the middle cost estimate, $26.7 million, and the high end cost estimate, $77.9 million, is the estimated cost to treat contaminated water from USDW. See March 2014 Estimate, Ex. B-2. In the middle cost estimate, FutureGen estimates that treating contaminated water will cost $14.4 million dollars, whereas the high end cost estimate is $62.8 million. Id. There is no explanation or accounting for the vast differences in amounts for treating contaminated groundwater. Because of the high degree of risks and the numerous unknowns, the emergency and remedial response cost estimate should be increased to the high cost estimate of $77.9 million thus ensuring that FutureGen will have sufficient funds to cover all potential emergency and remedial situations particularly as it relates to treating contaminated drinking water.	EPA informed FutureGen that it had revised the ERRP cost estimate to $26.7 million and FutureGen agreed to provide financial responsibility for that amount through the trust fund already in place to provide financial responsibility for corrective action, well plugging, and post-injection site care and site closure. The trust fund approach provides full and certain coverage for the entire ERRP cost estimate. That cost estimate is calculated using conservative assumptions, and will be regularly reassessed over the entire life of the project. As FutureGen notes, the estimate is sufficient to cover multiple serious or catastrophic events occur over the life of the project, a circumstance that is unlikely given the level of monitoring that will be conducted. The revised estimate of $26.7 million was developed by using EPA's Cost Estimation Tool (see Exhibit B-2 of EPA's Summary of Financial Responsibility Estimates for FutureGen Based on Cost Estimation Tool Outputs, March 2014). EPA's Cost Estimation Tool is designed to provide an "acceptable range of costs" for GS financial responsibility activities based on information submitted with a permit application. Because EPA's revised estimate falls within this range, EPA has determined that it is sufficient and does not find it necessary to additionally fund the trust fund to the high-end estimate generated by the Cost Estimation Tool at this time. Because the costs of any covered activities for a Class VI project will change over time, EPA will, over the life of the project, request revised cost estimates from FutureGen and modifications to the financial instruments if changes to any of the project plans increase the cost of those activities. See Part H. of the permits. If these revisions require modifications to the permits, they will go through the permit modification process described in 40 C.F.R. Part 144. Therefore, EPA will not revise the permits in response to this comment.

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12	Leinberger & Critchelow families	iii. Failure to provide detailed cost estimate A detailed written estimate is missing from the draft Permit and supporting materials for the injection and post-injection emergency and remedial response trust fund amount. Under 40 C.F.R. §146.85(c), "The owner or operator must have a detailed written estimate, in current dollars, of the cost of performing corrective action on wells in the Area of Review, plugging the injection well(s), post-injection site care and site closure, and emergency and remedial response." Section 146.85(c) further provides: "The cost estimate must be performed for each phase separately and must be based on the costs to the regulatory agency of hiring a third party to perform the required activities. A third party is a party who is not within the corporate structure of the owner or operator." 40 C.F.R. §146.85(c)(1) In Attachment H of the draft Permit, Tables 1 and 2 show the cost estimates for the activities that are covered by the Financial Responsibility. In support of these estimates, the draft Permit refers to the third-party cost estimates submitted by FutureGen in Appendix C of the permit application and EPA's independent evaluation of the cost estimates. See Attachment H, draft Permit, p. 11. Yet, Appendix C of the permit application Supporting Documentation is outdated and has inaccurate information. See App. C "Cost Estimate to Demonstrate Financial Responsibility for Class VI UIC Permit," March 2013 ("2013 Cost Estimate"). The 2013 Cost Estimate does not contain an accounting for the proposed emergency and remedial response trust fund amount for the injection and post-injection activity. At that time, FutureGen was	In Appendix C of its permit application, FutureGen provided a written detailed cost estimate for E&RR from a third party (Patrick Engineering). This cost estimate provided details including a description of the project and engineering assumptions; a description of activities that are included for each phase identified at 40 C.F.R. § 146.85(a)(2); and the company's methodology for developing the cost estimates. The rule does not require that the third party provide working papers of the analysis or to provide separate costs for the injection and post-injection phases, and EPA does not find them necessary to evaluate the cost estimates at this time. EPA considers these details adequate to meet the requirements at 40 C.F.R. § 146.85(c) for the permit application. EPA anticipates that financial responsibility for any Class VI project will change over time. Over the course of the project, EPA will regularly require revised cost estimates from FutureGen and modifications to the financial instruments if changes to project plans identified at 40 C.F.R. § 146.85(a)(2) increase the cost of those activities. See Part H of the permits. These changes will go through the permit modification process described in 40 C.F.R. Part 144. As described in more detail in response to comment #8 above, the revised cost estimate was developed by EPA, using detailed cost information provided by FutureGen, and applying EPA's Cost Estimation Tool. The regulations do not require a cost estimate to break down costs into pre-injection and post-injection categories, and as described in response to comment #6 above, the approach used to establish funding of the trust account is conservative. The independent third-party cost estimates developed by Patrick Engineering were based on the best understanding of the project details at the time FutureGen submitted its permit application. EPA is not aware of additional wells in the larger AoR that are deep

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		proposing two insurance policies for the emergency and remedial response financial assurance. See permit application Supporting Documentation, Section 9.4.2.2 and Appendix D. Now, without explanation, the emergency and remedial response trust fund amount is $26.7 million. See Attachment H, draft Permit, p. 12. The additional financial responsibility documents submitted by FutureGen to the AR also do not include a detailed cost estimate for emergency and remedial response. FutureGen submitted to EPA its March 2014 Estimate which proposed $26.7 million for emergency and remedial response. FutureGen's only explanation was that it was the middle range of costs generated by its "Cost Tool." See March 2014 Estimate, p. 8. According to the Cost Tools Output Table, Exhibit B-2, the estimated cost of treating contaminated water from a USDW ranged from $3.2 million to $62.8 million. Id at p. B- 2. The March 2014 Estimate did not give any additional details on the basis for the contaminated water estimates, but merely stated that the proposed $14.4 million was in the middle range of the estimate. Id. As required by the regulations, a detailed cost estimate is necessary to effectuate one of the important goals of the SDWA in protecting drinking water sources. Similarly, there is no explanation for the total costs for emergency and remedial response as proposed in Exhibit B-2. The draft Permit is equally opaque in its basis for the emergency and remedial response action cost estimates. The draft Permit breaks down the emergency and remedial response action cost estimates by assigning $6.1 million to the pre-injection	enough to potentially require corrective action. Additional information will be developed during construction and pre-injection testing and during the pre-injection review of the AoR required under Part Q.4 of the permits. EPA will require a new cost estimate if, based on information generated, there is reason to believe that the scope of corrective action is different than predicted in FutureGen's original plans. Any such changes will go through the permit modification process described in 40 C.F.R. Part 144. Therefore, EPA will not revise the permits in response to this comment.

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		emergency and remedial response, and $20.6 million for the injection and post-injection emergency and remedial response. See Attachment H of draft Permit, Table 2. There is no accounting or breakdown of the injection and post-injection emergency and remedial response cost estimate of $20.6 million. The cost-estimate for performing corrective actions on deficient wells in the Area of Review is also improper. As explained above, the Area of Review for the project significantly increased in the draft Permit, yet FutureGen did not reevaluate the wells in the Area of Review. Nor did FutureGen reevaluate the cost estimate for the wells in the Area of Review. Because FutureGen did not reconsider the additional deficient wells in the increased Area of Review, the proposed cost estimate for performing corrective actions is insufficient. The Director should require FutureGen to increase the cost estimate accordingly. The absence of explanation of the significant reduction in emergency and remedial response cost estimate is contrary to the regulatory requirements in 40 C.F.R. §146.85(c) which requires a detailed written estimate of the cost of emergency and remedial response. To remedy this legal deficiency, the Director should require FutureGen to provide a detailed explanation of the cost estimate for all of the emergency and remedial response cost estimates, particularly the cost estimate proposed for the injection and post-injection emergency and remedial response.	

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13	FutureGen	*Attachment H relates to Financial Assurance Demonstration and notes that the Alliance has agreed to use a trust fund to cover the costs of corrective action, emergency and remedial response, injection well plugging, and post-injection site care and site closure. The Alliance originally proposed to use third-party insurance to cover the costs of emergency and remedial response. The agreement to use the trust fund for such costs came after EPA expressed concern over the terms of the insurance policy specimen submitted by the Alliance.* *EPA's Class VI UIC permit regulations require an applicant to demonstrate financial responsibility for all aspects of the project – from construction through post-injection site care. An applicant must also demonstrate it has the financial capability to take any emergency and remedial response actions that may be necessary over the life of the project to protect underground sources of drinking water. Just as individuals purchase insurance to cover the cost of accidents or fires, the Alliance intends to purchase insurance to cover the cost of any emergency and remedial response actions that could be needed for the FutureGen 2.0 Project. The Alliance described its intention in its Class VI UIC permit application Supporting Documentation, and included a specimen insurance policy.* *During the course of EPA's review of the Alliance's permit applications, the terms of the specimen insurance policy were discussed between EPA and the Alliance. As a result, the Alliance, working with its insurance broker and insurance company AIG, was able to modify the terms of the policy in an effort to satisfy EPA's concerns with respect to renewal and*	As stated above, FutureGen originally proposed to include a $100 million insurance policy with a term of 3 to 5 years for the emergency and remedial actions as well as various other insurance policies including Control of Well and General Liability insurance and Umbrella/Excess coverage. See Sections 9.4.2.2, 9.4.2.5 and App. D Supporting Documentation; FutureGen Response to U.S. EPA p. 4. Because FutureGen's proposed insurance coverage included a number of elements beyond financial assurance for the ERRP and did not propose to initially cover the estimated post-injection ERRP costs, it is not clear what the actual amount of coverage would have been dedicated to financial responsibility under the permits. Without an insurance policy clearly delineating the liability amount dedicated to financial responsibility for E&RR, EPA could not be certain that the insurance policy provided the protective conditions of coverage required by 40 C.F.R. §146.85(a)(4)(i). Prior to issuing the draft permit decision, EPA worked closely with FutureGen to identify an insurance policy coverage that would be adequate to cover all of the activities identified in the Class VI rule (40 C.F.R. § 146.85). However, FutureGen submitted a quote for an insurance policy for the pre-injection phase with a $10 million coverage limit. While FutureGen had made substantial progress on the language of the policy, EPA determined that this policy was not sufficient to meet the rule requirements for the following reasons: 1. The policy did not specify the amount of funds available for the purpose of meeting financial responsibility requirements should an E&RR event occur. FutureGen's proposed $10 million insurance policy did not distinguish the coverage dedicated to financial responsibility versus other liabilities. 2. EPA did not find the policy limits acceptable given the estimated cost of E&RR events, as it appeared there were aggregate and per incident limits on the allowable claims for E&RR events.

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		cancellation. However, that effort was unsuccessful. Instead of relying on insurance, the Alliance agreed to add over $25 million to its trust fund already established to cover the cost of other aspects of the project. *The Alliance continues to believe that insurance is the most cost-effective risk transfer mechanism to address emergency and remedial response actions that may be – but are not expected to be – required and plans to continue its discussions with EPA prior to issuance of any final permits.* *Based on the discussions the Alliance and the Alliance's agents have had with insurance companies, it is not possible to have an insurance policy that is guaranteed to renew in perpetuity. Insurers are required to provide capital for a fixed-time period to cover potential claims, with option to renew at the end of the period. Similarly, it is not possible to obtain a non-cancellable policy. The cancellation clause of an insurance policy may be modified to be non-cancellable for anything other than non-payment of the premium, but it is not possible to entirely remove the cancellation provision of the policy. EPA must recognize these limitations within the insurance industry or be willing to accept that insurance is not a qualifying financial instrument as is indicated in the financial responsibility regulations.*	3. The policy did not meet the required conditions of coverage specified at 40 C.F.R. §146.85(a)(4). Specifically, the provisions for cancellation and renewal were not sufficient to ensure adequate time to identify and establish a new financial instrument should the insurance company choose to cancel or fail to renew the proposed insurance policy. Therefore, EPA was not confident that the coverage amounts and terms of those policies would adequately cover FutureGen's financial responsibility obligations. Given that EPA pursued parallel discussions about the use of the trust fund concurrent with discussions of the insurance policy, EPA accepted the use of the trust fund as an alternative instrument to demonstrate financial responsibility for E&RR, as indicated in the comment. This final decision facilitated the issuance of the draft permit(s) in March 2014. EPA will continue to work with FutureGen to identify acceptable and feasible language to meet these conditions of coverage if FutureGen decides to pursue the use of an insurance policy to cover E&RR. As stated in its comments, FutureGen did continue its discussions with EPA after issuance of the draft permits, obtaining further information on the necessary elements of an insurance policy that would satisfy the regulatory requirements. EPA is willing to work with FutureGen and potential insurers to consider approaches that would use options to renew (with lead time to substitute alternate mechanisms if it appears the policy may not be renewed at the end of its term) and that would consider use of commercially necessary cancellation provisions (as long as they provided sufficient notice so that FutureGen could substitute alternate mechanisms).

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			If FutureGen wishes to substitute an insurance policy as a financial responsibility mechanism for E&RR activities, it may propose to do so at any time. If the proposed policy satisfies the requirements of 40 C.F.R. §146.85, the proposal may proceed through the permit modification process outlined in 40 C.F.R. §144.39. Therefore, EPA will not revise the permits in response to this comment.
14	Leinberger & Critchelow families	It is also improper to allow FutureGen to fund the trust fund in a phased-approach because of the risks to the instrument and the potential for insufficient coverage later. Finally, the draft Permit fails to provide that the trust fund may not terminate until the Director has approved the completed post-injection site care and site closure plan and the final site closure. To resolve these deficiencies, the Director should require that FutureGen make the changes proposed herein, at minimum, so that the final Permit is legally sufficient.	According to 40 C.F.R. § 146.85(f), a pay-in period for a trust fund is allowable if approved by the Director. EPA approved the pay-in structure identified in Attachment H of FutureGen's permits because it is sufficient to protect USDWs and because it minimizes the risk of instrument failure in the interim for the following reasons: 1. The first deposit in the proposed pay-in period – of $8.823 million -- will occur within seven days of final permit approval, which will occur before the permits become effective and, therefore, before well construction may begin. This requirement will ensure that the instrument is sufficiently funded during the entire construction phase. 2. Based on a review of the independent third-party cost estimates (Patrick Engineering, Appendix C of the permit application), EPA has determined that the initial deposit of $8.823 million is sufficient to cover risks associated with the

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			potential need to address well plugging and/or E&RR during the construction phase of the project. The phase-in approach is based on an evaluation of when financial risk will be incurred over the life of the project. The $6.1 million cost estimate would cover the response to a catastrophic failure of the caprock, which was the costliest potential event identified. Such an occurrence is unlikely to occur even once injection proceeds, and caprock failure or other threats to USDW are highly unlikely to result from the mere act of constructing injection and monitoring wells. 3. The trust fund will be supplemented with an additional payment of $22.345 million within a year of the final permit issuance (or prior to any injection if injection is authorized by that point). Trust fund resources would be available for any of the activities requiring financial responsibility. The trust fund would then be fully funded with an additional $20.6 million within two years of final permit issuance, which EPA anticipates will occur prior to injection of CO_2. The full cost estimate is based on multiple potential events over a number of years. It is unlikely that multiple issues would arise, and especially unlikely that that would all arise at the very beginning of injection when the volume of sequestered CO_2 would be low. The two-year pay-in period is still shorter than the three-year period contemplated in the preamble to EPA's final class VI rules (see 75 Fed. Reg. 77271 (Dec. 10, 2010)); and its Underground Injection Control (UIC) Program Class VI Financial Responsibility Guidance, July 2011, p. 38. According to 40 C.F.R. § 146.85(b), a financial instrument may be terminated upon several conditions, one of which is that the Director "approves the completed post-injection site care and site closure plan" and "approves site closure." However, the permit language should not restrict the Director's ability to approve the

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			termination of an instrument to this condition alone. For example, FutureGen may seek to substitute one form of financial mechanism for another. If EPA approves such a substitution, termination of the superseded instrument would also be appropriate. As to the specific language in the trust agreement, EPA believes it is adequate, as EPA would not concur in the termination of the trust agreement unless all regulatory conditions had been met. Therefore, EPA will not revise the permits in response to this comment.
15	Leinberger & Critchelow families	Foremost, the emergency and remedial response financial assurance should not be a trust fund, but should be an insurance policy as originally proposed in the Permit Application. Because of the switch to a trust fund, the emergency and remedial response is now a quarter of the amount of coverage FutureGen originally proposed.	EPA agrees that a well-developed insurance policy that meets all necessary conditions of coverage and that clearly provides adequate coverage for E&RR costs is the best instrument to use to demonstrate financial responsibility for E&RR. However, for reasons described in response to comment #13, EPA did not find the insurance policy submitted by FutureGen on March 27, 2014 to be sufficient to meet financial responsibility requirements. As described in the response to comment #14, FutureGen's proposed insurance policies did not distinguish the coverage dedicated to financial responsibility versus other liabilities, so that it is not clear the amount actually devoted to E&RR costs, or even the precise nature of the policy or commitment to insure the injection and post-injection period. FutureGen may use any of the financial instruments listed at 40 C.F.R. § 146.85(a)(1) to demonstrate financial responsibility for E&RR as long as the instrument is sufficient to address endangerment of USDWs. EPA determined that the use of a trust fund for E&RR will meet this requirement because it meets the required conditions of coverage at 40 C.F.R. § 146.85(a)(4) and is sufficiently funded to cover the likely costs of E&RR events, as evaluated by EPA's Cost

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16	Leinberger & Critchelow families	i. A Trust Fund is Improper for the Emergency Remedial Response A trust fund to cover the emergency and remedial response financial assurance is improper and FutureGen should be required to obtain a pollution insurance policy as originally provided for in its Permit Application. The U.S. EPA Underground Injection Control (UIC) Program Class VI Financial Responsibility Guidance ("UIC Guidance Document") does not recommend a trust fund for emergency responses. "For activities of uncertain frequency and cost, such as emergency and remedial responses, the trust will likely not have the right amount of funds—too little is a partial failure of the instrument and too much represents an inefficient use of funds that unnecessarily raises GS costs. See U.S.EPA Underground Injection Control (UIC) Program Class VI Financial Responsibility Guidance, July 2011 p. 21, AR #438. Instead, the UIC Guidance Document states that "[i]nsurance policies are best suited for diversifying environmental risk. Insurance is the ideal instrument for handling the numerous possible scenarios associated with uncertain events such as emergency and remedial response demonstrations." Id at p. 22. In the permit application Supporting Documentation, FutureGen proposed to include a $100 million insurance policy with a term of 3 to 5 years for the emergency and remedial response actions. See Sections 9.4.2.2, 9.4.2.5 and App. D. In FutureGen's November 2013 response to U.S.EPA's Request for Additional Information, FutureGen stated that it "intends to obtain third party insurance for costs related to any required emergency and remedial response action." See FutureGen	Estimation Tool. Therefore, a requirement to use an insurance policy (precluding any other instrument) cannot be a condition of the UIC permit. Furthermore, EPA notes that it is beyond the scope of the Class VI rule to require various other insurance policies, such as Control Well and General Liability insurance and Umbrella/Excess coverage, beyond the coverage requirements at 40 C.F.R. § 146.85(a)(2). Therefore, EPA will not revise the permits in response to comments #15, 16 and 17.

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		Response, November 2013, p. 4, AR# 3. FutureGen further stated that it would obtain a $10 million insurance policy for the drilling phase and increase the coverage to a $100 million policy for the injection phase as well as "various other insurance policies including Control of Well and General Liability insurance and Umbrella/Excess coverage." Id. Yet, the draft Permit as issued only provides for a trust fund of $26.7 million. The draft Permit does not explain this last minute change in the financial assurance and nor does the "Summary of Financial Responsibility Estimates for FutureGen Based on Cost Tool Options" submitted on March 28, 2014 (the "March 2014 Estimate"). See AR# 320. The March 2014 Estimate merely states that FutureGen decided it would use a trust fund/agreement to cover the emergency and remedial response costs. Id at p. 7. As explained by the Guidance Document, insurance policies are the best financial mechanisms to provide for the virtually infinite possible emergency scenarios that may occur. This is particularly true for a first of its kind project such as this one. Thus, the Director should require FutureGen to reinstate an insurance policy to provide for all of the possible environmental risks associated with such a new project. The insurance policy must have a limit of at least $100 million and must not contain exclusions that render the policy inadequate for its purpose.	
17	Leinberger & Critchelow families	vi. Proposed Changes to the Financial Assurance As detailed above, there are multiple deficiencies in the financial assurance portion of the Draft Permit. The following are proposed remedies for these deficiencies: 1) In light of the unproven nature of the project and the	

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		high risks associated with this first-of-its-kind project, FutureGen should have a $100 million pollution policy as originally planned as well as various other insurance policies including Control Well and General Liability insurance and Umbrella/Excess coverage as provided for in FutureGen's November 2013 Response to U.S.EPA's comments.	
18	NRDC	*Financial Responsibility* 1. Effective financial assurance mechanisms are necessary to ensure that closure and post-closure site care, such as monitoring, can be conducted when the time comes, and that should corrective action and emergency and remedial responses become imperative, there is funding sufficient to complete this work. Were Applicant to become insolvent without an adequate financial assurance mechanism, significant delays could occur, increasing the likelihood of environmental contamination and adverse human health effects. Moreover, federal or state governments (and ultimately the general public) might become financially responsible for the closure and post- closure site care costs or emergency and remedial responses should those be required. Consequently, any uncertainties about the adequacy of financial assurances need to be minimized. It is clear that the Applicant has given considerable thought to the Financial Responsibility package for the FutureGen Storage Site. The Applicant originally proposed in section 9.0 of the application, to provide for and fund a Trust Fund to cover the expected future costs of any corrective action, injection well plugging, post-injection site care and site closure, and emergency and remedial response, pursuant to 40 C.F.R. § 146.85;	As discussed in more detail in response to comment #13, FutureGen originally proposed to use a third-party insurance policy to cover the expected future costs of emergency and remedial response as well as other potential liabilities beyond the scope of the UIC permitting program. The draft permits reflected a change in that approach to use the trust fund to provide financial responsibility for E&RR costs as well. The amount in the trust fund covers the entire cost estimate for financial responsibility elements required under the UIC permitting regulations. Consistent with those regulations, other or additional financial assurance will be required if the cost estimates increase so that the trust fund value no longer covers the expected costs. See 40 C.F.R. §146.85(c). According to 40 C.F.R. § 146.85(f), a pay-in-period for a trust fund is allowable if approved by the Director. EPA approved the pay-in structure identified in Attachment H of FutureGen's permits because it is sufficient to protect USDWs and because it minimizes the risk of instrument failure in the interim for the following reasons: 1. The first deposit in the proposed pay-in period – of $8.823 million -- will occur within seven days of final permit approval, which will occur before the permits become effective and, therefore, before well construction may begin. This requirement will ensure that the instrument is sufficiently funded during the entire construction phase. 2. Based on a review of the independent third-party cost estimates (Patrick Engineering, Appendix C of the permit

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		and also a third-party insurance policy (a Pollution Legal Liability policy), to be available to cover additional costs, should the Applicant become legally obligated to conduct any necessary emergency or remedial response actions. Application at 9.4.2.1. The Draft Permit and its attachments, however, refer only to the funding of a Trust Fund to cover all the costs, although also providing a directive to "establish other financial assurance or liability coverage," within 60 days of an update that indicates the cost estimate has been adjusted to a point at which the Trust Fund value no longer covers the expected costs. Proposed Draft Permit Attachment H. In general it appears that the Applicant was thoughtful in its approach to this issue, concerning the valuation of the amounts needed for initial capitalization of the Trust Fund, in initially proposing a backstop insurance policy. *See* Application section 9. EPA must take a hard look at the Trust document provided by the Applicant in Attachment H – because we see several aspects of the Trust Fund-only structure that are of concern to us, and that necessarily should be remedied, for the Trust Fund to meet the regulatory requirement to be "demonstrated and maintained" as "sufficient" to cover the costs outlined in 40 C.F.R. § 146.85 (a)(2) and (3). We think that it is relatively simple to fix the issues we identify and urge the Agency to consider our comments as it finalizes this Permit. First, as it is structured, there is no requirement for the Trust Fund to be fully capitalized before injection begins. *See* Attachment H, Schedule C. Partial capitalization must occur before injection begins, at a level of $31.168 million, but the remaining $20.6 million	application), EPA has determined that the initial deposit of $8.823 million is sufficient to cover risks associated with the potential need to address well plugging and/or E&RR during the construction phase of the project. The phase-in approach is based on an evaluation of when financial risk will be incurred over the life of the project. The $6.1 million cost estimate would cover the response to a catastrophic failure of the caprock, which was the costliest potential event identified. Such an occurrence is unlikely to occur even once injection proceeds, and caprock failure or other threats to USDW are highly unlikely to result from the mere act of constructing injection and monitoring wells. 3. The trust fund will be supplemented with an additional payment of $22.345 million within a year of the final permit issuance (or prior to any injection if injection is authorized by that point). Trust fund resources would be available for any of the activities requiring financial responsibility. The trust fund would then be fully funded with an additional $20.6 million within two years of final permit issuance, which EPA anticipates will occur prior to injection of CO_2. The full cost estimate is based on multiple potential events over a number of years. It is unlikely that multiple issues would arise, and especially unlikely that that would all arise at the very beginning of injection when the volume of sequestered CO_2 would be low. The two-year pay-in period is still shorter than the three-year period contemplated in the preamble to EPA's final class VI rules (see 75 Fed. Reg. 77271 (Dec. 10, 2010)); and its Underground Injection Control (UIC) Program Class VI Financial Responsibility Guidance, July 2011, p. 38. The trust fund approved in the draft permits includes restrictions on ways to invest the funds in Section 6 "Trustee Management," which is consistent with the recommended language in the Class VI

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		(covering emergency and remedial response costs, for which it would appear that the Applicant originally intended to provide an insurance policy), does not need to be in the Trust except "*within two years of final permit issuance*." Proposed Draft Permit, Attachment H, Schedule C, Table 1 (italics in original). We urge EPA to consider directing that all Trust Fund capitalization be completed before full- scale injection begins. Second, the Trust Fund document included with the Draft Permit does not limit the kinds of instruments that can be used for initial capitalization of the Trust Fund, for example, to low-risk securities or U.S. government instruments. We recognize that the Fund amounts must grow to maintain over time the amounts of money needed to cover the costs identified in 40 C.F.R. § 146.85(a)(2) and (3). But it seems unusually risky not to limit the investment or reinvestment of funds or to require that the principal amount must be maintained, at the very least. But the Trust Fund instrument in Attachment H does not limit how the initial capital can be reinvested – it does not, for example require that only amounts above the identified needed principal amount can be reinvested, or limit the kinds of investment that can occur to low-risk instruments (U.S. government bonds, for example). That concerns us, particularly when combined with the decision not to provide up front an insurance policy to cover the costs which 40 C.F.R. § 146.86 requires must be covered at "sufficient" levels and "maintain[ed]." In sum, we urge the Agency to require the Applicant at least to fully fund the Trust Fund before injection begins, and also to limit the extent to which the Trustee can invest the principal of the Trust, by allowing	Financial Responsibility Guidance. This language has undergone extensive review by industry experts and stakeholders, and EPA has determined that it is sufficiently protective of funds in the proposed trust fund. Furthermore, according to 40 C.F.R. § 146.85(a)(5)(ii), FutureGen must maintain financial responsibility requirements at all times. Therefore, if the value of the trust fund drops below the minimum funding requirements, FutureGen must deposit funds needed to maintain financial responsibility requirements. EPA also requires annual valuations of the trust fund and may require additional funds to be placed in the trust fund if the Director determines that its value is inadequate. EPA has determined that these safeguards are sufficient to ensure the adequacy of FutureGen's financial responsibility demonstration through the life of the project. Therefore, EPA will not revise the permits in response to this comment.

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		investment only of amounts above the required principal amount identified by the Applicant as sufficiently covering and maintaining amounts sufficient to meet the potential responsibilities outlined in 40 C.F.R. § 146.85(2)(a), and by limiting such investments to financial instruments of low or moderate risk.	

SECTION 5. CONSTRUCTION AND PRE-INJECTION TESTING COMMENTS

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1	Betty Niemann	Property owners were promised by Terry Dennison of the Jacksonville Region Economic Development Corporation that the FutureGen Project would be under close scrutiny. However, I believe that there is not enough scrutiny for me to rest easy about the CO_2 sequestration under the family land. I have experienced a definite lack of correct detail in initial documents prepared by FutureGen. What experience does the FutureGen Alliance have in drilling and maintaining wellheads?	EPA regulations at 40 C.F.R. Parts 144 and 146 state the requirements and standards that a permit applicant must meet to have a UIC permit application approved. These regulations deal primarily with the geologic siting, well engineering, operating, and monitoring standards for deep injection wells. EPA has reviewed the permit applications and finds that they contain sufficient information to satisfy the requirements of 40 C.F.R. Part 146, Subpart H, and the other relevant portions of 40 C.F.R. parts 144 and 146. Experience with drilling and maintaining wellheads is not addressed by the UIC regulations and is outside the scope of the UIC permit process.
2	Robert J. Finley	The requirements for construction meet or exceed standards employed in other sequestration sites around the world and build on the work done at these sites.	Thank you for your comment.
3	CSC	**Provision:** I(2) **Text of Draft Permit:** **2. Casing and Cementing –** Casing and cement or other materials used in the construction of the well must have sufficient structural strength for the life of the geologic sequestration project. All well materials must be compatible with all fluids with which the materials may be expected to come into contact and must meet or exceed standards developed for such materials by the American Petroleum Institute, ASTM International, or comparable standards acceptable to the Director. The casing and cementing program must prevent the movement of fluids into or between USDWs for the expected life of the well in accordance with 40 CFR 146.86. The casing and cement used in the construction of this well are shown in Attachment G	By issuing final permits with the same language used in the draft permits, EPA approves the casing and cementing plans submitted by FutureGen. However, EPA also recognizes that site-specific conditions or new information may present the need to alter the casing and cementing plan. To the extent new information indicates that the casing and/or cementing plans need to be revised, the permit language emphasizes the need to assure compliance with 40 C.F.R. § 146.86 and makes clear the standards against which any necessary revisions would be judged. At that time, FutureGen may propose to the Director changes in the casing and cementing plan. If any changes to the casing and cementing plans are required, those changes can be made through the permit modification process. Further, as stated in the response to General Comments above, FutureGen must comply with both its permits and the applicable regulations. Therefore, the permit language has not been modified based upon this comment.

#	Commenter	Comment Text	EPA Response
		of this permit and in the administrative record for this permit. Any change must be submitted in an electronic format for approval by the Director before installation. **Proposed Revision: 2. Casing and Cementing –** The permittee has demonstrated to the satisfaction of the Director that the casing and cement ~~or~~ and other materials to be used in the construction of the well must have sufficient structural strength for the life of the geologic sequestration project, . ~~All well materials must be~~ are compatible with all fluids with which the materials may be expected to come into contact, and ~~must~~ meet or exceed standards developed for such materials by the American Petroleum Institute, ASTM International, or comparable standards acceptable to the Director,. ~~The casing and cementing program must prevent the movement of fluids into or between USDWs for the expected life of the well~~ in accordance with 40 CFR 146.86. The casing and cement used in the construction of this well are shown in Attachment G of this permit **Comment:** Once again, this condition is written in a way that suggests that compliance requires something beyond following the approved construction plan. That is not the case. It is sufficient for the permittee to follow the construction plan submitted with the permit application and approved in the permit.	

#	Commenter	Comment Text	EPA Response
4	Leinberger & Critchelow families	**Well Design** 11) <u>Surface casing through lowermost USDW</u> a) FutureGen proposes to install 24 inch diameter conductor casing to a depth of approximately 140 feet bgs, 16 inch diameter surface casing to a depth of approximately 570 feet bgs and 10.75 inch diameter intermediate casing a depth of approximately 3,150 feet bgs where the 7 inch diameter stainless steel transition casing will extend to a depth of approximately 3,900 feet bgs (Section 4.2.2, Page 4.6, Supporting Documentation). Response to USEPA *Request for Additional Information #1* (RAI-1), Page 25 of 30, illustrates the open-hole completion that confirms these casing depths relative to the geologic formation depths. b) As stated in 40 CFR.86(b)(2), "Surface casing must extend through the base of the lowermost USDW….." Since the lowermost identified USDW is the St. Peter Sandstone with its base at approximately 1,950 feet bgs it would be appropriate to extend the surface casing to a depth of approximately 2,000 feet bgs not only to comply with the regulations but also to ensure that no contaminants (oil) are dragged down from overlying geologic units during the drilling process. *Requested Change/Action: FutureGen should modify their downhole casing design to comply with the regulations and ensure no cross contamination of the St. Peter Sandstone USDW from overlying geologic formations.*	EPA has determined that the casing details in the permit applications meet the requirements set forth in 40 C.F.R. § 146.86. The Preamble to the Class VI Rule (75 Fed. Reg. 77229) states that the "…two types of casing in most injection wells are (1) surface casing, the outermost casing that extends from the surface to the base of the lowermost USDW and (2) long-string casing, which extends from the surface to or through the injection zone." In addition, 40 C.F.R. § 146.86(b)(2) states "Surface casing must extend through the base of the lowermost USDW and be cemented to the surface through the use of a single or multiple strings of casing and cement." Although the well schematic uses technical nomenclature to distinguish the multiple strings of casing from one another, the proposed well construction consists of three strings that together comprise the surface casing (denoted as the Conductor Casing, Surface Casing, and Intermediate Casing) and one long-string casing (denoted as the Production Casing). All three strings of surface casing are to be cemented to the surface. The deepest portion of the surface casing (the Intermediate Casing) extends to 3,150 feet, which exceeds the lowermost USDW depth of 1,950 feet by more than an additional 1,000 feet. EPA finds that the proposed well construction meets both the letter and intent of the regulations and is designed to protect against contamination of the St. Peter Sandstone and other USDWs. Therefore, the permit language has not been modified based upon this comment.
5	NRDC	*Well Design* 1. In the permit application, Applicant indicates that, if a cased-hole completion configuration is	In their permit application, FutureGen stated that they propose to clean out their perforations with hydrochloric acid containing additives such as surfactants, clay stabilizers, and iron sequestering agents. This is a

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		used, the perforations in such injection wells will be acidized in order to clean up formation damage in the near-wellbore. EPA should require Applicant to fully disclose the identities, quantities, and concentrations of all chemicals used to acidize the perforations, including Chemical Abstract Service Registry Numbers ("CASRNs").	common well completion technique. After soaking to clean out the perforations, the acid will be removed from the well. Some flexibility is appropriate within those general parameters to adjust to the site-specific conditions. After injection wells are drilled and completed, a permittee is required to submit a well completion report pursuant to 40 C.F.R. § 146.82(c). This well completion report must include a list precisely identifying which constituents, including the quantities and concentrations, that were used to acidize the perforations. Therefore, the permit language has not been modified based upon this comment.
6	CSC	**Provision:** I(3) **Text of Draft Permit: 3. Tubing and Packer Specifications –** Tubing and packer materials used in the construction of the well must be compatible with fluids with which the materials may be expected to come into contact and must meet or exceed standards developed for such materials by the American Petroleum Institute, ASTM International, or comparable standards acceptable to the Director. The permittee shall inject only through tubing with a packer set within the long string casing at a point within or below the confining zone immediately above the injection zone. The tubing and packer used in the well are represented in engineering drawings contained in Attachment G of this permit. Any change must be submitted in an electronic format for approval by the Director before installation. **Proposed Revision: 3. Tubing and Packer Specifications** – Tubing and packer materials used in the construction of the well must be compatible with fluids with which the materials may be	By issuing final permits containing the language as presented in the draft permit, EPA approves the tubing and packer plans submitted by FutureGen. However, EPA also recognizes that site-specific conditions or new information may present the need to alter the tubing and packer plan. To the extent new information indicates that the Well Construction Plan needs to be revised, FutureGen will propose to the Director a new plan that complies with 40 C.F.R. § 146.86, and makes clear the standards against which any necessary revisions would be judged. If any changes to the casing and cementing plans are required, those changes can be made through the permit modification process. Further, FutureGen must comply with both its permits and the regulations. Therefore, the permit language has not been modified based upon this comment.

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		expected to come into contact and must meet or exceed standards developed for such materials by the American Petroleum Institute, ASTM International, or comparable standards acceptable to the Director. The permittee shall inject only through tubing with a packer set within the long string casing at a point within or below the confining zone immediately above the injection zone. The tubing and packer used in the well are as represented in engineering drawings contained in Attachment G of this permit. Any change must be submitted in an electronic format for approval by the Director before installation. **Comment:** Once again, this condition is written in a way that suggests that compliance requires something beyond following the approved engineering drawings, which is not the case. It is sufficient for the permittee to follow the engineering drawings submitted with the permit application and approved in the permit.	
7	FutureGen	*Page G1, 1st table* *Please change footnote (a)* *A corrosion-resistant alloy such as 13 Cr (13 percent chromium) having strength properties equal to or greater than 29-lb/ft P-110 and having premium connections will be used for this section.* *to read as:* A corrosion-resistant alloy such as 13 Cr (13 percent chromium) having strength properties comparable to 29-lb/ft P-110 and having premium connections will be used for this section.	Using "comparable" casing does not connote a clear standard that EPA can use to determine if an alternative casing is adequate. The comment did not provide any explanation or rationale for the change. If there is concern that a preferred option may be acceptable but may not meet the standard, those circumstances can be addressed through a plan revision and permit modification using the procedures described in 40 C.F.R. Part 144. Therefore, the permit language has not been modified based upon this comment.

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8	FutureGen	*Page G1, 1st table* *Please add the following footnote (b) to this table:* The depths shown in this table are based on geologic data from the FutureGen 2.0 stratigraphic well, located approximately 1.24 mile from the injection well location. Actual depths may vary depending on geologic conditions at the injection well location. Materials of construction may vary slightly depending on availability at time of construction.	UIC wells are initially permitted based upon best available information at the time of the application. All final information will be submitted by the FutureGen Alliance in a well completion report, pursuant to 40 C.F.R. § 146.82(c). To the extent that small deviations to the anticipated depths and construction details are identified after the wells are constructed and the geology is further surveyed, those corrections can typically be made through the minor modification process identified in 40 C.F.R. § 144.41. Therefore, the permit language has not been modified based upon this comment.
9	FutureGen	*Figure 1* *Please add the following note to this figure:* The depths shown in this figure are based on geologic data from the FutureGen 2.0 stratigraphic well, located approximately 1.24 mile from the injection well location. Actual depths may vary depending on geologic conditions at the injection well location. Materials of construction may vary slightly depending on availability at time of construction.	UIC wells are initially permitted based upon best available information at the time of the application. All final information will be submitted by the FutureGen Alliance in a well completion report, pursuant to 40 C.F.R. § 146.82(c). To the extent that small deviations to the anticipated depths and construction details are identified after the wells are constructed and the geology is further surveyed, those corrections can typically be made through the minor modification process identified in 40 C.F.R. § 144.41. Therefore, the permit language has not been modified based upon this comment.
10	FutureGen	*Page G5* *In Pre-Injection Testing Plan, 1st paragraph, lines 4-6, please change the following sentence:* *The pre-operational testing program will include a combination of logging, coring, formation hydrogeologic testing (e.g., a pump test and/or injectivity tests), and other activities during the drilling and construction of the CO_2 injection well.* *To read:* The pre-operational formation testing program will include a combination of logging, coring, formation hydrogeologic testing (e.g., a pump test and/or injectivity tests), and other activities during the drilling and construction of the CO_2 injection well,	This suggested change accurately clarifies the intended scope of the pre-operational formation testing program. The suggested change is incorporated into the final permits; however, in the last line of the suggested language, EPA will change "or" to "and" since the testing will apply to all of those wells listed.

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		monitoring well(s), or the FutureGen 2.0 stratigraphic well.	
11	FutureGen	*Page G5* *In Wireline Logging, lines 7-10, please change the following sentence:* *Open-borehole logs will include caliper, gamma, spontaneous potential (or brine formation equivalent), resistivity, neutron, density, photoelectric cross-section, sonic (full waveform), nuclear magnetic resonance, resistivity-based and/or acoustic-based micro-image, and gamma-spectroscopy logs.* *To read as follows:* Open-borehole logs for the surface, intermediate, and long-string sections of the well will include a suite of standard logs including gamma ray, formation density, neutron porosity, resistivity, spontaneous potential, photoelectric factor, and caliper. In addition, one or more specialized logs may also be run on the long-string section of the well, including for example, spectral gamma, sonic, resistivity-based and/or acoustic-based image, nuclear magnetic resonance, and elemental capture spectroscopy.	The comment helps to draw a distinction between logs that will be run on all casing strings and those that might be run on only the long string of casing. This clarification meets the requirements at 40 C.F.R. § 146.87 and is acceptable. The suggested change is incorporated into the final permits.
12	CSC	Section J(1)(d) of the draft permits appears to require that "tests" be conducted to determine "fracture pressure and the physical and chemical characteristics of the injection and confining zones".	Fracture pressures and physical and chemical characteristics can vary between geologic formations, even when they are of comparable depths and/or rock types. Therefore, determining fracture pressures and other formation characteristics accurately requires some testing as part of an

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		Yet, the applicable provision of section 146.87(d) only requires that "the owner or operator must determine or calculate" these items. Actual testing may or may not be necessary and should be completely optional if sufficient information is already available. Our attached detailed comments provide alternative language to achieve this result.	analysis. Information collected from tests of nearby wells may be confidently used without the need to collect data from the well being drilled. In those cases, the required test may collect the necessary information in a nearby well and be applied to the subject well via a corresponding calculation. In the case of FutureGen, actual testing of the formation is necessary to accurately determine fracture pressures, physical and chemical characterization and hence safe operating limits. Since this information may be applicable to the immediate area, this testing is not required at every well but still needs to be gathered. To the extent this provision goes beyond the specific language of the regulation, EPA may add permit requirements beyond those laid out specifically in the UIC regulations on a case-by-case basis under 40 C.F.R. § 144.52(a)(9) (case-by-case conditions as necessary to prevent migration) and § 144.52(b) (case-by-case conditions as required to provide for and assure compliance with all applicable requirements of the SDWA and regulations). This provision is a rational extension of the regulatory language, and is in place to assure protection of the well, the USDWs, and FutureGen. Protective language is especially important here, as these will be the first Class VI wells operated at this scale in the United States and accurate characterization of the injection and confining zones is a central part of the Class VI regulatory provisions. Therefore, the permit language has not been modified based upon this comment.

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13	Betty Niemann	b. The reservoir or storage layer also encompasses the Elmhurst Layer at the bottom of the Eau Claire formation. FutureGen did not do any porosity and pressure tests of this upper most layer of the storage zone. Why? One would think that the porosity and pressure datum would be important information to further define the storage zone. c. What is the pressure of the overburden? Will the injection pressure of the CO_2 be above the overburden pressure or below. If the overburden pressure is under the injection pressure, then there is a chance of the CO_2 to escape the injection and storage layers? As I understand a study on mechanisms for CO_2 leakage prevention by Johannes M. Miocic, Stuart M V Gilillan, Christopher McDermott, and R Stuart Haszeldine,xiii they conclude that supercritical CO_2 under pressure which is less than 50% of overburden (lithographic pressure) will have the least chance of leakage. d. What is the fracture pressure of the Eau Claire layer and what assurances that the injection pressure of the supercritical CO_2 will be below this fracture pressure?	b. FutureGen combined regional geologic data with specific site data collected via well logs, sidewall cores, and whole cores to characterize the Elmhurst formation. Elmhurst formation permeability values were determined using ELAN-based (ELAN=elemental analysis) calculated values derived from wireline logs. FutureGen will measure values from logging and coring data collected when additional wells are drilled to confirm or refine their current estimates. Therefore, the permit language has not been modified based upon this comment. c. EPA evaluated the information submitted by FutureGen and finds that the Eau Claire formation provides a suitable caprock to contain the injected carbon dioxide in the Mount Simon Sandstone. Background pressures of the Eau Claire and Mount Simon formations, and well as post-injection pressures, were all contained in the computational modeling that confirmed the viability of the injection site. Therefore, the permit language has not been modified based upon this comment. d. FutureGen's application states that site specific numbers will be obtained when the injection wells are drilled. EPA bases the maximum allowable injection pressure on the injection zone, where elevated pressure due to injection will be the highest. EPA is basing maximum allowable injection pressures on the lowest fracture pressure identified and recalculated based on the depth it will be monitored at. FutureGen determined fracture pressures at two locations (depths) within the confining zone and five within the injection zone. The lowest fracture pressure found was at the depth where the downhole pressure monitoring will occur. FutureGen will be collecting additional fracture pressure data for various depths in the confining and injection formations as new wells are drilled. EPA recognizes that site-specific conditions or new information may present the need to alter the maximum injection pressure. To the extent new information indicates that the permit needs to be revised, FutureGen will propose to the Director a proposed injection pressure that complies with 40 C.F.R. § 146.88. If any changes to

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			Attachment A are required, those changes can be made through the permit modification process. Therefore, the permit language has not been modified based upon this comment.
14	Betty Niemann	i. Well cement - during drilling of the wells and the use of cement, will FutureGen take core samples of each pore and test the core sample to see if the pore meets operational criteria in order to identify possible cement malfunctions in the future? j. Now on page B12 of 46 for Injection Well No. 1 FutureGen states, " Core samples that were noted as having potential cracks and/or were very small were eliminated if the results appeared to be unreasonable based on the sampled lithology." xvi If the core samples have potential cracks, why didn't FutureGen investigate as to why these core sample have potential to crack thereby compromising the integrity of the injection well and also thereby increasing the risk of seismic activity at the injection well site. If this is a true and honest well site characterization, all aspects are studied, and none are discarded? k. Page 12 (Appendix) of the Second Response for more information states," It should be noted that there is no available whole core from the confining layers; and available rotary sidewall cores do not	i. Prior to commencing injection, FutureGen must perform pre-injection testing of the injection and confining zones at the well sites. Additionally, the integrity of the casing and cement will be evaluated on all wells constructed. The volumes of cement used (some of which is special CO_2-resistant cement) must be verified. Injection wells will be required to run tests to demonstrate that fluid is not leaking upwards behind the casing. These external demonstrations of mechanical integrity must be run annually. Therefore, the permit language has not been modified based upon this comment. j. The drilling and extraction process can often cause core samples to break, and artificially introduced cracks can make test analyses suspect. When drilling the injection wells, FutureGen is required to retrieve more core samples. Further, as part of the tests required on the injection wells prior to commencing injection, FutureGen will obtain information from fracture finder and other logs that verify the cracks were artificially introduced. Fracture finder logs are imaging techniques (often sonic) that are used to locate fractures in rocks adjacent to a wellbore. Cracks in core samples do not automatically compromise the integrity of the wells or project, and do not increase the risk of seismic activity at the well site. EPA will analyze any new data when new wells are drilled to determine whether its initial findings are still valid and whether any revisions to the permit are needed. Therefore, the permit language has not been modified based upon this comment.

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		provide sufficient sample size for vertical measurements of permeability" xvii If this is correct, then HOW CAN FutureGen be certain that the reservoir will contain the supercritical CO_2 or how it will react within the reservoir?	k. Although FutureGen was unable to obtain whole core or usable sidewall cores from the confining zone in the stratigraphic test well, extensive downhole logging was completed in the well that verified previously documented data finding the confining zone to be appropriate. Additionally, when drilling the injection wells, FutureGen is required to retrieve more core samples of the confining zone. These additional data will be evaluated before injection may begin, under Part Q of the permits. Therefore, the permit language has not been modified based upon this comment.
15	Betty Niemann	h. In the drilling of the characterization well, there was a water leakage at the Potosi layer, what precautions will be taken to prevent a loss of CO_2 at this level or the Potosi layer being a layer for possible CO_2 leakage?	EPA believes the "leakage" mentioned is actually a case of lost circulation. Lost circulation can happen during drilling and/or cementing when a formation has a high capacity to accept fluids and the drilling mud or cement flow into the formation at higher than desired rate. The Potosi formation will be separated from the injection well tubing by two layers of protective steel casing and cement, consistent with the regulatory requirements. Therefore, the permit language has not been modified based upon this comment.
16	CSC	**Provision:** J(1)(d) **Text of Draft Permit:** (d) Tests to provide information about the injection and confining zones, including calculated fracture pressure and the physical and chemical characteristics of the injection and confining zones and the formation fluids in the injection zone that meet the requirements of 40 CFR 146.87(d); and **References:** 146.87(d) At a minimum, the owner or operator must determine or calculate the following information concerning the injection and confining zone(s): (1) Fracture pressure; (2) Other physical and chemical characteristics of the injection and confining zone(s); and (3) Physical and chemical characteristics of the formation fluids in the	Information collected from tests of nearby wells may be confidently used without the need to collect data from the well being drilled. In those cases, the required test may collect the necessary information in a nearby well and be applied to the subject well via a corresponding calculation. In the case of FutureGen, actual testing of the formation is necessary to accurately determine fracture pressures, physical and chemical characterization and hence safe operating limits. Since this information may be applicable to the immediate area, this testing is not required at every well but still needs to be gathered. The proposed change follows the regulatory requirements, which point out that collection of some data may be unnecessary when data collected nearby meets that need. The suggested change is incorporated into the final permits.

#	Commenter	Comment Text	EPA Response
		injection zone(s). **Proposed Revision:** (d) Tests as necessary to provide information about the injection and confining zones~~,~~ ~~including~~ to allow determination or calculation~~ed~~ of characteristics of the injection and confining zones and the formation fluids in the injection zone that meet the requirements of 40 CFR 146.87(d); and fracture pressure and the physical and chemical **Comment:** The applicable provision here is to make a determination or calculation. It may not be necessary to conduct any additional testing if the information already available is sufficient to support the determination or calculation.	

SECTION 6. OPERATIONS COMMENTS

#	Commenter	Comment Text	EPA Response
1	CSC	**Provision:** K(1) **Text of Draft Permit: 1. Injection Pressure Limitation –** Except during stimulation, the permittee must ensure that injection pressure does not exceed 90 percent of the fracture pressure of the injection zone(s) so as to ensure that the injection does not initiate new fractures or propagate existing fractures in the injection zone(s). In no case shall injection pressure initiate fractures or propagate existing fractures in the confining zone or cause the movement of injection or formation fluids into a USDW. The maximum injection pressure limit is listed in Attachment A. **References:** Attachment A states: The maximum injection pressure, which serves to prevent confining-formation fracturing, was determined using the following formula/methodology: · For maximum injection pressure using a downhole pressure gauge, the maximum pressure is calculated as follows: 90% of fracture pressure of the injection zone. Therefore, the maximum injection pressure using downhole pressure gauge is 2,252 psia or 2,252-14.7 = 2,237 psig. · For surface maximum wellhead injection pressure, this limitation was calculated using the following formula: [{90% of fracture gradient-(0.433psi/ft)(specific gravity)} X upper depth of perforated interval] - atmospheric pressure. The maximum wellhead injection pressure is: [{0.585-	Although the maximum injection pressure listed in Attachment A is calculated to set a limit at 90 percent of the fracture pressure of the injection zone(s) based on the information currently available, as additional information becomes available, that calculated value may change. To the extent new information indicates that the current value in Attachment A exceeds at 90 percent of the fracture pressure of the injection zone(s), the maximum injection pressure should be reduced even before any conforming change is made to the permits. This assures compliance with the regulatory standard in 40 C.F.R. § 146.88(a) and protection of USDWs. Similarly, although it is very unlikely, it may be possible for FutureGen to initiate new fractures or propagate existing fractures in the injection or confining zones, or cause the movement of injection or formation fluid into a USDW, even if they comply with the maximum injection pressure limitation. In that case, injection pressure would also need to be reduced to protect USDWs and to comply with 40 C.F.R. § 146.88(a). Therefore, the permit language has not been modified based upon this comment.

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		(0.433)(0.64)}3850] -14.7 = 1,171psig. **Proposed Revision: 1. Injection Pressure Limitation –** Except during stimulation, the permittee must ensure that injection pressure does not exceed ~~90 percent of the fracture pressure of the injection zone(s) so as to ensure that the injection does not initiate new fractures or propagate existing fractures in the injection zone(s). In no case shall injection pressure initiate fractures or propagate existing fractures in the confining zone or cause the movement of injection or formation fluids into a USDW.~~ the maximum injection pressure limit ~~is~~ listed in Attachment A. **Comment:** The applicable requirement is to comply with the maximum pressure limitation in the permit. The rest of what is specified in this condition has already been accomplished as a basis for setting that limit.	
2	CSC	Section K(1) of the draft permits inappropriately recites the regulatory requirements for determining the maximum injection pressure as if those requirements constitute additional permit conditions and, only after doing so, then states that "[t]he maximum injection pressure limit is listed in Attachment A". Referring to Attachment A confirms that the stated maximum injection pressure has been approved as properly calculated in accordance with the regulatory provisions. It can only be confusing to state this permit condition as if it constitutes a number of different requirements that must also be met. Compliance with the maximum injection pressures in Attachment A constitutes compliance with the regulatory	Although the maximum injection pressure listed in Attachment A is calculated to set a limit at 90 percent of the fracture pressure of the injection zone(s) based on the information currently available, as additional information becomes available, that calculated value may change. To the extent new information indicates that the current value in Attachment A exceeds at 90 percent of the fracture pressure of the injection zone(s), the maximum injection pressure should be reduced even before any conforming change is made to the permits. This assures compliance with the regulatory standard in 40 C.F.R. § 146.88(a) and protection of USDWs. Similarly, although it is very unlikely, it may be possible for FutureGen to initiate new fractures or propagate existing fractures in the injection or confining zones, or cause the movement of injection or formation fluid into a USDW, even if they comply with the maximum injection pressure limitation. In that case, injection pressure

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		requirement, which does not need to be restated in the condition in addition to being fully stated and explained in Attachment A.	would also need to be reduced to protect USDWs and to comply with 40 C.F.R. § 146.88(a). Therefore, the permit language has not been modified based upon this comment.
3	NRDC	*Summary of Requirements* 1. EPA has specified both surface and downhole maximum injection pressures for the injection wells. These pressures are based on the presumed fracture pressure/gradient of the injection zone. However, site-specific data on the fracture pressure of the injection and confining zones have not yet been collected, and the presumed fracture gradient of the injection formation of 0.65 psi/ft is based on wireline logs, triaxial pressure tests on core plugs, and published literature. The permit application states that step-rate injection tests or leak-off test data to more accurately determine the formation fracture pressures will be obtained when the injection wells are drilled. As such, <u>EPA and the Applicant must reevaluate the allowable injection pressures once such site-specific data are collected, and agree on a timeline for doing so</u>.	The maximum injection pressure limitation listed in the permits is based upon site specific data. FutureGen drilled a stratigraphic test well at the site and collected data used to determine the fracture pressure, the fracture pressure gradient, and the hence the maximum injection pressure limitation. However, once well drilling commences, the FutureGen will gather additional information to confirm or refine information about the fracture pressure and fracture pressure gradient. As part of the review conducted pursuant to Section Q.4 of the permits and 40 C.F.R. §146.82(c), the pressure limitations can be re-evaluated. Therefore, the permit language has not been modified based upon this request.
4	FutureGen	*The CO_2 injection well coordinates in EPA's draft FutureGen UIC Class VI Permit Cover Letter and Attachments for each of the injection wells is the injection point location described in FG-RPT-017, Revision 1 (May 2013). These same coordinates are used for all of the 4 injection wells throughout the FutureGen permitting documentation. <u>Because the currently planned CO_2 injection wells' locations and their mid-point location are to the NW of the stated location, the Alliance suggests the following</u>*	EPA has revised the first page of each permit and the first page of each permit attachment to reflect the accurate proposed location for each of the wells. To the extent that small deviations to the planned locations are identified after the wells are constructed and surveyed, those corrections can be made through the minor modification process identified in 40 C.F.R. § 144.41.

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		wording and footnote throughout the permitting documentation for the injection well locations: *(If using one set of coordinates for **all** CO_2 injection wells' permit documentation…)* **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80104°N and 90.07517°W [1] Actual injection well location will be surveyed after injection well construction. *(If using the planned coordinates of the **individual** CO_2 injection wells in each well's permit documentation…)* (Well#1) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80111°N and 90.07491°W [1] Actual injection well location will be surveyed after injection well construction. (Well#2) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80097°N and 90.07491°W [1] Actual injection well location will be surveyed after injection well construction. (Well#3) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80097°N and 90.07544°W [1] Actual injection well location will be surveyed after injection well construction. (Well#4) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80111°N and 90.07544°W [1] Actual injection well location will be surveyed after injection well construction.	
5	CSC	Section K(8) of the draft permits incorrectly states that injection must cease if "[t]he automatic alarm	While 40 C.F.R. § 146.88(f) might permit a well to resume operating while the "owner or operator … immediately investigate[s] and identif[ies] as

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		or automatic shut-off system is triggered" or if "[a] significant unexpected change in the annulus or injection pressure" occurs. Cessation of injection is required in such circumstances only if, "upon investigation, the well appears to be lacking mechanical integrity" after the event occurs. Our detailed comments provide an appropriate revision to make this condition consistent with the regulatory requirements of sections 146.88(f) and 146.94(b).	expeditiously as possible the cause of the shutoff," EPA believes it is a reasonable and appropriate precaution to cease operations while that immediate investigation proceeds. The same is true with respect to any significant unexpected change in annulus or injection pressure. All of these occurrences are indicators of a potential loss of mechanical integrity and/or fracturing of the injection and/or confining formations. If the facility were to resume injection before completing an investigation, its investigation may confirm that the well lacked integrity or that injection damaged the formation and that its interim injection activities caused significant violations of the permit and threats to USDWs. Shutting a well in when a loss of mechanical integrity is suspected limits the potential for endangering USDWs as well as limiting FutureGen's exposure to potentially serious violations. By ceasing injection, FutureGen will limit CO_2 volume associated with the event, isolate the injectate, and minimize the risk of subsurface fluid movement and associated problems that may endanger USDWs. To the extent this provision goes beyond the specific language of the regulation, EPA may add permit requirements beyond those laid out specifically in the UIC regulations on a case-by-case basis under 40 C.F.R. § 144.52(a)(9) (case-by-case conditions as necessary to prevent migration) and § 144.52(b) (case-by-case conditions as required to provide for and assure compliance with all applicable requirements of the SDWA and regulations). This provision is a rational extension of the regulatory language, and is in place to assure protection of the well, the USDWs, and FutureGen. Protective language is especially important here, as these will be the first Class VI wells operated at this scale in the United States. Therefore, the permit language has not been modified based upon this comment.
6	CSC	**Provision:** K(8) **Text of Draft Permit: 8. Circumstances Under Which Injection Must Cease –** Injection shall cease	Some level of variation in annulus or injection pressure is typical of well operation, and some planned events (such as well start up or tests) will create more substantial variations by design. However, as noted above,

#	Commenter	Comment Text	EPA Response
		when any of the following circumstances arises: (a) Failure of the well to pass a mechanical integrity test; (b) A loss of mechanical integrity during operation; (c) The automatic alarm or automatic shut-off system is triggered; (d) A significant unexpected change in the annulus or injection pressure; (e) The Director determines that the well lacks mechanical integrity; or (f) The permittee is unable to maintain compliance with any permit condition or regulatory requirement and the Director determines that injection should cease. **References:** 146.88(f) If a shutdown (i.e., down-hole or at the surface) is triggered or a loss of mechanical integrity is discovered, the owner or operator must immediately investigate and identify as expeditiously as possible the cause of the shutoff. If, upon such investigation, the well appears to be lacking mechanical integrity, or if monitoring required under paragraph (e) of this section otherwise indicates that the well may be lacking mechanical integrity, the owner or operator must: (1) Immediately cease injection; (2) Take all steps reasonably necessary to determine whether there may have been a release of the injected carbon dioxide stream or formation fluids into any unauthorized zone; (3) Notify the Director within 24 hours; (4) Restore and demonstrate mechanical integrity to the satisfaction of the Director prior to resuming injection; and (5) Notify the Director when injection can be expected to resume.	significant, unanticipated variations may be indicators of a potential loss of mechanical integrity and/or fracturing of the injection and/or confining formations. It is difficult to define the precise levels that may trigger these requirements, especially when the wells are not yet operational. As FutureGen and EPA gain more actual experience, it may be feasible to lay out more specific ground rules through modifications to the permits and/or incorporated plans. In the meantime, however, this provision requires FutureGen to make reasonable judgments on when it views an unanticipated variation as significant. If that creates an incentive for FutureGen to be cautious about this decision in the absence of more precise standards, that incentive is appropriate given the potential risks associated with injection into a well without mechanical or geological integrity. To the extent this provision goes beyond the specific language of the regulation, EPA may add permit requirements beyond those laid out specifically in the UIC regulations on a case-by-case basis under 40 C.F.R. § 144.52(a)(9) (case-by-case conditions as necessary to prevent migration) and § 144.52(b) (case-by-case conditions as required to provide for and assure compliance with all applicable requirements of the SDWA and regulations). Therefore, the permit language has not been modified based upon this comment.

#	Commenter	Comment Text	EPA Response
		146.94(b) If the owner or operator obtains evidence that the injected carbon dioxide stream and associated pressure front may cause an endangerment to a USDW, the owner or operator must: (1) Immediately cease injection; (2) Take all steps reasonably necessary to identify and characterize any release; (3) Notify the Director within 24 hours; and (4) Implement the emergency and remedial response plan approved by the Director. **Proposed Revision:** **8. Circumstances Under Which Injection Must Cease –** Injection shall cease when any of the following circumstances arises: (a) Failure of the well to pass a mechanical integrity test; (b) A confirmed loss of mechanical integrity during operation; (c) If, upon investigation, the well appears to be lacking mechanical integrity after (1) the automatic alarm or automatic shut-off system is triggered or ; (~~d~~2) A significant unexpected change in the annulus or injection pressure; (~~e~~d) The Director determines that the well lacks mechanical integrity; or (fe) The permittee is unable to maintain compliance with any permit condition or regulatory requirement and the Director determines that injection should cease. **Comment:** The permit condition is not consistent with the regulatory requirement, and the	

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		requirement to cease injection when there is "a significant unexpected change in the annulus or injection pressure" is very ambiguous and potentially troublesome. The recommendations for revised language will modify the permit conditions to be consistent with the applicable regulatory provisions which trigger investigations rather than automatic shutdowns. Cessation of injection must occur only when there is a reason to believe that a loss of mechanical integrity may have occurred. The "significant unexpected change" language remains ambiguous, and there should be some better understanding of how large these unexpected changes should be. For example, any change in annular pressure should be larger by more than double the magnitude of normal diurnal and temperature related fluctuations. The significance levels for these triggers should be established by written agreement once operating experience provides a basis for doing that.	
7	FutureGen	*Table-Injection Well Operating Conditions* *1) It should be specified that the injection depth is based on the FutureGen stratigraphic well observations and will be replaced by the actual depth at the injection wells once they will have been drilled. All the given injection pressures are based on this depth and will be also updated accordingly.* *2) The EPA method for calculating the maximum surface injection pressure does not fully account for all well-bore processes that affect pressure, in particular the friction loss, and for the variation of CO_2 density with pressure and temperature. The alliance proposes to use the model CO2Flow*	1) The depths of formations at both injection and monitoring wells are listed as where they are anticipated to be. Attachment A of the permits lists the depth of the downhole gauge and injection pressure calculations at 3850 feet below ground surface. Small deviations of depths are corrected through the minor modification process identified in 40 C.F.R. § 144.41. 2) The permits have the downhole pressure gauge as the primary point of compliance. Since this is at the injection interval, any compensation for the weight of the fluid, friction loss, etc., will be unnecessary. If the bottomhole gauge fails, a gauge on the wellhead will be the new point of compliance. To the extent that small deviations to the planned depths are identified after the wells are constructed and surveyed, those corrections can be made through the minor modification process identified in 40 C.F.R.

#	Commenter	Comment Text	EPA Response
		developed by PNNL and that accounts for all well-bore processes and the impacts of pressure and temperature. This value will be adjusted based on the observed relationship between surface pressure and downhole pressure measured during the injection period. *The Alliance thus proposes to replace the entire section "**Injection Well Operating Conditions**" by:* **-PARAMETER/CONDITION:** Maximum Injection Pressure (Surface) **PARAMETER/CONDITION:** 1,360 **UNIT:** psig **-PARAMETER/CONDITION:** Maximum Injection Pressure (Downhole) **PARAMETER/CONDITION:** 2,237 **UNIT:** psig **-PARAMETER/CONDITION:** Annulus Pressure **PARAMETER/CONDITION:** 100 minimum **UNIT:** psig **-PARAMETER/CONDITION:** Annulus Pressure/Tubing Differential **PARAMETER/CONDITION:** 100 above surface injection pressure **UNIT:** psig The *downhole gauge* for injection pressure monitoring is to be located at 3,850 feet below ground surface. This depth is based on the stratigraphic well observations and will be replaced by the actual depth at the injection wells once they will have been drilled. All the injection pressures based on this depth will be updated accordingly. The maximum injection pressure, which serves to prevent confining-formation fracturing, was determined using the following formula/methodology: · For *maximum injection pressure using a downhole pressure gauge,* the maximum pressure is	§ 144.41. This includes adjustments to the maximum injection pressure if the fracture pressure is measured at the different depth than was planned. FutureGen proposed using the CO2FLOW program to calculate surface injection pressures. Documentation for CO2FLOW states that is accuracy could be plus or minus 15% of the actual value which is unacceptable to EPA. Although use of the CO2FLOW program for calculating surface pressures might be considered in the future, EPA would need to verify the accuracy of its calculations while injection was taking place by comparing the calculations with measurements taken from calibrated downhole and surface gauges. Therefore, the permit language has not been modified based upon this comment.

#	Commenter	Comment Text	EPA Response
		calculated as follows: 90% of fracture pressure of the injection zone at this depth. Therefore, the maximum injection pressure using downhole pressure gauge at 3,850 feet below ground surface is 2,252 psia or 2,252-14.7 = **2,237 psig**. This pressure will be recalculated if the downhole pressure gauge is at a different depth. For *surface maximum wellhead injection pressure*, this limitation was calculated using the PNNL model (CO2Flow) that accounts for all well-bore processes and variations of CO_2 density with pressure and temperature. The maximum wellhead injection pressure is **1360 psig**. This pressure will be measured during operation. The measured pressure will be adjusted to the maximum wellhead injection pressure after EPA's approval. If the downhole pressure gauge fails to function properly, then the maximum injection pressure shall immediately be limited to the calculated surface pressure until the downhole pressure gauge is repaired or replaced.	
8	FutureGen	*The Shutdown Procedure paragraph should be replaced by:* The permittee shall develop and submit for EPA approval a procedure for implementing a gradual well shutdown prior to commencing injection.	FutureGen did not propose a gradual well shutdown procedure as part of the permit application, and is not required to do so by the regulations. If FutureGen wishes to propose a procedure for EPA review and approval, it may do so through the permit modification process outlined in 40 C.F.R. §144.39. Therefore, the permit language has not been modified based upon this comment.
9	FutureGen	*The CO_2 injection well coordinates in EPA's draft FutureGen UIC Class VI Permit Cover Letter and Attachments for each of the injection wells is the injection point location described in FG-RPT-017, Revision 1 (May 2013). These same coordinates are used for all of the 4 injection wells throughout the*	EPA has revised the first page of each permit and the first page of each permit attachment to reflect the accurate proposed location for each of the wells. To the extent that small deviations to the planned locations are identified after the wells are constructed and surveyed, those corrections can be made through the minor modification process identified in 40 C.F.R. § 144.41.

#	Commenter	Comment Text	EPA Response
		FutureGen permitting documentation. Because the currently planned CO_2 injection wells' locations and their mid-point location are to the NW of the stated location, the Alliance suggests the following wording and footnote throughout the permitting documentation for the injection well locations: *(If using one set of coordinates for **all** CO_2 injection wells' permit documentation…)* **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80104°N and 90.07517°W [1] Actual injection well location will be surveyed after injection well construction. *(If using the planned coordinates of the **individual** CO_2 injection wells in each well's permit documentation…)* (Well#1) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80111°N and 90.07491°W [1] Actual injection well location will be surveyed after injection well construction. (Well#2) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80097°N and 90.07491°W [1] Actual injection well location will be surveyed after injection well construction. (Well#3) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80097°N and 90.07544°W	

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		[1] Actual injection well location will be surveyed after injection well construction. (Well#4) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80111°N and 90.07544°W [1] Actual injection well location will be surveyed after injection well construction.	

SECTION 7. TESTING AND MONITORING COMMENTS

#	Commenter	Comment Text	EPA Response
1	Betty Niemann	Will the monitoring of the injection process install underground sensors to detect this land deformation?	Underground pressure, temperature and chemical data obtained from monitoring wells will be integrated with ground surface, aerial and orbital (satellite) data to detect slight changes in elevation of the ground surface at the injection site. No changes to the permits are needed in response to this comment.
2	Betty Niemann	**Concerns about Storage Leakage and CO_2 Leakage Remediation** First and foremost, before any leakage can be determined, a baseline study must be carried out. Page 2.66 discusses the baseline study. It does not mention the length of the study. The Midwest Geological Sequestration Consortium conducted an approximate 2 year baseline study prior to starting the injection process. What is the length of the baseline study that FutureGen will conduct?	EPA believes there are additional and potentially more important factors to consider in obtaining baseline data for geologic sequestration projects than the duration of the baseline study. A baseline study will typically include many different types of sampling and testing techniques and not necessarily a specified duration of study. EPA's draft permits for the FutureGen project include a minimum number of baseline sampling events that must occur prior to commencement of the project. The duration of baseline testing varies based on the parameter and location. For example, baseline pressure monitoring within the injection zone will be for one year prior to injection. No changes to the permits are needed in response to this comment.
3	Robert J. Finley	My reading of the draft permit shows that it contains numerous provisions that meet the Class VI permit requirements, and in many cases can be interpreted to exceed the basic requirements in terms of monitoring and maintaining safe operations.	EPA believes that the permit requirements closely follow the regulatory requirements. To the extent any provisions go beyond the specific language of the regulation, EPA may add permit requirements beyond those laid out specifically in the UIC regulations on a case-by-case basis under 40 C.F.R. § 144.52(a)(9) (case-by-case conditions as necessary to prevent migration) and § 144.52(b) (case-by-case conditions as required to provide for and assure compliance with all applicable requirements of the SDWA and regulations). Protective language is especially important here, as these will be the first Class VI wells operated at this scale in the United States.

#	Commenter	Comment Text	EPA Response
4	FutureGen	*Page C2* *In the last sentence of paragraph 3, EPA changed "may be activated" to "will be activated".* *The Alliance suggests the following rewording for this sentence:* If deep early-detection monitoring locations indicate that primary confining zone leakage has occurred, a comprehensive near-surface-monitoring program will be evaluated (in consultation with the UIC Program Director), and if warranted, will be activated to fully assess environmental impacts relative to baseline conditions.	40 C.F.R. §146.90(h) gives EPA broad discretion to include surface air and/or soil gas monitoring as a requirement of the initial permits. EPA has not required that monitoring initially, but such a provision is appropriate and protective if monitoring indicates leakage from the primary confining zone. The regulation provides for surface air and/or soil gas monitoring to address potential risks to USDWs within the AoR. Evidence of leakage from the confining zone presents such a risk. Therefore, the permit language has not been modified based upon this comment.
5	FutureGen	*Page C10* *Table 1* *The requirement to measure injection parameters (i.e., flow rate, pressure, temperature) every 5 seconds during injection is unnecessary. There is no reason to measure these parameters this frequently as injection will be a steady process that does not cause large changes in these parameters over a short time period, except during startup and shut down. Such a high frequency measurement program will result in excessive and unnecessary data collection and data management. The Alliance recommends changing this requirement to* every 5 minutes *to match the minimum recording frequency.*	The regulations and permits require "continuous" monitoring of flow rate, injection pressure, annulus pressure, annulus fluid level, and injection fluid temperature. The sampling frequency of every five seconds refers to how often the monitoring device obtains data from the well for that particular parameter. This is not the frequency at which this data must be recorded. Although most wells are designed to operate as a steady process, the five second monitoring frequency ensures that operational aberrations trigger corresponding alarm systems promptly and limits equipment and/or formation damage. Therefore, this provision of the permits has not been changed.
6	FutureGen	*The last sentence of page C6's paragraph 5 should be removed.* *Redundant fiber optic P/T monitoring is being*	EPA agrees that this correction is appropriate and consistent with the rest of the Plan. The suggested change is incorporated into the final permits.

#	Commenter	Comment Text	EPA Response
		considered for the SLR monitoring wells, not the injection wells.	
7	FutureGen	*Page C2* *In the last sentence of paragraph 3, EPA changed "may be activated" to "will be activated".* *The Alliance suggests the following rewording for this sentence:* If deep early-detection monitoring locations indicate that primary confining zone leakage has occurred, a comprehensive near-surface-monitoring program will be evaluated (in consultation with the UIC Program Director), and if warranted, will be activated to fully assess environmental impacts relative to baseline conditions.	If primary containment were to be breached, a more comprehensive near-surface monitoring program would be warranted and the nature and extent of such a program would be at the Director's discretion. Therefore, the permit language has not been modified based upon this comment.
8	FutureGen	*The CO_2 injection well coordinates in EPA's draft FutureGen UIC Class VI Permit Cover Letter and Attachments for each of the injection wells is the injection point location described in FG-RPT-017, Revision 1 (May 2013). These same coordinates are used for all of the 4 injection wells throughout the FutureGen permitting documentation. Because the currently planned CO_2 injection wells' locations and their mid-point location are to the NW of the stated location, the Alliance suggests the following wording and footnote throughout the permitting documentation for the injection well locations:* *(If using one set of coordinates for **all** CO_2 injection wells' permit documentation…)* **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80104°N and 90.07517°W	EPA has revised the first page of each permit and the first page of each permit attachment to reflect the accurate proposed location for each of the wells. To the extent that small deviations to the planned locations are identified after the wells are constructed and surveyed, those corrections can be made through the minor modification process identified in 40 C.F.R. § 144.41.

#	Commenter	Comment Text	EPA Response
		[1] Actual injection well location will be surveyed after injection well construction. *(If using the planned coordinates of the **individual** CO_2 injection wells in each well's permit documentation….* (Well#1) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80111°N and 90.07491°W [1] Actual injection well location will be surveyed after injection well construction. (Well#2) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80097°N and 90.07491°W [1] Actual injection well location will be surveyed after injection well construction. (Well#3) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80097°N and 90.07544°W [1] Actual injection well location will be surveyed after injection well construction. (Well#4) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80111°N and 90.07544°W [1] Actual injection well location will be surveyed after injection well construction.	
9	FutureGen	Page C1 Lines 2, 3, 4 - *Suggest changing sentence to:* Central to this monitoring strategy is the measurement of CO_2 saturation within the reservoir using three reservoir access tubes (RATs) extending through the base of the Mount Simon Formation and into the Precambrian basement.	EPA finds that this suggested change does not compromise the purpose of this testing and monitoring requirement. Thus, this correction is incorporated into the final permits.

#	Commenter	Comment Text	EPA Response
10	FutureGen	*Page C1* *Lines 6, 7, 8 - Suggest changing sentence to*: The three wells have been placed at increasing radial distances from the injection site to provide measures of CO_2 saturation at locations within the outer edges of the predicted 1-, 2-, and 4-year CO_2 plumes, respectively."	EPA finds that this suggested change corrects the statement to better align with the modeled prediction. Thus, this change is incorporated into the final permits.
11	FutureGen	*Page C5* *Under Analytical techniques:* *The QASP Sections referred to here are incorrect.* *B.4.4 should be* B.1.4.	EPA agrees that this correction is appropriate and consistent with the rest of the Plan. The suggested change is incorporated into the final permits.
12	Robert J. Finley	Baseline monitoring is proposed that allows a clear understanding of any out-of-bounds event that may occur or may be alleged, as turned out to be very important in the case of the Weyburn Field enhanced oil recovery project, however unlikely such events may be.	Thank you for your comment.
13	FutureGen	QASP Page B.1 *Cement-evaluation and casing inspection logging is not planned as part of the regular annul MIT demonstration, therefore, revise the following sentence:* *5. External Mechanical Integrity Testing – includes temperature logging and pulsed-neutron capture (PNC) logging (both gas-view and oxygen-activation mode), as well as cement-evaluation and casing inspection logging. See Section B.5.* *to read:* 5. External Mechanical Integrity Testing – includes temperature logging and pulsed-neutron capture (PNC) logging (both gas-view and oxygen-activation mode). See Section B.5.	EPA finds that the text included in the draft permits is appropriate. EPA acknowledges that the cement-evaluation and casing inspection logging tools listed on page B.1 are not be planned as part of the regular annual MIT demonstration and finds that the inclusion of their mention under this heading does not prescribe the tests to be conducted on an annual basis. Further, the referenced Section B.5 states that cement-evaluation logs will be run when tubing is removed from the well. Therefore, the permit language has not been modified based upon this comment.

#	Commenter	Comment Text	EPA Response
14	FutureGen	*<u>Revise the following paragraph at bottom of page B.3 and top of page B.4 of the QASP</u>:* ***Continuous Recording of Injection Pressure and Temperature*** *"An electronic P/T gauge will be installed on the outside of the tubing string, approximately 30 ft above the packer, and ported into the tubing to continuously measure* CO_2 *injection P/T inside the tubing at this depth. Mechanical strain gauges and thermocouples will be the primary monitoring devices for pressure and temperature. Injection P/T will also be continuously measured at the surface via real-time P/T instruments installed in the* CO_2 *pipeline near the pipeline interface with the wellhead. The P/T of the injected* CO_2 *will be continuously measured for each well. The pressure will be measured by electronic pressure transmitter with analog output mounted on the* CO_2 *line associated with each injection well. The temperature will be measured by an electronic temperature transmitter mounted in the* CO_2 *line at a location near the pressure transmitter, and both transmitters will be located near the wellhead. The transmitters will be connected to the Annulus Pressurization System (APS) programmable logic controller (PLC) located at the injection well site. Because the surface instruments can be more readily accessed and maintained than the bottomhole gauge, they will be used to control injection operations and trigger shutdowns."* *<u>To read</u>:* ***Continuous Recording of Injection Pressure and***	EPA finds that the downhole gauge is the primary point of compliance for injection pressure. Removing the language stating "*Mechanical strain gauges and thermocouples will be the primary monitoring devices for pressure and temperature"* could create confusion over the primary point of compliance. Therefore, the permit language has not been modified based upon this comment. Additionally, the last sentence of this section "*Because the surface instruments can be more readily accessed and maintained than the bottomhole gauge, they will be used to control injection operations and trigger shutdowns."* has been removed because it suggests that the downhole gauge is not the primary point of compliance. EPA does agree, however, that the additional detail that the PLC is "located in the Control Building adjacent to the injection well pad" provides helpful clarification. This clarification is appropriate and consistent with the rest of the Plan, so that requested change has been made.

#	Commenter	Comment Text	EPA Response
		Temperature An electronic P/T gauge will be installed on the outside of the tubing string, approximately 30 ft above the packer, and ported into the tubing to continuously measure CO_2 injection P/T inside the tubing at this depth. Injection P/T will also be continuously measured at the surface via real-time P/T instruments installed in the CO_2 pipeline near the pipeline interface with the wellhead. The P/T of the injected CO_2 will be continuously measured for each well. The pressure will be measured by electronic pressure transmitter with analog output mounted on the CO_2 line associated with each injection well. The temperature will be measured by an electronic temperature transmitter mounted in the CO_2 line at a location near the pressure transmitter, and both transmitters will be located near the wellhead. The transmitters will be connected to the Annulus Pressurization System (APS) programmable logic controller (PLC) located in the Control Building adjacent to the injection well pad. Because the surface instruments can be more readily accessed and maintained than the bottomhole gauge, they will be used to control injection operations and trigger shutdowns.	
15	FutureGen	QASP Page B.4 ***Continuous Recording of Injection Mass Flow Rate*** *Revise the 1st sentence of the 2nd paragraph in this section:* *The RTU will communicate with the Control Center through the APS PLC located at the injection well site.*	EPA agrees that this correction is appropriate and consistent with the rest of the Plan. This requested change is only a terminology edit. The suggested change is incorporated into the final permits.

#	Commenter	Comment Text	EPA Response
		To read: The flow meters will be connected to the main CO_2 storage site SCADA system for continuous monitoring and control of the CO_2 injection rate into each well.	
16	FutureGen	QASP Page A.15 *Cement-evaluation and casing inspection logging are not planned as part of the regular annual MIT demonstration, therefore, revise the following sentence:* ***External Well Mechanical Integrity Testing*** *Wireline logging, including pulsed-neutron capture (PNC) logs (both in the gas-view and oxygen activation modes) and temperature logs, and cement-evaluation and casing inspection logging, will be conducted to verify the absence of significant fluid movement through potential channels adjacent to the injection well bore and/or to determine the need for well repairs.* *to read:* **External Well Mechanical Integrity Testing** Wireline logging, including pulsed-neutron capture (PNC) logs (both in the gas-view and oxygen activation modes) and temperature logs will be conducted to verify the absence of significant fluid movement through potential channels adjacent to the injection well bore and/or to determine the need for well repairs.	EPA finds that the text included in the draft permits is appropriate. EPA acknowledges that the cement-evaluation and casing inspection logging tools listed on page A.15 are not planned as part of the regular annual Mechanical Integrity demonstration and finds that the inclusion of their mention under this heading does not prescribe the tests to be conducted on an annual basis. Therefore, the permit language has not been modified based upon this comment.

#	Commenter	Comment Text	EPA Response
17	FutureGen	*<u>QASP Page B.3</u>* *<u>Delete the following paragraph</u>, as it is repeated in the subsequent section:* *The injection wells will be completed with a string of 3.5-in.-OD tubing that extends from the wellhead at the surface to near the top of the perforated interval. A tubing string that is 4,000 ft long will extend approximately 11 ft below the top of the perforations. The tubing string will be held in place at the bottom by a packer that is positioned just above the uppermost perforations (approximate measured depth of 3,850 ft). An optical or electronic pressure-and-temperature (P/T) gauge will be installed on the outside of the tubing string, approximately 30 ft above the packer, and ported into the tubing to continuously measure* CO_2 *injection P/T inside the tubing at this depth. In addition, injection P/T will also be continuously measured at the surface via real-time P/T instruments installed in the* CO_2 *pipeline near the pipeline interface with the wellhead. Because the surface instruments can be more readily accessed and maintained than the bottom-hole gauge, they will be used to control injection operations and trigger shutdowns.*	EPA agrees that this correction is appropriate and consistent with the rest of the Plan. The suggested change is incorporated into the final permits.

#	Commenter	Comment Text	EPA Response
18	FutureGen	Page C55 ***APPENDIX F: Injection Well Continuous Monitoring Device Locations.*** *What is the purpose of this table, because it is not informative as a stand-alone table? <u>If it needs to stay in the permit, the following changes need to be made</u>:* *<u>Change</u>:* *Injection Pressure Monitoring – primary / Reservoir - Below Packer* *<u>To</u>:* Injection Pressure Monitoring – primary / Reservoir - Above Packer *<u>Change</u>:* *Temperature Monitoring / Reservoir - Below Packer* *<u>To</u>:* Temperature Monitoring / Reservoir - Above Packer	EPA agrees that these suggestions do not change the intent to comply with a downhole measurement, but rather clarify where that measurement will occur. Currently, instead of referencing the well construction, such as above or below the packer, Attachment A lists the downhole monitoring depth as 3,850 feet below ground surface. EPA believes this is more appropriate, and changed Appendix F on page C55 to give the depth of primary Injection Pressure and Temperature monitoring to 3,850 feet below ground surface. As noted in this document with other parameters, these are anticipated depths and are therefore subject to change. Small deviations identified after construction is completed can be corrected through the minor modification process identified in 40 C.F.R. § 144.41.
19	FutureGen	*<u>Page C9</u>* *<u>The following Note should be added to Table 4:</u>* All depths are approximate and may be adjusted based on information obtained when the well is drilled.	The depth of each well, as well as formation depths, are indicated as where the wells are intended to be placed. Since each permit has numerous citations of depths and locations, noting that these are anticipated depths and are therefore subject to change, would overly complicate the permits and be potentially confusing. Small deviations identified after construction is completed can be corrected through the minor modification process identified in 40 C.F.R. § 144.41. Therefore, the permit language has not been modified based upon this comment.

#	Commenter	Comment Text	EPA Response
20	Leinberger & Critchelow families	***11.) FutureGen should present a detailed justification for monitoring well placement and add additional monitoring wells as necessary based on the more-recently delineated AoR (Permit Section: Attachment C).*** FutureGen's monitoring network includes two "early-detection" wells completed in the first permeable unit above the confining zone (FutureGen 2014b, p.C1-C2/56). FutureGen has not demonstrated that these two monitoring wells alone will be adequate to detect potential leakage consistent with EPA guidance and regulations. EPA regulations require that AoR modeling be used to designate the number and placement of monitoring wells above the primary confining zone, and monitoring well placement be based on specific information about the project, including injection rate and volume, geology, the presence of artificial penetrations, and baseline geochemical data (U.S. EPA, 2010; 146.90[d]). EPA guidance recommends that monitoring wells be placed strategically to maximize the ability of the monitoring well network to detect potential leakage, and suggests that monitoring wells be cited based on modeling results, projected plume migration, dip direction, and the presence of potential leakage pathways (U.S. EPA, 2013b, p.56/115). EPA's monitoring guidance also states the following (U.S. EPA, 2013b, p.56-57/115): *The number of required monitoring wells may be greater for projects with larger predicted areas of elevated pressure and/or plume movement, or in*	The two monitoring wells in the Ironton Sandstone, immediately above the Eau Claire confining zone, are sufficient to detect changes in fluid chemistry, temperature and pressure that would indicate the movement of CO_2 beyond the injection zone formation. This is particularly true during the early years of the project where the CO_2 plume would typically still be relatively close to the wells and a potential problem with the confining zone (such as previously unknown faults or fractures or other permeable features) would be likely to become apparent. EPA also recommended in its guidance that monitoring wells be placed strategically to maximize the ability of the monitoring well network to detect potential leakage and track the plume migration and pressure front while minimizing the number of wells, which increase the risk for fluid movement. EPA considered the AoR modeling and geologic data in evaluating the spatial distribution and frequency of sampling at the monitoring wells (Evaluation of Area of Review Delineation and Corrective Action, March 2014). The proposed system of monitoring wells complies with 40 C.F.R. §146.90(d). The Testing and Monitoring Plan does refer to two wells that will monitor pressure in the Mt. Simon but a third well is planned and is required by the permit. This third well was described on pages C2 and C3 of the draft permit, and it will be a third Single-Level Reservoir (SLR) well to monitor below the confining zone. The Director may require additional monitoring wells as necessary if the Director determines that is needed for compliance with the permit and with 40 C.F.R. §146.90(d). Under the Permits (see Parts G and M), the AoR and the Monitoring Program will be regularly reviewed, and revised as appropriate. A review and re-evaluation is required before injection begins under Part Q of the permits. Those reviews will consider the factors identified in this comment, and other considerations. Any modifications made as part of those reviews will go through the permit modification process described in 40 C.F.R. Part 144.

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		cases of more complex or heterogeneous injection/confining zone hydrogeology. If the predicted area of impact of a given project increases in size as indicated during an AoR reevaluation, additional monitoring wells may be necessary... *The number of monitoring wells placed above the confining zone should be determined such that any leakage through the confining zone that may endanger a USDW will be detected in sufficient time to implement remedial measures. The number of monitoring wells above the confining zone may be determined based on a modeling and/or statistical analysis, which may be documented in the Testing and Monitoring Plan. Considerations that may be included in this analysis are the regional hydraulic gradient, flow paths, transmissivity, and baseline geochemistry.* In the initial FutureGen permit application, monitoring wells were placed within the boundaries of the projected carbon dioxide plume, which at that time defined the AoR (FutureGen, 2013). Subsequently the AoR size was significantly increased to include the boundaries of the 10 psi pressure increase (FutureGen, 2014a). However, additional monitoring wells were not added in the updated Testing and Monitoring Plan within this much larger area of elevated pressure. FutureGen has provided no analysis regarding additional search for potential leakage pathways or sensitive areas in this now larger AoR that may require additional monitoring wells above the	In addition to evaluating FutureGen's review of the area wells, EPA completed its own independent review of well records at the ISGS and the Illinois State Water Survey. EPA did not find any improperly constructed artificial penetrations that reach the confining zone. Therefore, the permit language has not been modified based upon this comment.

#	Commenter	Comment Text	EPA Response
		primary confining zone. Further, FutureGen has not provided any modeling or statistical analysis to demonstrate that two monitoring wells above the confining zone are adequate to detect leakage in sufficient time to implement remedial measures based on site-specific conditions, as suggested in EPA guidance as cited above. FutureGen should present a detailed analysis justifying the placement of monitoring wells, in consideration of the most recently updated AoR, and including a search for all potential leakage pathways within the expanded AoR. Additional monitoring wells may be necessary in order to be consistent with EPA guidance.	

#	Commenter	Comment Text	EPA Response
21	Leinberger & Critchelow families	E. Insufficient Monitoring FutureGen's proposed monitoring system is insufficient. As stated by EPA in the Preamble to the Class VI Rule, "GS is a new technology and there are a number of unknowns associated with the long-term effects of injecting large volumes of CO_2 …" Federal Requirements Under the Underground Injection Control Program for Carbon Dioxide Geologic Sequestration Wells ("E.P.A. Rule"), 75 Fed. Reg. 77230, 77261 (2010). Consequently, the monitoring and testing protocols must reflect the untested nature of the project. EPA regulations require that Area of Review modeling be used to designate the number and placement of monitoring wells. See 40 C.F.R. §146.90 (d)(2). EPA guidance suggests that monitoring wells be cited based on modeling results, projected plume migration, dip direction, and presence of potential leakage pathways. See Geologic Sequestration of Carbon Dioxide: Underground Injection Control (UIC) Program Class VI Well Testing and Monitoring Guidance p. 56/115, AR #441. In the initial (March 2013) permit application, monitoring wells were placed within the boundaries of the projected carbon dioxide plume, which at that time defined the Area of Review. See Permit App. Supporting Documentation p.C4/56. Subsequently, FutureGen significantly increased the size of the Area of Review to include the boundaries of the 10psi pressure increase. See Permit, Attachment B. However, no additional monitoring wells are	The commenter's statement that "no additional monitoring wells are included…in this area of elevated pressure" is inaccurate. Much of the plan does refer to two wells that will monitor pressure in the Mt. Simon but a third well is planned and is required by the permit. This third well was described on pages C2 and C3 of the draft permit, and it will be third SLR well to monitor below the confining zone. EPA considered the AoR modeling and geologic data in evaluating the spatial distribution and frequency of sampling at the monitoring wells (Evaluation of Area of Review Delineation and Corrective Action, March 2014). The proposed system of monitoring wells complies with 40 C.F.R. §146.90(d). The Director may require additional monitoring wells as necessary if the Director determines that it is needed for compliance with the permit and with 40 C.F.R. §146.90(d). EPA also recommended in its guidance that monitoring wells be placed strategically to maximize the ability of the monitoring well network to detect potential leakage and track the plume migration and pressure front while minimizing the number of wells, which increase the risk for fluid movement. Regarding potential leakage pathways in the expanded Area of Review, when the AoR was expanded, EPA investigated whether this larger area included any wells that penetrated the injection and/or confining zones. EPA found only two wells (aside from FutureGen's stratigraphic test well). One of those deep wells was plugged in June 2014. The other well is being used as an observation well at a gas storage operation. The well log database maintained by the ISGS did not show any other wells in the area that were drilled into the confining and/or injection formations. In addition to evaluating FutureGen's review of the area wells, EPA completed its own independent review of well records at the ISGS and the Illinois State Water Survey. EPA did not find any improperly constructed artificial penetrations that reach the confining zone.

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		included in the updated Testing and Monitoring plan to monitor in this area of elevated pressure. No discussion is included regarding any additional search for potential leakage pathways or sensitive areas in this now larger Area of Review. See Ex. 2, para. 11 (Schnaar report). The Director must obtain and review this additional information in order to ensure the monitoring system is adequate and the Permit is based on accurate data. Because geologic sequestration is a new technology, methods for monitoring the location of the plume are largely untested. Neither the draft Permit nor the Supporting Documentation contain details on how the number, type, and proposed location of the five monitoring wells (three Reservoir Access Tubes [RATs] and two Single-Level in- Reservoir [SLR] wells) for the injection zone (Attachment C p.C4/56) satisfy the Class VI requirements. Further, and as set forth in Section II.C above, FutureGen's modeled CO_2 plume must be enlarged, including in the southerly directions due to injection well length, injection pipe directions, and injection rates, and the extent of the monitoring in those areas must be correspondingly increased to satisfy the regulations. Additional deep monitoring wells penetrating the confining zone and shallow monitoring wells are needed. The proposed monitoring configuration would be inappropriate in light of a material change to the size and shape of the projected plume.	Therefore, the permit language has not been modified based upon this comment.

#	Commenter	Comment Text	EPA Response
22	Leinberger & Critchelow families	**Monitoring Well Network and Monitoring Activities** 9) <u>Shallow groundwater monitoring</u> A shallow groundwater well sampling investigation was performed in 2011 by ISGS for private domestic water-supply wells within 1.5 miles of the FutureGen stratigraphic well location (designated FG1 on Figure 2.26 on Page 2.41 of the Supporting Documentation). All of the wells were reportedly shallow (14 to 47 feet deep) and were identified with a FG-P-# designation. A summary of the analytical findings is provided in the Supporting Documentation. However, these wells are not identified by their ISWS ID numbers and do not appear to coincide with any of the wells identified on any other figures or tables within the Supporting Documentation. In Section 5 of the Supporting Documentation (Page 5.18) these wells are identified as being included in the planned shallow groundwater monitoring program. *Requested Change/Action: Since these well are part of the future monitoring network, FutureGen needs to identify these wells either by the ISWS number, if they are registered, or provide the owner identification and legal description (township and range). The full analytical reports from the previous sampling event should also be provided as part of their supporting documentation.* 10) <u>Monitoring above the St. Peter Sandstone</u> FutureGen is considering using three abandoned oil and gas wells reportedly located within the limits of the sc CO_2 plume (original AoR) for soil-gas	In section 9, the commenter stated that shallow groundwater wells are part of a future groundwater monitoring network. The nine landowners wells were sampled as a baseline sampling, but no sampling of these wells are planned during the injection phase. The results from all monitoring wells will be submitted to EPA after they are completed and EPA will retain this information in the event that sampling of these wells is conducted in the future for comparison to baseline conditions. Regarding the comments on section 10, the subject abandoned oil-gas wells, even with no evaluation of well construction and well cement, are unlikely to serve as conduits for fluid movement to the surface because they do not intersect the injection zone, CO_2 plume, or confining zone for the project. In the unlikely event that leakage out of the injection zone did occur, or if these wells were recompleted as monitoring wells, the Director would require any corrective action and/or emergency response necessary to protect USDWs, including requiring mechanical integrity testing. The commenters raised concerns about the use of older wells for monitoring shallower formations. The use of these wells is acceptable to EPA as long as they meet the required monitoring needs and do not serve as pathways for leakage into USDWs. EPA will fully evaluate these wells if they are converted. Although not explicitly required by the UIC regulations, EPA is requiring in the permits that the wells not only initially demonstrate mechanical integrity, but also re-demonstrate mechanical integrity every five years that the well is in use to help assure protectiveness. Therefore, the permit language has not been modified based upon this comment.

#	Commenter	Comment Text	EPA Response
		monitoring. The wells reportedly extend to depths of approximately 1,000 to 1,500 feet below ground surface (bgs) through some of the shallower shale formation above the St. Peter Sandstone and therefore have the potential for providing a preferential pathway for CO_2 gas migration (Section 5.1.1, Page 5.3, Supporting Documentation). *Requested Change/Action: FutureGen did not specifically identify the three wells though their API identification numbers can be deduced from the tables and figures. FutureGen needs to confirm their identification and conduct an assessment of the drilling and abandonment logs to assess the integrity of the wells. If these wells become part of the future monitoring program, integrity testing and upgrading of these wells would be required and this requirement should be a condition of the Permit.*	
23	Leinberger & Critchelow families	FutureGen is considering use of three abandoned oil and gas wells completed at greater than 1,000 feet bgs for soil-gas monitoring because of their potential for providing a preferential pathway for CO_2 gas migration. See Ex. 1, para. 10 (Price report). The Director should require that FutureGen provide information concerning the wells, including integrity testing and the need for upgrading of these wells, given their potential use.	These abandoned oil-gas wells, even with no evaluation of well construction and well cement, are unlikely to serve as conduits for fluid movement to the surface because they do not intersect the injection zone, CO_2 plume, or confining zone for the project. If these wells were to be required monitoring wells per the permits, the Director would require any testing or corrective action necessary to protect USDWs, including mechanical integrity testing. Therefore, the permit language has not been modified based upon this comment.

#	Commenter	Comment Text	EPA Response
24	CSC	**Provision:** M(1)(a) **Text of Draft Permit:** (a) The permittee shall maintain and comply with the approved Testing and Monitoring Plan (Attachment C of this permit) and with the requirements at 40 CFR 144.51(j), 146.88(e), and 146.90. The Testing and Monitoring Plan is an enforceable condition of this permit. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. Procedures for all testing and monitoring under this permit must be submitted to the Director in an electronic format for approval at least 30 days prior to the test. In performing all testing and monitoring under this permit, the permittee must follow the procedures approved by the Director. If the permittee is unable to follow the EPA approved procedures, then, the permittee must contact the Director at least 30 days prior to testing to discuss options, if any are feasible. When the test report is submitted, a full explanation must be provided as to why any approved procedures were not followed. If the approved procedures were not followed, EPA may take an appropriate action, including but not limited to, requiring the permittee to re-run the test. **Proposed Revision:** (a) The permittee shall maintain and comply with the approved Testing and Monitoring Plan (Attachment C of this permit) ~~and with~~ to meet the requirements at 40 CFR 144.51(j), 146.88(e), and 146.90. The Testing and Monitoring Plan is an enforceable condition of this permit. ~~Samples and~~	As a general matter the UIC permit is intended as a roadmap to identify the relevant requirements and obligations of FutureGen. The relevant regulatory provisions are lengthier and more detailed, so that the permit language may summarize those requirements and provide reference to the regulatory details rather than copying them in their entirety. This makes the permit more reader-friendly and easy to follow. Incorporating the additional details by reference does not create any conflict or confusion between the terms of the permit and the regulations. In addition, 40 C.F.R. §146.90 makes it clear that FutureGen is responsible to comply with both the permit requirement and the regulatory requirement upon which it is based. For Class VI wells, EPA anticipates that the testing and monitoring plan will be regularly reviewed and revised as required by 40 C.F.R. §146.90(j) and Section M of the Permits. Reference to the relevant regulatory provisions provides clarity on the standards against which any revisions will be judged. Therefore, the permit language has not been modified based upon this comment.

#	Commenter	Comment Text	EPA Response
		~~measurements taken for the purpose of monitoring shall be representative of the monitored activity. Procedures for all testing and monitoring under this permit must be submitted to the Director in an electronic format for approval at least 30 days prior to the test. In performing all testing and monitoring under this permit, the permittee must follow the procedures approved by the Director. If the permittee is unable to follow the EPA approved procedures, then, the permittee must contact the Director at least 30 days prior to testing to discuss options, if any are feasible. When the test report is submitted, a full explanation must be provided as to why any approved procedures were not followed. If the approved procedures were not followed, EPA may take an appropriate action, including but not limited to, requiring the permittee to re-run the test.~~ --OR— The permittee has submitted the approved Testing and Monitoring Plan, which is included in Attachment C of this permit. This plan includes the information required by Sections 144.51(j), 146.88(e), and 146.90 and demonstrates how each of the applicable requirements will be met. The Testing and Monitoring Plan is an enforceable condition of this permit. **Comment:** The procedures are all spelled out in the plan.	

#	Commenter	Comment Text	EPA Response
25	CSC	**Provision:** M(2) **Text of Draft Permit:** 2. **Carbon Dioxide Stream Analysis** – The permittee shall analyze the carbon dioxide stream with sufficient frequency to yield data representative of its chemical and physical characteristics, as described in the Testing and Monitoring Plan and to meet the requirements of 40 CFR 146.90(a). **Proposed Revision:** 2. **Carbon Dioxide Stream Analysis** – The permittee shall analyze the carbon dioxide stream with sufficient frequency to yield data representative of its chemical and physical characteristics, as described in the Testing and Monitoring Plan ~~and~~ to meet the requirements of 40 CFR 146.90(a). **Comment:** By issuing the permit, EPA has determined that implementing the Testing and Monitoring Plan does meet the requirements of 40 CFR 146.90(a).	As a general matter the UIC permit is intended as a roadmap to identify the relevant requirements and obligations of FutureGen. The relevant regulatory provisions are lengthier and more detailed, so that the permit language may summarize those requirements and provide reference to the regulatory details rather than copying them in their entirety. This makes the permit more reader-friendly and easy to follow. Incorporating the additional details by reference does not create any conflict or confusion between the terms of the permit and the regulations In addition, 40 C.F.R. §146.90 makes it clear that FutureGen is responsible to comply with both the permit requirement and the regulatory requirement upon which it is based. For Class VI wells, EPA anticipates that the testing and monitoring plan will be regularly reviewed and revised as required by 40 C.F.R. §146.90(j) and Section M of the Permits. Reference to the relevant regulatory provisions provides clarity on the standards against which any revisions will be judged. Therefore, the permit language has not been modified based upon this comment.
26	FutureGen	*Page C5* *Under Laboratory to be used/chain of custody procedures:* *The QASP Sections referred to here are incorrect. B.4.5 through B.4.7 should be* B.1.4 through B.1.7.	EPA agrees that this correction is appropriate and consistent with the rest of the Plan. The suggested change is incorporated into the final permits.
27	FutureGen	*Page C5* Under Quality assurance and surveillance measures: The QASP Sections referred to here are incorrect. A.9 should be B.14. B.4 should be B.1.3 and B.14.	EPA agrees that this correction is appropriate and consistent with the rest of the Plan. The suggested change is incorporated into the final permits.

#	Commenter	Comment Text	EPA Response
28	FutureGen	*Page C6* *The acronym "WAPMMS" (well annulus pressure maintenance and monitoring system) should be replaced with* APS (annulus pressurization system) throughout the permit documents.	This requested change is only a terminology clarification. The suggested change is incorporated into the final permits.
29	FutureGen	*Page C6* *In the section titled Continuous Recording of Injection Mass Flow Rate* *Change the following sentence:* *The flow transmitters will each be connected to a remote terminal unit (RTU) on the flow meter skid. The RTU will communicate with the Control Center through the well annular pressure maintenance and monitoring system (WAPMMS) programmable logic controller (PLC) located at the injection well site.* *To read:* The flow meters will be connected to the main CO_2 storage site SCADA system for continuous monitoring and control of the CO_2 injection rate into each well.	EPA agrees that this clarification provides helpful detail, and is appropriate and consistent with the rest of the Plan. The suggested change is incorporated into the final permits.
30	FutureGen	*Page C6* *In the section titled Continuous Recording of Injection Pressure* *Change the last sentence to read*: The transmitter will be connected to the APS PLC located in the Control Building adjacent to the injection well pad.	EPA agrees that this clarification provides helpful detail, and is appropriate and consistent with the rest of the Plan. The suggested change is incorporated into the final permits.

#	Commenter	Comment Text	EPA Response
31	FutureGen	*Page C6* *In the section titled "**Continuous Recording of Injection Temperature**"* *The PLC will be located in the Control Building adjacent to the injection well pad.* *In the section's 2nd paragraph, change the sentence:* *Mechanical strain gauges and thermocouple wires will be the primary monitoring devices for P/T and will be frequently recalibrated (initially on a quarterly basis; any changes to this frequency will be in consultation with the UIC Director).* *to read:* Instruments for measuring surface injection pressure and temperature will be calibrated initially before commencing injection and recalibrated periodically as needed based on regular (e.g., quarterly) instrument checks. *Paragraphs 3 and 4 should be combined and revised as shown below and a new section header titled "Bottomhole Pressure and Temperature" should be inserted after the second paragraph in this section.* Bottomhole Pressure and Temperature An optical or electronic P/T gauge will be installed on the outside of the tubing string, approximately 30 ft above the packer, and ported into the tubing to continuously measure CO_2 injection P/T inside the tubing at this depth. The downhole sensor will be the point of compliance for maintaining injection pressure below 90% of formation fracture pressure. If the downhole probe goes out between scheduled maintenance events then the surface pressure limitation noted in Attachment A of this	EPA agrees that the clarification suggested for the section titled "Continuous Recording of Injection Temperature," provides helpful detail. The suggested change has been incorporated into the final permits with additional changes to provide further clarity. It now states "Instruments for measuring surface injection pressure and temperature will be calibrated initially before commencing injection and recalibrated periodically as needed based on regular (e.g., quarterly) instrument checks. **These instruments for measuring surface injection pressure and temperature will be recalibrated annually.** [emphasis added] Regarding the second part of this comment, EPA agrees that putting this under a new section header is appropriate. However, EPA does not agree to the suggested revision of the two paragraphs that will appear beneath the heading. Revising the paragraphs to the commenter's suggested text would remove reference to the surface instrumentation/monitoring points. EPA also has corrected the paragraph to provide consistency with other portions of the permits by removing the following sentence from the permits: "The CO2Flow program developed by the Pacific Northwest National Laboratory estimates pressure and fluid state evolution as CO_2 moves through pipelines and injection tubing and will be used to determine an equivalent downhole pressure." While use of the CO2Flow program for calculating surface pressures might be considered in the future; EPA would need to verify the accuracy of its calculations while injection was taking place by comparing the calculations with measurements taken from calibrated downhole and surface gauges. EPA will also remove the CO2Flow text regarding the same from section A.6.1 of the QASP that stated "If the downhole probe fails between scheduled maintenance events, then the surface pressure measurement coupled with the analytical code, CO2Flow, will be used to determine permit compliance downhole at the injection elevation. The CO2Flow program estimates pressure and fluid state evolution as CO_2 moves

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		permit will be used as a backup until the downhole probe/gauge is repaired or replaced. The CO2Flow program developed by the Pacific Northwest National Laboratory estimates pressure and fluid state evolution as CO_2 moves through pipelines and injection tubing and will be used to determine an equivalent surface pressure that will not cause bottomhole pressure to exceed 90% of formation fracture pressure.	through pipelines and injection tubing and will be used to determine an equivalent downhole pressure."
32	CSC	**Provision:** M(3) **Text of Draft Permit: 3. Continuous Monitoring –** The permittee shall maintain continuous monitoring devices and use them to monitor injection pressure, flow rate, volume, the pressure on the annulus between the tubing and the long string of casing, annulus fluid level, and temperature. This monitoring shall be performed as described in the Testing and Monitoring Plan to meet the requirements of 40 CFR 146.90(b). **Comment:** This is excellent because it properly recognizes that performing in accordance with the Testing and Monitoring Plan meets the requirements of 40 CFR 146.90(b).	The permit language has not been modified based upon this comment.
33	FutureGen	*Page C7* *In line 2, surface pressure "limation" should be changed to surface pressure* limitation.	EPA agrees that this correction is appropriate. The suggested change is incorporated into the final permits.

#	Commenter	Comment Text	EPA Response
34	CSC	**Provision:** M(4) **Text of Draft Permit:** 4. **Corrosion Monitoring** – The permittee shall perform corrosion monitoring of the well materials for loss of mass, thickness, cracking, pitting, and other signs of corrosion on a quarterly basis using the procedures described in the Testing and Monitoring Plan and in accordance with 40 CFR 146.90(c) to ensure that the well components meet the minimum standards for material strength and performance set forth in 40 CFR 146.86(b). **Proposed Revision:** 4. **Corrosion Monitoring** – The permittee shall perform corrosion monitoring of the well materials for loss of mass, thickness, cracking, pitting, and other signs of corrosion on a quarterly basis using the procedures described in the Testing and Monitoring Plan ~~and in accordance with 40 CFR 146.90(c)~~ to ensure that the well components meet the minimum standards for material strength and performance set forth in 40 CFR 146.86(b). **Comment:** Once again, this condition is written in a way that suggests that compliance requires something beyond following the approved corrosion monitoring process, which is not the case.	As a general matter the UIC permit is intended as a roadmap to identify the relevant requirements and obligations of FutureGen. The relevant regulatory provisions are lengthier and more detailed, so that the permit language may summarize those requirements and provide reference to the regulatory details rather than copying them in their entirety. This makes the permit more reader-friendly and easy to follow. Incorporating the additional details by reference does not create any conflict or confusion between the terms of the permit and the regulations In addition, 40 C.F.R. §146.90 makes it clear that FutureGen is responsible to comply with both the permit requirement and the regulatory requirement upon which it is based. For Class VI wells, EPA anticipates that the testing and monitoring plan will be regularly reviewed and revised as required by 40 C.F.R. §146.90(j) and Section M of the Permits. Reference to the relevant regulatory provisions provides clarity on the standards against which any revisions will be judged. Therefore, EPA will not make any changes to the permits based on this comment.

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35	FutureGen	*Page C8* *Change the table caption:* *"Table 3. Wireline Tools for Monitoring Corrosion of Casing and Tubing."* *To read:* Table 3. Example Wireline Tools for Monitoring Corrosion of Casing and Tubing.	The commenter has not provided any basis or explanation for this change. The table lists identified tools that may be used. They are not examples. Therefore, EPA will not make any changes to the permits based on this comment.
36	FutureGen	*Page C7* *In section* ***Corrosion Monitoring*** *In the 4th paragraph in this section, change the following sentence:* *" The tools (described in Table 3), which will be used to monitor the condition of well tubing and casing, include:"* *To read:* The types of tools (examples described in Table 3), which may be used to monitor the condition of well tubing and casing, include:	Table 3 lists identified tools that may be used. They are not examples. Because there is flexibility in deciding which tool or tools to use, EPA will change "will" to "may" in the quoted language. EPA will not make any other changes to the permits based on this comment.
37	CSC	**Provision:** M(5) and (6) **Text of Draft Permit:** 5. **Ground Water Quality Monitoring–** The permittee shall monitor ground water quality and geochemical changes above the confining zone(s) that may be a result of carbon dioxide movement through the confining zone(s) or additional identified zones. This monitoring shall be performed for the parameters identified in the Testing and Monitoring Plan at the locations and depths, and at frequencies described in the Testing and Monitoring Plan to meet the requirements of 40 CFR 146.90(d). **Comment**: The language in these conditions succeeds better than other formulations in	Thank you for your comment. The permit language has not been modified based upon this comment.

#	Commenter	Comment Text	EPA Response
		indicating that compliance with the Testing and Monitoring Plan will "meet the requirements" of the respective regulatory provisions. The approach reflected in the Class IH permit provisions used by EPA Region 5 is still preferable to this formulation, but this approach is acceptable.	
38	FutureGen	*Page C12* *In the first sentence, the word techniques should be changed to* requirements*.*	EPA agrees that this correction is appropriate. The suggested change is incorporated into the final permits.
39	FutureGen	*The last sentence on page C10 refers to Table 1 for monitoring well sampling/recording frequencies (i.e., for continuous monitoring data), but Table 1 presents frequency specifications for injection wells only. Tables 6, 7, 13, 14, and 17 also refer back to Table 1.* *Table 1 needs to be modified to address* ***monitoring well*** *sampling/recording frequencies.* *Either a new "*Well Condition*" needs to be added or the second category could be changed to read "*For monitoring wells and Injection wells that are shut-in:*" The planned monitoring well sampling frequency is 10 minutes; this specification is well within the minimum specification for shut-in injection wells. The specification for operating injection wells is not appropriate for monitoring wells since changes would be expected to occur much more slowly. If EPA prefers to create a new "Well Condition" for monitoring wells, then the Alliance recommends a minimum sampling frequency of 30 minutes and a minimum recording frequency of 2 hours.*	EPA agrees that this correction is appropriate. Table 1 was revised to reflect sampling and recording frequencies for all monitoring well categories, specifically to show the continuous sampling frequency of every 30 minutes (and recording of data every 2 hours) for temperature and pressure monitoring in: the St. Peter monitoring well; the two ACZ wells in the Ironton; and the two SLR wells in the Mt. Simon.

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40	FutureGen	*Page C11* *The following Note should be added to Table 6:* Depth is approximate and may be adjusted based on information obtained when the well is drilled.	The depth of each well, as well as formation depths, are indicated as where the wells are intended to be placed. Since each permit has numerous citations of depths and locations, noting that these are anticipated depths and are therefore subject to change would overly complicate the permits and be potentially confusing. Small deviations identified after construction is completed can be corrected through the minor modification process identified in 40 C.F.R. § 144.41. Therefore, the permit language has not been modified based upon these comments.
41	FutureGen	*Page C12* *The following Note should be added to Table 7:* Depth is approximate and may be adjusted based on information obtained when the well is drilled.	
42	FutureGen	*Please append the following paragraph to page 12:* The relative benefit of each analytical measurement will be evaluated throughout the design and initial injection testing phase of the project to identify the analytes best suited to meeting project monitoring objectives under site-specific conditions. If some analytical measurements are shown to be of limited use, they will be removed from the analyte list and not carried forward through the operational phases of the project. This selection process will consider the uniqueness and signature strength of each potential analyte and whether their characteristics provide for a high-value leak-detection capability. Any modification to the parameter list in Table 8 will be made in consultation with the UIC Program Director.	This is also EPA's understanding, and the suggested language was added to the permits to provide clarification. As a further clarification, the following sentence will be added as well: "Modifications to the parameter list will also require modifications to the permits through the process described in 40 C.F.R. Part 144." EPA will consider in the future the merits of modifying the sampling targets on a case-by-case basis.

#	Commenter	Comment Text	EPA Response
43	NRDC	*Area of Review ("AOR") and Corrective Action* 1. As noted in the permit application, the Cambrian Ironton-Galesville Sandstone is a groundwater aquifer, and serves as an underground source of drinking water ("USDW") in Northern Illinois. The Ironton-Galesville lies directly above the primary confining zone at the injection well site. The Applicant estimates based on a groundwater salinity map and calculations from wireline logs that the salinity in the Ironton-Galesville at the proposed injection well site is approximately 15,000 mg/L, however no fluid samples have been collected and there is no published data on the salinity at the site. We support the Applicant's proposal to take three baseline samples in each of the two above confining zone ("ACZ") wells, and urge that the final permit contain obligations to measure the salinity in the aquifer in a reliable and accurate manner. If the results of the baseline fluid sampling program in the Ironton-Galesville in the ACZ monitoring wells reveal lower salinity than expected, EPA must require Applicant to discuss what implications this may have for the suitability of the primary confining zone to protect the Ironton-Galesville, and to make any necessary changes accordingly to the AOR, corrective action plan, the testing and monitoring plan, and any other relevant plans and requirements.	Future information obtained after drilling and sampling of various formations, including the Ironton-Galesville, will be evaluated by EPA at that time. Additional site specific information will inform the model and may require additional modeling. Under the Permits (see Parts G and M), the AoR, Corrective Action, and the Monitoring Program will be regularly reviewed, and revised as appropriate. A review and re-evaluation is required before injection begins under Part Q of the permits. Those reviews will consider the factors identified in this comment, and other considerations. Any modifications made as part of those reviews will go through the permit modification process described in 40 C.F.R. Part 144. Therefore, EPA will not make any changes to the permits based on this comment.

#	Commenter	Comment Text	EPA Response
44	NRDC	*Testing and Monitoring* 1. The testing and monitoring plan includes mechanical integrity tests ("MITs") of monitoring wells every five years. As noted previously, improperly constructed or maintained wells are the most likely pathway by which injected fluids may reach USDWs. As stated in the permit application, "This positive head difference suggests a natural vertical flow potential from the Mount Simon to the overlying St. Peter if hydraulic communication is afforded (*e.g.,* an open communicative well)." Although the monitoring wells are constructed with CO_2-resistant materials and will have continuous monitoring of pressure, temperature, and specific conductance, more frequent proactive MITs can help identify and remediate mechanical integrity issues before they become problematic. <u>EPA should consider requiring more frequent MITs in the monitoring wells that penetrate the injection or confining zone, particularly once the CO_2 plume reaches these wells</u>.	The UIC regulations do not require that monitoring wells demonstrate mechanical integrity since they are not injection wells. However, demonstrations of mechanical integrity in these wells are valuable for at least two reasons: to ensure that the wells are not acting as leakage pathways; and to ensure that the monitoring is of the targeted zone. Given that these monitored wells are being observed and evaluated for unusual changes in monitored parameters, EPA's five year mechanical integrity schedule is appropriate. Therefore, the permit language has not been modified based upon this comment.
45	CSC	Provision: M(5) and (6) Text of Draft Permit: 6. **External Mechanical Integrity Testing** – The permittee shall demonstrate external mechanical integrity as described in the Testing and Monitoring Plan and Section L of this permit to meet the requirements of 40 CFR 146.90(e). **Comment:** The language in these conditions succeeds better than other formulations in indicating that compliance with the Testing and Monitoring Plan will "meet the requirements" of	Thank you for your comment. The permit language has not been modified based upon this comment.

#	Commenter	Comment Text	EPA Response
		the respective regulatory provisions. The approach reflected in the Class IH permit provisions used by EPA Region 5 is still preferable to this formulation, but this approach is acceptable.	
46	FutureGen	*Page C16* *The section titled **External Mechanical Integrity Testing** discusses both external MIT and internal MIT, so the section heading should be changed to reflect this or else create a new section for Internal Mechanical Integrity Testing and move related text to this section.*	EPA agrees with this comment and corrected the section heading by deleting the word "External." This suggested change is incorporated into the final permits.
47	FutureGen	Page C16 Delete the last sentence of 3rd paragraph: *"A preliminary schedule for the annual well maintenance event is provided in Table 10."*	Table 10 is provided for informational purposes and is not, in itself, a permit requirement. Therefore, the permit language has not been modified based upon this comment.
48	FutureGen	*Page C16* *The exact maintenance activities and their sequence and duration should not be a permit requirement.* *Delete Table 10.*	
49	FutureGen	*Page C17, Par 2* *Since the monitoring wells will not be used to inject fluids, there is no valid reason to conduct internal mechanical integrity testing of the monitoring wells. Furthermore, only the SLR (single-level reservoir [SLR] monitoring wells will have tubing and packer installed.*	Mechanical integrity of monitoring wells is essential to ensure that the monitoring wells themselves do not serve as conduits for leakage. EPA will retain the requirement that all monitoring wells must demonstrate protective construction by demonstrating integrity of the tubulars and cement after well construction. However, wells that do not reach the Eau Claire formation will not be required to continually demonstrate

#	Commenter	Comment Text	EPA Response
50	FutureGen	*Page C17, Par 2* *<u>This paragraph needs to be reworded to clarify the difference between SLR and ACZ monitoring wells.</u>* *<u>The Alliance requests the following wording of this paragraph:</u>* External mechanical integrity tests will be conducted for monitoring wells that penetrate the primary confining zone, once after construction and every five years until they are plugged. No well maintenance is anticipated for the ACZ and USDW monitoring wells during the 20-year operational (i.e., injection) period or the subsequent post injection monitoring period. Unlike the in-reservoir monitoring wells, these wells do not penetrate the primary confining zone; therefore, conducting external MITs to look for evidence of upward CO_2 or brine migration out of the CO_2 storage zone is not warranted.	mechanical integrity – tests on these monitoring wells will only be required if a potential problem is detected. Based on these comments, the language in the final permits is modified to read: "All monitoring wells required under this permit will establish and maintain mechanical integrity. After construction, each monitoring well must establish internal and external mechanical integrity. Wells that do not have a tubing and packer shall perform a pressure test on the casing. Each monitoring well that reaches the Eau Claire (the confining zone) shall establish mechanical integrity after construction, shall conduct an Internal mechanical integrity test at least every five years or continuously monitor the annulus, and shall conduct an External mechanical integrity test at least every five years. The testing of monitoring wells that reach the Eau Claire shall continue until they are plugged."
51	FutureGen	*Page C17* *The activities listed in Table 11 (other than PNC logging) are not required and will only be performed if necessary to maintain well integrity and performance.* *<u>Delete the paragraph 3 that begins "It is also anticipated that…."</u>*	Table 11 and its descriptive paragraph are provided for informational purposes and are not, in themselves, permit requirements. Therefore, the permit language has not been modified based upon these comments.
52	FutureGen	*Page C17* *The activities listed in Table 11 (other than PNC logging) are not required and will only be performed if necessary to maintain well integrity and performance.* *<u>Delete Table 11.</u>*	

#	Commenter	Comment Text	EPA Response
53	FutureGen	*Page C18* *Since fall-off testing is required once every 5 years, the gauges used for the purpose of fall-off testing should be calibrated per the method described prior to conducting the fall-off test rather than annually.* *In lines 5 and 6 of paragraph 2, revise the following sentence:* *Pressure gauges that are used for the purpose of the fall-off test will be calibrated on an annual basis with current annual calibration certificates provided with test results to EPA.* *To read:* Pressure gauges that are used for the purpose of the fall-off test will be calibrated prior to conducting the fall-off test with current calibration certificates provided with test results to EPA.	The intent of requiring gauge calibration is to ensure that the gauge used for a fall-off test has been calibrated no more than one year prior to its use for the fall-off test. EPA clarified the language identified by the commenter to read: "Pressure gauges that are used for the purpose of the fall-off test shall have been calibrated no more than one year prior to the date of the fall-off test with current calibration certificates provided with the test results to EPA." This suggested change is incorporated into the Final Permits.
54	Betty Niemann	The EIS 460D document makes the following statements: "Other planned monitoring may include 10 to 15 permanent surface monitoring stations for measuring injection related ground surface deformation by interferometric synthetic aperature radar, gravity surveys, tilt meters, and differential positioning systems…Surface changes for CO_2 storage would be measured in millimeters and, if present, would not be visible to the human eye." xxiii In other words, FutureGen 2.0 will be using InSARxxiv xxv xxvi- interferometric synthetic aperature radar as part of its MVA. There is no discussion of the impact this might have on tile and drainage systems or what happens if there is a development of sink holes/subsidence.	The proposed ground deformation monitoring is expected to have no effect on tile and drainage systems. Evaluation of the site geology by both FutureGen and EPA, and further supported by the historical absence of any occurrence, indicate that sink hole and/or subsidence is unlikely to occur. Therefore, the permit language has not been modified based upon this comment.

#	Commenter	Comment Text	EPA Response
55	CSC	**Provision:** P(1) **Text of Draft Permit:** 1. The Emergency and Remedial Response Plan describes actions the permittee must take to address movement of the injection or formation fluids that may cause an endangerment to a USDW during construction, operation, and post-injection site care periods. The permittee shall maintain and comply with the approved Emergency and Remedial Response Plan (Attachment F of this permit), which is an enforceable condition of this permit, and with 40 CFR 146.94. **Proposed Revision:** 1. The Emergency and Remedial Response Plan describes actions the permittee must take to address movement of the injection or formation fluids that may cause an endangerment to a USDW during construction, operation, and post- injection site care periods. The permittee shall maintain and comply with the approved Emergency and Remedial Response Plan (Attachment F of this permit), which is an enforceable condition of this permit~~, and with 40 CFR 146.94~~. **Comment:** Once again, this condition is written in a way that suggests that compliance requires something beyond following the approved Emergency and Remedial Response Plan, which is not the case. The revision recommended here should be adopted and incorporated in the final permit.	As a general matter the UIC permit is intended as a roadmap to identify the relevant requirements and obligations of FutureGen. The relevant regulatory provisions are lengthier and more detailed, so that the permit language may summarize those requirements and provide reference to the regulatory details rather than copying them in their entirety. This makes the permit more reader-friendly and easy to follow. Incorporating the additional details by reference does not create any conflict or confusion between the terms of the permit and the regulations. In addition, 40 C.F.R. §146.94(a) makes it clear that FutureGen is responsible to comply with both the permit requirement and the regulatory requirement upon which it is based. For Class VI wells, EPA anticipates that emergency and remedial response plan will be regularly reviewed and revised as required by 40 C.F.R. §146.94(d) and Section P of the Permits. Reference to the relevant regulatory provisions provides clarity on the standards against which any revisions will be judged. Therefore, EPA will not make any changes to the permits based on this comment.

#	Commenter	Comment Text	EPA Response
56	CSC	**Provision:** M(8) **Text of Draft Permit:** (a) The permittee shall use direct methods to track the position of the carbon dioxide plume and the pressure front in the injection zone as described in the Testing and Monitoring Plan and to meet the requirements of 40 CFR 146.90(g)(1). (b) The permittee shall use indirect methods to track the position of the carbon dioxide plume and pressure front as described in the Testing and Monitoring Plan and to meet the requirements of 40 CFR 146.90(g)(2). **Proposed Revision:** (a) The permittee shall use direct methods to track the position of the carbon dioxide plume and the pressure front in the injection zone as described in the Testing and Monitoring Plan ~~and~~ to meet the requirements of 40 CFR 146.90(g)(1). (b) The permittee shall use indirect methods to track the position of the carbon dioxide plume and pressure front as described in the Testing and Monitoring Plan ~~and~~ to meet the requirements of 40 CFR 146.90(g)(2). **Comment:** By issuing the permit, EPA has determined that implementing the Testing and Monitoring Plan does meet the applicable requirements.	As a general matter the UIC permit is intended as a roadmap to identify the relevant requirements and obligations of FutureGen. The relevant regulatory provisions are lengthier and more detailed, so that the permit language may summarize those requirements and provide reference to the regulatory details rather than copying them in their entirety. This makes the permit more reader-friendly and easy to follow. Incorporating the additional details by reference does not create any conflict or confusion between the terms of the permit and the regulations In addition, 40 C.F.R. §146.90 makes it clear that FutureGen is responsible to comply with both the permit requirement and the regulatory requirement upon which it is based. For Class VI wells, EPA anticipates that the testing and monitoring plan will be regularly reviewed and revised as required by 40 C.F.R. §146.90(j) and Section M of the Permits. Reference to the relevant regulatory provisions provides clarity on the standards against which any revisions will be judged. Therefore, EPA will not make any changes to the permits based on this comment.
57	FutureGen	*Page C20* *The following Note should be added to Table 12:* All depths are approximate and may be adjusted based on information obtained when the well is drilled.	

#	Commenter	Comment Text	EPA Response
58	FutureGen	*Page C21* *The following Note should be added to Table 13:* All depths are approximate and may be adjusted based on information obtained when the well is drilled.	The depth of each well, as well as formation depths, are indicated as where the wells are intended to be placed. Since each permit has numerous citations of depths and locations, noting that these are anticipated depths and are therefore subject to change would overly complicate the permits and be potentially confusing. Small deviations identified after construction is completed can be corrected through the minor modification process identified in 40 C.F.R. § 144.41. Therefore, the permit language has not been modified based upon these comments.
59	FutureGen	*Page C22* *The following Note should be added to Table 14:* Depth is approximate and may be adjusted based on information obtained when the well is drilled.	
60	FutureGen	*Please append the following paragraph to page 23:* The relative benefit of each analytical measurement will be evaluated throughout the design and initial injection testing phase of the project to identify the analytes best suited to meeting project monitoring objectives under site-specific conditions. If some analytical measurements are shown to be of limited use, they will be removed from the analyte list and not carried forward through the operational phases of the project. This selection process will consider the uniqueness and signature strength of each potential analyte and whether their characteristics provide for a high-value leak-detection capability. Any modification to the parameter list in Table 8 will be made in consultation with the UIC Program Director.	This is also EPA's understanding, and the suggested language was added to the permits to provide clarification. As a further clarification, the following sentence was added as well: "Modifications to the parameter list will also require modifications to the permits through the process described in 40 C.F.R. Part 144." EPA will consider in the future the merits of modifying the sampling targets on a case-by-case basis.
61	FutureGen	*Page C28* *Table 1 lists injection well sampling frequencies and is not relevant to the indirect methodologies*	The reference to Table 1 is relevant due to the requirement for continuous monitoring in certain parts of Table 17. The permit language has not been modified based upon this comment.

#	Commenter	Comment Text	EPA Response
		presented in Table 17. *The Note referring to Table 1 and the related sentence in the text just prior to this table should be removed.*	
62	FutureGen	*Page C20* *In section **Direct Pressure Monitoring**,* *Revise the 4th bullet point:* *Gauges will be installed above any packers so they can be removed if necessary for recalibration by removing the tubing string. Redundant gauges may be run on the same cable to provide confirmation of downhole P/T.* *To read:* P/T gauges will be installed in the injection wells above any packers so they can be removed if necessary by removing the tubing string without pulling the packer. P/T gauges will be installed either above or below the packer in the two SLR monitoring wells that will have tubing and packer.	EPA finds that this suggested clarification does not change the requirement to monitor pressure and temperature downhole in the wells, it only specifies whether the gauge is above or below the packer. Based on this comment, the language in the final permits is modified to read: "P/T gauges will be installed in the injection wells above any packers so they can be removed if necessary by removing the tubing string without pulling the packer. P/T gauges will be installed either above or below the packer in the SLR monitoring wells that will have tubing and packer. Redundant gauges may be run on the same cable to provide confirmation of downhole P/T."
63	FutureGen	*Page C21* *The paragraph starting with "Injection P/T will also be continuously measured …" is not relevant to direct pressure-front monitoring. Delete that paragraph.*	EPA finds the language in the paragraph still applicable since the injection wells will monitor pressure and temperature. However, the last sentence of this section "*Because the surface instruments can be more readily accessed and maintained than the bottomhole gauge, they will be used to control injection operations and trigger shutdowns."* has been removed because it suggests that the downhole gauge is not the primary point of compliance.
64	FutureGen	*Page C23* *In the last sentence of paragraph 2, the word techniques should be changed to* requirements.	EPA agrees that this clarification is appropriate, so the requested change was made.
65	FutureGen	*Page C24*	EPA agrees that this clarification is appropriate, so the requested change was made.

#	Commenter	Comment Text	EPA Response
		The Table 15 caption should be changed to: Table 15. Aqueous Sampling Requirements for Target Injection Zone Parameters.	
66	FutureGen	*Page C28* *2nd bullet point should be:* PNC logging for determination of reservoir CO_2 saturation;	EPA agrees that this correction is appropriate, so the requested change was made.
67	Robert J. Finley	Further, I particularly commend the monitoring in the Ironton-Galesville Sandstone, the first permeable and porous zone above the primary seal, which would give significant advance warning should any leakage occur through the primary sealing lithologies. This type of subsurface monitoring has become a key standard at other demonstration sites, and would show any impacts long before near-surface potable ground water would be affected.	Thank you for your comment.

SECTION 8. PLUGGING AND POST-INJECTION SITE CARE COMMENTS

#	Commenter	Comment Text	EPA Response
1	FutureGen	*The CO_2 injection well coordinates in EPA's draft FutureGen UIC Class VI Permit Cover Letter and Attachments for each of the injection wells is the injection point location described in FG-RPT-017, Revision 1 (May 2013). These same coordinates are used for all of the 4 injection wells throughout the FutureGen permitting documentation. Because the currently planned CO_2 injection wells' locations and their mid-point location are to the NW of the stated location, the Alliance suggests the following wording and footnote throughout the permitting documentation for the injection well locations:* *(If using one set of coordinates for **all** CO_2 injection wells' permit documentation…)* **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80104°N and 90.07517°W [1] Actual injection well location will be surveyed after injection well construction. *(If using the planned coordinates of the **individual** CO_2 injection wells in each well's permit documentation…)* (Well#1) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80111°N and 90.07491°W [1] Actual injection well location will be surveyed after injection well construction. (Well#2) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80097°N and 90.07491°W [1] Actual injection well location will be surveyed	EPA has revised the first page of each permit and the first page of each permit attachment to reflect the accurate proposed location for each of the wells. To the extent that small deviations to the planned locations are identified after the wells are constructed and surveyed, those corrections can be made through the minor modification process identified in 40 C.F.R. § 144.41.

#	Commenter	Comment Text	EPA Response
		after injection well construction. (Well#3) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80097°N and 90.07544°W [1] Actual injection well location will be surveyed after injection well construction. (Well#4) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80111°N and 90.07544°W [1] Actual injection well location will be surveyed after injection well construction.	
2	FutureGen	*Page D3 to D6* *Is there a reason why there are the four PAP instead of one?*	Each permit's Attachment D has been corrected to show only the plugging and abandonment plan for that particular injection well. Attachment D is consequently shortened from six to three pages for each permit.
3	FutureGen	*Page 25* *Reference to O(5)(c) is not consistent with permit organization.*	The references to *Section O(5)(c)* on page 25 of the permits have been corrected to *Section O(6)(d)*.
4	FutureGen	*Page 25* *Reference to O(5)(b) is not consistent with permit organization.*	The references to *Section O(5)(b)* on page 25 of the permits have been corrected to *Section O(6)(b)*.

#	Commenter	Comment Text	EPA Response
5	CSC	**Provision:** O(6)(b) **Text of Draft Permit: (**b) The permittee shall monitor the site following the cessation of injection to show the position of the carbon dioxide plume and pressure front and demonstrate that USDWs are not being endangered, as specified in the Post-Injection Site Care and Site Closure Plan and in 40 CFR 146.90, and 40 CFR 146.93, including: **Proposed Revision: (**b) The permittee shall monitor the site following the cessation of injection to show the position of the carbon dioxide plume and pressure front and demonstrate that USDWs are not being endangered, as specified in the Post-Injection Site Care and Site Closure Plan ~~and in 40 CFR 146.90, and 40 CFR 146.93~~, including: **Comment:** By issuing the permit, EPA has determined that implementing the Post-Injection Site Care and Site Closure Plan does meet the applicable requirements.	As a general matter the UIC permit is intended as a roadmap to identify the relevant requirements and obligations of FutureGen. The relevant regulatory provisions for testing and monitoring, and for the PISC, are relatively lengthy and technical, so that the permit language may summarize those requirements and provide reference to the regulatory details rather than copying them in their entirety. This makes the permit more reader-friendly and easy to follow. Incorporating the additional details by reference does not create any conflict or confusion between the terms of the permit and the regulations. In addition, 40 C.F.R. §146.93(a) makes it clear that FutureGen is responsible to comply with both the permit requirement and the regulatory requirement upon which it is based. For Class VI wells, EPA anticipates that the PISC Plan may require revisions. See 75 Fed. Reg. 77266 (Dec. 10, 2010) and Section H of the Permits. Reference to the relevant regulatory provisions provides clarity on the standards against which any revisions will be judged. Therefore, EPA will not make the suggested changes to the permits.
6	CSC	**Provision:** O(6)(b)(v) **Text of Draft Permit:** (v) The permittee shall continue to conduct post-injection site monitoring for at least 50 years or for the duration of any alternative timeframe approved pursuant to 40 CFR 146.93(c) and the Post-Injection Site Care and Site Closure Plan. **References:** 146.93(b) (2) If the owner or operator can demonstrate to the satisfaction of the Director before 50 years or prior to the end of the approved alternative timeframe based on monitoring and other site-specific data, that the geologic sequestration project no longer poses an endangerment to USDWs, the Director may	Per 40 C.F.R. § 146.93(a), the owner or operator must submit the post-injection site care and site closure plan as a part of the permit application to be approved by the Director. Among other requirements cited at 40 C.F.R. § 146.93(a)(2), the post-injection site care and site closure plan must include the duration of the post-injection site care timeframe and, if approved by the Director, the demonstration of the alternative post-injection site care timeframe that ensures non-endangerment of USDWs FutureGen did not submit an alternative post-injection timeframe with its permit application. At any time during the life of the geologic sequestration project, the owner or operator may modify and resubmit the post-injection site care and site closure plan for the Director's approval. The language cited by the

#	Commenter	Comment Text	EPA Response
		approve an amendment to the post-injection site care and site closure plan to reduce the frequency of monitoring or may authorize site closure before the end of the 50-year period or prior to the end of the approved alternative timeframe, where he or she has substantial evidence that the geologic sequestration project no longer poses a risk of endangerment to USDWs. **Proposed Revision:** (v) The permittee shall continue to conduct post- injection site monitoring until the Director has authorized site closure. ~~for at least 50 years or for the duration of any alternative timeframe approved pursuant to 40 CFR 146.93(c) and the Post Injection Site Care and Site Closure Plan .~~ **Comment:** There are a number of different scenarios that would allow the permittee to cease post-injection monitoring before 50 years, but all involve obtaining authorization for site closure. Therefore, this wording is sufficient to cover all of those contingencies.	commenter provides information on the process and standards that would apply if FutureGen seeks a change. The post injection site care plans for the four FutureGen permits meet the federal UIC regulations in 40 C.F.R. § 146.93, and there is no basis or need to amend the language of this section of the permits. Therefore, the permit language has not been modified based upon this comment.
7	CSC	**Provision:** O(6)(d) **Text of Draft Permit:** (d) Prior to authorization for site closure, the permittee shall submit to the Director for review and approval, in an electronic format, a demonstration, based on information collected pursuant to Section O(5)(b) of this permit, that the carbon dioxide plume and the associated pressure front do not pose an endangerment to USDWs and that no additional monitoring is needed to ensure that the project does not pose an endangerment to USDWs, as required under 40 CFR 146.93(b)(3). The Director reserves the right to	The references to *Section O(5)(c)* on page 25 of the permits have been corrected to *Section O(6)(d)*. The references to *Section O(5)(b)* on page 25 of the permits have been corrected to *Section O(6)(b)*. As EPA's "Geologic Sequestration of Carbon Dioxide: Underground Injection Control (UIC) Program Class VI Well Project Plan Development Guidance" (Aug. 2012) states at p. 50, [t]he purpose of reviewing the PISC and Site Closure Plan is to consider:

#	Commenter	Comment Text	EPA Response
		amend the post-injection site monitoring requirements (including extend the monitoring period) if the carbon dioxide plume and the associated pressure front have not stabilized or there is a concern that USDWs are being endangered. **References:** 146.93(b) (3) Prior to authorization for site closure, the owner or operator must submit to the Director for review and approval a demonstration, based on monitoring and other site-specific data, that no additional monitoring is needed to ensure that the geologic sequestration project does not pose an endangerment to USDWs. **Proposed Revision:** (d) Prior to authorization for site closure, the permittee shall submit to the Director for review and approval, in an electronic format, a demonstration, based on information collected pursuant to Section O(5)(b) of this permit, that the carbon dioxide plume and the associated pressure front do not pose an endangerment to USDWs and that no additional monitoring is needed to ensure that the project does not pose an endangerment to USDWs, as required under 40 CFR 146.93(b)(3). The Director reserves the right to amend the post-injection site monitoring requirements (including extend the monitoring period) if ~~the carbon dioxide plume and the associated pressure front have not stabilized or~~ there is a concern that USDWs are being endangered. **Comment:** There is no requirement for the carbon dioxide plume and the associated pressure front to "stabilize", whatever that means. Indeed, the word	• Whether post-injection site care is adequate to ensure that USDWs are protected from endangerment from carbon dioxide injection activities (or provide early warning of potential endangerment); • Whether changes to monitoring are needed, e.g., if the types of monitoring can be reduced as data indicate post-injection stabilization of the carbon dioxide plume and pressure front; and • Whether appropriate amounts and types of data are being collected to support an eventual non-endangerment demonstration, and whether making this demonstration before the required fifty (50) year PISC timeframe is appropriate. The UIC Program Director may determine whether a shorter or longer PISC timeframe is necessary. Since the concern about the "stabilization" of the CO_2 plume and/or injection pressure front in the guidance is based upon the protection of USDWs, EPA made the change suggested by the commenter to reflect the regulatory language more precisely. It should be clear under EPA's guidance, however, that plume and pressure front stability will be factors EPA will consider in evaluating whether there is a risk to USDWs.

#	Commenter	Comment Text	EPA Response
		stabilize does not appear in any form in the final Class VI regulations and is unnecessary here.	
8	CSC	**Provision:** O(6)(f) **Text of Draft Permit:** (f) After the Director has authorized site closure, the permittee shall plug all monitoring wells as specified in Attachment E of this permit – the Post-Injection Site Care and Site Closure Plan – in a manner which will not allow movement of injection or formation fluids that endangers a USDW. The permittee shall also restore the site to its pre- injection condition. **Proposed Revision:** (f) After the Director has authorized site closure, the permittee shall plug all monitoring wells as specified in Attachment E of this permit – the Post-Injection Site Care and Site Closure Plan – in a manner which will not allow movement of injection or formation fluids that endangers a USDW. ~~The permittee shall also restore the site to its pre-injection condition.~~ **Comment:** The UIC regulations do not include a requirement for site restoration.	Good stewardship of the facility at the time of closure is a logical extension of the closure process. As EPA's "Geologic Sequestration of Carbon Dioxide: Underground Injection Control (UIC) Program Class VI Well Project Plan Development Guidance" (Aug. 2012) states at p. 47: "EPA recommends that owners or operators also describe in their PISC and Site Closure Plan how they plan to close the site following the conclusion of the PISC period. Site closure activities may include: plugging all monitoring wells, removing all surface equipment, and restoring the site to its prior condition (e.g., planting vegetation)." The guidance also states on p. D-6 that the template for a PISC and Site Closure Plan, "Describe plans for removing all surface equipment and restoring vegetation." In EPA's April 2013, "Draft Underground Injection Control (UIC) Program Guidance on Class VI Well Plugging, Post-Injection Site Care, and Site Closure, this same concepts are reiterated at p. 47, p. D-4 and at p. G-2 that a template for a site closure report "Include a description of completed site restoration activities such as removing all surface equipment and restoring vegetation (or status, as appropriate)." In the Post-Injection Site Care (PISC) Plan that FutureGen submitted, they state that the site will be restored to its pre-injection condition. The PISC plans are part of the final permits and are therefore enforceable

#	Commenter	Comment Text	EPA Response
			conditions. Retaining the language is consistent with the permit condition in the PISC Plan. Therefore, the permit language has not been modified based upon this comment.
9	FutureGen	*The CO_2 injection well coordinates in EPA's draft FutureGen UIC Class VI Permit Cover Letter and Attachments for each of the injection wells is the injection point location described in FG-RPT-017, Revision 1 (May 2013). These same coordinates are used for all of the 4 injection wells throughout the FutureGen permitting documentation. Because the currently planned CO_2 injection wells' locations and their mid-point location are to the NW of the stated location, the Alliance suggests the following wording and footnote throughout the permitting documentation for the injection well locations:* *(If using one set of coordinates for **all** CO_2 injection wells' permit documentation…)* **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80104°N and 90.07517°W [1] Actual injection well location will be surveyed after injection well construction. *(If using the planned coordinates of the **individual** CO_2 injection wells in each well's permit documentation…)* (Well#1) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80111°N and 90.07491°W [1] Actual injection well location will be surveyed after injection well construction. (Well#2)	EPA has revised the first page of each permit and the first page of each permit attachment to reflect the accurate proposed location for each of the wells. To the extent that small deviations to the planned locations are identified after the wells are constructed and surveyed, those corrections can be made through the minor modification process identified in 40 C.F.R. § 144.41.

#	Commenter	Comment Text	EPA Response
		Location of Injection Well[1]: Morgan County, IL; 26-16N-9W; 39.80097°N and 90.07491°W [1] Actual injection well location will be surveyed after injection well construction. (Well#3) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80097°N and 90.07544°W [1] Actual injection well location will be surveyed after injection well construction. (Well#4) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80111°N and 90.07544°W [1] Actual injection well location will be surveyed after injection well construction.	
10	FutureGen	*The CO_2 injection well coordinates in EPA's draft FutureGen UIC Class VI Permit Cover Letter and Attachments for each of the injection wells is the injection point location described in FG-RPT-017, Revision 1 (May 2013). These same coordinates are used for all of the 4 injection wells throughout the FutureGen permitting documentation. Because the currently planned CO_2 injection wells' locations and their mid-point location are to the NW of the stated location, the Alliance suggests the following wording and footnote throughout the permitting documentation for the injection well locations:* *(If using one set of coordinates for **all** CO_2 injection wells' permit documentation…)* **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80104°N and 90.07517°W [1] Actual injection well location will be surveyed after injection well construction. *(If using the planned coordinates of the **individual***	EPA has revised the first page of each permit and the first page of each permit attachment to reflect the accurate proposed location for each of the wells. To the extent that small deviations to the planned locations are identified after the wells are constructed and surveyed, those corrections can be made through the minor modification process identified in 40 C.F.R. § 144.41.

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		CO_2 injection wells in each well's permit documentation…) (Well#1) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80111°N and 90.07491°W [1] Actual injection well location will be surveyed after injection well construction. (Well#2) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80097°N and 90.07491°W [1] Actual injection well location will be surveyed after injection well construction. (Well#3) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80097°N and 90.07544°W [1] Actual injection well location will be surveyed after injection well construction. (Well#4) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80111°N and 90.07544°W [1] Actual injection well location will be surveyed after injection well construction.	
11	FutureGen	*Page E1, Par. 2nd from bottom* *The maximum injection is limited by the 90% fracture pressure, which is dependent on depth below ground surface. The limit of 2,252 psi was calculated for the depth of 3,850 ft bgs. After injection well construction, the depth of the injection point may not be exactly at 3,850 ft bgs. Hence, the number 2,252 psi should not be used. A revised version of the last sentence is:* Current permit limitations will require the pressure at the injection point not to exceed 90% of the	Establishing a maximum injection pressure (MIP) permit condition is a pivotal part of EPA's permitting process. EPA's calculation of MIP uses conservative values to prevent formations from fracturing. This assures compliance with the regulatory standard in 40 C.F.R. § 146.88(a) and protection of USDWs. EPA limits maximum injection pressure (MIP) by calculating MIP with conservative values. A definitive MIP is a necessary condition in any final permit; however, as additional information becomes available, that calculated value may change. The permitted MIP can be modified by Region 5 to reflect that actual construction specifications, including injection interval depth, through the minor modification process identified in 40 C.F.R. § 144.41.

#	Commenter	Comment Text	EPA Response
		fracture pressure at the injection point depth and measured at this well .	Therefore, the permit language has not been modified based upon this comment.
12	CSC	Section O(6)(b)(v) incorrectly states that "[t]he permittee shall continue to conduct post- injection site monitoring for at least 50 years or for the duration of any alternative timeframe approved pursuant to 40 CFR 146.93(c) and the Post-Injection Site Care and Site Closure Plan." The permittee may discontinue post-injection site monitoring earlier than either of those dates if, pursuant to section 146.93(b)(2) the Director "authorize[s] site closure before the end of the 50- year period or prior to the end of the approved alternative timeframe". A permittee is never subject to an absolute requirement to continue monitoring for at least 50 years, and the permit should not suggest otherwise. Given the potential alternative scenarios for discontinuation of monitoring, it would be more accurate to simply state: "The permittee shall continue to conduct post-injection site monitoring until the Director has authorized site closure."	As described in comment Response #6 above, the post-injection site care and site closure plan must include the duration of the post-injection site care timeframe and, if approved by the Director, the demonstration of the alternative post-injection site care timeframe that ensures non-endangerment of USDWs. FutureGen did not submit an alternative post-injection timeframe with its permit application. At any time during the life of the geologic sequestration project, the owner or operator may modify and resubmit the post-injection site care and site closure plan for the Director's approval. The post injection site care plans for the four FutureGen permits meet the federal UIC regulations in 40 C.F.R. § 146.93, and there is no basis or need to amend the language of this section of the permits. Therefore, the permits were not modified based upon this comment.
13	FutureGen	*Page E30* *The Alliance suggests the following addition to this section:* As indicated in Section O(6)(b)(v) of this permit, the permittee shall continue to conduct post-injection site monitoring for at least 50 years or for the duration of any alternative timeframe approved pursuant to 40 CFR 146.93(c).	EPA has determined that this additional cross-reference is a helpful clarification. Therefore, this suggested change is incorporated into the final permits.

#	Commenter	Comment Text	EPA Response
14	FutureGen	*Page E9, Par. 2* *Groundwater sampling in the surficial aquifer is not planned for the PISC phase of the project, as indicated in Tables 2 and 3.* *The last sentence of paragraph 2 should be removed.*	Inclusion of this sentence in the draft permits was in error. EPA acknowledges that FutureGen had originally proposed to monitor the surficial aquifer during the injection and post-injection periods, but during subsequent documented communications, FutureGen decided not to monitor shallow groundwater wells. FutureGen is not required to monitor the surficial aquifer under the regulations, and EPA finds that the monitoring program contained in the permits is appropriate without the inclusion of shallow groundwater monitoring. The Director may require additional monitoring wells as necessary if the Director determines it is needed for compliance with the permit and with 40 C.F.R. §146.90(d). Under the Permits, the Monitoring Program will be regularly reviewed, and revised as appropriate, as required by 40 C.F.R. §146.90(j) and Section M of the Permits. Thus, the suggested change is incorporated into the final permits.
15	FutureGen	*Groundwater sampling in the surficial aquifer is not planned for the PISC phase of the project, as indicated in Tables 2 and 3. Information on these surficial aquifer wells is provided in the Testing and Monitoring Plan.* *The last paragraph on page 10, related Figure 8 on page 12, and Appendix B should be removed.*	As noted in the response to the above comment #14, FutureGen is not required to monitor the surficial aquifer under the regulations. The last paragraph on page E10 will be changed to "Although monitoring of the shallow surficial aquifer is not required or anticipated during the post-injection period, the network remains available for monitoring activities should the need arise."
16	FutureGen	*Table 2* *The Note at the bottom of this table refers to Table 13 for monitoring well sampling/recording frequencies (i.e., for continuous monitoring data) but Table 13 presents frequency specifications for injection wells only. Tables 4, 5, 8, and 9 contain this same footnote and Table 13 is referred to in several other places in the text for monitoring well sampling/recording frequencies.* *Table 13 on page 29 needs to be modified to*	EPA agrees that this correction is appropriate. Table 13 has been revised to reflect sampling and recording frequencies for all monitoring well categories. Specifically, Table 13 will be revised to show the continuous sampling frequency of every 30 minutes (and recording of data every 2 hours) for temperature and pressure monitoring in: the St. Peter monitoring well; the two ACZ wells in the Ironton; and the two SLR wells in the Mt. Simon.

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		address monitoring well sampling/recording frequencies. *Either a new "Well Condition" needs to be added or the second category could be changed to read "For monitoring wells and Injection wells that are shut-in:" The planned monitoring well sampling frequency is 10 minutes; this specification is well within the minimum specification for shut-in injection wells. The specification for operating injection wells is not appropriate for monitoring wells since changes would be expected to occur much more slowly. If EPA prefers to create a new "Well Condition" for monitoring wells, then the Alliance recommends a minimum sampling frequency of 30 minutes and a minimum recording frequency of 2 hours.*	
17	FutureGen	*Page E9* *Line 1: Pressure monitoring in the injection zone will occur in* three *monitoring wells, not four.* *During the first few years of operations, injection zone pressure will be monitored in the two single-level in-reservoir wells discussed in the second bullet on the same page and shown in Figure 7.* *The Alliance committed to installing one additional injection zone pressure monitoring well within 5 years of the start of injection so it will be available for monitoring during the PISC phase of the project.*	The statement that pressure monitoring would occur in four monitoring wells was in error. EPA agrees that this correction is appropriate. The suggested change is incorporated into the final permits.
18	FutureGen	*Table 2* *As indicated in the previous text, there are 9 local landowner wells, not 10.*	The statement that there are 10 local landowner wells was in error. EPA agrees that this correction is appropriate. The suggested change is incorporated into the final permits.
19	FutureGen	*Page E14, Second bullet: The Table 6 parenthetical should be moved to the end of the bullet item since*	EPA agrees that this correction is appropriate.

#	Commenter	Comment Text	EPA Response
		Table 6 also includes indicators of brine composition.	The suggested change is incorporated into the final permits.
20	FutureGen	*Page E14, Third bullet: <u>The Table 6 parenthetical should be moved to the end of the sentence since Table 6 also includes indicators of brine composition</u>:* Target parameters include pressure, temperature, and hydrogeochemical indicators of CO_2 and brine composition (Table 6).	EPA agrees that this correction is appropriate. The suggested change is incorporated into the final permits.
21	FutureGen	<u>Page E23</u> <u>Discussion of tracers should be removed since they are not planned</u>. This is outdated language was taken from the permit application. <u>The first sentence should be ended after</u> "…TDS, specific gravity)" and <u>delete everything between this point and the sentence leading with</u> "Analysis of carbon and oxygen isotopes…." (line 7).	EPA agrees that this correction is appropriate, so the requested change has been made. FutureGen explained in documented discussions with EPA the rationale for deciding not to use tracers and EPA agrees that they are neither necessary nor required. Although FutureGen may do sampling and analysis of isotopes or other tracer methods, these are currently not a requirement in the permits. Under the Permits, the monitoring program will be regularly reviewed, and revised as appropriate, as required by 40 C.F.R. §146.90(j) and Section M of the Permits. The suggested change is incorporated into the final permits.
22	FutureGen	<u>Page E23</u> <u>*In line 11 of paragraph 3, the word* techniques *should be changed to* requirements</u>.	EPA agrees that this correction is appropriate. The suggested change is incorporated into the final permits.
23	FutureGen	*Page E14, Par 1* *The last sentence states that the baseline data will be collected during the injection phase.* <u>*It should instead state that* baseline data will be collected prior to start of the injection phase.</u>	The statement that the baseline data would be collected during the injection phase was in error. EPA agrees that this correction is appropriate. The suggested change is incorporated into the final permits.

#	Commenter	Comment Text	EPA Response
24	FutureGen	*Page E15* *1) The surficial aquifer will not be sampled so discussion of additional analytes is irrelevant; 2) The last sentence repeats test immediately above. The last two sentences on the page should be removed.*	Given that there are no current plans to conduct additional sampling and analysis of the surficial aquifers, Table 3 on page E14 seems unnecessary. However, EPA reserves the right to require such sampling in the unlikely event of leakage out of the injection zone and into shallower USDWs. EPA may add permit requirements beyond those laid out specifically in the UIC regulations on a case-by-case basis under 40 C.F.R. § 144.52(b) (case-by-case conditions as required to provide for and assure compliance with all applicable requirements of the SDWA and regulations). Therefore, EPA will retain the table and all discussion of monitoring in the surficial aquifer. The list of analytes is consistent with other monitoring wells. EPA agrees that the last sentence on page E15 is redundant. This portion of the suggested change is incorporated into the final permits.
25	FutureGen	*Page E19, Par 1* *Pipeline fluid sampling will not be conducted during the PISC phase of the project, so it is unclear why the CoC requirements are mentioned here.*	EPA agrees that this correction is appropriate and consistent with the rest of the Plan, so the reference to "and pipeline fluid" has been removed.
26	FutureGen	*The following Note should be added to Table 8:* Depth is approximate and may be adjusted based on information obtained during drilling.	The depth of each well, as well as formation depths, are indicated as where the wells are intended to be placed. Since each permit has numerous citations of depths and locations, noting that these are anticipated depths and are therefore subject to change would overly complicate the permits and be potentially confusing. Small deviations identified after construction is completed can be corrected through the minor modification process identified in 40 C.F.R. § 144.41. Therefore, the permit language has not been modified based upon this comment.

#	Commenter	Comment Text	EPA Response
27	FutureGen	*Page E23* *Last sentence of paragraph 2 should be removed. This verbiage was from the permit application and was later updated to reflect the fact that present CO_2 saturation could not be derived from aqueous samples due to sampling artifacts.*	Inclusion of this sentence in the draft permits was in error. The updated version of the Testing and Monitoring Plan, on Page C1, states "However, once supercritical CO_2 ($scCO_2$) breakthrough occurs, these wells can no longer provide representative fluid samples because of the two-phase fluid characteristics and buoyancy of $scCO_2$." This language and the identical sentence on Page C23 of the Testing and Monitoring Plan has been deleted, as suggested in the comment, in order to provide consistency with the intended methods as quoted from Page C1.
28	FutureGen	*Page E30* *3D surface seismic surveys are not planned for the PISC phase of the project. The Alliance recommends replacing the third sentence with the following:* The data used to update the computational model and to monitor the site will include both direct (e.g., temporal measurements of pressure, temperature, groundwater quality, and injection zone fluid composition) and indirect geophysical methods (e.g., passive seismic and integrated deformation monitoring, PNC logging).	EPA agrees that this clarification and additional detail is appropriate and helpful, so the requested change has been made.
29	FutureGen	*Page E31* *3D surface seismic surveys are not planned for the PISC phase of the project.* *The 2nd sentence under "Evaluation of Carbon Dioxide Plume" should be removed.*	EPA agrees that inclusion of this sentence was in error. EPA retains the ability to require additional monitoring in support of a non-endangerment demonstration, such as seismic surveys, if the demonstration is not adequate to ensure protection of USDWs. EPA agrees that this correction is appropriate and will provide consistency with the Testing and Monitoring Plan, so the suggested change is incorporated into the final permits.
30	FutureGen	Page E33 Will the control building be downsized for the PISC phase? The footprint of this building is relatively small and it's hard to see how the effort/cost to downsize the building is justified. The MVA datacenter capability would need to be maintained at a minimum.	FutureGen's application for four Class VI injection wells included a proposed Site Closure Plan. This part of the application (7.3.1), proposed the following: "At the end of the active injection period, plume monitoring will continue, but there will be no further need for the pumping and control equipment. The Site Control Building will be demolished. All features will be removed

#	Commenter	Comment Text	EPA Response
			except the WAPMMS Building, a 12-ft-wide access road with five parking spaces, a concrete sidewalk from the parking lot to the building, underground electrical and telephone services, and a chain-link fence surrounding the building. The common wall between the WAPMMS Building and the Site Control Building will be converted to an exterior wall. The injection wells will be plugged and capped below grade (see Chapter 6.0). The gravel pad will be removed. The WAPMMS Building at the storage site will be repurposed to act as the collection node for data from the plume monitoring equipment. The building will contain equipment to receive real-time data from the monitoring wells and other monitoring stations and send the data via an internet connection to be analyzed offsite during the 50-year post-injection monitoring period." The permits reflect the proposal in the permit application. The comment does not propose any specific changes. If FutureGen wishes to propose a revised PISC Plan that addresses these concerns and questions for EPA review and approval, it may do so through the permit modification process outlined in 40 C.F.R. Part 144. Therefore, the permit language has not been modified based upon this comment.
31	FutureGen	Page E33 It is suggested that we make a recommendation at the end of the PISC to delete all references to downsizing the control building on page E33	The permits reflect the proposal in the permit application. If FutureGen wishes to propose a revised PISC Plan that addresses these concerns and questions for EPA review and approval, it may do so through the permit modification process outlined in 40 C.F.R. Part 144. Therefore, the permit language has not been modified based upon this comment.
32	FutureGen	Page E33/Global *Change the reference to the WAPMMS to* annulus pressurization system (APS) for the injection wells.	This requested change is only a terminology clarification. The suggested change is incorporated into the final permits.

SECTION 9. EMERGENCY AND REMEDIAL RESPONSE COMMENTS

#	Commenter	Comment Text	EPA Response
1	Betty Niemann	What is really missing from the remediation plan in case of leakage or seismic event are detailed plans ready to implement. The remediation plan is alluded to in the USEPA UIC permitting application reference on page 2-67. Dr. Sally Benson xlii from Stanford University, Benson Laboratory, recommends that when an injection site is selected, the remediation plan should be part of the site selection and determined first - before any construction and injection takes place. In her work along with Ariel Esposito, "*Evaluation and development of options for remediation of* CO_2 *leakage into groundwater aquifers from geologic carbon storage*", she states "There are many good reasons to have confidence in the long-term security of carbon dioxide (CO_2) storage in properly selected and operated projects. However, the possibility remains that the CO_2 leaks out of the formation, for example, up an abandoned well, into an overlying groundwater aquifer. As large scale demonstration projects of carbon capture and storage (CCS) come closer to development in the US, the need for contingency planning to formulate groundwater remediation scenarios in case of a possible leakage event from a geologic storage site is very important. Leakage of CO_2 into groundwater aquifers may degrade valuable groundwater resources, may pose a risk to human health if hazardous trace metals dissolve into ground-water, and may interfere with agricultural activities. " xliii	40 C.F.R. §146.83 establishes the minimum criteria for siting. A permit applicant may choose the site they it wishes to propose. EPA will issue a permit at that site if the application meets all regulatory requirements. FutureGen must demonstrate that the location is a suitable geologic system, comprising: (1) An injection zone(s) of sufficient areal extent, thickness, porosity, and permeability to receive the total anticipated volume of the carbon dioxide stream; and (2) Confining zone(s) free of transmissive faults or fractures and of sufficient areal extent and integrity to contain the injected carbon dioxide stream and displaced formation fluids and allow injection at proposed maximum pressures and volumes without initiating or propagating fractures in the confining zone(s). Beyond those criteria, initial site selection and considerations involved are beyond the scope and role of EPA's regulatory process. The FutureGen Alliance proposed this location in its UIC permit application and EPA finds the location suitable for geologic sequestration of CO_2 under its Class VI rule. In the unlikely event of a large magnitude seismic event or CO_2 leakage from the injection zone formation, remedial response procedures will need to be tailored to the specific circumstances, extent of contamination and risk factors involved. These details would be unknowable prior to the seismic event and emergency situation. EPA finds the ERRP plan to contain sufficient detail to mandate the appropriate remedial response to the full range of unlikely but possible emergency scenarios. It identifies likely options and appropriate factors for consideration in implementing responses, while providing the flexibility to adjust and adapt to unpredictable or unforeseeable circumstances. Although the well construction, operation and monitoring requirements under the permits and the regulations make it unlikely that FutureGen would need to implement emergency and remedial response actions, it is important to

#	Commenter	Comment Text	EPA Response
		I have spoken to her and she feels this is very important in the success of Carbon Storage. Ken Humphries' in many presentations indicates that CO_2 storage is safe but in my research for this commentary, I found Dr. Benson's paper and also her presentation to the contrary. If CO_2 storage is completely safe, then why is there a need for a remediation plan? To me the risk to ground water contamination in an agricultural injection site setting is unsettling to say the least.	require that FutureGen show its readiness and ability to respond if it becomes necessary. EPA does not take a position in regard to the research or views of Dr. Benson or Mr. Humphrey. Under the Safe Drinking Water Act, EPA does not issue UIC permits unless it is satisfied that USDWs will be protected from the proposed injection activity. EPA finds that USDWs are adequately protected from the proposed injection activity and notes that the permits are designed so that CO_2 will be stored well below any potential USDW. Therefore, EPA has not made any change to the permits based on this comment.
2	CSC	Provision: P(1) Text of Draft Permit: 1. The Emergency and Remedial Response Plan describes actions the permittee must take to address movement of the injection or formation fluids that may cause an endangerment to a USDW during construction, operation, and post-injection site care periods. The permittee shall maintain and comply with the approved Emergency and Remedial Response Plan (Attachment F of this permit), which is an enforceable condition of this permit, and with 40 CFR 146.94. References: Proposed Revision: 1. The Emergency and Remedial Response Plan describes actions the permittee must take to address movement of the injection or formation fluids that may cause an endangerment to a USDW during construction, operation, and post- injection site care periods. The permittee shall maintain and	As a general matter the UIC permit is intended as a roadmap to identify the relevant requirements and obligations of FutureGen. The relevant regulatory provisions are lengthier and more detailed so that the permit language may summarize those requirements and provide reference to the regulatory details rather than copying them in their entirety. This makes the permit more reader-friendly and easy to follow. EPA has determined that incorporating additional details by reference does not create any conflict or confusion between the terms of the permit and the regulations. In addition, 40 C.F.R. §146.94(a) makes it clear that FutureGen is responsible to comply with both the permit requirement and the regulatory requirement upon which it is based. For Class VI wells, EPA anticipates that the emergency and remedial response plan will be regularly reviewed and revised as required by 40 C.F.R. §146.94(d) and Section P of the Permits. Reference to the relevant regulatory provisions provides clarity on the standards against which any revisions will be judged. EPA has not made any change to the permits based on this comment.

#	Commenter	Comment Text	EPA Response
		comply with the approved Emergency and Remedial Response Plan (Attachment F of this permit), which is an enforceable condition of this permit~~, and with 40 CFR 146.94.~~ Comment: Once again, this condition is written in a way that suggests that compliance requires something beyond following the approved Emergency and Remedial Response Plan, which is not the case. The revision recommended here should be adopted and incorporated in the final permit.	

#	Commenter	Comment Text	EPA Response
3	CSC	**Provision:** P(1) **Text of Draft Permit:** 1. The Emergency and Remedial Response Plan describes actions the permittee must take to address movement of the injection or formation fluids that may cause an endangerment to a USDW during construction, operation, and post-injection site care periods. The permittee shall maintain and comply with the approved Emergency and Remedial Response Plan (Attachment F of this permit), which is an enforceable condition of this permit, and with 40 CFR 146.94. **Proposed Revision:** 1. The Emergency and Remedial Response Plan describes actions the permittee must take to address movement of the injection or formation fluids that may cause an endangerment to a USDW during construction, operation, and post- injection site care periods. The permittee shall maintain and comply with the approved Emergency and Remedial Response Plan (Attachment F of this permit), which is an enforceable condition of this permit~~, and with 40 CFR 146.94~~. **Comment:** Once again, this condition is written in a way that suggests that compliance requires something beyond following the approved Emergency and Remedial Response Plan, which is not the case. The revision recommended here should be adopted and incorporated in the final permit.	As a general matter the UIC permit is intended as a roadmap to identify the relevant requirements and obligations of FutureGen. The relevant regulatory provisions are lengthier and more detailed so that the permit language may summarize those requirements and provide reference to the regulatory details rather than copying them in their entirety. This makes the permit more reader-friendly and easy to follow. EPA believes that incorporating additional details by reference does not create any conflict or confusion between the terms of the permit and the regulations. In addition, 40 C.F.R. §146.94(a) makes it clear that FutureGen is responsible to comply with both the permit requirement and the regulatory requirement upon which it is based. For Class VI wells, EPA anticipates that the emergency and remedial response plan will be regularly reviewed and revised as required by 40 C.F.R. §146.94(d) and Section P of the Permits. Reference to the relevant regulatory provisions provides clarity on the standards against which any revisions will be judged. EPA has not made any change to the permits based on this comment.

#	Commenter	Comment Text	EPA Response
4	Betty Niemann	What experience does FutureGen writing, implementing and keeping up to date a disaster plan for the sequestration site that includes but not limited to drilling, well problems, well maintenance, monitoring sites and their technology, weather related problems, seismic potential and finally preventing damage to agricultural land in America's breadbasket?	EPA's regulatory purview under the Safe Drinking Water Act includes consideration of measures to protect underground sources of drinking water only and does not include consideration of the permit applicant's past experience. EPA finds that FutureGen's plan meets the requirements of the regulations in 40 C.F.R. §146.94 and is consistent with "Geologic Sequestration of Carbon Dioxide: Underground Injection Control (UIC) Program Class VI Well Project Plan Development Guidance" (Aug. 2012). The regulations and the permits require regular review of the plan to take into account new information and data related to the matters identified by the commenter. See 40 C.F.R. §146.94(d) and Section P of the Permits. EPA has not made any change to the permits based on this comment.
5	Betty Niemann	There is also no discussion on the mitigation compensation of such changes of surface deformation to individual landowners during the life of the project or after the project ends.	Any coverage for damages and risks beyond protection of USDWs and human health from contaminants injected into the wells cannot be a condition of a UIC permit. For this reason, EPA has not made any change to the draft permits based on this comment. EPA notes that surface deformation was evaluated as part of the permitting process and found to be negligible and that surface deformation will also be monitored throughout the life of the project, although EPA's regulatory authority is focused on protection of USDWs. EPA also understands that under Chapter 20 of the Illinois Compiled Statutes, Section 1108, the State of Illinois may address some of the risks beyond those addressed under the UIC permitting regulations.

#	Commenter	Comment Text	EPA Response
6	Betty Niemann	In addition, the Lawrence Berkley National Laboratory has performed studies on CO_2 storage areas even to the extent that it may be necessary to drill wells to remove brine in saline aquifers to keep the CO_2 plume within the storage area. xxxvi If this happens, then where does the brine go, how it is treated as it cannot be used for drinking and agriculture?	At present, there are no plans for the removal of brine for pressure maintenance or CO_2 plume control, but in the event that brine disposal is necessary in the future, any brine disposal activity would be subject to all regulatory requirements. Part A of the permits stipulates 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 or local laws or regulations. *Nothing in this permit shall be construed to relieve the permittee of any duties under applicable regulations*." Therefore, EPA has not made any change to the permits based on this comment. If FutureGen needed to consider brine disposal in the future, they would need to coordinate with the applicable state and federal programs to determine what safe and legal method is most appropriate.
7	Betty Niemann	b. What mitigation plan does FutureGen *have* for agricultural damage to the land that could happen if CO_2 mitgrates[sic] upward over time and the land becomes unusable for agriculture? How will FutureGen repair the agricultural land? Critical Pressure Front, Increased Seismic Activity and Possible Effects on Sangamon County Subsidence a. On the Critical Pressure Front comments,	The possibility of the FutureGen Project damaging agricultural land is remote given the depth of proposed injection, the many geologic confining zones between the injection zone and the surface, and the required monitoring at various depths that would detect such fluid movement before it reaches the surface. Any coverage for damages and risks beyond protection of USDWs and human health from contaminants injected into the wells cannot be a condition of a UIC permit. For these reasons, EPA has not made any change to the draft permits based on this comment. EPA understands, however, that under Chapter 20 of the Illinois Compiled Statutes, Section 1108, the State of Illinois may address some of the risks beyond those addressed under the UIC permitting regulations. EPA does not expect the FutureGen Project to cause subsidence of the surface land and finds that underground coal mine shafts do not extend to the depth of the Mt. Simon and Eau Claire injection formations. No increase in pressure is expected in the shallower formations where the coal mine shafts exist. Obtaining compensation for damage resulting to homes as a result of the FutureGen project is beyond the scope and role of

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		FutureGen was to make known in January of this year the studies on critical pressure and the pressure front. I have looked at the map included in the UIC Class VI public hearing notification. The red circle denotes a 10psi pressure front that spreads eastward all the way through the middle of Springfield and encompasses even Petersburg. I would like to know what effect this pressure front will have on the underground coal mine shafts which occur under the western half of Springfield and even under parts of Petersburg. This is important, as there has been one instance of subsidence in Springfield in 1989. xviii Will the pressure front from the FutureGen sequestration project cause and increase in the potential of subsidence in the AoR. Note: if one plots the 10psi pressure front line on an ISGS map of underground mines (I used Menard County map) this line clearly encompasses half of the underground mines in western Springfield, Illinois. Is FutureGen prepared to pay for any home destruction in Springfield, Illinois or other homes in the AoR by subsidence?	EPA's UIC Program. Part A of the permits clearly states: "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 or local law or regulations." (See also 40 C.F.R. §144.35.) Any coverage for damages and risks beyond protection of USDWs and human health from contaminants injected into the wells cannot be a condition of a UIC permit. For these reasons, EPA has not made any change to the permits based on this comment. EPA understands, however, that under Chapter 20 of the Illinois Compiled Statutes, Section 1108, the State of Illinois may address some of the risks beyond those addressed under the UIC permitting regulations.
8	FutureGen	*The CO_2 injection well coordinates in EPA's draft FutureGen UIC Class VI Permit Cover Letter and Attachments for each of the injection wells is the injection point location described in FG-RPT-017, Revision 1 (May 2013). These same coordinates are used for all of the 4 injection wells throughout the FutureGen permitting documentation. Because the currently planned CO_2 injection wells' locations and their mid-point location are to the NW of the stated location, the Alliance suggests the following wording and footnote throughout the permitting*	EPA has revised the first page of each permit and the first page of each permit attachment to reflect the accurate proposed location for each of the wells. To the extent that small deviations to the planned locations are identified after the wells are constructed and surveyed, those corrections can be made through the minor modification process identified in 40 C.F.R. § 144.41.

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		documentation for the injection well locations: *(If using one set of coordinates for **all** CO_2 injection wells' permit documentation…)* **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80104°N and 90.07517°W [1] Actual injection well location will be surveyed after injection well construction. *(If using the planned coordinates of the **individual** CO_2 injection wells in each well's permit documentation…)* (Well#1) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80111°N and 90.07491°W [1] Actual injection well location will be surveyed after injection well construction. (Well#2) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80097°N and 90.07491°W [1] Actual injection well location will be surveyed after injection well construction. (Well#3) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80097°N and 90.07544°W [1] Actual injection well location will be surveyed after injection well construction. (Well#4) **Location of Injection Well[1]**: Morgan County, IL; 26-16N-9W; 39.80111°N and 90.07544°W [1] Actual injection well location will be surveyed after injection well construction.	

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9	FutureGen	*Table 4* *Presently the Operations Staff Description does not include a professional skilled in mechanical and instrument operations and maintenance from a process engineering perspective. <u>It is suggested that a fifth position be added to the bottom of Table 4. The entry might be as follows</u>:* Position: Operations Engineer Function: Manages mechanical and fluid management operation of the injection wells, annulus pressure control system, and well head piping systems. Maintains and repairs injection-related equipment, including valves, instruments, piping. Assists in mechanical and electronic control of injection process. Qualifications: Undergraduate degree in engineering, preferably related to mechanical, chemical or process control. At least 2 years of direct hands on operation and service of equipment and instruments related to pressurized well systems and wellhead controls.	EPA agrees that adding this detail will improve the Emergency Response and Remediation Plan and has incorporated the suggested change into the final permits.
10	Betty Niemann	b. Likewise, Alberto Mazzoldi, Antonio P. Rinaldi, Andrea Borgia, and Jonny Rutqvist, have authored an article entitled "Induced Seismicity within Geological Carbon Sequestration Projects: Maximum Earthquake Magnitude and Leakage Potential from Undetected Faults".xix There have been two measureable earthquakes (1986 and 2011) felt in Morgan County. These earthquakes did not originate within Morgan County but have caused people to feel them. Has adequate seismic studies been performed by FutureGen to identify possible preexisting small faults or the potential of	EPA reviewed FutureGen's seismic evaluation (study) and performed its own evaluation. As a summary of its evaluation, EPA produced the document titled "Induced Seismicity Evaluation Using the EPA-Developed Decision Model The FutureGen Alliance Project: Morgan County Class VI UIC Wells 1, 2, 3 and 4 (EPA Permit Numbers: IL-137-6A-0001, IL-137-6A-0002, IL-137-6A-0003 and IL-137-6A-0004)" (March 2014). The format and contents of this document are modeled after the "Injection-Induced Seismicity Decision Model" developed by EPA and state agencies with input from the United States Geological Survey, academic institutions, and other national seismicity experts.

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		cracks in important integral formations? I believe FutureGen should reexamine the stratigraphic characterization bore samples in light of this new research paper to determine if there is a potential for the project to create seismic events especially given the following that FutureGen has stated that:	Regarding the specific test types mentioned by the commenter, a seismic survey would not be an appropriate technique to assess the potential for fractures in formations, nor would the evaluation of core samples and logs for fractures be an appropriate test for seismic potential. The presence or absence of fractures, by itself, is not an indicator of the potential for seismic activity. The purpose of conducting a reflected seismic survey (transmitting surface vibrations downward through geologic strata and then detecting the reflections of those vibrations bounced back from subsurface geologic features) is to identify where displacement along a potential fault might have occurred in the past. Since movement along a fault can result in seismic events, the extent of such movement in the past can be used to evaluate the potential for seismic events in the future or evaluate if there are natural leakage pathways that need to be investigated. EPA has determined that the reflective seismic survey conducted by FutureGen as part of its seismic study, indicates no faults of concern (i.e., no faults where significant displacement has occurred or that might serve as leakage pathways).
11	NRDC	2. We support Applicant's proposal to perform passive microseismic monitoring to help identify induced seismicity that may be caused by injection operations. However, we suggest that EPA require additional information and planning to address the risk of induced seismicity. As noted in the permit application, the 2D seismic reflection survey at the proposed injection well site is low quality and, "…insufficient to rule out the presence of small-scale faults/fracture zones." Documented incidences of induced seismicity caused by UIC Class II injection operations have often occurred on previously unknown and/or sub-seismic faults. 2 According to the comprehensive report	EPA's review of the potential for induced seismicity included evaluation of extensive site-specific information, including the seismic history of the area, the location of faults and fractures, operating data (including the volume of CO_2 to be injected) and computational modeling analyses of plume and pressure front behavior over the duration of the project. This evaluation was much more extensive than the evaluations typically performed for Class II permits such as those associated with the events in Ohio and Oklahoma to which the commenter refers, and supports a conclusion that the wells pose a low risk of inducing felt seismic events. See "Induced Seismicity Evaluation Using the EPA-Developed Decision Model The FutureGen Alliance Project: Morgan County Class VI UIC Wells 1, 2, 3 and 4 (EPA Permit Numbers: IL-137-6A-0001, IL-137-6A-0002, IL-137-6A-0003 and IL-137-6A-0004)" (March 2014).

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		on induced seismicity and energy technologies produced by the National Academy of Sciences, "The factor that appears to have the most direct consequence in regard to induced seismicity is the net fluid balance (total balance of fluid introduced into or removed from the subsurface)…"3 Projects that do not balance injection and withdrawal, like carbon capture and sequestration or storage ("CCS"), may have a greater potential to cause induced seismicity, although more research is needed. Induced earthquakes caused by Class II injection operations have been large enough to cause property damage and injury.4 Even in the absence of actual damage, induced seismicity is a nuisance and source of anxiety for nearby communities, and may undermine public trust and support for CCS projects. Researchers at Lawrence Berkeley National Laboratory5 and the National Academy of Sciences6 have published detailed information on the elements that should be considered for inclusion in a protocol for addressing induced seismicity, including but not limited to 1) a stakeholder communications and outreach plan; 2) criteria for ground vibration and noise; 3) a hazard assessment; 4) a risk assessment; 5) seismic monitoring, and; 6) mitigation plans. Using these guidelines we request that EPA require Applicant to develop a protocol to address induced seismicity.	Although the components suggested by Lawrence Berkeley National Laboratory and the National Academy of Sciences are not required by the UIC regulations, EPA agrees with the need to monitor for and potentially address induced seismicity. The Emergency and Remedial Response Plan, which is an enforceable condition of FutureGen's permits, includes protocols for natural and induced seismic events that include many of the same things as are recommended in the National Academy of Science publication the commenter cited. The Plan includes response protocols that correspond to the site's potential risk and the level of seismic activity and an emergency communications plan. Required passive seismic monitoring (described in the enforceable Testing and Monitoring Plan) will inform FutureGen and EPA regarding when any natural or induced event occurs—any such event will require implementation of the Emergency and Remedial Response Plan.

Final Permit

The final permits and Response to Comments document are available for viewing at the Jacksonville Public Library, 201 W. College Avenue, Jacksonville, Illinois.

Please contact Jeffrey McDonald of my staff at (312) 353-6288, or via email at mcdonald.jeffrey@epa.gov if you have any questions about the FutureGen Industrial Alliance injection well permits.

Tinka G. Hyde

Date 8/29/2014

Tinka G. Hyde
Director, Water Division
U.S. Environmental Protection Agency
Region 5