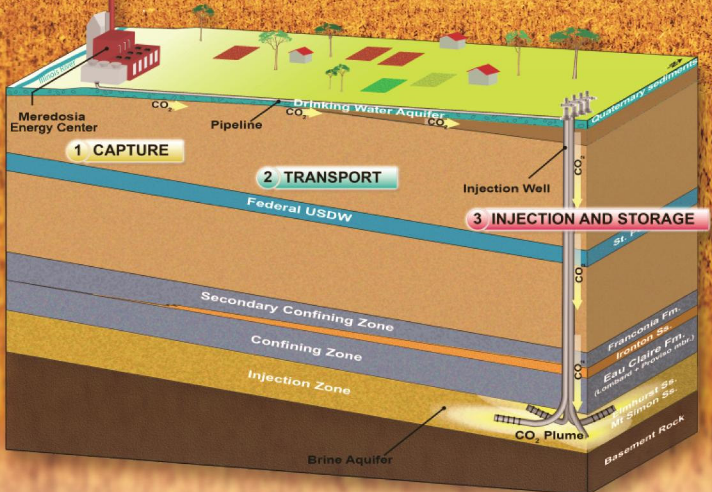
U.S. Department of Energy

FutureGen 2.0 Project

Final Environmental Impact Statement

DOE/EIS-0460 | October 2013



Summary

Office of Fossil Energy

National Energy Technology Laboratory

COVER SHEET

Responsible Federal Agency: U.S. Department of Energy (DOE)

Cooperating Agencies: None

Title: Final Environmental Impact Statement for the FutureGen 2.0 Project (DOE/EIS-0460)

Location: Morgan County, Illinois

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Abstract:

This Environmental Impact Statement (EIS) evaluates the potential impacts associated with DOE's proposed action to provide financial assistance to the FutureGen Industrial Alliance (the Alliance) for the FutureGen 2.0 Project, including the direct and indirect environmental impacts from construction and operation of the proposed project. DOE's proposed action would provide approximately $1 billion of funding (primarily under the American Recovery and Reinvestment Act) to support construction and operation of the FutureGen 2.0 Project. The funding would be used for project design and development, procurement of capital equipment, construction, and to support a 56-month demonstration period for a coal-fueled electric generation plant integrated with carbon capture and storage.

For the FutureGen 2.0 Project, the Alliance would construct and operate a 168-megawatt electrical (MWe) gross output coal-fueled electric generation plant using advanced oxy-combustion technology. The plant would use existing infrastructure, including the existing steam turbine generator (Unit 4), at Ameren Energy Resources' Meredosia Energy Center on the Illinois River just south of Meredosia, Illinois. The proposed project would include facilities designed to capture at least 90 percent of the carbon dioxide (CO_2) that would otherwise be emitted to the atmosphere **during steady-state operation**, equivalent to approximately 1.2 million tons (1.1 million metric tons) of CO_2 captured per year. The captured CO_2 would be compressed and transported via a new underground pipeline, approximately 30 miles long and **nominally 10 to** 12 inches in diameter, to a geologic storage area in eastern Morgan County, where it would be injected and stored in the Mt. Simon Formation (a saline aquifer) approximately 4,000 feet below the ground surface. The project would also employ systems for the monitoring, verification, and accounting of the CO_2 being geologically stored. Visitor, research, and training facilities would be sited in the vicinity of Jacksonville, Illinois. The proposed project would provide performance and emissions data, as well as establish operating and maintenance experience, that would facilitate future large-scale commercial deployment of oxy-combustion technology and geologic CO_2 storage.

DOE is the lead federal agency responsible for preparation of this EIS. DOE prepared the EIS pursuant to the National Environmental Policy Act (NEPA) and in compliance with the Council on Environmental Quality (CEQ) implementing regulations for NEPA (40 Code of Federal Regulations [CFR] 1500 through 1508) and DOE NEPA implementing procedures (10 CFR 1021). The EIS evaluates the potential environmental impacts of the FutureGen 2.0 Project as part of DOE's decision-making process to

determine whether to provide financial assistance. The EIS also analyzes the no action alternative, under which DOE would not provide financial assistance for the FutureGen 2.0 Project.

Public Participation:

DOE encourages public participation in the NEPA process. The Notice of Availability of the Draft EIS appeared in the *Federal Register* on May 3, 2013, which invited comments on the Draft EIS through the end of the comment period on June 17, 2013. DOE conducted a public hearing for the Draft EIS in Jacksonville, Illinois, on May 21, 2013, which included an informational session for one hour prior to the formal hearing. During the hearing, the public was encouraged to provide oral comments and to submit written comments to DOE through the close of the comment period. DOE also considered late comments. A summary of the public hearing is included in new Appendix I along with all agency and public comments on the Draft EIS and DOE responses.

Changes from the Draft EIS:

In this Final EIS, bold text and vertical lines in the margin indicate where the Draft EIS has been revised or supplemented (as exemplified by this paragraph). Deletions are not demarcated. Additions to the appendices in Volume II are indicated on the appendix cover sheets with vertical lines in the margin and bold text.

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Acronyms

Acronym	Definition
CCPI	Clean Coal Power Initiative
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO_2	carbon dioxide
dBA	A-weighted sound level in decibels
DOE	U.S. Department of Energy
EIS	Environmental Impact Statement
FR	Federal Register
GHG	greenhouse gas
IDNR	Illinois Department of Natural Resources
IDOA	Illinois Department of Agriculture
IGCC	integrated gasification combined cycle
ILCS	Illinois Compiled Statutes
MVA	monitoring, verification, and accounting
MWe	megawatt electrical
NEPA	National Environmental Policy Act
NOA	Notice of Availability
NOI	Notice of Intent
NPDES	National Pollution Discharge Elimination System
NRHP	National Register of Historic Places
ppmv	parts per million by volume
ROD	Record of Decision
ROI	region of influence
ROW	right-of-way
SHPO	State Historic Preservation Office
U.S.	United States
UIC	Underground Injection Control
USACE	U.S. Army Corps of Engineers
USDW	underground source of drinking water
USEPA	U.S. Environmental Protection Agency

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Summary

INTRODUCTION

The United States (U.S.) Department of Energy (DOE) prepared this Environmental Impact Statement (EIS) to evaluate the potential impacts associated with the proposed FutureGen 2.0 Project. DOE's proposed action would provide financial assistance to the FutureGen Industrial Alliance (the Alliance) for the FutureGen 2.0 Project. DOE is the federal agency responsible for preparation of this EIS, which was prepared pursuant to the National Environmental Policy Act (NEPA) and in compliance with the Council on Environmental Quality (CEQ) implementing regulations (40 Code of Federal Regulations [CFR] 1500-1508) and DOE NEPA implementing procedures (10 CFR 1021). To date, DOE has authorized the expenditure of funds for the purpose of project definition, cost estimating, and preliminary and front-end engineering design activities, and to facilitate environmental review. Such activities do not have an adverse impact on the environment or limit the choice of reasonable alternatives. This EIS will inform DOE's decision of whether to authorize the expenditure of additional funds for final design, construction, and initial operation of the FutureGen 2.0 Project.

FutureGen 2.0 is a public-private partnership with the purpose of developing the world's first large-scale oxy-combustion electric generation project integrated with carbon capture and storage. The FutureGen 2.0 Project replaces the original FutureGen Project (DOE/EIS-0394) as explained in Section 1.2. The FutureGen 2.0 Project consists of two major components: the Oxy-Combustion Large Scale Test and the Carbon Dioxide (CO_2) Pipeline and Storage Reservoir (see Figure S-1). To date, DOE has authorized the expenditure of cost-shared funding to support project definition and planning efforts under Phase I and Phase II. DOE proposes to provide approximately $1 billion of financial assistance to the Alliance that would support preliminary and final design (completion of Phase II), construction and commissioning (Phase III), and operations (Phase IV).

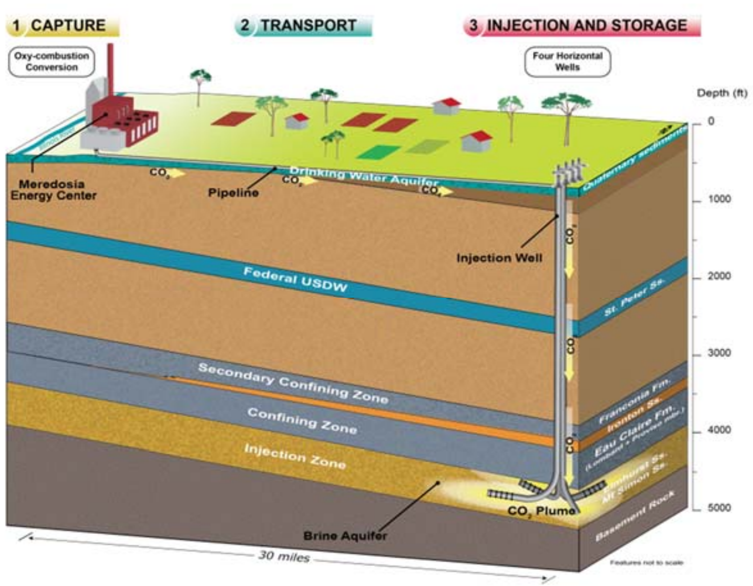


Figure S-1. The FutureGen 2.0 Project

> FutureGen 2.0 Project Features
>
> Oxy-Combustion Large Scale Test – Construction and operation of an integrated oxy-combustion coal boiler with CO_2 capture, purification, and compression. Oxy-combustion is the combustion of coal with a mixture of manufactured oxygen and recycled flue gas (instead of air), resulting in a gas by-product that is primarily CO_2.
>
> CO_2 Pipeline – Construction and operation of approximately 30 miles of pipeline to transport CO_2 from the Meredosia Energy Center to a storage reservoir in Morgan County.
>
> Storage Reservoir – Construction and operation of surface facilities and injection and permanent storage of captured CO_2 into a deep geologic formation.

DOE entered into a cooperative agreement with the Alliance under which the Alliance, cooperating with Ameren Energy Resources (Ameren), would upgrade one unit in a power plant currently owned by Ameren near Meredosia, Illinois (see Figure S-2). The repowered unit would include oxy-combustion and carbon capture technologies provided by the Babcock & Wilcox Power Generation Group, Inc. and Air Liquide Process and Construction, Inc. The unit would capture at least 90 percent of its CO_2 emissions **during steady-state**

operation and reduce other emissions to near zero. The captured CO_2 would be transported through a 30-mile pipeline to injection wells where it would be injected deep into a geologic saline formation for permanent storage. The project would be designed to capture, transport, and inject approximately 1.2 million tons (1.1 million metric tons) of CO_2 annually, up to a total of 24 million tons (22 million metric tons) over approximately 20 years. The Alliance would also construct and operate a visitor and research center in addition to training facilities related to carbon capture and storage in the vicinity of Jacksonville, Illinois. The DOE-funded demonstration period would last for 56 months from the start of operations (approximately 2017) through 2022.

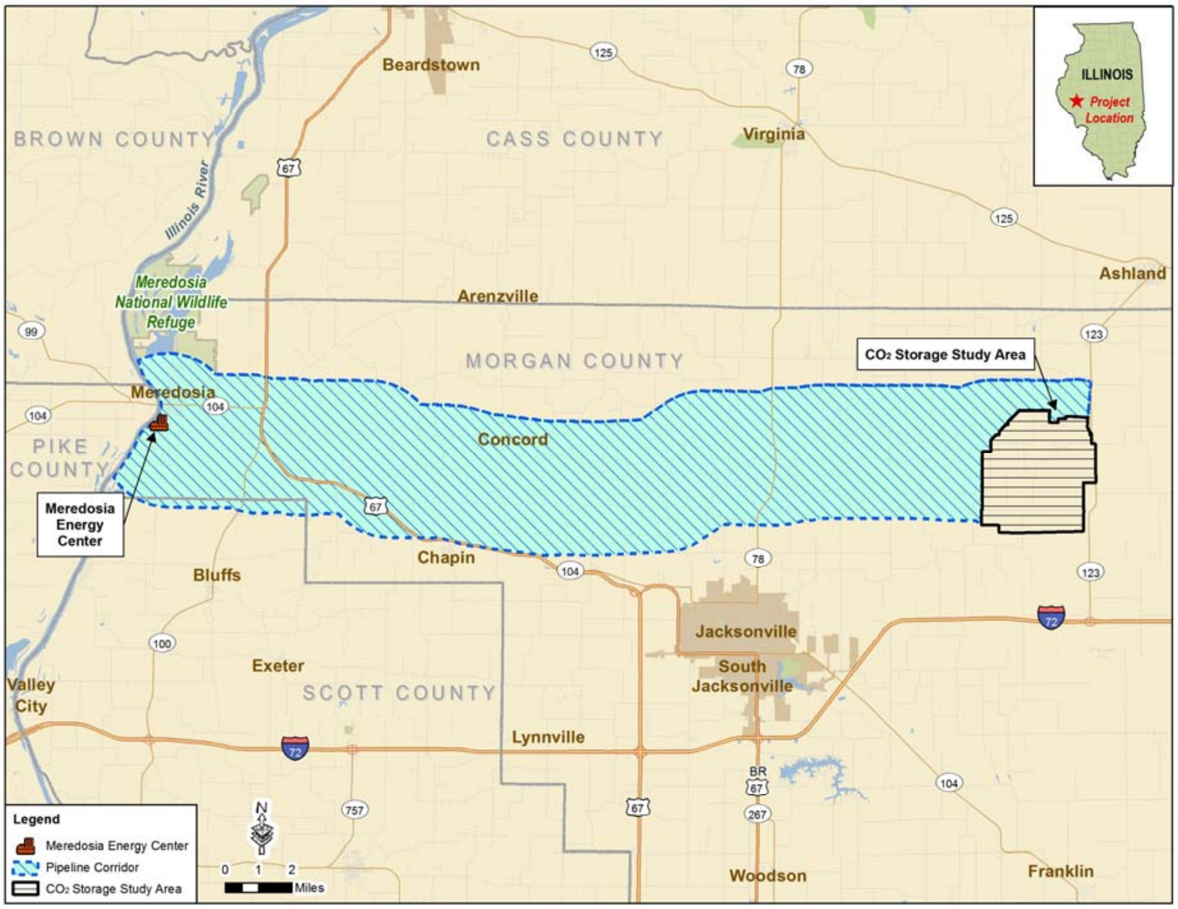


Figure S-2. Project Location Map

The Alliance is a non-profit membership organization created to benefit the public interest and the interests of science through research, development, and demonstration of near-zero emissions coal technology. It was formed to partner with DOE on the FutureGen Initiative, announced by President George W. Bush on February 27, 2003. Members of the Alliance include some of the largest coal producers, coal users, and coal equipment suppliers in the world. The Alliance's current members are: Alpha Natural Resources, Inc.; Anglo American, SA; Joy Global, Inc.; Peabody Energy Corporation; and Xstrata PLC. The active role of industry in this FutureGen Initiative ensures that the public and private sector share the cost and risk of developing the advanced technologies necessary to commercialize the FutureGen concept.

DOE PURPOSE AND NEED

DOE considers the advancement of carbon capture and storage technology critically important to addressing CO_2 emissions and global climate change concerns associated with coal-fueled energy. The purpose of DOE's proposed action is to demonstrate the commercial feasibility of an advanced coal-based energy technology (oxy-combustion) that can serve as a cost-effective approach to implementing carbon capture at new and existing coal-fueled energy facilities. The proposed project would also demonstrate utility-scale integration of transport and permanent storage of captured CO_2 in a deep geologic formation. Implementation of the FutureGen 2.0 Project supports the objectives of the FutureGen Initiative to establish the feasibility and viability of producing electricity from coal with at least 90 percent CO_2 capture **during steady-state operation** and near-zero emissions of air pollutants.

Aging Energy Infrastructure

Nearly half of the electric power generating infrastructure in the United States is more than 30 years old, with a significant portion of this infrastructure having been in service for 60 years or more (EIA 2009b). Substantial refurbishment or replacement of this infrastructure will be required to keep pace with forecasted energy demands. FutureGen 2.0 provides an approach to refurbishment or replacement while addressing CO_2 emissions and global climate change concerns.

One of DOE's primary strategic goals is to protect our national and economic security by promoting a diverse supply and delivery of reliable, affordable, and environmentally sound energy. DOE's action is needed to further this strategic goal with the recognition that coal serves an important role in the nation's energy supply, and that there is growing need to upgrade or replace the nation's aging energy infrastructure. The development of carbon capture and storage technologies through the FutureGen 2.0 Project would demonstrate a viable path forward for the ongoing and future use of the nation's abundant coal reserves in a manner that addresses both aging infrastructure and environmental challenges. Federal financial support is needed to help reduce the risks inherent in these first-of-a-kind projects, which without financial assistance would be unlikely to occur.

DOE PROPOSED ACTION

DOE proposes to provide approximately $1 billion of financial assistance to the Alliance for the FutureGen 2.0 Project. The financial assistance would support final design (Phase II), construction and commissioning (Phase III), and operations (Phase IV). The FutureGen 2.0 Project consists of two major components: the Oxy-Combustion Large Scale Test and the CO_2 Pipeline and Storage Reservoir (see Figure S-1). The proposed action would support the FutureGen 2.0 Project components as summarized in the Description of the FutureGen 2.0 Project, below, and described in detail in Chapter 2, Proposed Action and Alternatives (see Sections 2.1, 2.4, and 2.5).

ALTERNATIVES CONSIDERED BY DOE

Section 102(2)(C) of NEPA (42 United States Code 4332(2)(C)) requires that agencies discuss alternatives to the proposed action in an EIS. The purpose and need for a federal action determines the reasonable alternatives to be analyzed in the NEPA process. Thus, any reasonable alternative to the continued funding of the FutureGen 2.0 Project must be capable of satisfying the underlying purpose and need of the FutureGen Initiative. DOE developed the range of reasonable alternatives for the FutureGen 2.0 Project based on:

- Evaluation of various clean coal technologies through the Clean Coal Power Initiative (CCPI) Program;
- Analysis of the original FutureGen Project in terms of technology, costs, and suitability for geologic storage;

- Data obtained and reviewed through various funding opportunity announcements; and
- Interest of industry to participate in projects to support FutureGen 2.0.

No Action Alternative

Under the no action alternative, DOE would not continue to fund the FutureGen 2.0 Project into the final design, construction, and operation phases. Without DOE funding, it is unlikely that the Alliance, or industry in general, would undertake the utility-scale integration of CO_2 capture and geologic storage with a coal-fueled power plant using oxy-combustion. Therefore, the no action alternative also represents a “no-build” alternative. Without DOE's investment in a utility-scale facility, the development of oxy-combustion repowered plants integrated with CO_2 capture and geologic storage would also occur more slowly or not at all.

Alternatives Dismissed from Further Evaluation

Alternative Fuel Sources

Because the FutureGen Initiative was conceived for the purpose of encouraging commercial development of advanced coal-based carbon capture and storage technologies, other technologies that cannot serve to carry out that goal are not reasonable alternatives. Nuclear power, renewable energy sources (e.g., wind and solar power), and energy conservation improvements do not address the specific goal of reducing CO_2 emissions from coal-fueled energy production and, therefore, are not considered to be reasonable alternatives to FutureGen 2.0. These fuel sources and many others are addressed by other programs and projects in DOE’s diverse portfolio of energy research, development, and demonstration efforts.

Alternative Advanced Coal-Based Electric Generating Technologies

Technologies for carbon capture at advanced coal-based electric generating facilities fall into two general categories, pre-combustion and post-combustion. Pre-combustion capture technologies remove carbon from the process stream (fuel gas) after the solid coal feed has been converted (i.e., gasified). Post-combustion capture technologies remove carbon from the process stream (flue gas) after it has been combusted in the boiler. As explained in Section 1.2, the original FutureGen Project considered the demonstration of integrated gasification combined cycle (IGCC) technology for the generation of electricity with pre-combustion capture and storage of CO_2 that would otherwise be emitted. Rising costs for the original project delayed DOE’s decision and during the intervening time a number of commercial IGCC projects were proposed, many of which would employ pre-combustion carbon capture technology similar to that which was to be proven by the original FutureGen Project. At the time of award of the FutureGen 2.0 Project, DOE had already awarded funding for four other large-scale projects intended to demonstrate the underlying IGCC concept of the original FutureGen Project.

Due to the now-commercial status of IGCC, along with multiple pre-combustion carbon capture projects within DOE’s demonstration portfolio, DOE identified the need for a utility-scale demonstration of post-combustion carbon capture technologies. Accordingly, the agency does not consider pre-combustion technologies to be reasonable alternatives for the FutureGen 2.0 Project.

Alternative Retrofitting Technologies

Through review and consideration of the data and analysis associated with the original FutureGen Project, DOE identified the repowering of an existing power plant with oxy-combustion technology as the approach that would best meet cost and technology advancement objectives of the FutureGen Initiative. Instead of funding the construction and operation of a new IGCC plant, DOE considered two options for retrofitting an existing power plant to facilitate carbon capture and storage: repowering with oxy-combustion technology or post-combustion scrubbing (removal from flue gas). DOE determined that the selection of the oxy-combustion technology for testing and evaluation would complement its CCPI portfolio by providing the opportunity to address a technology option that otherwise would be absent from DOE’s slate of projects. Therefore, DOE chose to consider retrofitting an existing power plant with oxy-combustion technology as a lower-cost replacement for the IGCC process originally proposed in the FutureGen Project. Because DOE is already assessing the merits of post-combustion scrubbing in other projects, the agency does not consider that technology to be a reasonable alternative for the FutureGen 2.0 Project.

Alternative Sites for the Oxy-Combustion Large Scale Test

After determining that construction and operation of a new power plant was not reasonable and building upon the findings in the original FutureGen Final EIS, DOE considered potential power plants in the vicinity of the originally proposed Mattoon CO_2 power plant and storage site as practicable candidates for the FutureGen 2.0 Project. DOE determined that the Meredosia Energy Center had the only available and appropriately sized electrical generating unit that would be suitable for the FutureGen 2.0 Project. Ameren was willing to make its Meredosia Energy Center Unit No. 4 available for the FutureGen Initiative in part because the aging unit was not a baseload power generator and operated only sporadically to provide peaking power. Therefore, repowering efforts at the Meredosia Energy Center would not pose unacceptable disruptions of power generation or affect existing power purchase agreements. It is difficult for owners of existing power plants to accept the financial and operational risks associated with repowering existing equipment and adding untested CO_2 capture and storage to their plants. With no other power plant owners willing to undertake the inherent financial and operational risks, DOE considers the Meredosia Energy Center to be the only viable location for the Oxy-Combustion Large Scale Test component of FutureGen 2.0. DOE does not consider other power plants that are unavailable to the FutureGen 2.0 Project to be reasonable alternatives.

Alternative CO_2 Pipeline and Storage Reservoir Locations

After DOE identified the Meredosia Energy Center for the evolving FutureGen Initiative, the Mattoon site proponents withdrew their site from further consideration based on a determination that use of the site strictly for CO_2 storage was not in the community's best interest. In response to the Mattoon site being withdrawn as a storage site, DOE asked the Alliance to identify alternate storage sites to which it would be economically viable to transport the CO_2 captured at the Meredosia Energy Center for injection and permanent storage in the same geologic formation as proposed for the Mattoon site (the Mt. Simon Formation). The Alliance then undertook a siting process, similar to the original process used to select the Mattoon site, to identify possible locations. The Alliance's siting process included screening sites using specific qualifying criteria related to geologic conditions as well as a variety of other factors, including land use and environmental considerations (see Section 2.5.2.1). This process culminated in the selection of a site in Morgan County as the Alliance's preferred site, with two sites (in Christian County and Douglas County) identified as potential alternate sites.

The Alliance conducted a detailed geological stratigraphic analysis at the preferred Morgan County site to characterize and verify the viability of the proposed CO_2 storage reservoir. The Alliance also conducted pipeline routing studies for the three sites under consideration, as well as desktop and targeted field studies to evaluate sensitive environmental resources that could be adversely affected by the project. Based on the findings of the geological analysis and environmental studies, combined with a cost analysis of the pipelines to the alternate sites, the Alliance confirmed that the proposed Morgan County site remained its preferred site. Through these analyses, the Alliance also determined that the costs of siting, constructing, and operating a CO_2 pipeline to either the Christian County or Douglas County sites would be cost-prohibitive. The Alliance estimated that an additional $50 million to $100 million would be required to construct a pipeline that would be approximately 50 miles (Christian County) or 100 miles (Douglas County) longer than a pipeline required for the Morgan County site.

On July 17, 2012, the Alliance Board of Directors affirmed that the proposed Morgan County site remained its preferred location and voted to direct the Alliance to no longer pursue the sites in Christian County and Douglas County as alternate sites due to cost considerations. The Alliance notified DOE and the proponents of Christian County and Douglas County that their locations were no longer being considered as alternate sites and that the Alliance would not construct or operate a CO_2 storage reservoir at either site. As a result, the site proponents were released to find other uses for their proposed sites.

Because of the Alliance's decision to no longer consider the Christian County and Douglas County sites, DOE has determined that these sites are not reasonable alternatives as CO_2 storage reservoirs for FutureGen 2.0. Therefore, these sites have been eliminated from further consideration in this EIS.

EIS SCOPING PROCESS

On May 23, 2011, DOE published a Notice of Intent (NOI) to prepare an EIS in the *Federal Register* (FR) under Docket ID No. FR Doc. 2010–12632 (76 FR 29728). The NOI initially identified potential issues and areas of impact that would be addressed in the EIS. After issuing the NOI, DOE conducted three public scoping meetings and consulted with various interested governmental agencies and stakeholders. During the public scoping period, DOE solicited public input to ensure that: (1) significant issues were identified early; (2) issues of minimal significance would not consume excessive time and effort; and (3) the EIS would be thorough and balanced, in accordance with applicable regulations and guidance. DOE held public scoping meetings on the dates indicated at the following locations:

> **EIS Scoping**
>
> EIS scoping is the process by which the scope of issues and alternatives to be examined in the EIS is determined. The process includes soliciting input from the public and consulting with interested governmental agencies and stakeholders, to identify public and agency concerns and significant issues.

- June 7, 2011, at Taylorville High School, Taylorville, Illinois
- June 8, 2011, at Ironhorse Golf Club, Tuscola, Illinois
- June 9, 2011, at the Elks Lodge, Jacksonville, Illinois

The public scoping period ended on June 22, 2011, after a 30-day comment period. During the comment period, DOE accepted comments by telephone, facsimile, U.S. mail, and email.

In general, respondents expressed concerns regarding potential impacts to farmers and farmland (e.g., loss of farmland or impacts to soil). Other concerns included: issues with the experimental nature of the project; a lack of confidence that economic benefits would occur; concerns about the use of public funds for a private endeavor; belief that DOE funding should go toward renewable and alternative energy technologies from sources other than coal; and concerns about potential increased electricity costs for consumers. The majority of issues strictly related to natural resources tended to be general in nature (e.g., potential impacts to surface waters should be addressed). Additionally, two petitions in opposition to the project, signed by a total of approximately 340 residents and landowners in Morgan County, and one petition signed by 55 residents and landowners in Douglas County, were submitted to DOE.

Of the commentors that responded favorably for the project, many commented positively primarily due to economic and job creation benefits for the community, as well as benefits in terms of self-sufficient national energy production.

Following the intent of NEPA, DOE uses the scoping process to focus the analysis of issues and impacts in the EIS. Rather than providing responses to specific comments received during scoping, DOE endeavors to ensure that the EIS addresses and analyzes issues and potential environmental impacts appropriately based on commentor concerns. Chapter 1 (see Table 1-1) provides a summary of the scoping comments received, organized by comment category or applicable resource area, and it identifies the appropriate sections in the EIS where the respective issues are addressed. The subjects and issues raised in specific comments are summarized in more detail in Table 3 of Appendix A, Public Scoping.

DOE also contacted federal and state agencies and Native American tribes during the scoping process to initiate interagency and intergovernmental coordination requirements under various laws. Consultation with the Illinois State Historic Preservation Office (SHPO) resulted in the development of a

Programmatic Agreement signed by DOE, the Alliance, the SHPO, and the Advisory Council on Historic Preservation that outlines steps to address potential discoveries protected by the National Historic Preservation Act **(see Appendix B, Cultural Resources Consultation [B3]).** Consultation with the U.S. Fish and Wildlife Service and the Illinois Department of Natural Resources (IDNR) resulted in the identification of species protected by the Endangered Species Act and by state law to be addressed in the EIS. DOE contacted the U.S. Army Corps of Engineers (USACE) to discuss the potential need for wetland permitting under Sections 10 **and 404** of the Clean Water Act, and contacted the U.S. and Illinois Departments of Agriculture (IDOA) to ensure conformance with the Federal Farmland Protection Policy Act. In compliance with the National Historic Preservation Act, DOE contacted the 18 federally-recognized Native American tribal organizations that could have a cultural or historic affiliation with the area to be affected by the proposed project, based on the National Park Service's listing of tribes to be contacted in conformance with the Native American Graves Protection and Repatriation Act.

COMMENTS RECEIVED ON THE DRAFT EIS

DOE produced the FutureGen 2.0 Draft EIS in April 2013 and published a Notice of Availability (NOA) in the *Federal Register* on May 3, 2013 (78 FR 26004), which is included in Appendix I, Public Comments on the Draft EIS. On the same date, the U.S. Environmental Protection Agency (USEPA) published its NOA for the Draft EIS (78 FR 26027), which initiated the 45-day public comment period (from May 3 to June 17, 2013).

On May 21, 2013, DOE held a public hearing on the Draft EIS for the FutureGen 2.0 Project at Jacksonville High School, Jacksonville, Illinois. An informational session was held from 5:00 p.m. to 6:00 p.m., followed by the formal presentations and comment period from 6:00 p.m. to approximately 8:00 p.m. Appendix I, Public Comments on the Draft EIS, provides a summary of the public hearing and commenting period.

In addition to the notice of the hearing in the NOA, DOE posted notices in three area newspapers (Jacksonville *Journal-Courier*, Springfield *State Journal-Register*, and Illinois *Farm Week*) during the three weeks prior to the public hearing that announced the hearing date, time, location, and purpose. DOE also distributed notifications for the public hearing on April 26, 2013, including 147 letters each with a hardcopy of the Draft EIS, 164 notification letters alone, and 180 notifications by email.

A total of 46 people signed attendance sheets for the public hearing, and seven individuals signed up to give oral comments. During the informational session, the public was invited to view various displays about the NEPA process and the FutureGen 2.0 Project and to talk with DOE and Alliance representatives. During the formal hearing, presentations were made by the DOE Document Manager and the Alliance's Chief Executive, and the floor was opened for public comments. A court reporter recorded the formal presentations and oral comments as documented in the transcript included in Appendix I, Public Comments on the Draft EIS.

DOE received comments from two federal agencies, two state agencies, one local elected official, four non-governmental or public-private organizations, and seven members of the public during the official 45-day comment period, including the oral comments at the hearing. The comments are catalogued according to the specific comments by each respective commentor in Appendix I, Public Comments on the Draft EIS, along with DOE's response to each comment. In aggregate, a total of 116 comments were received in 19 separate submissions from 16 individuals (1 member of the public spoke at the hearing and also submitted 3 sets of written comments). In preparing the Final EIS, DOE fully considered all comments both individually and cumulatively, including comments received after the closing date.

The largest proportion of comments related to the adequacy of information provided about the project and potential impacts. The majority of resource-specific comments focused on

socioeconomic issues, geology, and climate and greenhouse gas emissions. Another substantial group of comments was distributed relatively evenly among concerns about health and safety, biological resources, NEPA requirements, and air quality. The remaining group of comments was distributed among other subject areas: alternatives, land use, purpose and need, cumulative impacts, environmental justice, regulatory issues, surface water, wetlands, groundwater, physiography and soils, and utilities.

Comments about the adequacy of information in the Draft EIS expressed dissatisfaction with the level of detail provided about the project and engineering features, alleged that the Alliance withheld or provided inconsistent information, questioned the Alliance's qualifications to complete the project, claimed that the Draft EIS did not provide adequate information about financial assurances and monitoring for the geologic CO_2 storage component, or alleged other deficiencies in project information.

Several comments on socioeconomic issues expressed support for the project based on the potential for economic stimulus and other benefits. Other socioeconomic comments expressed concerns about potential cost overruns and the adverse impacts on taxpayers and ratepayers. Additional comments questioned whether the project would be justified by a full cost-benefit analysis, expressed concerns about economic risks, or questioned whether economic benefits would be realized.

Geology-related comments expressed concerns about whether selection of the CO_2 storage area was justified, whether the geologic storage formation could adequately support the project, whether the caprock formation could withstand the chemical effects of CO_2 injection, and similar issues.

Comments on climate and greenhouse gases included some that questioned whether the project would in fact reduce greenhouse gas emissions, questioned the validity of climate change, or expressed concerns about other greenhouse gas issues. Other comments expressed support for the project based on potential reductions in emissions from fossil fuel combustion.

The balance of comments addressed other subjects, including potential health and safety risks associated with leakage from the CO_2 storage formation or the pipeline, mitigation for potential biological resource impacts, concerns about DOE's implementation of NEPA, claims that the purpose and need or consideration of alternatives were not adequately addressed, or concerns about potential impacts on other resources.

PRINCIPAL CHANGES BETWEEN THE DRAFT AND FINAL EIS

The Draft EIS primarily analyzed the Alliance's initial design for the FutureGen 2.0 Project. Throughout DOE's NEPA process, the Alliance continued to develop its conceptual and preliminary designs for the oxy-combustion facility, CO_2 pipeline, injection wells and associated surface facilities for permanent geologic CO_2 storage, and educational facilities. The Final EIS reflects the changes made as more information became available, including: (a) project design changes, (b) studies not completed in time to be included in the Draft EIS, and (c) recent regulatory developments. DOE also revised and updated the Final EIS as appropriate in response to comments received on the Draft EIS as discussed above.

Table S-1 (new in the Final EIS) summarizes the principal changes in the project between the Draft and Final EIS and explains how these changes affected respective sections in the Final EIS. The additions to this Final EIS reflecting substantive changes from the Draft EIS are shown in the same text format as displayed in this paragraph (i.e., new inserted text appears in bold type accompanied by a bar in the margin; deletions are not shown, and minor editorial changes are not marked.

Changes from Draft to Final EIS

Additions to this Final EIS reflecting substantive changes from the Draft EIS are shown in bold type accompanied by a bar in the margin; deletions are not shown, and minor editorial changes are not marked.

Table S-1. Principal Changes from the Draft to the Final EIS

Project Feature	Change	Basis and Description of Change	Section(s) of EIS Affected
FutureGen 2.0 Project			
	Project design updates	Throughout DOE's NEPA process, the Alliance continued to develop its conceptual and preliminary designs for the energy center, pipeline, and injection wells for permanent geologic CO_2 storage. In February 2013, the Alliance entered Phase II of the project for completion of front-end engineering and design. The Final EIS reflects the changes that have been made to the project design since release of the Draft EIS.	DOE updated all sections of the EIS and appropriate appendices to reflect new design details for the proposed project. For some resources, DOE maintains the impact analyses from the original project design analyzed in the Draft EIS as upper-bound scenarios.
	New or additional information provided based on efforts completed since publication of Draft EIS	In addition to the refinements in the conceptual and preliminary design, DOE and the Alliance performed associated studies and field work that provided new or updated data for consideration in the Final EIS.	DOE updated all sections of the EIS and appropriate appendices to include the new or updated information made available since publication of the Draft EIS.
	Public hearing held on the Draft EIS and comments received	Agency and public comments on the Draft EIS directed the need for updates or changes to the Final EIS.	DOE added Appendix I, which includes the summary of the public hearing, comments received, DOE responses, and the Notice of Availability of the Draft EIS. Section 1.6.3 was added to Chapter 1 summarizing the public hearing and comments received; this information was also added to this Summary. Text throughout the Final EIS was updated where appropriate to reflect responses to comments.
Oxy-Combustion Facility at the Meredosia Energy Center			
	Reduction in impacted area at the Meredosia Energy Center	The need by Ameren Transmission Company to use portions of the energy center property for the separate Illinois River Transmission Line project, as well as consultation with the USFWS and comments received from the USDOI, resulted in reevaluation of the site layout to reduce the amount of forested land that could potentially be impacted by the oxy-combustion facility at the energy center.	DOE added Figure 2-15 to Chapter 2 to present the revised impact areas at the energy center, reducing the forested impact acreage from approximately 33 acres (analyzed in the Draft EIS) to approximately 9 acres. The Final EIS analyzes impacts from this reduced impact scenario, while also maintaining the impact analysis from the Draft EIS as an upper-bound scenario. DOE has made associated updates to Sections 2.4.3; 3.3 Physiography and Soils; 3.6 Surface Water; 3.7 Wetlands and Floodplains; 3.8 Biological Resources; and 3.10 Land Use.

Table S-1. Principal Changes from the Draft to the Final EIS

Project Feature	Change	Basis and Description of Change	Section(s) of EIS Affected
Oxy-Combustion Facility at the Meredosia Energy Center *(continued)*			
	Changes to process materials and waste quantities, and changes to coal delivery options.	Refinements in the project design since publication of the Draft EIS resulted in an increase in input rates for coal, hydrated lime, trona, and the generation rate of bottom ash, along with the daily and yearly truck and barge trips. Also, the Alliance is now considering an option for offsite blending of the two coal types at an existing commercial coal handling facility in St. Louis, instead of the current plan for onsite blending. This option would reduce truck traffic but require additional barge deliveries.	DOE updated Sections 2.4.4.1 and 2.4.4.2 to reflect the changes in process materials and waste, as well as Section 3.12, Materials and Waste Management. Section 3.13, Traffic and Transportation, was updated to discuss the option for offsite blending and the resultant change in truck and barge traffic.
	Air quality analysis updates to reflect 168 MWe design.	The FutureGen 2.0 designers initially calculated emissions for the oxy-combustion facility based on a proposed generating capacity of 200 MWe. Estimated emissions based on these calculations were reported in the construction permit application to the IEPA in February 2012. While the Draft EIS was being prepared, the Alliance decided to reduce the planned generating capacity to 168 MWe, and DOE analyzed all other resources in the Draft EIS based on the revised capacity of 168 MWe. But the air quality analysis in the Draft EIS was based on a 200 MWe capacity because a revised construction permit application had not yet been submitted for the lower capacity. Since publication of the Draft EIS, the Alliance prepared and submitted a revised construction permit application in June 2013 to reflect the 168 MWe capacity.	DOE updated Section 3.1, Air Quality, to present estimated air emissions based on the 168 MWe design, as well as updated analyses contained in the revised construction permit application. As explained, the impacts analyses for other resources in the Draft EIS were already based on the 168 MWe design.
	Increase in river water usage.	Ongoing design efforts increased the river water usage rate from 11.4 to 13.6 million gallons per day for the oxy-combustion facility.	DOE revised Section 2.4.4.1 and Section 3.6, Surface Water, to reflect the increase in water usage.
CO_2 Pipeline			
	The pipeline corridor was reduced in size.	Due to developments in pore space acquisitions, the Alliance expanded the CO_2 storage study area (see below for further discussion). This expansion caused a reduction in the CO_2 pipeline corridor acreage.	DOE updated Figure 2-17 to show the revised CO_2 pipeline corridor. All resource sections that describe characteristics of the corridor were updated as appropriate.
	The Alliance selected the southern pipeline route as the proposed	Since publication of the Draft EIS, the Alliance selected the proposed location for the injection wells. Thus the proposed alignment of the southern pipeline route was	DOE revised Section 2.5.1 to explain the changes to the southern pipeline route. Updates were made to all figures in the EIS

Table S-1. Principal Changes from the Draft to the Final EIS

Project Feature	Change	Basis and Description of Change	Section(s) of EIS Affected
CO_2 Pipeline *(continued)*			
	route and further defined the alignment.	extended within the CO_2 storage study area to the injection well site. After extensive field work and coordination with landowners and federal and state agencies (i.e., Illinois SHPO, the IDNR, and the USACE), the Alliance further defined the most likely pipeline route. The route was selected based on coordination with landowners and consideration of constructability, access to existing ROWs, and the desire to avoid, to the extent possible, sensitive environmental resources such as wetlands, cultural resources, forest land, and threatened or endangered species and their habitats.	that depict the pipeline routes. All resource sections that describe impacts along the southern pipeline route were updated as appropriate. Since the Alliance does not plan to move forward with the northern pipeline route, final routing within the storage study area was not identified for the northern route to the injection wells. As a result, DOE addresses the pipeline impacts for the northern route based on the analysis presented in the Draft EIS using hypothetical end-of-pipeline spurs. The depicted southern pipeline route could ultimately deviate as a result of final project design and coordination with landowners; however, the Alliance would follow the same siting criteria and impacts would be consistent with those addressed in this EIS, as described in updated Section 3.0.
Injection Well Site			
	The Alliance selected a location for the injection well site.	Since publication of the Draft EIS, the Alliance selected a location for the injection well site and submitted UIC Class VI permit applications to the USEPA for the injection wells. The construction of injection wells cannot begin until the UIC permits are issued. In the Draft EIS, DOE analyzed hypothetical injection well sites and pipeline spurs to represent a range of potential impacts in the Draft EIS. In the Final EIS, DOE analyzes impacts related to the recently proposed injection well site location.	DOE revised Section 2.5.2 to explain the selection of the injection well site and updates to the design and impacts of the horizontal injection wells. Updates were made to all figures in the EIS that depict the injection wells. All resource sections that analyze impacts at the injection well site were updated. DOE updated Sections 3.4, Geology, and 3.17, Human Health and Safety, to reflect recent data included in the UIC permit applications.
	The CO_2 storage study area was expanded.	Since publication of the Draft EIS, the Alliance has been working with local landowners to acquire additional pore space rights to ensure that the CO_2 plume would not affect subsurface rights of non-participating landowners. As a result of these efforts, the size of the CO_2 storage study area has been expanded to 6,800 acres with the additional 1,500 acres	DOE revised Section 2.5.2 to explain the expanded CO_2 storage study area and associated reduction in the pipeline corridor acreage. Updates were made to all figures in the EIS that depict the CO_2 storage study area. All resource sections that analyze impacts at the CO_2 storage study area were updated.

Table S-1. Principal Changes from the Draft to the Final EIS

Project Feature	Change	Basis and Description of Change	Section(s) of EIS Affected
Injection Well Site *(continued)*			
		located south and west of the original study area boundary. While the location of the CO_2 plume has shifted south slightly as a result of availability of additional pore space and the Alliance's plan to construct and operate four horizontal injection wells of varying lengths, the subsurface plume extent would remain as estimated in the Draft EIS; approximately 4,000 acres.	
	Design changes to the injection well site configuration.	**The proposed injection well site would include four horizontal injection wells on one well pad, the site control and maintenance building, parking area, sidewalks, and other infrastructure (stormwater basin, a packaged wastewater treatment system, screening berms, and fencing). The configuration of the injection well site would be dependent on the design scenario – single-site or dual-site scenario. Since the Alliance selected the single-site scenario with four horizontal injection wells as its preferred option, additional details about this injection well site configuration were made available for the Final EIS. The principal changes include the following:** • **<u>Buildings</u>. The Draft EIS included both a single-site scenario with four horizontal injection wells at one well pad; and a dual-site scenario with one vertical injection well and one well pad at each of two different sites. The new design details specified that the single-site scenario would require only one building to house the surface facilities, as opposed to the dual-site scenario that would require as many as four buildings distributed between two sites.** • **<u>Size of Site.</u> In the Draft EIS, the land area impacted by the injection well site(s) reflected the dual-site scenario, as it was more conservative, and the single-site scenario was in very preliminary design. Since publication of the Draft EIS, the Alliance chose a location for the single injection well site and furthered its conceptual design, resulting in a reduction in acreage of**	**DOE revised Sections 2.5.2.2 through 2.5.2.4 to explain the changes to the design of the injection well site for the single-site scenario. Updates were made to all figures in the EIS that depict the injection and monitoring wells, surface facilities, and infrastructure. All resource sections that analyze impacts at the injection well site were updated.** **DOE has updated the impact analyses in the Final EIS to discuss impacts resulting from the single-site scenario, while maintaining the dual-site impact analysis as presented in the Draft EIS to serve as a more conservative upper bound.**

Table S-1. Principal Changes from the Draft to the Final EIS

Project Feature	Change	Basis and Description of Change	Section(s) of EIS Affected
Injection Well Site *(continued)*			
		impact areas compared to the dual-site scenario. Additionally, the length and acreage required for access roads would be less for the single-site scenario compared to the dual-site scenario. • Monitoring Well Network. Since publication of the Draft EIS, the Alliance updated details regarding the monitoring well network for the single-site scenario.	
Educational Facilities			
	Design changes to the educational facilities configuration.	Since publication of the Draft EIS, the Alliance modified its plans such that the current conceptual design assumes that the visitor, research, and training facilities would be housed in a single building, rather than two separate buildings. However, since design concepts are still in development, the Final EIS maintains the impact analyses in the Draft EIS, based on the original conceptual design for multiple educational buildings, as representing a conservative upper bound for potential impacts.	DOE revised Section 2.5.3 to explain changes to the design of the educational facilities. All resource sections that analyze impacts at the educational facilities were updated.

CO_2 = carbon dioxide; DOE = U.S. Department of Energy; EIS = Environmental Impact Statement; IDNR = Illinois Department of Natural Resources; IEPA = Illinois Environmental Protection Agency; MWe = megawatt electrical; NEPA = National Environmental Policy Act; ROW = right-of-way; SHPO = State Historic Preservation Office; UIC = Underground Injection Control; USACE = U.S. Army Corps of Engineers; USDOI = United States Department of the Interior; USEPA = United States Environmental Protection Agency; USFWS = United States Fish and Wildlife Service

DESCRIPTION OF THE FUTUREGEN 2.0 PROJECT

For the FutureGen 2.0 Project, the Alliance would purchase from Ameren the assets of the Meredosia Energy Center that would be needed for the Oxy-Combustion Large Scale Test component of the proposed project. Ameren suspended plant operations at the end of 2011 but has retained the permits associated with the facility and will maintain the facilities to be available for the FutureGen 2.0 Project. All equipment remains in operable condition, which would enable Ameren to operate the generating facilities if the resumption of operations were to fit Ameren's requirements. If the FutureGen 2.0 Project is implemented, Ameren would permanently terminate operations of the existing boilers and related power generation infrastructure.

With support from Babcock & Wilcox and Air Liquide, the Alliance would design, construct, and operate an advanced oxy-combustion power generation plant. The oxy-combustion project has a proposed design capacity of 168 megawatt electrical (MWe) (gross) and would be integrated into the Meredosia Energy Center in order to make use of existing facilities and infrastructure. The facility would operate continuously to generate baseload electric power. The project would repower the existing Unit 4 steam turbine generator and capture and compress approximately 1.2 million tons (1.1 million metric tons) of CO_2 per year for subsequent transport and geologic storage. The project would be designed to meet DOE's CO_2 capture target of at least 90 percent (the project **may achieve a** 98 percent **capture efficiency**) **during steady-state operation** while reducing emissions levels of sulfur oxides**, carbon monoxide,** nitrogen oxides, mercury, acid gases, and particulate matter during normal operations.

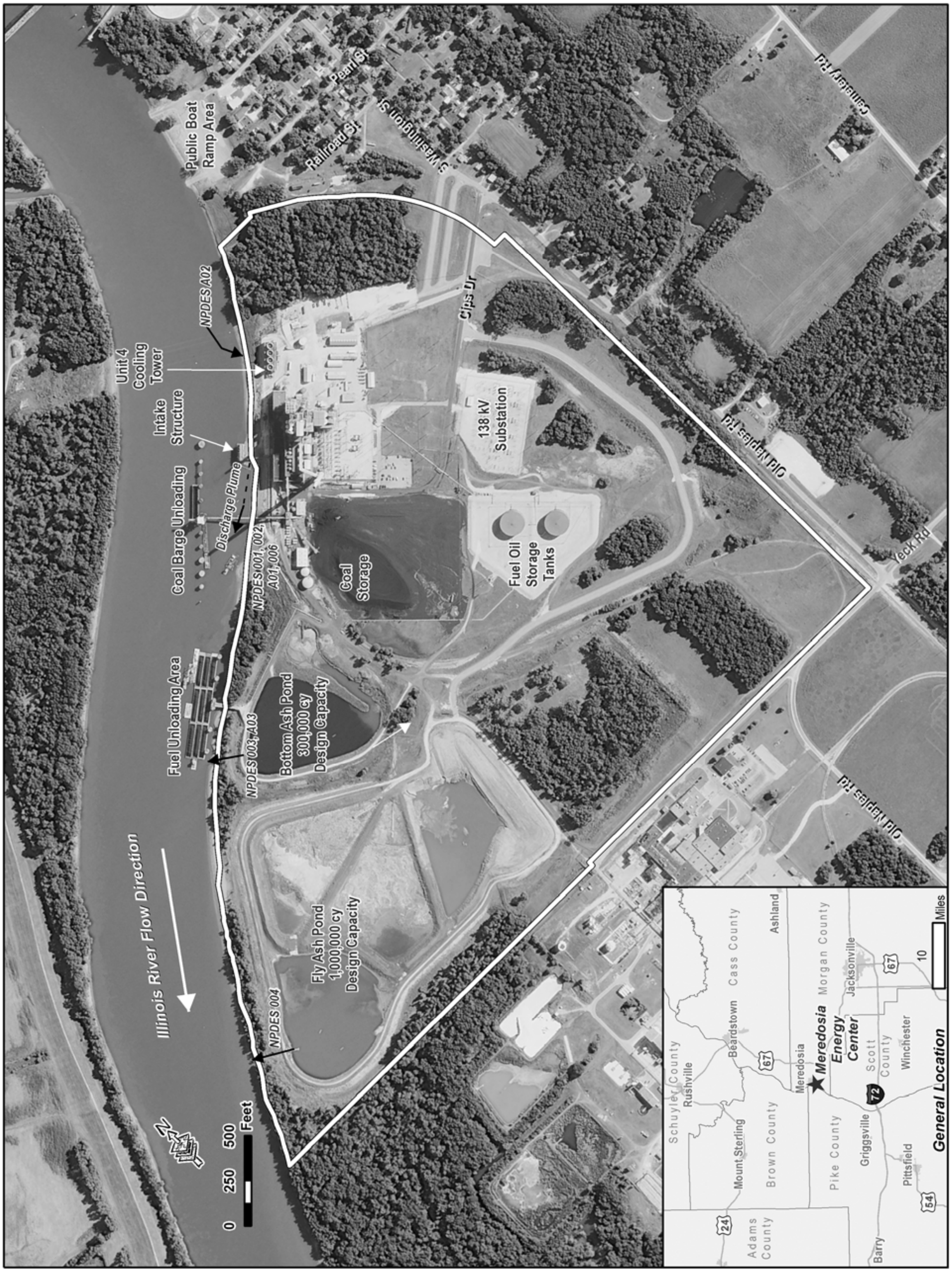
The Meredosia Energy Center

The Meredosia Energy Center, shown in Figure S-3, is located adjacent to the east side of the Illinois River, south of the village of Meredosia, Illinois. The 5,300-foot western boundary of the 263-acre energy center fronts the Illinois River, where the station's oil and coal barge unloading facilities are located (see Figure S-4). The energy center includes the infrastructure necessary to support the operation of a power generation plant including material and fuel handling and delivery facilities, process water sources, intake structures and treatment systems, stormwater and wastewater systems, cooling systems, and interconnects to high voltage transmission lines.

Figure S-3. Meredosia Energy Center

The Meredosia Energy Center includes four electric generating units (see Figure S-5). An electric generating unit refers to the combination, or unit, of equipment used to generate electricity including the boilers that create heat energy through combustion, steam cycle equipment that uses the heat to generate steam, steam turbines that convert the steam to mechanical energy, and electric generators that convert the mechanical energy to electricity. These units also include supporting equipment and facilities. Units 1 and 2 consist of four coal-fired boilers (Boilers 1, 2, 3, and 4), with each unit having a nominal rated generating capacity (i.e., capacity) of 60 MWe. Unit 3 consists of one coal-fired boiler (Boiler 5) and has a capacity of 229 MWe.

Unit 4 consists of one oil-fired boiler (Boiler 6) with a capacity of 200 MWe. Unit 4 was placed in service as an interim measure in 1975 to meet anticipated load growth until new generating facilities came online in 1977. During the 1980s and early 1990s, Unit 4 was operated as a peaking unit, accumulating approximately 20,000 hours of operation, with 900 starts. Peaking units are electric generating units that are only used during periods of high electricity demand.



cy = cubic yard; kV = kilovolt; NPDES = National Pollutant Discharge Elimination System

Figure S-4. Meredosia Energy Center Features – Aerial Overview

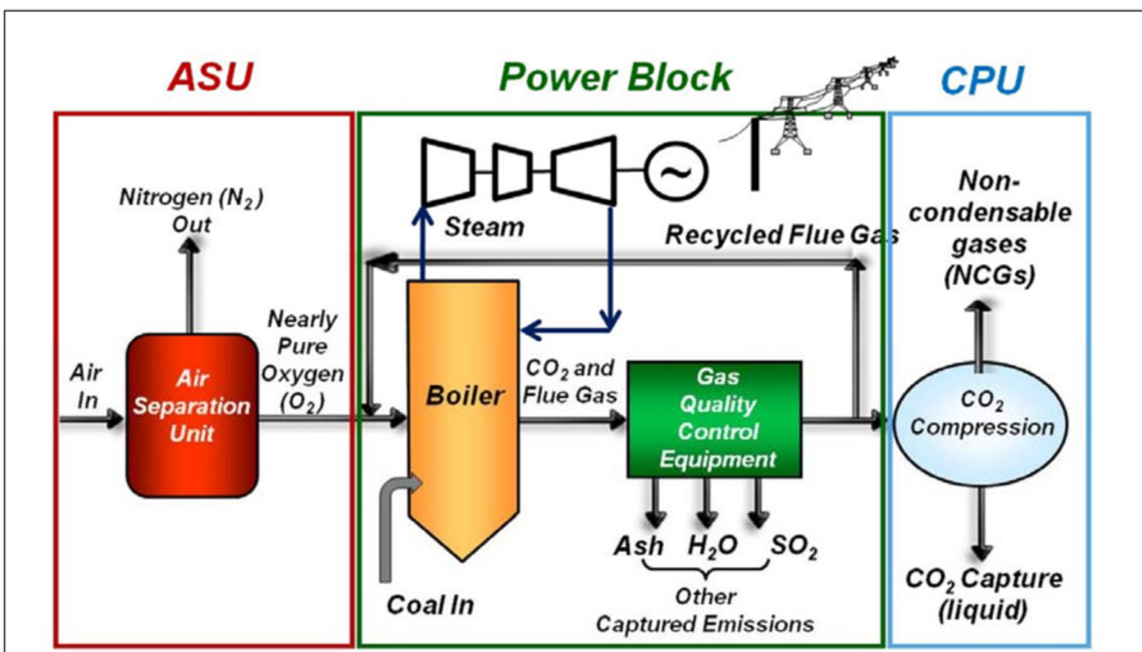
Figure S-5. Meredosia Energy Center Features – Coal and Fuel Handling Systems

The downtown area of the village of Meredosia is approximately 0.25 mile north of the energy center. Meredosia has a population of approximately 1,000 (USCB 2010a) and is approximately 18 miles west of Jacksonville, Illinois. Land use immediately east of the energy center consists of roadways, roadway rights-of-way (ROWs), rail access, and an unused railroad ROW. Beyond these immediate areas, land use is primarily residential to the north and northeast, scattered residential and agricultural to the east, and industrial to the south. Across the river, approximately 700 feet west, are forested lands, a small portion of a levee, and a transmission line ROW.

Oxy-Combustion Large Scale Test

The Oxy-Combustion Large Scale Test component of the FutureGen 2.0 Project would include the design, construction, and operation of an oxy-combustion power generation facility. The project would repower the existing Unit 4 using a new oxy-combustion coal boiler (in place of the existing oil-fired boiler) with equipment to capture, purify, and compress CO_2 for use in the CO_2 pipeline and storage reservoir component of the project. The oxy-combustion facility would be integrated into the existing infrastructure of the Meredosia Energy Center and would utilize the existing coal handling systems (delivery, storage, and conveyance), water supply systems (intake structures and wells), wastewater discharge outfalls, the main cooling tower (to be rebuilt from the existing Unit 4 cooling tower), substation equipment, the Unit 4 steam turbine, the Unit 4 electric generator, and other common plant infrastructure such as roadways (see Figures S-4 and S-5).

The proposed oxy-combustion facility is based on using the Babcock & Wilcox–Air Liquide cool recycle oxy-combustion process. A simplified diagram of this oxy-combustion system is provided in Figure S-6, with a conceptual layout of how the oxy-combustion system would be configured at the energy center presented in Figure S-7. Major components of the system (new and existing), and an overview of their key features, are provided in Table S-2. The repowered unit would be designed to generate approximately 168 MWe gross. The oxy-combustion system would use a mix of high-sulfur bituminous coal from Illinois and low-sulfur Powder River Basin (Wyoming) coal.



Source: Babcock & Wilcox 2010

ASU = air separation unit; CO_2 = carbon dioxide; CPU = compression and purification unit; H_2O = water; N_2 = nitrogen; NCGs = non-condensable gases; O_2 = oxygen; SO_2 = sulfur dioxide

Figure S-6. Simplified Diagram of Oxy-Combustion Facility

To accommodate the proposed plant at the Meredosia Energy Center, several existing warehouses, a deaerator, and one of the condensate storage tanks would be relocated. Three existing groundwater supply wells (Wells 3, 4, and 5) would be removed and one new well would be installed. The main cooling tower would be reconstructed and two additional cooling towers would be constructed, one for the direct contact cooler polishing system and one for both the air separation unit and the compression and purification unit.

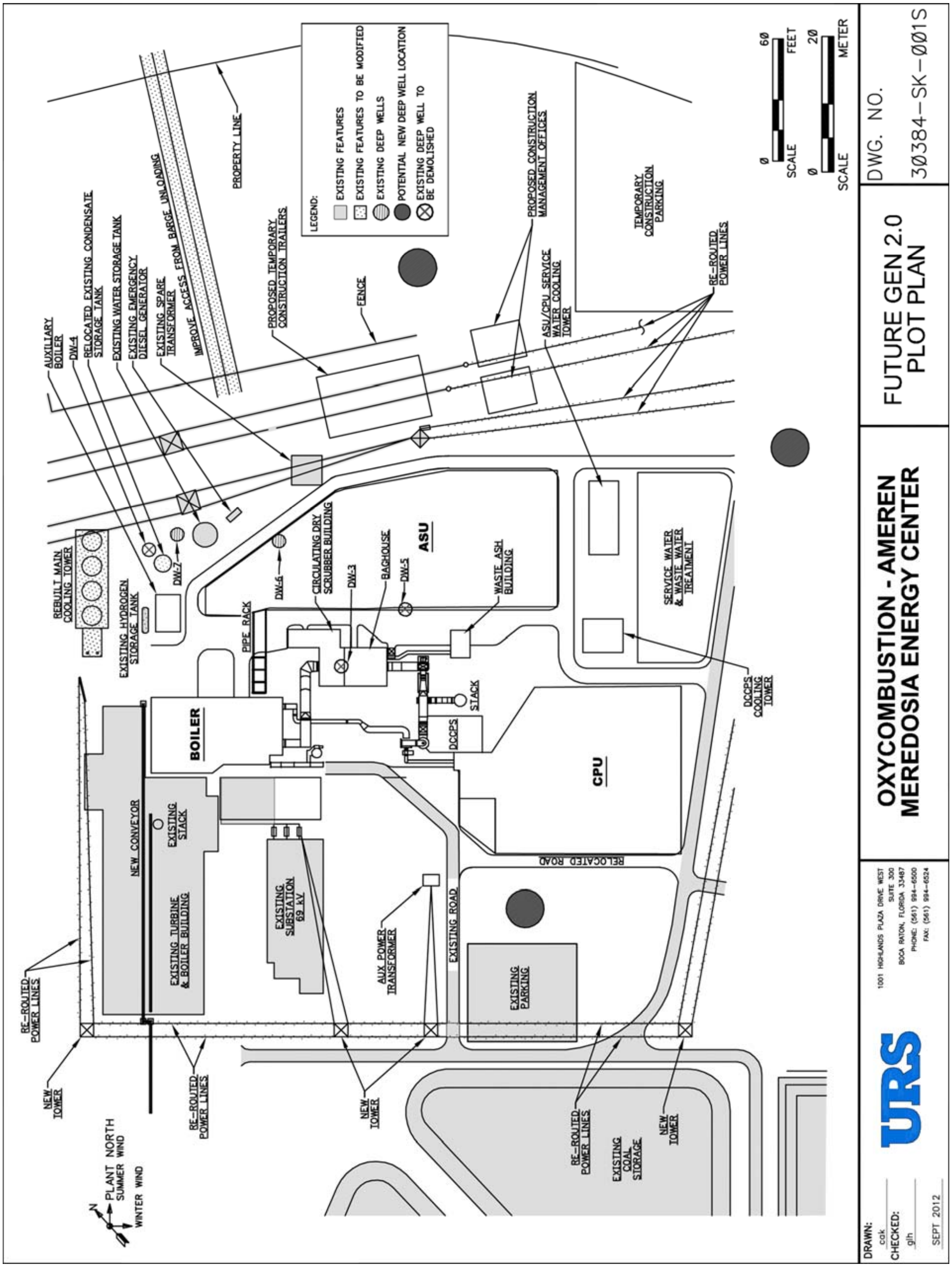
During construction at the Meredosia Energy Center, the Alliance plans to use the area between the existing boat ramps to the north of the energy center (in Figure S-4 labeled ‘Public Boat Ramp Area’) to unload a number of large equipment modules for the oxy-combustion facility. The modules would be constructed offsite and sent by barge on the Illinois River. The boat ramp area is owned by the village of Meredosia. Only one of the two existing boat ramps would be needed to offload the modules. There are two exits from the boat ramp area to the village, only one of which would be obstructed during barge unloading. Additional phases of project engineering and coordination with the village of Meredosia would be required to determine further accessibility arrangements, but the Alliance expects to ensure that at least one of the boat ramps remains open for public access during project construction. It is anticipated that impacts to the boat ramp area would be short term, lasting between 1 to 3 months during each of several construction unloading timeframes. It is expected that barge unloading activities related to construction of the oxy-combustion facility would begin in **2015** and conclude **by 2017**.

The construction phase for the oxy-combustion facility, including initial demolition, is estimated to occur over a period of approximately 42 months beginning in 2014 and extending through 2017. However, construction would be substantially completed within 30 months, and the last 12 months of construction would overlap with a 1-year commissioning and startup effort. The number of construction and craft workers onsite would range from 100 to 200 for the first 7 months, 300 to 400 for the next 8 months, and 450 to 500 at peak for the next 8 months. Beginning with the 24th month, the onsite construction staff would reduce to approximately 300 for 8 months, then decline to between 50 and 200 for the final 11 months.

CO_2 Pipeline

The CO_2 captured by the oxy-combustion facility would be processed for removal of contaminants, and compressed to 2,100 pounds per square inch pressure. The compressed gas would then be delivered to a new **nominal** 12-inch **or 10-inch** diameter pipeline for transport to the injection wells located in Morgan County, Illinois. The CO_2 would be at least 97 percent pure and transported in a liquid-like dense phase, which is the method of choice adopted by all major CO_2 pipeline companies. In this dense phase, the CO_2 is non-corrosive and is safe to transport in a pipeline.

The Alliance proposes to site, design, construct, and operate a CO_2 pipeline approximately 30 miles in length from the Meredosia Energy Center to the injection wells within the CO_2 storage study area. The Alliance designated a 4-mile wide corridor to the CO_2 storage study area through which the pipeline route would pass. Because the exact pipeline **alignment was not known during the analysis for the Draft EIS**, DOE used the corridor to set the boundaries and general existing conditions of where the pipeline would be located. Two possible pipeline routes within this corridor, the southern route and northern route, were identified by the Alliance (see Figure S-8). **In the early stages of the FutureGen 2.0 Project, the Alliance identified the northern route for initial cost-estimating purposes. Based on subsequent discussions with the SHPO, IDNR, and USACE, as well as related investigations and field work, the Alliance identified the southern route as the preferable and proposed pipeline route**. The southern pipeline route would utilize existing highway ROWs and further avoid sensitive environmental resources such as wetlands, cultural resources, forest land, and threatened or endangered species and their habitats to the fullest extent possible. **Although the northern pipeline route is included in this Final EIS for comparison purposes, the Alliance is no longer considering the northern route for the FutureGen 2.0 Project.**



ASU = air separation unit; CPU = compression and purification unit; DCCPS = direct contact cooler polishing system; DW = deep well; kV = kilovolt

Figure S-7. Conceptual Oxy-Combustion Facility Site Layout

Table S-2. Overview of Oxy-Combustion Facility Components and Features

Component	Features
Air Separation Unit (new)	Generates oxygen for the oxy-combustion boiler: - Compresses and dries ambient air; - Separates oxygen through compression and cryogenic distillation; - Directs manufactured oxygen to the boiler for combustion process; and - Vents separated **remaining gases** to atmosphere.
Power Block	Generates thermal energy through combustion, converts the thermal energy to steam, and uses steam to create mechanical energy to drive the electric generator that produces electricity.
Boiler (new)	Combusts pulverized coal with a mixture of oxygen and recycled flue gas. Uses heat generated in the combustion process to generate steam.
Gas Quality Control System (new)	Treats flue gas generated during the combustion process to remove pollutants and impurities. Directs treated gas to the CPU and also back to the boiler. Includes the following: - CDS to remove sulfur compounds (e.g., sulfur dioxide and sulfur trioxide); - Pulse jet fabric filter to remove particulates; and - DCCPS for reduction of moisture and **additional removal of pollutants to meet CPU purity requirements**.
Steam Turbines (existing)	Converts thermal energy captured in steam to mechanical energy through the spinning of the turbines.
Electric Generators (existing)	Uses mechanical energy (spinning) from turbines to drive electric generators that produce electricity.
Electrical Control System (existing and new)	Transfers electricity from generators to the transmission grid.
Compression and Purification Unit (new)	Purifies and compresses treated flue gas for delivery to CO_2 pipeline.
Additional Equipment and Systems	Additional equipment is needed to supply process water, provide cooling to plant processes, supply and handle fuel (coal), and treat waste streams.
Cooling Towers (existing & new)	The cooling towers include two new cooling towers and reconstruction of the existing Unit 4 cooling tower. Cooling towers are used to provide cool water for the condensation of steam in the steam condenser and to remove excess heat from other system processes (e.g., ASU and CPU).
Process Water Systems (existing & new)	Includes use of existing water intake structures and wells (one new well) to supply water to the plant and new water treatment systems to remove water impurities.
Wastewater Treatment Systems (new)	Includes **three** new wastewater treatment systems that would remove pollutants from wastewater generated in the **CPU, the DCCPS, and areas where stormwater could be contaminated by industrial activities**.
Coal Storage and Handling (existing)	Includes delivery, storage, and conveyance systems.
Exhaust Stack (new)	A new exhaust stack (**chimney**) would be **approximately** 450 feet tall **and contain two exhaust vents, one for the oxy-combustion boiler during air firing operations and a second for the CPU.** The exhaust stack would discharge treated flue gas during normal operations, discharge monitored volumes of flue gas during unit startup and the transition to oxygen-fired status, and discharge flue gas and CO_2 during normal shutdown.
Auxiliary Boiler (new)	A new auxiliary boiler would be used to provide steam to the plant that is needed during the startup process. This would most likely be an oil-fired boiler.

ASU = air separation unit; CDS = circulating dry scrubber; CO_2 = carbon dioxide; CPU = compression and purification unit; DCCPS = direct contact cooler polishing system

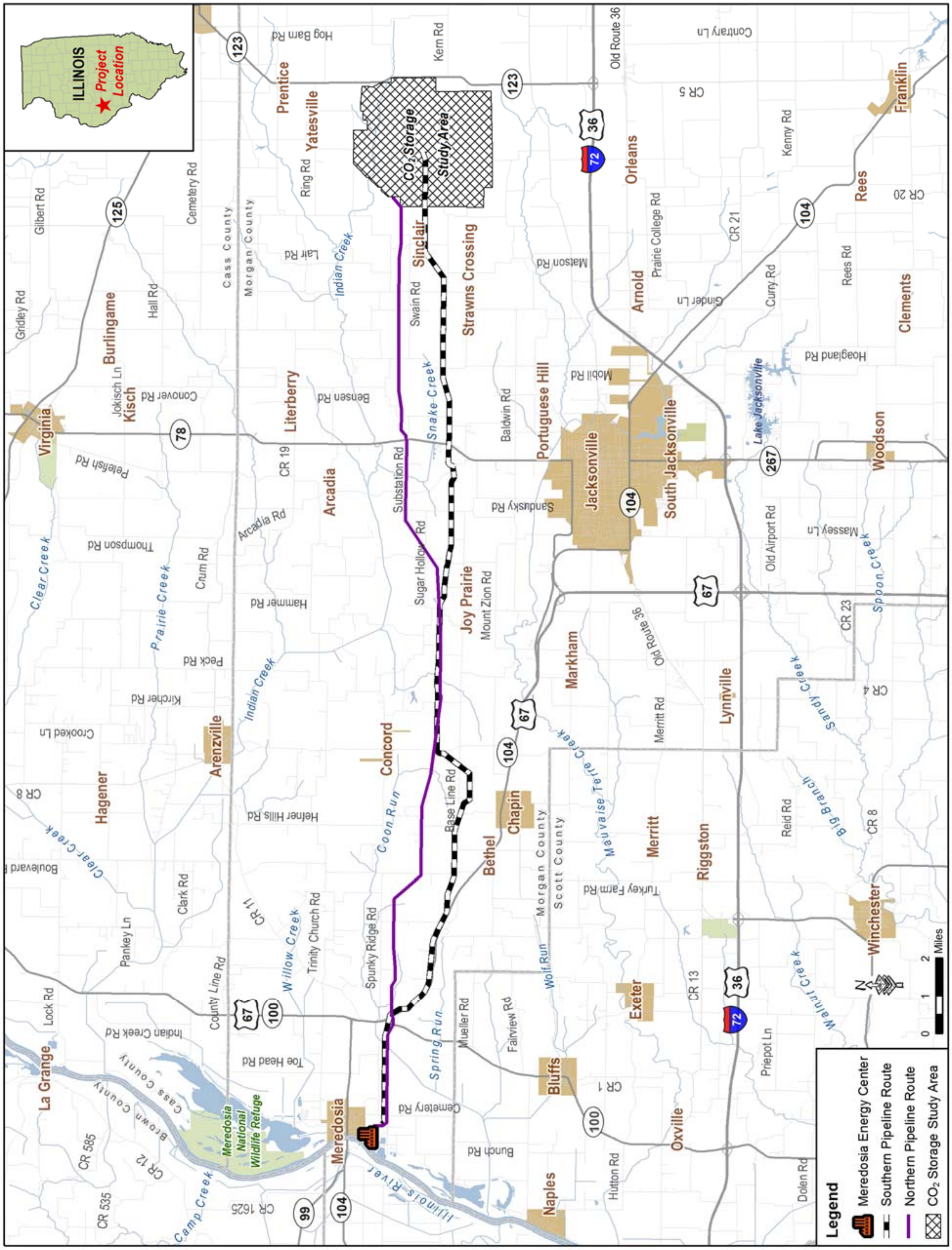


Figure S-8. Southern and Northern CO_2 Pipeline Route Options to CO_2 Storage Study Area

The CO_2 pipeline would comply with all applicable pipeline requirements under the U.S. Department of Transportation's regulation entitled "Transportation of Hazardous Liquids in Pipelines" (49 CFR 195) and provide safeguards to mitigate risks associated with CO_2 safety hazards. These safeguards would include mainline block valves to isolate pipeline sections, a leak detection system to alert the operator, and a supervisory control and data acquisition telecommunication system to communicate information and data about pipeline performance. In addition, pipeline monitoring and surveillance procedures would be implemented in the field on a daily basis.

The CO_2 pipeline would have an operational ROW of 50 feet wide with a construction ROW of 80 feet wide (100 feet in limited circumstances as dictated by terrain). The CO_2 pipeline would be constructed over a **4** to **5** month period and in a manner to minimize potential impacts. The number of construction workers for the pipeline would range from 150 to 300. The pipeline would be buried at least 4 feet underground, which is more stringent than required by 49 CFR 195, with additional depth of cover for crossings, drainage ditches, and irrigation tiles. For agricultural land, the pipeline would be buried at least 5 feet deep in accordance with IDOA pipeline construction standards and policies. Topsoil would be removed first and stored separately along the pipeline trench segregated from other subsoil (see Figure S-9). The Alliance signed an Agricultural Impact Mitigation Agreement with the IDOA (**see Appendix H, Agricultural Mitigation**) that identifies additional mitigation measures during construction related to activities in the ROW (e.g., tree clearing and management of debris).

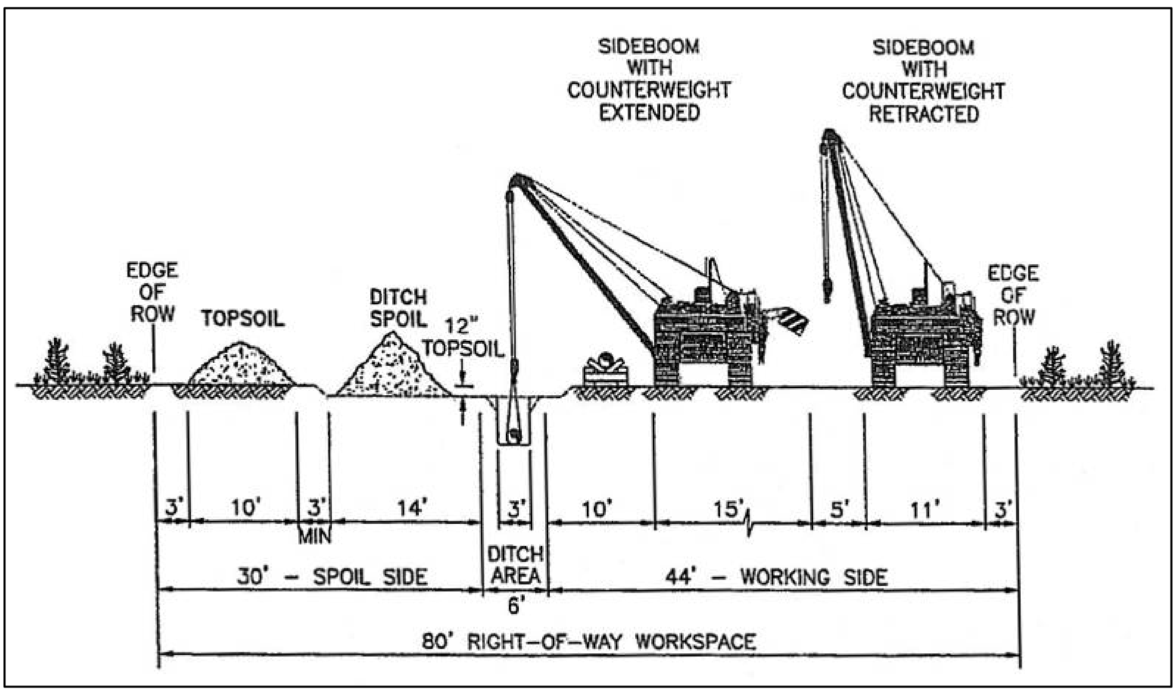


Figure S-9. Recommended Construction Right-of-Way Cross Section

Access to the construction ROW would be provided (as much as possible) from existing roads near the pipeline route. Horizontal directional drilling would be used for major waterbody crossings (i.e., waterbodies more than 100 feet wide) to avoid disturbing streambeds. Jack and bore tunneling would be used for smaller surface water features and wetland areas for the same purpose. It is also possible that trenching would be used for crossings of dry stream channels. Existing pipelines would be under-crossed unless over-crossing is specifically permitted by the pipeline owner. All road and railroad crossings would be bored under the road or railroad (i.e., without casings) using heavy wall pipe with abrasion resistant coating.

Pipeline operations would be managed and monitored on a continuous basis from a central control room located in the site control **and maintenance** building at the CO_2 injection well site. The central control room would send command and control signals remotely using the supervisory control and data acquisition network to all pump and metering stations and the launcher and receivers in the system. Operation of the pipeline would be performed in full compliance with applicable U.S. Department of Transportation rules and regulations and would require regular visual and in-line inspections to ensure safety and integrity. Pipeline patrolling would be by road, by foot, and **potentially** by helicopter, contracted to specialist companies. These visual surveys would be conducted every two weeks and would look for signs of leaks (e.g., discolored vegetation, disturbed soil) and potential infrastructure concerns (e.g., exposed pipe at stream crossings). Post-construction monitoring would be conducted (potentially for several years) to ensure that restoration of wetlands and agricultural lands would be undertaken in accordance with all permit and Agricultural Impact Mitigation Agreement requirements.

CO_2 Storage Study Area

The CO_2 injection well site(s) would be located within the CO_2 storage study area identified in Figure S-2. **The storage study area would encompass all of the surface facilities required for the injection and monitoring of the CO_2 as well as the underground CO_2 plume and all properties that hold subsurface rights within the predicted extent of the underground CO_2 plume area. Since the Draft EIS was published, the Alliance has been working with local landowners to acquire additional rights to subsurface pore space to maximize flexibility for CO_2 injection and to ensure that the CO_2 plume would not affect subsurface rights of non-participating landowners. (Non-participating landowners are those who have declined the Alliance's offer to purchase options for subsurface rights needed for CO_2 storage.) As a result of these efforts, the size of the CO_2 storage study area has been expanded to 6,800 acres of surface lands.**

Since publication of the Draft EIS, the Alliance identified a proposed property for the injection well site based on the results of data gathered from a stratigraphic well that was drilled in the CO_2 storage study area, other characterization activities, and the results of modeling of reservoir and seal performance.

The injection well facilities would be constructed within a site to be acquired by the Alliance consisting of approximately 9.5 acres as shown in Figure S-10. The Alliance would lease an additional 5.5 acres of adjoining property to the north for staging and laydown during the construction phase. The construction would be undertaken in a manner that would avoid areas of jurisdictional wetlands along the western edge of the properties, and the Alliance intends to leave as many trees intact on the properties as practicable. The Alliance cannot construct or operate the injection wells until Underground Injection Control (UIC) permits are issued by the USEPA.

The Alliance evaluated several injection well configurations using both vertical and horizontal injection wells at one or two sites. After consideration of site-specific data from the stratigraphic well, the Alliance is currently proposing to construct and operate four horizontal injection wells at one injection well site **(the single-site scenario) and is no longer considering the option of two sites with vertical injection wells (the dual-site scenario). Although the Alliance plans to move forward with the single-site configuration, the impact analysis in the Final EIS considers both the single-site scenario and dual-site scenario for comparative purposes.**

The single-site scenario would involve a single injection well site containing four horizontal wells. The conceptual layout for the injection well site, as depicted in Figure S-11, includes a gravel well pad, a parking lot, and the site control and maintenance building, which would house the well annulus maintenance and monitoring system. The single-site scenario would result in a smaller overall land area requirement for surface facilities compared to the dual-site scenario, because the CO_2 injection wells, building, supporting facilities, and access roads would occupy less than 14 acres.

Figure S-10. Location of Injection Well Site Property for Single-Site Scenario

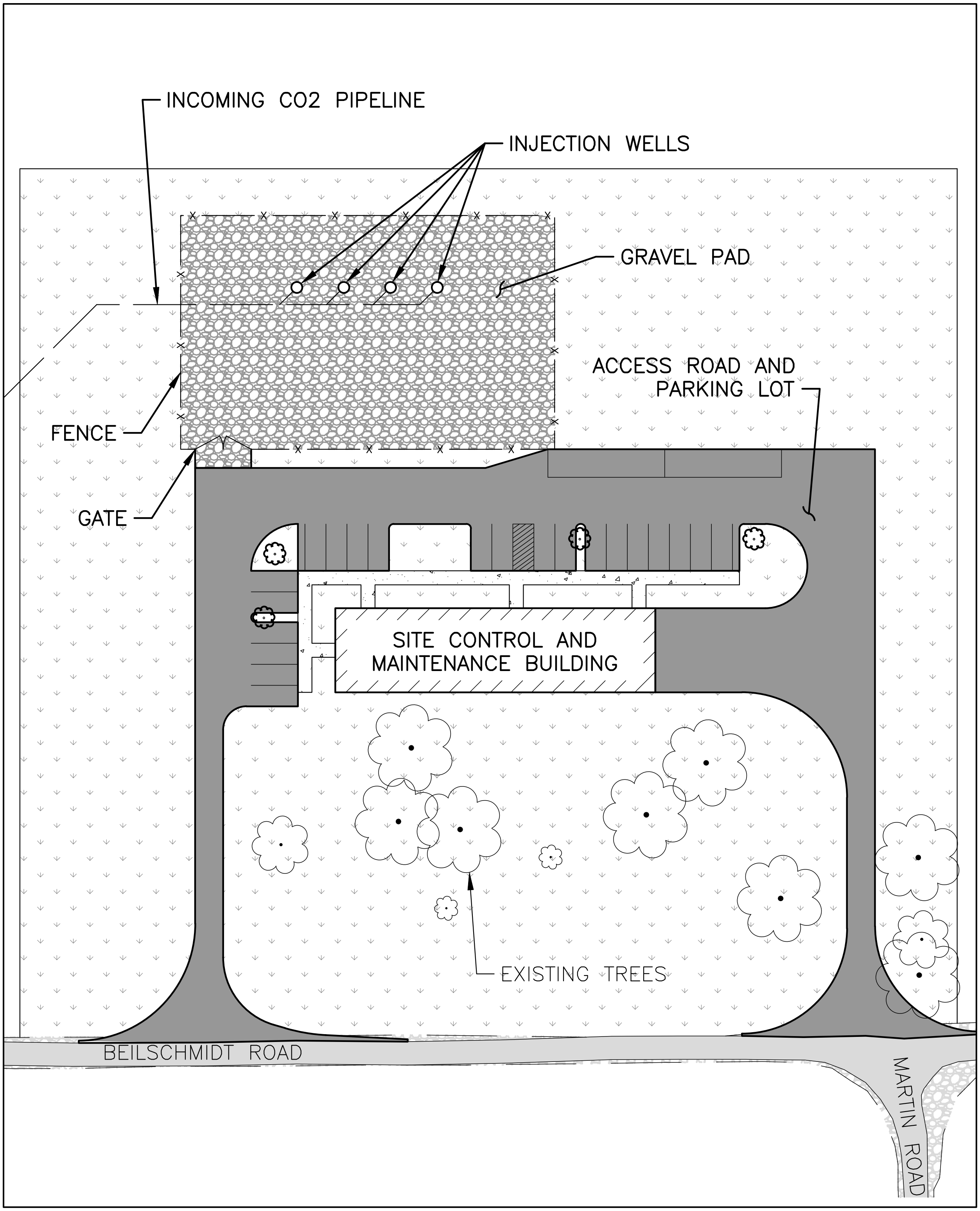


Figure S-11. Single-Site Scenario - Injection Well Site Surface Features Conceptual Layout

The dual-site scenario**, as analyzed in the Draft EIS and presented in the Final EIS for comparative purposes,** would involve two separate injection well locations, would require the most land area for surface facilities, and would occupy up to 25 acres within the CO_2 storage study area. Approximately 10 acres would be needed for the permanent operational footprint of the injection and monitoring wells and associated infrastructure and buildings, while **up to** 15 acres would be used for access roads to the well sites. As depicted in Figure S-12, the primary injection well location would include the injection well, booster pump building (if required), well maintenance and monitoring building, site control building (including the central control room), and other supporting infrastructure (e.g., parking lots, access roads, etc.). The secondary injection well site (see Figure S-13) would be approximately 200 feet by 200 feet and would be limited to the injection well, well maintenance and monitoring building, and an access road. Both locations would have security fences with controlled access. Additional acreage would be needed during well drilling and construction.

Well drilling would require approximately 14 construction workers over 100 to 120 days per well. Construction of the single-site scenario would require approximately 10 to 21 employees over a 25-week period. Construction of the surface facilities for the dual-site scenario would require approximately 10 to 36 construction workers over a 38-week period. The total land area disturbance during construction of the buildings, structures, associated facilities, and access roads, including construction staging areas, would collectively affect approximately 42 acres for the single-site scenario and 91 acres for the dual-site scenario.

Pursuant to an Illinois Commerce Commission ruling on the FutureGen 2.0 Project, the Alliance is proposing a 20-year injection period. The injection wells would be designed to collectively inject 1.2 million tons (1.1 million metric tons) of CO_2 per year over 20 years for a total of up to 24 million tons (22 million metric tons) into the target formation. The target formation is the Mt. Simon Formation, which is one of the Illinois Basin's major deep saline formations **(approximately 4,000 feet below ground surface)** with estimated total dissolved solids of approximately 48,000 parts per million **at the CO_2 storage study area.** This high level of total dissolved solids exceeds safe drinking water standards; thus, this formation is not suitable to serve as a future drinking water source in Morgan County. The formation's positive characteristics for CO_2 storage include its depth, lateral continuity, relative permeability, and its upper contact with an impermeable caprock (Eau Claire Formation).

> **Safe Drinking Water Act Underground Injection Control Program**
>
> On December 10, 2010, the USEPA published a final rule, "Federal Requirements Under the Underground Injection Control (UIC) Program for CO_2 Geologic Sequestration (GS) Wells" (*Federal Register* Vol. 75, No. 237) (the "Class VI rule"). Under this rule, the USEPA created a new category of injection wells (Class VI wells) with new federal requirements to allow for injection of CO_2 for geologic sequestration to ensure the protection of underground sources of drinking water (USDW). The Class VI rule would apply to the FutureGen 2.0 injection wells.

The injection wells would be designed, permitted, and constructed as Class VI wells in compliance with the Safe Drinking Water Act, UIC Program regulations (40 CFR 146). These regulations include strict standards related to the siting, construction, and monitoring of Class VI wells. The Alliance considered injection well configurations with both vertical and horizontal wells at one or two injection well sites. Figures S-14 and S-15 show the conceptual designs for a horizontal and vertical injection well, respectively. The figures also present the geological stratigraphic column for the CO_2 storage study area, showing the depth and thickness of the Mt. Simon Formation. The injection wells would extend into the Mt. Simon Formation. The Alliance **filed UIC permit applications (one permit application for each injection well) with the USEPA in March 2013 (revised May 2013). The UIC permit applications proposed** an injection well configuration with four horizontal injection wells that originate from one injection well site and operate independently of each other.

Ongoing efforts to characterize the geology at the CO_2 storage study area, including drilling of a stratigraphic well, have been used to provide an improved geologic understanding of the site. The

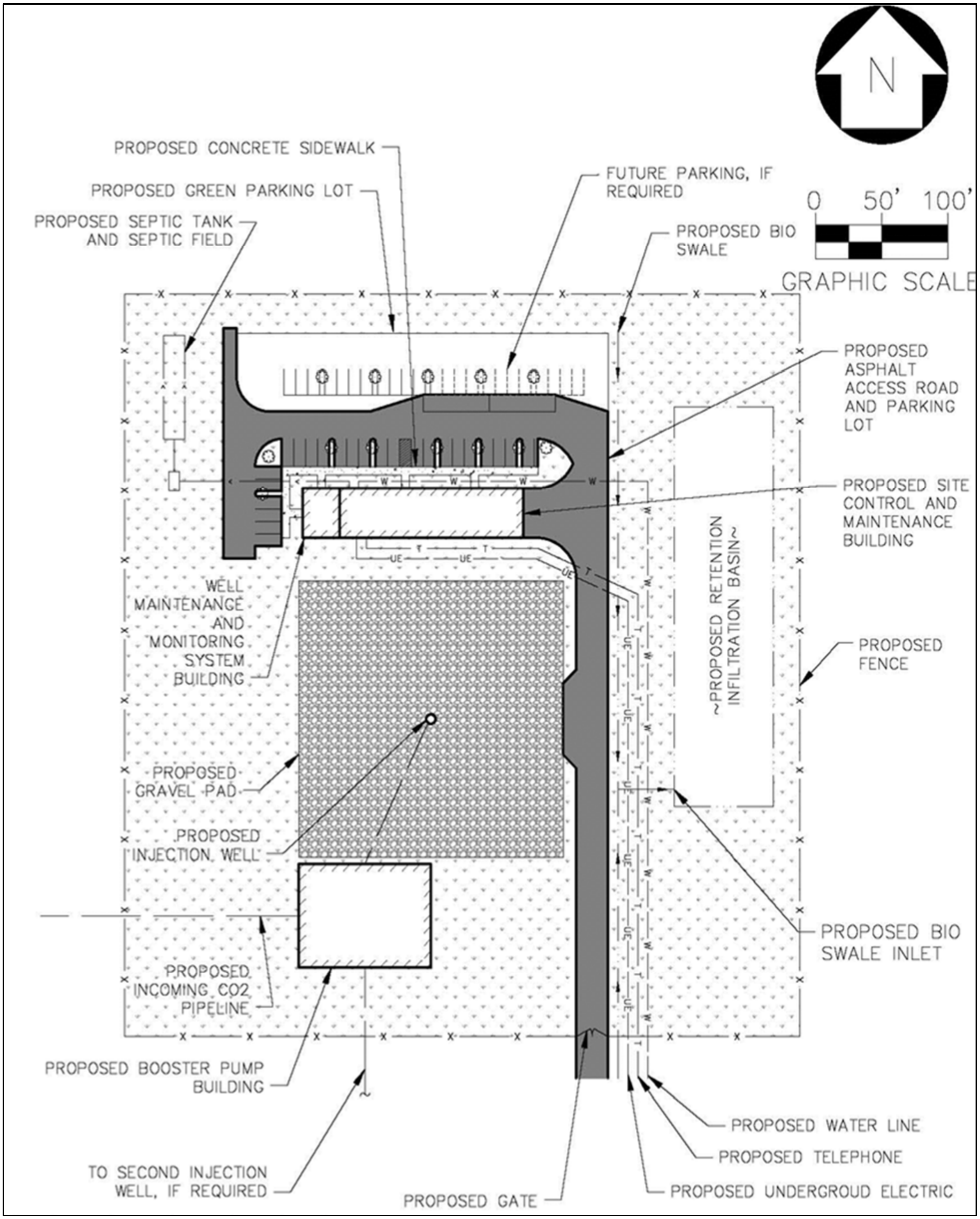


Figure S-12. Dual-Site Scenario - Primary Injection Well Site Surface Features Conceptual Layout

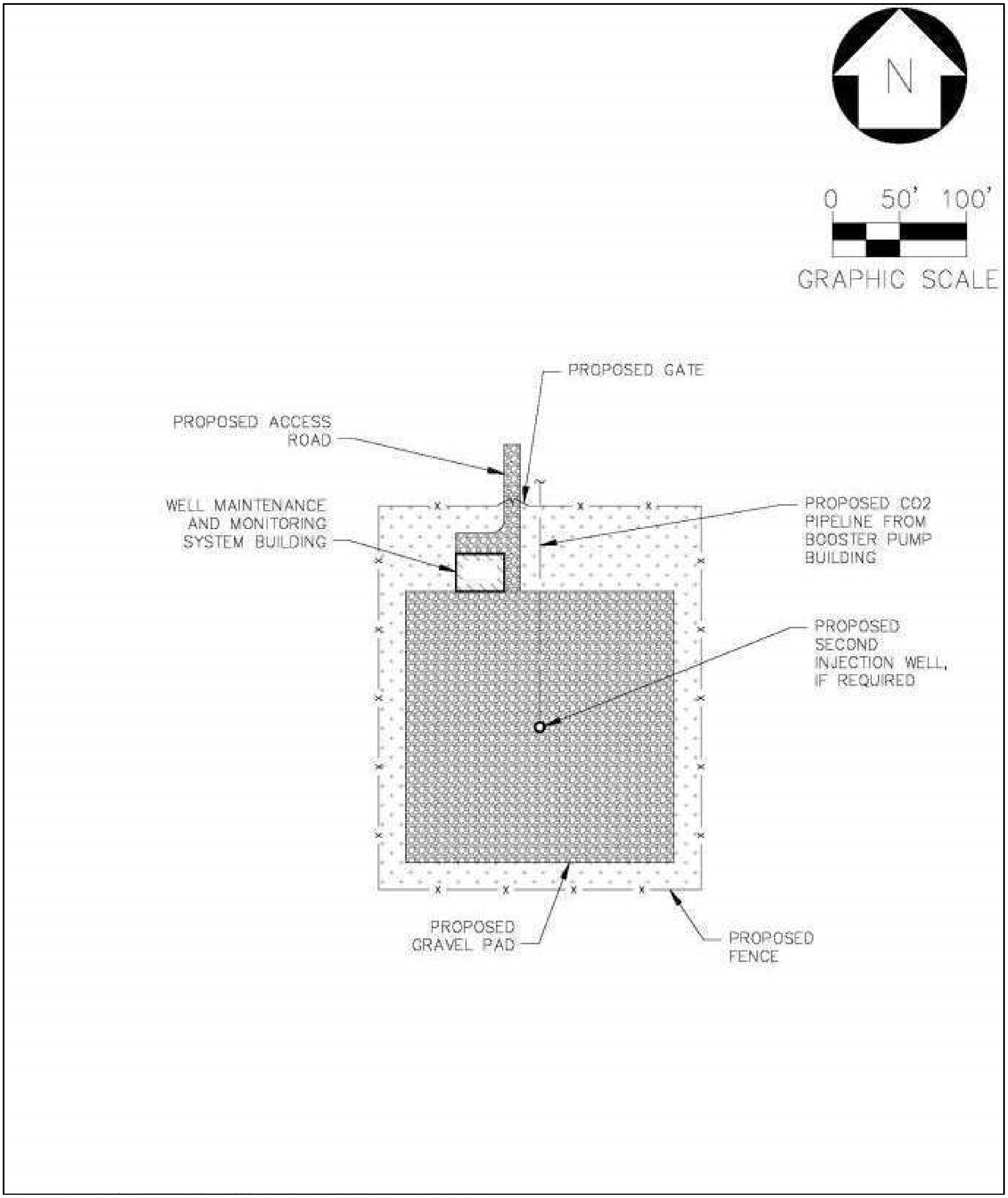


Figure S-13. Dual-Site Scenario - Secondary Injection Well Site Surface Features Conceptual Layout

Alliance conducted computer modeling using data from these efforts to simulate the currently proposed configuration of four horizontal injection wells, which indicates that the underground CO_2 plume would expand to encompass an area of approximately 4,000 acres over the 20-year injection period, as shown in Figure S-16. **Figure S-16 depicts the predicted CO_2 injection plumes after 5, 10, 20, 22, and 70 years. The 22-year plume is the predicted maximum extent of the plume. The impact analysis in this EIS conservatively estimates that the plume would be approximately 4,000 acres in size and contained within the 6,800-acre CO_2 storage study area**.

The Alliance would implement a monitoring, verification, and accounting (MVA) program to monitor the injection and storage of CO_2 within the geologic formations to verify that it stays within the target formation. The MVA program would meet injection control permitting and any additional requirements that DOE may impose. The MVA program would consist of the following components: (1) injection system monitoring; (2) containment monitoring (via monitoring wells, mechanical integrity testing, and other means); (3) CO_2 plume tracking via multiple techniques; (4) CO_2 injection simulation modeling; and (5) perhaps new experimental techniques not yet in practice. The Alliance anticipates constructing approximately **12** monitoring wells as part of the MVA program. **The conceptual monitoring network design is shown in Figure S-16 based on the single-site scenario with four injection wells.**

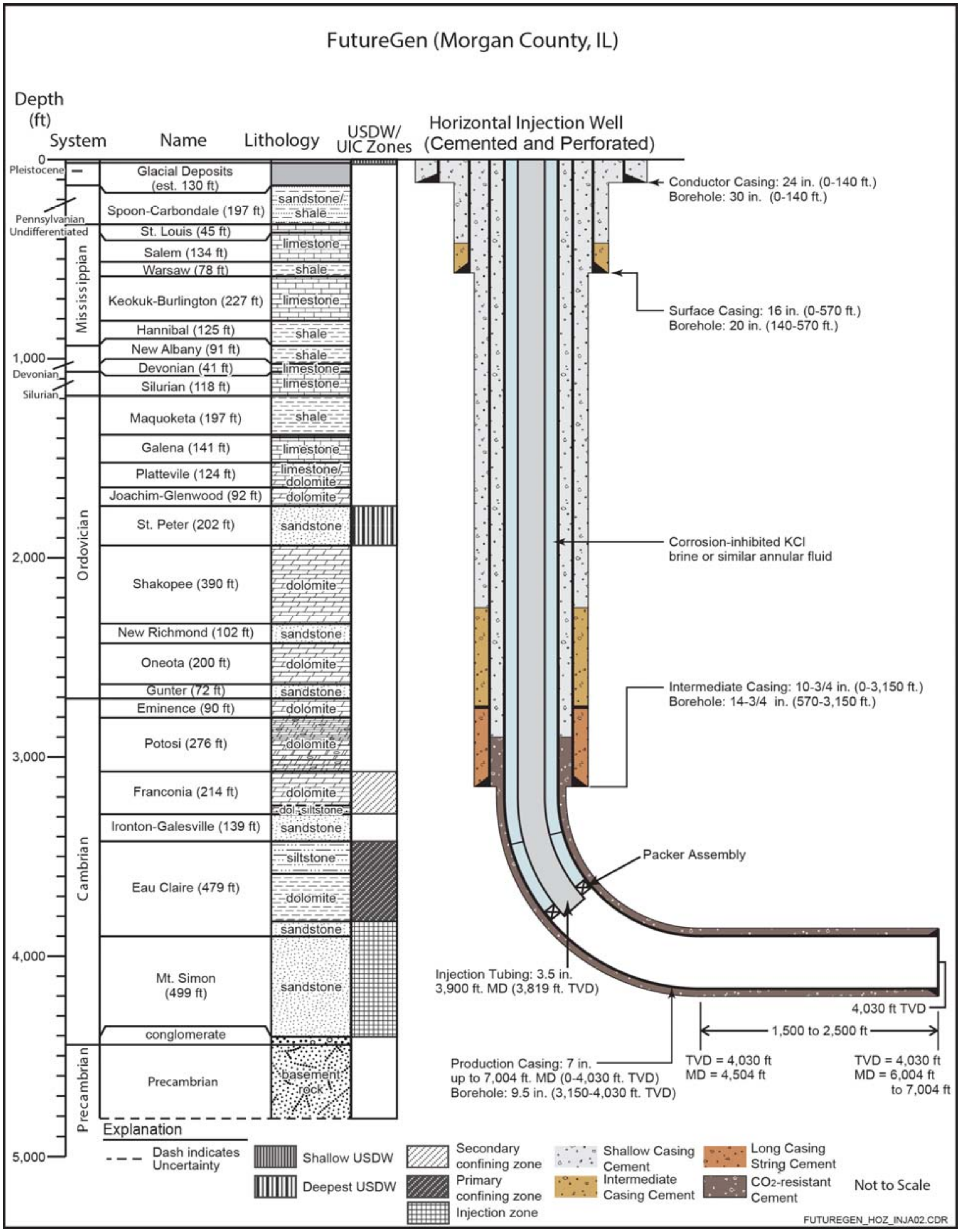
The Alliance characterized the injection and confining zones and designed the injection wells to minimize the potential for a CO_2 release. If, however, an adverse event were to occur during construction or operation, the Alliance would deploy a variety of emergency or remedial responses, depending on the characteristics of the event (e.g., the location, type, and volume of a release). The individual procedures, based on the event, are described in the MVA plan, which has been included with the UIC Class VI permit applications. In the unlikely event that monitoring indicates that the plume has the potential to migrate outside the study area, the Alliance could make adjustments to the injection rate or the duration of the injection period to prevent this from happening.

The DOE-funded demonstration period, with active injection and monitoring, would begin in 2017 and end in 2022; however, commercial operations could continue beyond the DOE-funded period of the project. The CO_2 injection would operate for a total of 20 years. The monitoring and verification processes would proceed throughout the planned injection period and continue for another 50 years or until such time during that 50-year post-injection period when the UIC permitting authority is satisfied that the plume is stable, not moving, and no further monitoring is required.

In addition to the onsite staff managing and monitoring pipeline operations, the Alliance expects that two of the staff personnel (3 shifts per day, 7 days per week) would be onsite to continually monitor injection operations. Alternatively, the Alliance could acquire the services of a vendor that would remotely and continuously monitor the injection operations.

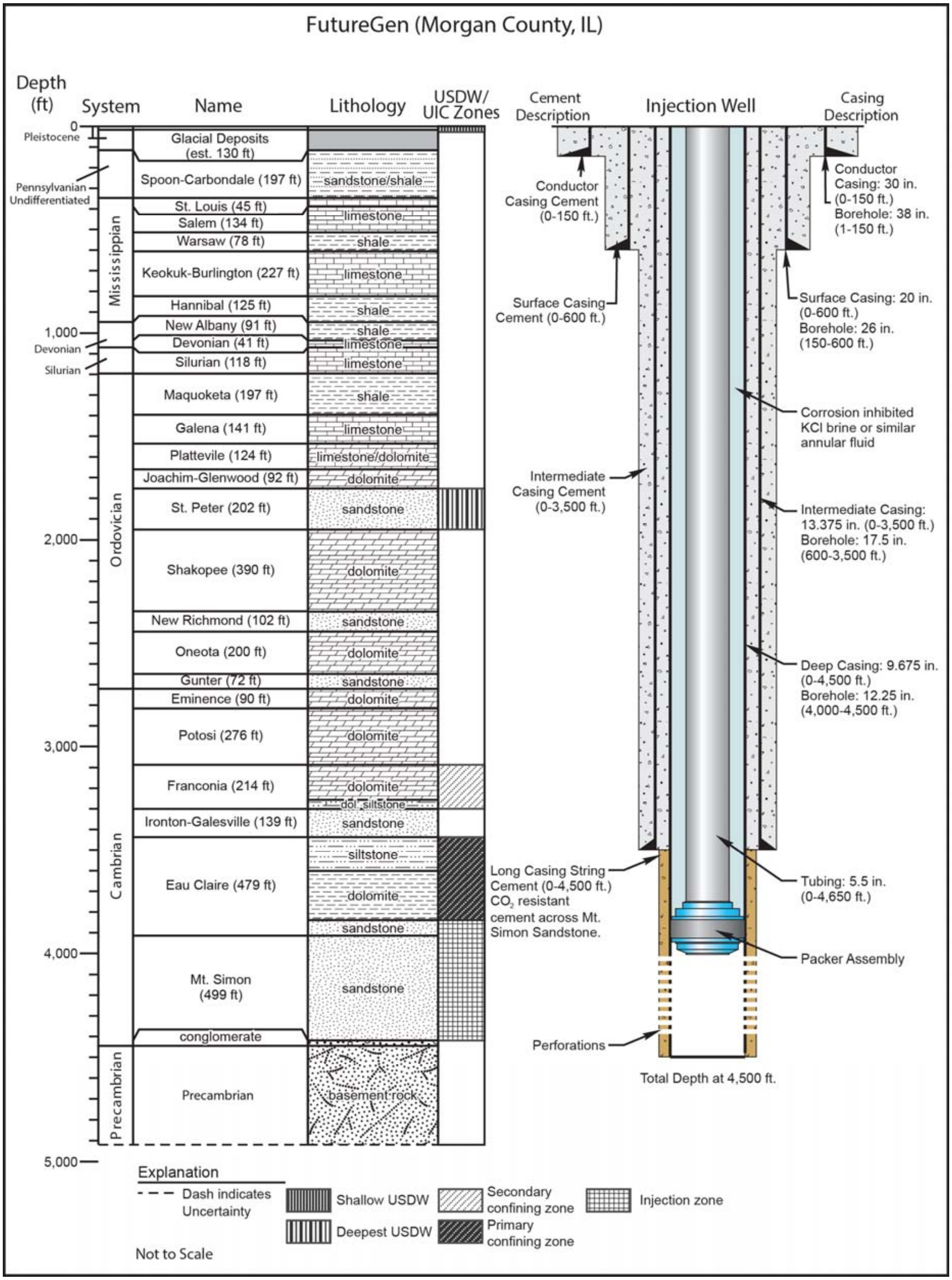
Prior to commencement of CO_2 injection, the UIC Class VI regulations require the Alliance to develop a Post-Injection Site Care and Site Closure Plan. The plan ensures that the well owner/operator obtains approval from the UIC Program Director for the procedures to be followed after injection operations cease. The Post-Injection Site Care and Site Closure Plan would also help identify the appropriate types and amounts of data needed to determine that the CO_2 plume and pressure front do not endanger drinking water, and it would support a determination of whether conditions warrant site closure and, therefore, an end to Post-Injection Site Care (i.e., there is no longer a risk of endangerment to drinking water). The plan would identify the types and duration of monitoring that would occur; the minimum Post-Injection Site Care duration is 50 years unless otherwise approved by the UIC Program Director.

Under subpart RR of the UIC Class VI rule, facilities conducting geologic sequestration are required to report the amount of CO_2 received, develop and implement a USEPA-approved monitoring, reporting, and verification plan, and report the amount of CO_2 sequestered using a mass balance approach. USEPA provides exemptions on subpart RR to geologic sequestration research and development projects, in



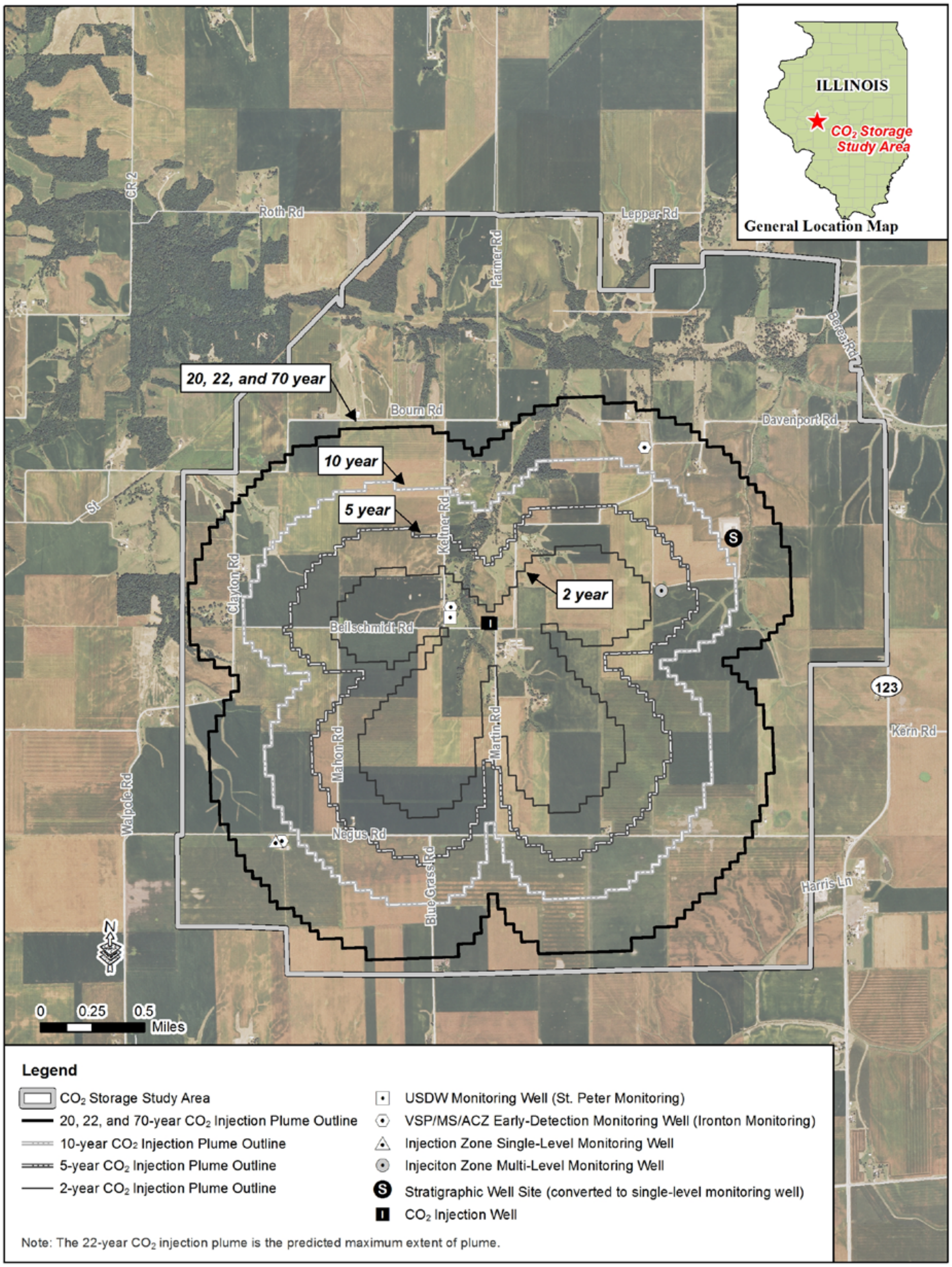
CO_2 = carbon dioxide; ft = feet; in = inch; KCl = potassium chloride; MD = measured depth; TVD = true vertical depth; UIC = Underground Injection Control; USDW = underground source of drinking water

Figure S-14. Proposed Horizontal Injection Well Construction Details



CO_2 = carbon dioxide; ft = feet; in = inch; UIC = Underground Injection Control; USDW = underground source of drinking water

Figure S-15. Geological Stratigraphic Column for the CO_2 Storage Study Area and Vertical Injection Well Construction Details



ACZ = above confining zone; CO_2 = carbon dioxide; MS = microseismic; USDW = underground source of drinking water; VSP = vertical seismic profile; yr = year

Figure S-16. Predicted Areal Extent of CO_2 Plume and Monitoring Well Network for Single-Site Scenario with Four Horizontal Wells

which case those projects need to report basic information under subpart UU on the CO_2 received for injection. The UIC regulations also require the Alliance to develop a Construction Operations Plan, Testing and Monitoring Plan, Injection Well Plugging Plan, Emergency and Remedial Response Plan, and Financial Responsibility Plan.

Educational Facilities

The Alliance would construct and operate visitor, research, and training facilities (also referred to as the educational facilities) at suitable locations in the Jacksonville area to support public outreach and communication, and to provide training and research opportunities associated with near-zero emissions power generation and CO_2 capture and storage technologies. These facilities would:

- Familiarize visitors **(including national and international researchers)** with the inner workings of the oxy-combustion power generation plant, the CO_2 pipeline, and the CO_2 storage project area, as well as other local points of interest;
- Provide research opportunities focused on monitoring processes and results, including improvements to monitoring system designs; and
- Educate and train trade workers, technicians, engineers, and scientists to manage and monitor CO_2 sequestration operations and implement near-zero emissions power generation technologies.

The Alliance originally assumed that one building would house the visitor center and research functions and that a second building (possibly at a separate location) would house the training function. Since publication of the Draft EIS, the Alliance modified its plans such that the current conceptual design assumes that the visitor, research, and training facilities would be housed in a single building, rather than two separate buildings. The intended general location for the educational facilities is the vicinity of Jacksonville, Illinois, which is the largest community in Morgan County **and the analysis of impacts in the Final EIS remains generally focused on the Jacksonville vicinity.**

The Alliance has been working with local stakeholders to identify the location or locations that would be advantageous to the FutureGen 2.0 Project and to the local community. Discussions between the Alliance and Jacksonville authorities have recently focused on the prospect of locating the educational facilities within a 5-acre parcel in the northeast portion of Jacksonville Community Park. The location is adjacent to West Morton Avenue and South Main Street on the south side of the Jacksonville downtown area, and it is currently occupied by offices of the Jacksonville Area Chamber of Commerce, which would be demolished if the site were used. Construction of the educational facilities would disturb a maximum of 3.5 acres but would not affect the existing Ferris wheel near the corner of West Morton Avenue and South Main Street. The Community Park is a landscaped urban park that includes public structures, the Jacksonville Area Senior Center, playgrounds, soccer fields, internal roadways, and parking areas. South Main Street and Morton Avenue both provide access to Jacksonville from Interstate 72, and the parcel is adjacent to all necessary utility infrastructure. No decision has been reached with respect to the use of this potential location.

CHARACTERISTICS OF THE AFFECTED ENVIRONMENT

The affected environment, also referred to as the region of influence (ROI), for the project was defined for 19 different environmental resource areas. The size of the ROI varies depending upon the extent of potential impacts on respective resources resulting from the construction and operation of the FutureGen 2.0 Project. In general, the EIS considered the environmental setting in Morgan County and applicable portions of neighboring counties in Illinois. Table S-3 summarizes the affected environment for each of the 19 resource areas. The affected environment for each of these resources is described in greater detail in Chapter 3 of the EIS.

ENVIRONMENTAL IMPACTS

DOE evaluated the potential impacts of the no action alternative and the proposed project in relation to the baseline conditions described in Chapter 3 and summarized in Table S-3, above. A detailed discussion of potential impacts is provided in Chapter 3. Table S-4 summarizes the criteria considered when analyzing potential impacts, and summarizes the potential impacts for each of the 19 resource areas for the no action alternative and for the proposed project.

The EIS uses the following descriptors to qualitatively characterize impacts on respective resources:

- ***Beneficial*** – Impacts would benefit the resource.
- ***Negligible*** – No apparent or measurable impacts are expected; may also be described as “none” if appropriate.
- ***Minor*** – The action would have a barely noticeable or measurable adverse impact on the resource.
- ***Moderate*** – The action would have a noticeable or measurable adverse impact on the resource. This category could include potentially significant impacts that would be reduced to a lesser degree by the implementation of mitigation measures.
- ***Substantial*** – The action would have obvious and extensive adverse effects that could result in potentially significant impacts on a resource despite mitigation measures.

MITIGATION

The NEPA regulations of the President’s Council on Environmental Quality direct the lead agency for an EIS to “include appropriate mitigation measures not already included in the proposed action or alternatives” (40 CFR 1502.14(f)). Per established protocols, procedures, and requirements, the Alliance would comply with all applicable federal, state, or municipal regulations and ordinances, as well as associated permitting processes, through the implementation of standard operating procedures and best management practices. These are generally required by environmental regulatory mandates applicable to the design, construction, and operation of the project. The Alliance also incorporated other mitigation measures in its preliminary design for the project as outlined in Section 4.2, Measures to Mitigate Adverse Impacts. Therefore, as the lead agency for this EIS, DOE considers that these measures are “already included in the proposed action or alternatives” consistent with 40 CFR 1502.14(f). The impacts summarized in Table S-4 are based on the expectation that these measures would be implemented by the Alliance.

DOE has also explored the range of reasonable mitigation measures, beyond those included in the proposed action, which have been outlined in Section 4.2 of the EIS. Where additional measures would be necessary and appropriate to reduce impacts that would otherwise be considered substantial, or to reduce impacts noticeably from anticipated moderate levels, the measures are identified in Table S-4 along with the anticipated effect in reducing impacts. For potential impacts that are identified as minor or negligible in Table S-4, DOE does not consider additional mitigation measures to be necessary or appropriate, because the effects of mitigation on the environment would generally not be measurable or noticeable. If DOE decides to proceed with the proposed action, the Record of Decision (ROD) will “state whether all practicable means to avoid or minimize environmental harm from the alternative selected have been adopted, and if not, why they were not,” in conformance with the CEQ NEPA regulations (40 CFR 1505.2(c)). For those additional mitigation measures deemed appropriate in its ROD, DOE will adopt and describe a monitoring and enforcement program to ensure that the measures would be implemented (40 CFR 1505.2(c)).

Table S-3. Affected Environment of the FutureGen 2.0 Project

Resource	Existing Conditions
Air Quality	All components of the FutureGen 2.0 Project would occur in Morgan County, Illinois. Morgan County is located within the West Central Illinois Intrastate Air Quality Control Region 75, which has been designated as either "in attainment" or "unclassifiable" for all criteria pollutants of the National Ambient Air Quality Standards.
Climate and Greenhouse Gases	Emissions of CO_2 from fossil fuel combustion within the state of Illinois totaled 317 million tons (288 million metric tons) in 2007, with 105 million tons (95 million metric tons) resulting from electric power generation. Illinois' Clean Coal Portfolio Standard Law (20 Illinois Compiled Statutes [ILCS] 3855/1-5) establishes carbon sequestration targets for new coal-fueled power plants. Plants that begin operations during 2016-2017 must capture and store 70 percent of the carbon emissions the facility would otherwise emit, and plants beginning operations after 2017 must capture and store 90 percent. The law also requires large utilities serving Illinois to enter into long-term, cost-based contracts to purchase up to 5 percent of their electricity from clean coal facilities that capture at least 50 percent of their greenhouse gas (GHG) emissions.
Physiography and Soils	The project area is located within the Till Plains section of the Lower Illinois River Basin (LIRB), an area characterized by low relief and covered by glacial drift deposits, and incised by the Illinois River. Elevations throughout the LIRB generally range from 600 feet to 800 feet above mean sea level, although elevations as low as 400 feet above mean sea level exist along and adjacent to the Illinois River in portions of the LIRB. The soils are primarily a combination of silt, clay, and loam, formed in the glacial till deposits. At the Meredosia Energy Center, areas covered by existing plant structures are classified as Urban. Almost all of the soils within the pipeline corridor and the CO_2 storage study area are classified as prime farmland or farmland of a statewide importance, although some may need to be drained or protected from flooding.
Geology	The bedrock in the ROI is sedimentary rock sequences formed within the Illinois Basin, which stretches from northwest Illinois to Kentucky and Tennessee. Glacial and modern alluvial deposits are draped over the bedrock formations, and create the topographic relief while providing the source material for soils. A stratigraphic well drilled in the CO_2 storage study area reached the Mt. Simon Formation, a thick layer of sandstone, at **3,904** feet below ground surface (bgs) with a thickness of 499 feet. The Mt. Simon Formation and a small sandstone member of the Eau Claire (Elmhurst) Formation comprise the injection zone. CO_2 injection would occur within a horizon of the Mt. Simon Formation. The primary confining zone consists of two members of the Eau Claire Formation (Proviso and Lombard), 413 feet of dolomite and shale layers, which are present at **3,425** feet bgs. Above the Eau Claire is the secondary confining zone, which consists of the Franconia dolomite, found at **3,072** feet bgs. The St. Peter Formation is the deepest underground source of drinking water (USDW), as defined by the USEPA, and is located at **1,740** feet bgs. Deep seismic surveys did not identify any faults or cross-cutting structures present in the CO_2 storage study area. There have been no earthquakes within 30 miles of the CO_2 storage study area since the U.S. Geological Survey has tracked seismicity; however two earthquakes were reported in the early 20^{th} century. In November 1923, a 3.3 magnitude (estimated) earthquake occurred near Petersburg, Illinois, approximately 15 miles northwest of the CO_2 storage study area. In July 1909, a 4.5 magnitude (estimated) earthquake occurred approximately 26 miles north of the CO_2 storage study area. There are three historical oil and gas fields in Morgan County. The Waverly field is now used for natural gas storage, the Jacksonville field has three active wells, and the Prentice field currently has no producing wells.

Table S-3. Affected Environment of the FutureGen 2.0 Project

Resource	Existing Conditions
Groundwater	The Meredosia Energy Center is located above the Illinois River Basin Aquifer, which supplies municipal water for Meredosia, Jacksonville, and other surrounding communities. The Illinois River Basin Aquifer has a high recharge capacity, with the municipal and industrial wells regularly pumping at 300 gallons per minute. Within the storage study area, an unnamed aquifer is present, and some individual users withdraw water from thin sandy glacial deposits. The St. Peter Formation has total dissolved solids concentrations below 10,000 milligrams per liter, so it is considered the deepest USDW by USEPA's definition, although it is unlikely to be used as drinking water because of its high levels of total dissolved solids The Illinois Environmental Protection Agency does not consider the St. Peter to be a USDW under state law. The St. Peter is located approximately **1,740** feet bgs, and 1,483 feet above the top of the primary confining zone for the proposed project. The Mt. Simon has a total dissolved solids concentration over 10,000 milligrams per liter, so it is not classified as a USDW at the CO_2 storage study area.
Surface Water	The project components would be located in the Lower Illinois River Watershed. Major water quality issues in the Lower Illinois River watershed include sedimentation, toxic substances in sediment, high concentrations of nutrients and agricultural chemicals, and low dissolved oxygen concentrations. The Meredosia Energy Center is located along the east side of the Illinois River. The CO_2 pipeline corridor contains over 700 miles of streams, the vast majority of which are intermittent, and nearly 500 acres of freshwater ponds and lakes. The CO_2 storage study area site contains **52** miles of stream (**predominantly** intermittent) and approximately **14** acres of small ponds and lakes.
Wetlands and Floodplains	Two small wetlands were identified at the Meredosia Energy Center property. Both wetlands are located near the eastern property boundary along Old Naples Road, covering areas of 0.37 acre and 0.26 acre. Over 1,000 acres of freshwater wetlands are located within the CO_2 pipeline corridor and within the CO_2 storage study area. **A wetland delineation conducted within the proposed southern pipeline route identified approximately 0.5 acre of freshwater wetlands.** Approximately 11,000 acres of Federal Emergency Management Agency-mapped 100-year floodplains are located within the ROI. The base flood elevation calculated at the Meredosia Energy Center is 447 feet above mean sea level.
Biological Resources	All proposed project components would occur entirely within the Interior River Valleys and Hills Level III Ecoregion, made up of many wide, flat-bottomed terraced valleys, forested valley slopes, and dissected glacial till plains. Specific habitats occurring within the ROI include: terrestrial habitats—agricultural land (including cropland and pastureland), developed land, forests (including deciduous forest and forested wetlands), and grassland—and aquatic habitats. Developed land dominates the landscape at the Meredosia Energy Center, while agriculture represents the dominant land cover type within the proposed CO_2 pipeline corridor and the CO_2 storage study area. A total of 19 protected species potentially occur in Morgan County. These include: bald eagle (*Haliaeetus leucocephalus*), bent milkvetch (*Astragalus distortus*), blue hearts (*Buchnera americana*), bunchflower (*Melanthium virginicum*), decurrent false aster (*Boltonia decurrens*), eastern prairie fringed orchid (*Platanthera leucophaea*), ebonyshell (*Fusconaia ebena*), Hall's bulrush (*Schoenoplectus hallii*), Illinois chorus frog (*Pseudacris illinoensis*), Indiana bat (*Myotis sodalis*), lined snake (*Tropidoclonion lineatum*), loggerhead shrike (*Lanius ludovicianus*), Ottoe skipper (*Hesperia ottoe*), pale false foxglove (*Agalinis skinneriana*), pink milkwort (*Polygala incarnata*), regal fritillary (*Speyeria idalia*), sheepnose mussel (*Plethobasus cyphyus*), starhead topminnow (*Fundulus dispar*), and upland sandpiper (*Bartramia longicuada*). A species-specific survey for the Illinois chorus frog conducted at the Meredosia Energy Center did not identify any individuals. A similar survey for violets, the sole larval food source of the regal fritillary, encountered adult individuals and several areas of suitable larval habitat at the Meredosia Energy Center and within the proposed CO_2 pipeline corridor.

Table S-3. Affected Environment of the FutureGen 2.0 Project

Resource	Existing Conditions
Cultural Resources	Phase I Cultural Resource Surveys were conducted for the Meredosia Energy Center property, various portions of the southern and northern pipeline routes, and a small portion of the CO_2 storage study area. The Meredosia Energy Center survey records indicate that one site, 11Mg473, was reported within the Meredosia Energy Center study area. Archeological site 11Mg473 represents the subsurface remains of the extant Meredosia Train Depot. The depot is located adjacent to the Northern Cross Railroad line, one of the first rail lines constructed in the state of Illinois during the late 1830s. The study also identified a second site, 11Mg22, which was described as a light density artifact scatter exposed along the cutbank of the Illinois River and adjacent to the developed portion of the Meredosia Energy Center. The southern and northern pipeline route surveys revealed the presence of one archaeological site along the southern pipeline route, archaeological site 11Mg281. Site 11Mg281 is an early historic site dating to the late 1800s and was identified in 1998 during Survey #9344 by the Center for American Archaeology. Remains of structures, a well, and a cistern were noted at this location as well as piles of brick. The site is within the proximity of a 19th century school appearing on historical atlases. The school was reported to have burned down in 1905. This site is currently being mitigated by the Illinois Department of Transportation for a roadway-widening project. Based on the results of field investigations and on information collected during archival and background research for the Phase I Cultural Resources Survey conducted within the CO_2 storage study area, the area that was surveyed for the stratigraphic well does not contain evidence for the presence of archaeological, historical, or cultural resources, sites, areas, or artifacts. Additional surveys could be required within the project area, as stipulated in a proposed Programmatic Agreement signed with the Illinois SHPO **(see Appendix B, Cultural Resources Consultation [B3])**. Consultation with the SHPO is ongoing.
Land Use	The proposed project would be constructed within Morgan County, which is primarily agricultural and rural with small areas of developed land. The oxy-combustion facility would be constructed on Meredosia Energy Center property, which is a heavily developed industrial site with areas of fields and open space (e.g., trees and grassy areas). The pipeline would traverse northern Morgan County to the CO_2 storage study area. Agricultural land is the most abundant land use type found within the pipeline corridor and CO_2 storage study area. A portion of the southern route option for the pipeline would align with existing highway ROWs. The energy center, pipeline, and CO_2 storage study area are not subject to existing zoning ordinances or comprehensive plans. The educational facilities would likely be located in the city of Jacksonville, which has a zoning ordinance and comprehensive plan.
Aesthetics	The oxy-combustion facility would be constructed and operated in a developed area characterized by existing industrial structures. The CO_2 pipeline and injection well site(s) would be constructed and operated in a rural, primarily flat portion of central Illinois. The educational facilities would be constructed and operated in the city of Jacksonville, which is the county seat and largest city in Morgan County and contains well-preserved historic architecture. The landscape of the CO_2 pipeline corridor and storage study area is predominately row-crop farm land during the growing season, and barren, fallow fields during the remainder of the year. Additional features within the viewshed include minor stream drainages characterized by dense forest cover and shrubbery, as well as other waterbodies (e.g., ponds, lakes, and rivers). Small towns are located throughout the region, as are scattered single-family homes and agricultural structures (e.g., grain silos). Because of the rural nature of the landscape and associated lack of large urban centers in close proximity, light pollution is minimal throughout the region in which the proposed project would occur; however, some lighting infrastructure and light domes from towns (e.g., Jacksonville and Springfield) are visible from various points in the ROI.

Table S-3. Affected Environment of the FutureGen 2.0 Project

Resource	Existing Conditions
Materials and Waste Management	The Meredosia Energy Center historically used coal from within Illinois and from the Powder River Basin in Wyoming, and the proposed project would continue to source coal from these locations. Suppliers exist within the region surrounding the energy center for construction and operational materials that would be needed for the project. Over 175 million cubic yards of landfill capacity exists within the surrounding counties. There are 18 hazardous waste treatment, storage, disposal, and recycling facilities in the state of Illinois, and 45 additional facilities in neighboring states. There are no known areas of historical or current contamination within the proposed project's study area.
Traffic and Transportation	The ROI includes the roadway network within 40 miles of the Meredosia Energy Center, along the pipeline corridor, and adjacent to the CO_2 storage study area. Most of the roadways in the ROI operate with little or no congestion due to the rural character of the region and, consequently, operate within capacity (i.e., level of service C or better). Some roadways were identified with minor congestion, which are primarily roadways that travel through more urban areas and are subject to higher traffic volumes during peak travel hours. Barge unloading facilities for coal and fuel oil deliveries at the Meredosia Energy Center are located on the Illinois River along the western border of the Meredosia Energy Center site. Historically, Powder River Basin coal was delivered by barge (from St. Louis, Missouri, where it was delivered from Wyoming via rail). Coal deliveries by barge over the past several years ranged from approximately 140 to 500 deliveries per year; annual fuel oil deliveries by barge were sparse, ranging from 0 to 2 over the past several years.
Noise	Existing dominant noise sources in the vicinity of the Meredosia Energy Center mainly consist of noise associated with the nearby grain elevator operations at the Cargill, Inc. facility located to the north of the energy center site; vehicular traffic on Old Naples Road, South Washington Street, and IL-104; rail traffic on the Norfolk Southern rail line providing access to the industrial sites to the south of the Meredosia Energy Center; and prior to the end of 2011, equipment and vehicle noise related to the operations of the energy center. After 2011, the Meredosia Energy Center no longer contributes to the ambient noise in the area. Noise sources along the pipeline corridor and within the CO_2 storage study area primarily consist of vehicular traffic from nearby roadways within a predominantly rural environment. Areas in the vicinity of the city of Jacksonville, Illinois, have typical urban noise levels from vehicular traffic.
Utilities	Prior to its suspension at the end of 2011, the Meredosia Energy Center produced its own electricity for operations. Potable water for the energy center was provided by onsite wells and the village of Meredosia public water system. Process water was supplied from the Illinois River, onsite wells, and, in small part, the village of Meredosia public water system. Sanitary wastewater was routed to the Meredosia sewer system, which discharged to evaporative settling ponds north of the village. After the suspension of the energy center, very limited use of utilities is required for maintenance and security of the facility. Electricity in the vicinity of the CO_2 storage study area is currently provided by Menard Electric Cooperative. The service area of the Illinois Rural Electric Cooperative includes the city of Jacksonville and the area encompassed by the CO_2 pipeline corridor. Ameren Illinois also provides electricity throughout the ROI. Potable water is provided to users in the area of the CO_2 pipeline and storage study area by the North Morgan County Water Cooperative. The Jacksonville Water Department supplies potable water to the city of Jacksonville via the Jacksonville Water Plant. Septic tanks are primarily utilized in rural portions of the ROI that encompass the CO_2 pipeline corridor and the storage study area. Sanitary wastewater in Jacksonville is treated at the Jacksonville Sewer Plant.

Table S-3. Affected Environment of the FutureGen 2.0 Project

Resource	Existing Conditions
Community Services	Morgan County is served by the Morgan County Sheriff's Office, District 9 of the Illinois State Police, and 6 additional police departments located throughout the county. There are 10 police departments, 4 sheriff's offices, and Districts 9 and 20 of the Illinois State Police that serve Brown, Cass, Pike, and Scott counties. There are 8 fire departments in Morgan County and a total of 25 fire stations in Brown, Cass, Pike, and Scott counties. The Illinois Emergency Management Agency and Mutual Aid Box Alarm System are responsible for statewide disaster planning and local emergency medical services mobilization, respectively. A volunteer ambulance service provides emergency response in Meredosia, and 2 ambulance providers operate in the city of Jacksonville, as well as paramedic services that operate from Passavant Area Hospital. The ROI is served by 2 hospitals. There are 21 public schools and 5 private schools in Morgan County. The adjacent counties of Brown, Cass, Pike, and Scott have a total of 32 public schools and 3 private schools.
Human Health and Safety	The ROI for Human Health and Safety primarily relates to population densities within 2 miles of the Meredosia Energy Center, the CO_2 pipeline, or injection wells. The population of towns in or along the pipeline corridor in 2010 was 3,851 people in Meredosia, 512 people in Chapin, and 167 in Concord. Jacksonville is located 21.4 miles east-southeast of the energy center; the outskirts of the town extend to within 0.5 mile of the southern edge of the pipeline corridor. In 2010, the population of Jacksonville was 19,446. The pipeline corridor is located in a rural area with low population densities (5 to 25 people per square mile or less), except small areas near the towns and north of Jacksonville where the density increases to 100 to 500 people per square mile. The predominant wind direction is from the south approximately 12 percent of the time. The next most common direction is from the northwest approximately 7 percent of the time. Wind directions between due north and due east occur less than 5 percent of the time in any one direction. The CO_2 storage study area is located in a rural area with a low population density of mostly 2 to 5 people per square mile, except for a small part with a density of 5 to 25 people per square mile.
Socioeconomics	Collectively, Morgan County and the four adjacent counties (Brown, Cass, Pike, and Scott) have a population of approximately 77,911. Morgan County had a total population of 35,547 in 2010 with a rate of decline higher than the overall regional rate since 2000. The five counties include approximately 34,223 housing units of which approximately 3,897 units were vacant and 19.1 percent vacancy rate within the ROI. The median household income in the ROI ranged from $39,191 to $49,450. In 2010, the average unemployment rates were 9.0 percent for the ROI and 9.4 percent for Morgan County, compared to an unemployment rate of 8.9 percent in both the United States and Illinois.
Environmental Justice	The percentage of minorities within the Morgan County population (9.1 percent) is substantially lower than both the state (28.5 percent) and national (27.6 percent) averages. The low income population distribution in Morgan County (14.1 percent) is slightly higher than the state average (13.3 percent) and slightly lower than the national average (14.3 percent).

bgs = below ground surface; CO_2 = carbon dioxide; GHG = greenhouse gas; ILCS = Illinois Compiled Statutes; LIRB = Lower Illinois River Basin; ROI = region of influence; ROW = right-of-way; SHPO = State Historic Preservation Office; USDW = underground source of drinking water; USEPA = U.S. Environmental Protection Agency

Table S-4. Summary of Environmental Impacts by Alternative for the FutureGen 2.0 Project

Criteria Considered	No Action	Proposed Project
Air Quality		
Impacts were assessed based on whether the proposed project would: • Result in emissions of criteria pollutants or hazardous air pollutants that would exceed relevant air quality or health standards; • Cause an adverse change in air quality related to the National Ambient Air Quality Standards or Illinois standards; • Violate any federal or state permits; • Affect visibility and regional haze in Class I areas; or • Conflict with local or regional air quality management plans to attain or maintain compliance with the federal and state air quality regulations.	**No Impacts.** Baseline conditions would not change.	**Construction**: *Minor Adverse Impacts:* Construction of the proposed FutureGen 2.0 Project would result in short-term, minor, localized increased tailpipe and fugitive dust emissions. Because the proposed project would occur in an area listed as either in "attainment" or "unclassified" for all criteria pollutants, Clean Air Act conformity requirements are not applicable and thus there are no emissions thresholds that pertain to the construction phase of this project. Emissions would be concentrated at the construction sites and would steadily decrease with distance. **Operations**: *Minor Adverse Impacts:* **Operations of the oxy-combustion facility would cause increases in air emissions over current conditions. Air emissions generated by operations of the project would not exceed relevant air quality standards when analyzed as an isolated project or when cumulatively combined with applicable regional sources.** During normal operations of the oxy-combustion facility, the gas quality control system would incorporate state-of-the-art flue gas scrubbing technology to minimize criteria pollutant emissions from the stack. *Beneficial impacts* could result from overall lower emissions, as electricity generated by this project may displace electricity generated by traditional coal-fired power plants that emit significantly higher levels of pollutants.
Climate and Greenhouse Gases		
Impacts were assessed based on whether the proposed project would: • Cause an increase (or decrease) in GHG emissions of 75,000 tons per year (68,250 metric tons per year) CO_2-equivalent or more; or • Threaten to violate federal, state, or local laws or requirements regarding GHG emissions.	**No Direct Impacts.** **Indirect Adverse Impacts** related to not furthering commercial-scale advanced oxy-combustion coal-based power generation technologies with CO_2 capture and sequestration. Further, without the project, regional electricity needs would likely be met by conventional coal- or natural gas-based electric power generation. Therefore,	**Construction**: *Minor Adverse Impacts:* Construction of the proposed FutureGen 2.0 Project would generate approximately **48,009** tons (**43,688** metric tons) of CO_2 emissions over the multi-year construction period. **Operations**: *Beneficial Impacts:* The capture and geological storage of GHG emissions by the project would produce a beneficial cumulative effect on a national and global scale. Operation of the project components would result in **up to** approximately **169,701** tons per year (**154,283** metric tons per year) of new CO_2 emissions (net after CO_2 capture and storage). The proposed project would capture and sequester approximately 1.2 million tons per year (1.1 million metric tons per year) of CO_2 emissions from the generation of 168 MWe **(gross)** electric power, which would generate approximately 90 percent lower GHG emissions compared to a similarly sized conventional coal-fired power plant, or approximately 70 percent lower compared to a natural-gas fired power plant. **On September 30, 2013, the USEPA proposed a CO_2 emissions standard for new coal-based power plants that could require emissions to be as low as 1,000 pounds CO_2/MWh gross. The proposed oxy-combustion facility would emit approximately 295 pounds CO_2/MWh gross and would therefore meet this requirement if it were to be finalized.** The reduction in CO_2 emissions resulting from the project would incrementally reduce the rate of GHG accumulation in the atmosphere and help to incrementally mitigate climate change related to atmospheric concentrations of GHGs. On a broader scale, successful implementation of the project may lead to widespread acceptance and deployment of

Table S-4. Summary of Environmental Impacts by Alternative for the FutureGen 2.0 Project

Criteria Considered	No Action	Proposed Project
Climate and Greenhouse Gases *(continued)*		
	regional GHG emissions would likely be greater in the absence of the proposed project.	oxy-combustion technology with geologic storage of CO_2, thus fostering a long-term reduction in the rate of CO_2 emissions from power plants across the United States. **Further, the project would demonstrate a path forward for future coal-powered generation facilities in light of more stringent standards, such as those proposed by the USEPA.**
Physiography and Soils		
Impacts were assessed based upon whether the proposed project would: • Result in permanent or temporary soil removal; • Cause the permanent loss of prime farmland soil or farmland of statewide importance (through conversion to nonagricultural uses); • Result in significant soil erosion; • Cause soil contamination due to spills of hazardous materials; or • Change soil characteristics and composition.	**No Impacts.** Baseline conditions would not change.	**Construction**: <u>*Minor Adverse Impacts*</u>*:* Construction of the proposed FutureGen 2.0 Project would increase the potential for soil erosion and compaction, increase the amount of impermeable surfaces, and withdraw some prime farmland soils from agricultural production. **Overall construction for the proposed project would disturb up to a maximum of 364 acres of soil classified as prime farmland. However, with the identification of the proposed injection well site as addressed in this Final EIS, the permanent loss of prime farmland would be approximately 14 acres (4 percent) for all associated facilities, as compared to less than 25 acres (7 percent) based on the original concept for the injection well facilities. All other prime farmland in the pipeline route could be restored to preconstruction use. Based on the revised site plan, construction at the Meredosia Energy Center would disturb up to a maximum of 95 acres of soils classified as farmland of statewide importance (of which 54 acres would be permanently converted for project use), as compared to 146 acres reported in the Draft EIS (79 acres permanently converted). However, these soils at the energy center are not currently used for agricultural purposes and likely are no longer suitable for agricultural use. Also, construction would affect 16 acres of Urban soils and 2 acres of hydric soils at the energy center.** **Operations**: <u>*Minor Adverse Impacts*</u>*:* **Based on the revised site layout, approximately 54 acres of soils classified as farmland of statewide importance would be permanently converted to uses for the Meredosia Energy Center (compared to 79 acres for the original layout). Also, approximately 14 acres of prime farmland soils would be permanently converted to project uses at the proposed injection well site (compared to less than 25 acres for the original injection well concept). DOE anticipates that the property above the CO_2 pipeline would be returned to agricultural use after the construction period ends.**
Geology		
Impacts were assessed based on whether the proposed project would: • Cause or be damaged by geologic-related events (e.g., earthquake, landslides, sinkholes);	**No Impacts.** Baseline conditions would not change; the stratigraphic well would be closed.	**Construction**: <u>*Minor Adverse Impacts*</u>*:* Construction at the Meredosia Energy Center and CO_2 pipeline may require excavation of glacial materials. Construction of the injection wells would result in removal of geologic media through the drilling process. This process would not be unique to the area and would not affect the availability of local geologic resources.

Table S-4. Summary of Environmental Impacts by Alternative for the FutureGen 2.0 Project

Criteria Considered	No Action	Proposed Project
Geology *(continued)*		
• Reduce the value of mineral or petroleum resources or unique geologic formations, or render them inaccessible; • Alter unique geologic formations resulting in the migration of geologically stored CO_2 through faults, compromised caprock, or other pathways such as abandoned or unplugged wells; • Cause visible ground heave or upward vertical displacement of the ground surface; or • Affect human exposure to radon gas.		**Operations**: *<u>Minor Adverse Impacts</u>:* Operation of the oxy-combustion facility and CO_2 pipeline would not affect geologic resources. At the injection wells, the potential of CO_2 migrating out of the injection zone is considered highly unlikely. Computer modeling conducted by the Alliance for their proposed injection well configuration of four horizontal wells installed at one injection well site predicted that the CO_2 plume would expand to encompass an area of approximately 4,000 acres within the CO_2 storage study area over the 20-year injection period. During injection, the Alliance would monitor the formation pressure to ensure that injection-induced seismicity would not occur. The Alliance would also follow a USEPA-approved MVA plan, and conduct extensive studies and monitoring to minimize this potential long-term impact. As required by the UIC permits, appropriate mitigation strategies would be implemented should such CO_2 migration be identified.
Groundwater		
Impacts were assessed based on whether the proposed project would: • Deplete groundwater supplies on a scale that would affect available capacity of a groundwater source for use by existing water rights holders, or interfere with groundwater recharge; • Conflict with established water rights, allocations, or regulations protecting groundwater for future beneficial uses; • Contaminate shallow aquifers due to chemical spills, well drilling or well completion failures; • Conflict with regional or local aquifer management plans or the goals of governmental water authorities; or • Contaminate USDWs through acidification of an aquifer due to migration of CO_2 or toxic metal dissolution and mobilization, displacement of naturally occurring	**No Impacts.** Baseline conditions would not change.	**Construction**: *<u>Negligible Impacts</u>:* Construction at the Meredosia Energy Center and pipeline corridor would not include onsite discharges to groundwater and would follow the updated National Pollutant Discharge Elimination System permit and Spill Prevention, Control, and Countermeasure plans to minimize any potential for groundwater contamination. Construction of the injection wells would follow the construction plan in the UIC permits so that local groundwater aquifers would not be impacted from drilling. **Operations**: *<u>Minor Adverse Impacts</u>:* Operation of the Meredosia Energy Center would withdraw approximately 124,000 gallons of groundwater per day from three onsite groundwater wells, which is less than the historical use at the energy center site (between 212,000 and 982,000 gpd), and less than 4 percent of the historical use by the industrial plants in the Meredosia area. The potential for groundwater contamination would be minimized during operations by implementing a Spill Prevention, Control, and Countermeasure Plan and implementing the procedures in the National Pollutant Discharge Elimination System permit. Operation of the pipeline would have negligible impacts as it would not be expected to affect groundwater. At the injection wells, the potential for CO_2 migration upward through fractures in the caprock seal is considered highly unlikely, and extensive vertical movement into drinking water aquifers would not be expected. As part of the UIC permit applications **(submitted in early 2013)**, **the Alliance provided an MVA plan, which presents** the procedures that the Alliance would use to monitor and contain the CO_2 within the injection zone.

Table S-4. Summary of Environmental Impacts by Alternative for the FutureGen 2.0 Project

<table>
<tr><th>Criteria Considered</th><th>No Action</th><th>Proposed Project</th></tr>
<tr><td colspan="3">Groundwater (continued)</td></tr>
<tr><td>brine (saline groundwater) due to CO_2 injection, or chemical spills, well drilling, well development, or well failures.</td><td></td><td></td></tr>
<tr><td colspan="3">Surface Water</td></tr>
<tr><td>Impacts were assessed based on whether the proposed project would:
• Alter stormwater discharges, which could adversely affect drainage patterns, flooding, erosion, and sedimentation;
• Alter or damage existing farmland drainage infrastructure;
• Alter infiltration rates, which could affect (substantially increase or decrease) the volume of surface water that flows downstream;
• Conflict with applicable stormwater management plans or ordinances;
• Violate any federal, state, or regional water quality standards or discharge limitations;
• Modify surface waters such that water quality no longer meets water quality criteria or standards established in accordance with the Clean Water Act, state regulations, or permits; or
• Change the availability of surface water resources for current or future uses.</td><td>No Impacts.
Baseline conditions would not change.</td><td>Construction: <u>Minor Adverse Impacts</u>: Construction of the oxy-combustion facility and barge unloading facility has the potential to increase sedimentation in the Illinois River and increase the potential for surface water contamination from material spills. Although the Alliance's current plans for unloading equipment would avoid potential impacts to the bank or bottom of the Illinois River, the EIS maintains the options evaluated in the Draft EIS as representing appropriate upper bounds for the barge unloading operations during construction of the oxy-combustion facility. If the Alliance undertakes activities related to the barge unloading facility that would disturb the river bottom, then water quality could be reduced by increased turbidity and sedimentation during streambed disturbance. While all perennial streams and the majority of intermittent streams would be avoided using trenchless technologies for pipeline construction, trenching could occur during pipeline construction at certain ephemeral and intermittent streams that are seasonally-dry at the time of construction. However, these features would be restored to pre-construction conditions after construction activities were completed. Construction of the injection well site(s) could increase the potential for contamination from material spills.

Operations: <u>Minor Adverse Impacts</u>: Based on refinements in design since publication of the Draft EIS, the project would withdraw an estimated 13.6 mgd from the Illinois River for oxy-combustion facility operations and discharge 10.6 mgd of treated effluents (representing increases from the estimated 11.4 mgd withdrawal and 9 mgd discharge analyzed in the Draft EIS for the original design). However, the surface water withdrawals and discharges for operations would be approximately 94 percent less than the average 217 mgd withdrawal and 189 mgd discharge during historical operations at the energy center. There would be no operational impacts associated with the barge area, as this area would be returned to pre-existing conditions after construction activities at the Meredosia Energy Center were completed. The proposed project would increase the potential for stormwater runoff due to increased impervious area at the proposed oxy-combustion facility site and would increase the potential for contamination from material spills. Operation of the pipeline and injection well site(s) would not affect surface water, other than increasing the potential of material spills during maintenance.</td></tr>
</table>

Table S-4. Summary of Environmental Impacts by Alternative for the FutureGen 2.0 Project

Criteria Considered	No Action	Proposed Project
Wetlands and Floodplains		
Impacts were assessed based on whether the proposed project would: • Cause filling of wetlands or otherwise alter drainage patterns that would affect wetlands; • Cause wetland type or classification conversions due to alterations of land cover attributes; • Alter a floodway or floodplain or otherwise impede or redirect flows such that human health, the environment, or personal property could be affected; • Conflict with applicable flood management plans or ordinances; or • Conflict with the Federal Emergency Management Agency's national standard for floodplain management (i.e., maximum allowable increase of water surface elevation of 1 foot for a 1 percent annual chance [100-year recurrence interval] flood event).	**No Impacts.** Baseline conditions would not change.	**Construction**: <u>*Negligible to Minor Adverse Impacts*</u>*:* No impacts to wetlands would occur at the Meredosia Energy Center as a result of the proposed project. **Although the Alliance's current plans for unloading equipment would avoid potential impacts to the bank or bottom of the Illinois River, the EIS maintains the options evaluated in the Draft EIS as representing appropriate upper bounds for the barge unloading operations during construction of the oxy-combustion facility.** If the Alliance undertakes activities related to the proposed barge unloading facility that would disturb the river bottom, then temporary impacts would occur resulting in potential increased sedimentation of the Illinois River. For the CO_2 pipeline, the southern route operational ROW contains no **NWI-mapped wetlands, but may contain up to 0.5 acre of freshwater wetlands based on a wetland delineation performed by the Alliance in spring 2013**; the northern route**, which is no longer being considered by the Alliance,** contains 0.2 acre of **NWI-mapped** open water wetlands. While all wetlands, perennial streams, and the majority of intermittent streams would be avoided using trenchless technologies, trenching could occur during pipeline construction at certain ephemeral and intermittent streams which are seasonally-dry at the time of construction. Construction of the pipeline at these locations, which although dry may still be considered USACE-jurisdictional features, would cause temporary **disturbance of the dry stream channel bed and would be restored after construction activities were completed. In addition to the above, the wetland delineation conducted by the Alliance also identified a 0.03 acre area of hydric soils located in an active agricultural field within the southern pipeline route that would be crossed using traditional trenching. Although this feature possesses the characteristics of a wetland, it is not expected to be considered jurisdictional by the USACE.** No impacts to wetlands are anticipated at the CO_2 injection well site(s). Construction within the 100-year floodplain would primarily occur only in areas that are currently developed at the Meredosia Energy Center; therefore, additional impacts are not expected. If the Alliance undertakes activities related to the proposed barge unloading facility **as analyzed in the Draft EIS**, temporary placement of facilities within the 100-year floodplain would occur during construction, and the area would be returned to pre-construction conditions after construction activities are completed. Construction of the CO_2 pipeline would cross 100-year floodplains and may result in small ancillary structures being placed in the 100-year floodplain, resulting in minor impacts. Construction at the CO_2 injection well site(s) is not anticipated to impact floodplains; as per the siting criteria, these areas would be avoided. **Operations**: <u>*Negligible to Minor Adverse Impacts*</u>*:* There would be no operational impacts to wetlands as maintenance of the ROW (e.g., mowing or vegetation clearing) would not occur within wetland areas. Mainline block valves would be placed on either side of streams and other wetland features, as needed.

Table S-4. Summary of Environmental Impacts by Alternative for the FutureGen 2.0 Project

Criteria Considered	No Action	Proposed Project
Biological Resources		
Impacts were assessed based on whether the proposed project would: • Cause displacement of terrestrial or aquatic communities or loss of habitat; • Diminish the value of habitat for wildlife or plants; • Cause a decline in native wildlife populations; • Interfere with the movement of native resident or migratory wildlife species; • Conflict with applicable management plans for terrestrial, avian, and aquatic species and their habitat; • Cause the introduction of noxious or invasive plant species; • Diminish the value of habitat for fish species (including altering drainage patterns causing displacement of fish species or interfering with movement of native resident fish species); • Cause a decline in native fish populations; • Adversely affect endangered, threatened, or other special status species; or • Cause adverse modification to designated critical habitat of a federally-listed species.	**No Impacts.** Baseline conditions would not change.	**Construction**: _Minor to Moderate Adverse Impacts:_ **The Alliance originally anticipated the need to clear approximately 33 acres of forested area at the energy center and 8 acres for the southern pipeline route. However, through ongoing refinements in the site plan at the energy center and the use of trenchless boring techniques during pipeline construction, the Alliance expects to reduce the amount of forested area cleared to a maximum of 9 acres at the energy center and 6 acres for construction of the southern pipeline route.** **Although the Alliance's current plans for unloading equipment at the energy center would avoid potential impacts to the bank or bottom of the Illinois River, the Final EIS maintains the options evaluated in the Draft EIS as representing appropriate upper bounds for the barge unloading operations during construction of the oxy-combustion facility. If the Alliance undertakes the barge unloading activities analyzed in the Draft EIS,** there could be a disturbance to riverbed sediments and a release of buried contaminants, including polychlorinated biphenyls and mercury. This release could have an adverse impact on local and downstream aquatic resources, including protected species. **DOE is preparing a Biological Assessment addressing the three federally-listed species for which suitable habitat occurs in the project area: the Indiana bat, decurrent false aster, and eastern prairie fringed orchid. Indiana bat habitat surveys were completed at the energy center and southern pipeline route in the spring and summer of 2013. Decurrent false aster surveys were conducted during flowering in late summer 2013 where potential habitat was identified in the project area. Initial surveys for the eastern prairie fringed orchid determined that the soil types are unsuitable and no individuals were found. Based on the progress of the Biological Assessment, DOE believes that the proposed action is not likely to adversely affect any of the listed species. The Biological Assessment, when submitted to the United States Fish and Wildlife Service, will provide DOE's final determination and will identify measures as appropriate to minimize impacts on federally-listed species. Forested areas along the pipeline and at the energy center would be cleared between September and February to avoid disturbing the Indiana bat and migratory birds.** **Operations**: _Minor Adverse Impacts:_ During operation, the 50-foot wide CO_2 pipeline operational ROW would be kept free of woody vegetation to permit access for inspection and maintenance activities. This would leave the vegetation in the operational ROW in a persistent herbaceous state, creating a permanent habitat conversion in areas that were previously forested. Clearing of forested areas would cause a small degree of habitat fragmentation. In total, the proposed southern route **as refined after release of the Draft EIS would result in the loss of up to 6 acres of forested lands (compared to 8 acres in the original layout)**. The northern CO_2 pipeline route**, which is no longer being considered by the Alliance,** would result in

Table S-4. Summary of Environmental Impacts by Alternative for the FutureGen 2.0 Project

Criteria Considered	No Action	Proposed Project
Biological Resources *(continued)*		
		the loss of up to **22** acres of forested lands. Due to the comparatively small areas of forest to be permanently converted, these potential fragmentation effects would be minor.
Cultural Resources		
Impacts were assessed based on whether the proposed project would cause the loss, isolation, or alteration of: • Archaeological resources listed or eligible for the National Register of Historic Places (NRHP) listing; • Historic sites or structures listed or eligible for NRHP listing, either directly or by introducing visual, audible, or atmospheric elements that would adversely affect the historic resource; • Native American resources, including graves, remains, and funerary objects, either directly or by introducing visual, audible, or atmospheric elements that would adversely affect the resource's use; • Paleontological resources listed or eligible for listing as a National Natural Landmark; or • Cemeteries.	**No Impacts.** Baseline conditions would not change.	**Construction**: <u>*Negligible Adverse Impacts*</u>*:* DOE has not identified any cultural resources that would be impacted by the project. However, any potential impacts to cultural resources would be avoided or mitigated in accordance with the Programmatic Agreement between the DOE, the Alliance, and the SHPO **(see Appendix B, Cultural Resources Consultation [B3])**. **The proposed injection well site identified after publication of the Draft EIS would require demolition of a single, abandoned dwelling that was constructed between 1959 and 1963. This structure is not unique in the region and appears to lack the necessary degree of architectural merit or historical relevance to be considered as potentially eligible for listing on the National Register of Historic Places.** In addition, other historic resources within the applicable area of potential effects would not be expected to incur any apparent or measurable impacts as the project would not be expected to alter the setting or other aspects of integrity of these resources. The project would not introduce visual, atmospheric, or audible elements that diminish the integrity of the resource's significant historic features. **Operations**: <u>*No Impacts*</u>*:* Operation of the proposed project would not be expected to have an adverse impact on cultural resources.
Land Use		
Impacts were assessed based on whether the proposed project would: • Be incompatible with land use adjacent to the Meredosia Energy Center and within and adjacent to the CO_2 pipeline corridor, CO_2 storage study area, and associated components and facilities; • Result in land use restrictions on adjacent properties; or	**No Impacts.** Baseline conditions would not change.	**Construction**: <u>*Minor Adverse Impacts*</u>*:* Since there are no applicable zoning and land use plans in unincorporated Morgan County, construction of the proposed project would not conflict with any designated county zoning plans. The educational facilities in the city of Jacksonville would be designed to abide by the existing zoning and comprehensive plan. The Meredosia Energy Center property offers sufficient infrastructure to support most of the construction activities required for the oxy-combustion facility. Additional land area outside of the energy center would be used for construction staging and equipment laydown, but that land area would only be temporarily impacted as it would revert back to its original condition after construction. Impacts due to construction of the CO_2

Table S-4. Summary of Environmental Impacts by Alternative for the FutureGen 2.0 Project

Criteria Considered	No Action	Proposed Project
Land Use *(continued)*		
• Conflict with regional or local land use plans and zoning.		pipeline and injection well site(s) would be negligible to minor. Short-term impacts would result from temporarily restricting access and disrupting the ability to use the land for existing purposes (e.g., agricultural crops); land would be returned to its original condition after construction to the extent practicable. Long-term impacts would occur in areas that require conversion of land, such as vegetated land, for the pipeline ROW and for the CO_2 injection well site(s). Construction of the educational facilities in the city of Jacksonville would have negligible impacts since the Alliance would follow stipulations of the Jacksonville Zoning Ordinance. **Operations**: *<u>Negligible Adverse Impacts</u>:* Operation of the oxy-combustion facility would not conflict with any designated county zoning plans. Additionally, operation of the oxy-combustion facility would be compatible with the developed, industrial land use within and adjacent to the Meredosia Energy Center; therefore, impacts would be negligible. Impacts due to operation of the CO_2 pipeline and injection well site(s) would be negligible to minor. Most of the land along the pipeline is agricultural and would continue to be used for agricultural purposes during operations. Operation of the injection well site(s) would result in minor impacts associated with permanently removing **less than** 25 acres of mostly agricultural land from existing use. To the extent practicable, the Alliance would avoid net reductions in agricultural land. To replace acreages of land potentially removed from agricultural use due to the project, the Alliance would designate land that is currently not farmed as agricultural land. Land potentially placed into new agricultural use would be in the immediate vicinity of land taken out of agricultural use. Operation of the educational facilities in the city of Jacksonville would have negligible impacts since the Alliance would follow stipulations of the Jacksonville Zoning Ordinance.
Aesthetics		
Impacts were assessed based on whether the proposed project would: • Block or degrade a scenic vista or viewshed; • Degrade or diminish a federal, state, or local scenic resource; • Change the area's visual resources; • Create glare or illumination that would be obtrusive or incompatible with existing land use; or • Create visual intrusions or visual contrasts affecting the quality of a landscape.	**No Impacts.** Baseline conditions would not change.	**Construction**: *<u>Minor to Moderate Adverse Impacts</u>:* Construction of the proposed FutureGen 2.0 Project would result in temporary minor adverse impacts from increased visibility of construction activities to nearby sensitive receptors, as well as from fugitive dust, transportation, and noise. Temporary moderate impacts would occur as a result of the lighting required to support well drilling on a 24-hour per day basis. **Operations**: *<u>Minor Adverse Impacts</u>:* Operations of the project would result in minor impacts to aesthetics from the introduction of new buildings to the viewshed, including a 450-foot stack and associated steam plume. Minor impacts would occur to the viewshed from new utility lines constructed to the injection well site(s), placement of pipeline markers along the CO_2 pipeline, and from the introduction of the new surface facilities at the injection well site(s). Additional minor impacts would occur from the permanent conversion of natural areas (i.e., forests or grasslands) to typically revegetated grass in the areas of the pipeline ROW and injection well site(s). Periodic vegetation clearing and other maintenance activities would also result in negligible impacts.

Table S-4. Summary of Environmental Impacts by Alternative for the FutureGen 2.0 Project

Criteria Considered	No Action	Proposed Project
Materials and Waste Management		
Impacts were assessed based on whether the proposed project would: • Cause new sources of construction materials and operational supplies to be developed, such as new mining areas, processing plants, or fabrication plants; • Affect the capacity of existing material suppliers and industries in the region; • Create wastes for which there are no commercially available disposal or treatment technologies; • Create the need for a hazardous waste treatment, storage, or disposal permit for the project; • Affect the capacity of waste collection services, and treatment, storage, and disposal facilities; • Create reasonably foreseeable conditions that would increase the risk of a hazardous waste release; or • Create reasonably foreseeable conditions that would increase the risk of a hazardous material release.	**No Impacts.** Baseline conditions would not change.	**Construction**: *Negligible Adverse Impacts:* Construction of the proposed FutureGen 2.0 Project would require the use of structural and other materials in quantities that would have negligible impact on local or regional supplies. Generation of construction wastes would be minimized through material management practices such as spill prevention for petroleum products and segregation of recyclable materials. Adequate disposal capacity exists in the region to handle any construction wastes that would be generated. **Operations**: *Minor to Moderate Adverse Impacts:* **Based on the Alliance's refinements to the design since publication of the Draft EIS, project operation would require the following materials in larger quantities compared to the quantities analyzed in the Draft EIS**: **coal (approximately 745,000 tons per year, compared to 700,000 in the Draft EIS), hydrated lime (approximately 68,200 tons per year, compared to 43,000 in the Draft EIS), and trona (approximately 3,200 tons per year, compared to 800 in the Draft EIS).** These and other materials required to operate the proposed project are widely available; their use in the project would not have a noticeable impact on local and regional supplies. The largest waste streams from operation of the project would consist of fly ash (approximately 200,000 tons per year) and bottom ash (approximately **14,000** tons per year**, compared to 12,000 in the Draft EIS**). The Meredosia Energy Center would attempt to sell fly ash by-product to local and regional businesses. Bottom ash, and any fly ash that is not beneficially reused, would be disposed of in permitted landfills. Disposal of these waste streams could have minor to moderate impact on local and regional disposal capacity. The project also has the potential to generate hazardous waste and non-hazardous municipal solid wastes from the oxy-combustion facility, CO_2 pipeline, injection well site(s), and educational facilities. These wastes would be collected and transported offsite for disposal in accordance with applicable regulations, and the amounts **and types of waste** generated would not substantially affect local and regional treatment and disposal capacity.
Traffic and Transportation		
Impacts were assessed based on whether the proposed project would: • Substantially increase daily vehicular traffic on key roadway segments and thereby degrade the level of service to exceed traffic-handling capacity; • Substantially increase daily barge traffic on the Illinois River to exceed capacity and interfere with other users; or	**No Impacts.** Baseline conditions would not change.	**Construction**: *Minor Adverse Impacts:* Construction of the proposed FutureGen 2.0 Project would cause temporary and localized congestion, particularly on roadways close to the Meredosia Energy Center, and to a lesser extent, on roadways close to the other construction sites. However, construction would be temporary, and all roadways in the ROI have the capacity to accommodate traffic increases associated with the construction of all components of the proposed project without substantially degrading the level of service. Limited adverse effects due to additional barge traffic and offloading would be expected.

Table S-4. Summary of Environmental Impacts by Alternative for the FutureGen 2.0 Project

Criteria Considered	No Action	Proposed Project
Traffic and Transportation *(continued)*		
• Conflict with regional or local transportation improvement plans.		**Operations**: *Minor Adverse Impacts:* Operation of the proposed FutureGen 2.0 Project would have long-term minor adverse effects on transportation resources resulting from increased vehicle and truck traffic. Operation would cause long-term but localized congestion, particularly on roadways close to the Meredosia Energy Center. The level of service would not change on any roadways during operations, when compared to a no-build scenario. **Current design anticipates that Powder River Basin coal would be the only material delivered by barge, which would require approximately 180 barge trips per year. However, alternatively, the Alliance may decide to have the Illinois bituminous coal (IL No.6) and the Powder River Basin coal blended offsite at a commercial coal-handling facility. In that case the entire volume would be delivered by barge, amounting to approximately 451 barge deliveries per year to transport coal to the energy center (1 to 2 barge deliveries on a daily basis). Historically, the number of annual barge deliveries ranged between 140 and 500 over the past several years. Therefore, waterway capacity would be sufficient for the operation of the barges, and impacts are expected to be negligible. Potential deliveries of blended coal by barge would replace daily deliveries by truck.**
Noise		
Impacts were assessed based on whether the proposed project would: • Conflict with any state or local noise ordinances; • Cause perceptible increases in ambient noise levels at sensitive receptors during construction—from either mobile or stationary sources; • Cause long-term perceptible increases in ambient noise levels at sensitive receptors during operations—from either mobile or stationary sources; or • Cause excessive ground-borne vibration to persons or property.	**No Impacts.** Baseline conditions would not change.	**Construction:** *Minor to Moderate Adverse Impacts:* Construction noises at the Meredosia Energy Center could have a minor to moderate impact on the few nearest residences; however, due to the nature of construction, the noise would be intermittent and temporary until the construction phase is over. Construction of the pipeline would result in minor to moderate, short-term, and intermittent increases in noise and vibrations at receptors near the pipeline ROW due to construction equipment activity and increased truck traffic. Not accounting for natural attenuation, receptors at distances greater than approximately 830 feet during typical pipeline construction, or approximately 2,330 feet during trenchless boring activities, would hear the construction noise at levels below 65 dBA, which is the limit deemed as normally acceptable to residential receptors. At the injection well site(s), the primary sources of noise during construction would be from drilling the wells and construction of the supporting facilities. The drilling of the injection wells would occur over a continuous, 24-hour duration, 7 days per week, for approximately **100 days per well**, and because of the duration, would be the dominant noise source. The Alliance would construct earthen noise berms around the well pad to mitigate the noise impact to the nearest residences during this period. Ground vibrations from well drilling activities are expected to have negligible impact to nearby structures.

Table S-4. Summary of Environmental Impacts by Alternative for the FutureGen 2.0 Project

Criteria Considered	No Action	Proposed Project
Noise *(continued)*		
		Operations: *Minor Adverse Impacts:* During operations, noise from the Meredosia Energy Center would either remain the same or be reduced in comparison to historical energy center operations. Similarly, noise levels during operations are expected to stay at the same level in comparison to current (post-2011) ambient conditions, since local noise levels are and will continue to be dominated by the existing Cargill facility and the highway IL-104. There would, however, be an increase in truck noise in the near vicinity of the energy center due to increased usage of trucks for coal delivery under the proposed project, compared to the historical use of barges as the primary means for coal delivery. The volume of truck traffic transporting feedstock (mainly coal and limestone) and removing wastes (mainly fly ash and bottom ash) would total **less than** 88 daily roundtrips. This represents almost 50 additional roundtrips a day when compared to historic truck traffic volumes. Operations at the injection well site(s) under normal operating conditions would be dominated by typical heating, ventilation, and air conditioning systems. Since the nearest sensitive receptors at the injection well site(s) are expected to be farther than 500 feet away, the noise impacts from operational equipment at the injection well site(s) would be minor.
Utilities		
Impacts were assessed based on whether the proposed project would: • Impact the effectiveness of existing utility infrastructure or cause temporary failure; • Affect the capacity and distribution of local and regional utility suppliers to meet the existing or anticipated demand; or • Require public utility system upgrades.	**No Impacts.** Baseline conditions would not change.	**Construction**: *Minor Adverse Impacts:* Construction of the proposed FutureGen 2.0 Project would result in increased demand for potable and process water, increased generation of wastewater, and increased electricity consumption. In addition, the placement of new electrical lines would be required to support operation of the proposed project. Construction-related impacts to water supplies would be short term and minor, while construction-related impacts to wastewater treatment would be negligible. Overall impacts to utilities during construction would be minor. **Operations**: *Minor Adverse Impacts:* Operation of the oxy-combustion facility would result in demand for potable and process water, generation of wastewater, and electricity consumption and generation. Existing utilities have adequate capacity to handle additional demands. Operation of the injection well site(s) and educational facilities would result in increased demand for potable water and electricity, and increased generation of wastewater. Operations impacts to water supplies would be negligible. Overall impacts to utilities during operations would be minor.

Table S-4. Summary of Environmental Impacts by Alternative for the FutureGen 2.0 Project

Criteria Considered	No Action	Proposed Project
Community Services		
Impacts were assessed based on whether the proposed project would: • Displace, impede effective access to, or increase demand beyond available capacities of emergency response services, fire protection, law enforcement, healthcare facilities, and school systems in the ROI; or • Conflict with local and regional plans for emergency response services, fire protection, law enforcement, healthcare facilities, or school systems.	**No Impacts.** Baseline conditions would not change.	**Construction**: *Negligible Adverse Impacts:* A temporary workforce of **approximately 900 based on the updated design** would be required during peak construction of the proposed project **(a slight reduction from the Draft EIS)**. These workers would likely be drawn from the existing workforce of the area; however, an undeterminable number of workers and associated families may relocate to the area temporarily. Existing community services (i.e., law enforcement, emergency response, hospitals, and education) are expected to be adequate to address the needs of the population in the ROI, including project personnel and their dependents. Existing emergency response capabilities are expected to be adequate to address potential accidents and other risks. Negligible impacts on community services would be expected. **Operations**: *Negligible Adverse Impacts:* Long-term operation of the project would require **approximately 124 to 152 new employees based on the updated design (a slight reduction from the Draft EIS)**. It is likely that these workers would be drawn from the existing workforce of the area; however, an undeterminable number of workers and associated families may relocate to the area permanently. Existing community services (i.e., law enforcement, emergency response, hospitals, and education) are expected to be adequate to address the needs of the population in the ROI, including project personnel and their dependents. Existing emergency response capabilities are expected to be adequate to address potential accidents and other risks. Negligible impacts on community services would be expected.
Human Health and Safety		
Impacts were assessed based on whether the proposed project would: • Increase worker health risks due to industrial accidents, injuries, or illnesses during construction and normal operating conditions; • Increase public health risks due to accidental releases of CO_2 or other trace gases associated with captured CO_2 during transport, active geologic storage activities, and following closure of the injection wells; or • Increase public health risks due to intentional destructive acts.	**No Impacts.** Baseline conditions would not change.	**Construction**: *Minor Adverse Impacts:* The potential for worker injuries would be present during construction of the proposed FutureGen 2.0 Project. Based on the incident rate for utility system construction, the number of lost work days is estimated to be 12.5 **or less** over the entire construction period for all project components. **Operations**: *Minor Adverse Impacts:* Accidents and lost work days during operation of the oxy-combustion facility could occur. The two liquid oxygen tanks at the facility pose the highest potential consequences if an accident were to occur, which could affect workers but not the general public. However, such accidents are extremely unlikely to occur (i.e., the potential for an accident to occur is between once in 10,000 years and once in a million years). The potential for accidents involving the CO_2 pipeline are considered to be unlikely (i.e., the potential to occur between once in 100 years and once in 10,000 years). Workers in the vicinity of a pipeline puncture or rupture would be most susceptible to harm due largely to potential physical effects related to high-pressure and the velocity of the release, as well as from exposure to extreme temperature drops which could cause frostbite. In addition, high concentrations of CO_2 would be present in the narrow band

Table S-4. Summary of Environmental Impacts by Alternative for the FutureGen 2.0 Project

Criteria Considered	No Action	Proposed Project
Human Health and Safety *(continued)*		
		of CO_2 escaping from the leak site. Immediate life threatening effects related to asphyxiation from short-term exposure to these high concentrations (i.e., exposure to CO_2 at concentrations that exceed 100,000 ppmv) could occur; however, workers would likely be able to flee the areas with high concentration due to the visual, physical, and audible signs associated with the event. A pipeline rupture or puncture would potentially cause exposure and risk to the public as the CO_2 expands and disperses creating a vapor plume. The potential maximum reasonably foreseeable accident scenario or exposure distances would occur with a pipeline rupture under calm meteorological conditions. There would be no effects to the general public from this type of rupture beyond a distance where CO_2 concentrations would exceed 5,000 parts per million, which over a 60-minute time period, could extend to a distance of up to **1,769** feet. Transient effects, which include temporary symptoms such as headache, dizziness, sweating, or vague feelings of discomfort, could occur within these distances. Exposure distances would be much shorter under meteorological conditions with wind levels greater than calm, when more air movement and subsequent chemical dissipation would occur. The Alliance's pipeline siting criteria includes an intended minimum distance of 150 feet from any occupied structure, which is greater than the distances at which exposures could result in serious adverse effects or life-threatening effects **under meteorological conditions present more than 95 percent of the time**. **Under meteorological conditions D10 and D12, which occur only 3.6 and 0.7 percent of the time, respectively, irreversible or serious adverse effects associated with CO_2 exposures, could occur within exposure distances of up to 152 feet from the rupture site, and the potential for life-threatening effects from exposures could occur within 79 feet.** Potential health impacts from accidental releases of CO_2 from the **horizontal** injection wells, considered to be extremely unlikely events, **could extend to 114 feet if injection tubing is used, or to 540 feet if not. Under the vertical well configuration, analyzed in the Draft EIS but no longer proposed by the Alliance, effects of CO_2 from a release** would be limited in extent to 92 feet from the well site. Releases of CO_2 following the end of injection operations are not expected to result in ambient air concentrations above established health criteria; thus health effects to the public would not be expected. Potential health effects could occur from exposure to trace gases in the pipeline and injection wells (hydrogen sulfide, sulfur dioxide, and sulfur trioxide); however, under normal operating conditions these components are not expected be present in measurable concentrations. **Note that the oxy-combustion process is not expected to produce measureable concentrations of hydrogen sulfide.** Potential effects from catastrophic or intentional destructive acts are expected to be similar to the above impacts.

Table S-4. Summary of Environmental Impacts by Alternative for the FutureGen 2.0 Project

Criteria Considered	No Action	Proposed Project
Socioeconomics		
Impacts were assessed based on whether the proposed project would: • Displace existing population or demolish existing housing; • Alter projected rates of population growth; • Affect the housing market; • Displace existing businesses; • Affect local businesses and the economy; • Displace existing jobs; or • Affect local employment or the workforce.	**No Impacts.** Baseline conditions would not change.	**Construction**: *<u>Beneficial Impacts</u>:* Spending and employment for the proposed project would generally result in net beneficial impacts to socioeconomic conditions during construction. A temporary increase in population caused by a slight influx of construction workers from outside the ROI would not have an adverse impact on population and housing. There is adequate capacity in the region to meet the labor force demand and the project is expected to benefit the regional economy. **Operations**: *<u>Beneficial Impacts:</u>* Spending and employment for operations of the proposed project would generally result in net beneficial impacts to socioeconomic conditions. In addition, the potential influx of workers for project operations would not have a substantial effect on regional population and housing.
Environmental Justice		
Impacts were assessed based on whether the proposed project would: • Cause a significant and disproportionately high and adverse effect on a minority population; or • Cause a significant and disproportionately high and adverse effect on a low-income population.	**No Impacts.** Baseline conditions would not change.	**Construction**: *<u>Negligible Adverse Impacts</u>:* No disproportionately high and adverse impacts to minority and low-income populations are anticipated during construction of the project. **Operations**: *<u>Negligible Adverse Impacts</u>:* No disproportionately high and adverse impacts to minority and low-income populations are anticipated during operation of the project.

CO_2 = carbon dioxide; dBA = A-weighted sound level in decibels; DOE = U.S. Department of Energy; GHG = greenhouse gas; IDNR = Illinois Department of Natural Resources; mgd = million gallons per day; MVA = monitoring, verification, and accounting; MWe = megawatt electrical; MWh = megawatt hour; NRHP = National Register of Historic Places; ppmv = parts per million by volume; NWI = National Wetland Inventory; ROI = region of influence; ROW = right-of-way; SHPO = State Historic Preservation Office; UIC = Underground Injection Control; USACE = U.S. Army Corps of Engineers; USDW = underground source of drinking water

POTENTIAL CUMULATIVE IMPACTS

DOE addressed the impacts of the FutureGen 2.0 Project incrementally when added to the reasonably foreseeable impacts of other significant known or proposed projects within the geographic area in accordance with the cumulative impact requirements of NEPA (40 CFR 1508.7). As a result of the cumulative impacts analysis, DOE concluded that the FutureGen 2.0 Project, in combination with other reasonably foreseeable future actions, may result in cumulative impacts on the resource areas listed in Table S-5. In no case would the incremental effects of the FutureGen 2.0 Project on any resource, when added to the effects of other reasonably foreseeable actions, result in cumulative impacts that would be substantially greater than the impacts of the FutureGen 2.0 Project or other actions individually.

Table S-5. Summary of Cumulative Impacts

Resource	Potential Cumulative Impacts
Air Quality	It is not expected that the proposed project, when combined with past, present, and reasonably foreseeable actions, would lead to a violation of the NAAQS or change in attainment status of the region. Therefore, cumulative effects on air quality would not be significant.
Climate and Greenhouse Gases	The oxy-combustion facility would result in a net decrease in GHG emissions compared to equivalent generation by a conventional coal or natural gas power plant. Further, 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. Other projects in the ROI that would include combustion of additional fossil fuels or other sources of GHG emissions (e.g., the Illinois Route 104 Bridge Replacement Project) would cumulatively emit additional incremental amounts of GHGs within the ROI. Compared to regional and national GHG emissions rates, cumulative impacts would be low; their effect on the regional and global climate is currently indeterminable.
Physiography and Soils	Incrementally, in combination with other ongoing and foreseeable actions, the FutureGen 2.0 Project would have a minor cumulative impact to the soil resources of the region. The amount of permanently affected prime farmland soils would be a negligible percentage of the soils in Illinois, and a very small amount of the soils in Morgan County, particularly when compared to the increase in farmland acreage that has occurred in the county in recent decades. Most of the disturbed soils would also occur on industrial property, directly adjacent to roads, or in previously disturbed areas.
Geology	Negligible cumulative impacts would be expected from construction of the proposed project and the foreseeable future actions, as most of the impacts would be related to the earthmoving needed for each and would not overlap. There would be minor cumulative effects on regional geology from operation of the proposed project and other CO_2 storage projects in the Illinois Basin. Capacity estimates predict that the Illinois Basin and the Mt. Simon Formation could safely accommodate 20 individual storage projects, each injecting 5.5 million tons (5 million metric tons) per year of CO_2 for 50 years, which is well above the capacity of the projects planned or underway.
Groundwater	There would be minor cumulative impacts to groundwater resources from constructing the proposed project in combination with other reasonably foreseeable future actions. Both the FutureGen 2.0 Project and the Illinois Route 104 Bridge Replacement Project would obtain water locally in the Meredosia area during construction, but the combined requirements would not substantially affect local groundwater capacity. Other construction projects would likely require trucking in groundwater from available sources, which would occur at different times and not impose substantial overlapping demands. There would be negligible cumulative impacts to groundwater from the operations of the proposed project and the other planned or potential CO_2 storage projects in Decatur and Taylorville. The CO_2 plume for FutureGen 2.0 would not overlap with the plumes of other projects based on modeling results. The shallow groundwater aquifers are not directly connected, so any near-surface contamination from material spills during construction or operation would not add incrementally to the impacts at other project sites.

Table S-5. Summary of Cumulative Impacts

Resource	Potential Cumulative Impacts
Surface Water	The FutureGen 2.0 Project in combination with current and reasonably foreseeable future projects would result in minor, short-term cumulative adverse impacts to water quality during construction and operation of the FutureGen 2.0 Project. Increased sedimentation (turbidity) of surface water features from soil erosion could occur during earth-moving activities associated with construction and from stormwater discharges associated with operations. These impacts would be mitigated, to the extent possible, through the use of best management practices and adherence to permit conditions.
Wetlands and Floodplains	The FutureGen 2.0 Project would not add incrementally to potential impacts on wetlands and floodplains from other regional projects. Development of the US-67 improvements and the Illinois Route 104 Bridge Replacement Project would cause a relatively small amount of wetland loss. The FutureGen 2.0 Project would not be expected to contribute to additional wetland loss in the area. The US-67 improvements, Illinois Route 104 Bridge Replacement Project, and the FutureGen 2.0 Project may have some effect on floodplains of the Illinois River; however, the FutureGen 2.0 Project would not be expected to cause any long-term impacts. Required permitting for impacts on flood hazards would greatly minimize the potential for any significant flood hazard impacts to occur as a result of any future floodplain development in the area.
Biological Resources	Development of the US-67 improvements and the Illinois Route 104 Bridge Replacement Project would involve the loss of natural terrestrial wildlife habitat and, potentially, small degrees of aquatic habitat degradation causing minor impacts of vegetation loss and associated animal habitat loss/degradation. The FutureGen 2.0 Project contribution would be minor and would not cause substantial cumulative impacts. Development of the US-67 improvements has the potential to impact protected species; however, consultation with regulators and conservation planning has been performed. Thus, no impacts to protected species populations would be expected. The FutureGen 2.0 Project is in the process of consultation and conservation planning, and it is expected that, if necessary, any potential impacts would be mitigated to acceptable levels. No incremental addition to adverse cumulative impacts on protected species populations would occur from the project.
Cultural Resources	Based on the project's planned mitigation and implementation of a Programmatic Agreement, a low likelihood of cumulative adverse effects to cultural resources is expected.
Land Use	The construction schedule for the FutureGen 2.0 Project is not expected to coincide with the construction schedule for improvements to a portion of US-67 and require construction in the same ROW along US-67 at the same time. The FutureGen 2.0 Project would not contribute incrementally to any induced development along the highway attributable to the US-67 improvement project. The FutureGen 2.0 Project in combination with the Illinois Route 104 Bridge Replacement Project would not contribute incrementally to cumulative impacts on land use conversions and compatibility with surrounding land uses. Both the Illinois Rivers Transmission Project and the FutureGen 2.0 Project would require acquisition of easements for the transmission lines and CO_2 pipeline, respectively. Therefore, it is likely that some land within Morgan County would be subject to ROW easements as a result of both projects, which would cause a minor cumulative effect on land use. In areas where a transmission line or pipeline would be constructed on agricultural land, the Illinois Department of Agricultural guidelines would be followed, and cumulative effects on compatibility with surrounding land uses would be minor.
Aesthetics	Moderate cumulative impacts to the local viewshed could occur to sensitive receptors in Meredosia as a result of increased visibility of large construction equipment and processes during the construction of the FutureGen 2.0 Project and the replacement of the Illinois 104 Meredosia Bridge. These include the combined nuisance effects of traffic congestion, dust generation during construction, and overnight lighting, as well as the introduction of new, permanent infrastructure to the viewshed (stack, bridge, and overhead utilities). The Illinois Rivers Transmission Project could result in minor cumulative impacts as a result of increased visibility of utility infrastructure in typically flat areas when combined with the visual impacts from the utility infrastructure that would be constructed under the FutureGen 2.0 Project.

Table S-5. Summary of Cumulative Impacts

Resource	Potential Cumulative Impacts
Materials and Waste Management	The FutureGen 2.0 Project would add incrementally to the nationwide demands for coal but without substantially affecting the available capacities or operations at existing mines. Minor to moderate adverse cumulative impacts on regional landfill capacity could occur as a result of the proposed project and the foreseeable future projects. Generation of construction-related wastes from these projects, when combined with fly ash and bottom ash generated by the proposed project, could reduce landfill capacity available to local municipalities and businesses. These adverse impacts could be mitigated through beneficial reuse of some of the major waste streams generated by the proposed project.
Traffic and Transportation	Cumulative impacts associated with transportation and traffic would be minor. The introduction of a temporary increase in traffic during construction would be easily accommodated by the existing road systems with only minor temporary disruptions. Operation of the oxy-combustion facility, the CO_2 pipeline, and the CO_2 injection wells would have minor effects as a relatively small number of commuting employees and support trucks would be added. No large-scale projects or proposals have been identified that, when combined with the project, would cause impacts on traffic substantially greater than those described for the proposed project.
Noise	Cumulative impacts associated with noise would be negligible. It is highly unlikely that any of the reasonably foreseeable future actions would occur at the same location and at the same time as the proposed project; however, if they did overlap, there would be a minor cumulative impact of increased noise temporarily during construction activities. No cumulative impact in operational noise would be anticipated.
Utilities	The FutureGen 2.0 Project would contribute negligible impacts incrementally to the effects on utility systems and providers.
Community Services	The FutureGen 2.0 Project would contribute negligible impacts incrementally to the effects on community services.
Human Health and Safety	None of the foreseeable future actions would add incrementally to the potential impacts of the FutureGen 2.0 Project to an extent that long-term cumulative adverse impacts on human health and safety would be considerably greater than those described for the proposed project.
Socioeconomics	The FutureGen 2.0 Project would contribute net beneficial impacts to the effects on socioeconomic conditions.
Environmental Justice	The FutureGen 2.0 Project would not have a disproportionate adverse effect on minority and low-income populations and would not contribute incrementally to environmental justice impacts.

CO_2 = carbon dioxide; GHG = greenhouse gas; ROI = region of influence; ROW = right-of-way

GLOSSARY

Term	Definition
100-Year Floodplain	Land that becomes or will become submerged by a flood that has a chance to occur every 100 years (1 percent annual chance of flooding).
A-Weighted Scale	Assigns weight to sound frequencies that are related to how sensitive the human ear is to each sound frequency.
Air Liquide Process & Construction, Inc. (Air Liquide)	An international company that has been involved in the development of oxy-combustion technologies for power generation with carbon capture for the past 10 years. For the FutureGen 2.0 Project, Air Liquide is responsible for developing complex components of the oxy-combustion facility, such as the air separation unit and the compression and purification unit.
Air Separation Unit	An integrated component of the oxy-combustion facility that will supply oxygen for the oxy-combustion boiler by separating oxygen and nitrogen from the air through a cold distillation process.
Alluvial	Relating to, composed of, or found in alluvium, which is defined as loose, unconsolidated soil or sediments, which have been eroded, reshaped by water in some form, and deposited in a non-marine setting.
Ambient	Of or relating to the conditions of the surrounding environment or atmosphere as it normally exists.
Ameren Energy Resources (Ameren)	An integrated energy commodity holding company, created in 2000 for providing energy solutions to the midwestern United States market. The original owner and operator of the Meredosia Energy Center, which was selected by the Department of Energy's clean coal power program to be the site for the FutureGen 2.0 Project.
Aquifer	Underground geologic formation composed of permeable layers of rock or sediment that holds and transmits water.
Archaeological Resource	Any material remains of the past, which offer the potential for investigation, analysis, and contribution to the understanding of past human communities.
Area of Potential Effect	The geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties.
Attainment Area	A geographic area that meets the National Ambient Air Quality Standards for a criteria pollutant.
Auxiliary Boiler	The boiler that would be used to provide steam to the plant that is needed during the startup process.

Term	Definition
Babcock & Wilcox Power Generation Group, Inc. (Babcock & Wilcox)	An international company that designs, manufactures, and constructs steam generating systems and emissions control equipment for utilities and industry. Developer of the boiler island and gas quality control system for the FutureGen 2.0 oxy-combustion facility.
Bedrock	Unweathered rock overlaid in most places by soil or rock fragments.
Booster Pump Building	The building that would house the well injection pumps and associated flow meters, flow control valves, and variable speed drive cabinets **(for the dual-site scenario only)**.
Bottom Ash	Coarse particles generated during the combustion of coal that fall by gravity to the bottom of the boiler.
Brine	Highly salty and heavily mineralized water that may contain heavy metal and organic contaminants.
Caprock	The geologic formation or formations that overlie the injection zone and act as a confining layer to prevent the upward vertical migration of CO_2 out of the injection zone. Caprock is typically comprised of low permeability and porosity rock layers (typically shale, limestone, or dolomite) making it relatively impermeable.
Carbon Capture and Storage	The process of capturing CO_2 and ultimately injecting it into underground geologic formations for secure storage. Sometimes referred to as carbon capture and sequestration.
Carbon Dioxide	A greenhouse gas created by natural processes such as animal and plant respiration as well as from human activity such as the burning of fossil fuels.
Circulating Dry Scrubber	Scrubber used in the oxy-combustion gas quality control system to remove sulfur dioxide and sulfur trioxide from flue gas. Also called a circulating fluidized bed – flue gas desulfurization unit.
Compression and Purification Unit	Component of the oxy-combustion facility that purifies and compresses treated flue gas for delivery to the CO_2 pipeline.
Cooling Tower	A structure that is used to provide cool water for the condensation of steam in the steam condenser, and to remove excess heat from other system processes (e.g., air separation and compression and purification units) by circulating the water along a series of panels through which cool air passes.
Criteria Pollutant	The Clean Air Act of 1970 required the U.S. Environmental Protection Agency to set air quality standards for common and widespread pollutants to protect human health and welfare. There are six criteria pollutants: ozone, carbon monoxide, sulfur dioxide, lead, nitrogen dioxide, and particulate matter.
Critical Habitat	A geographic area that contains features essential for the conservation of a threatened or endangered species that may require management and protection.

Term	Definition
Cultural Resource	Archaeological resources, including prehistoric and historic archaeological sites; historic resources; cultural or historic landscapes or viewsheds; Native American resources; and paleontological resources.
Cumulative Impact	The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions.
Decibel	A unit for expressing the relative intensity of sounds on a logarithmic scale.
Direct Contact Cooler Polishing System	Component of the oxy-combustion gas quality control system facility that removes moisture and sulfur dioxide from treated flue gas.
Effluent	Waste stream flowing into the atmosphere, surface water, groundwater, or soil.
Emissions	Release of gases and particles into the atmosphere from various sources.
Endangered Species	A species, subspecies, or varieties in danger of extinction throughout all or a significant portion of their range. The federal list of endangered species can be found in 50 CFR 17.11 (wildlife), 50 CFR 17.12 (plants), and 50 CFR 222.23 (marine organisms). The Illinois Endangered Species Protection Board also maintains a list of endangered species regulated by the Illinois Department of Natural Resources.
Environmental Justice	The fair treatment and meaningful involvement of all people – regardless of race, ethnicity, and income or education level – in environmental decision making. Environmental Justice programs promote the protection of human health and the environment, empowerment via public participation, and the dissemination of relevant information to inform and educate affected communities.
Fault	A subsurface fracture or discontinuity in geologic strata, across which there is observable displacement as a result of earth movement.
Floodplain	Flat or nearly flat land adjacent to a stream or river that experiences occasional or periodic flooding.
Flue Gas	Residual gases resulting from combustion that are vented to the atmosphere through a flue or chimney.
Fly Ash	Fine particles generated during combustion that are collected by electrostatic precipitators or baghouses prior to discharge of the flue gas to the atmosphere.
Formation	The primary unit associated with formal geological mapping of an area. Geologic formations possess distinctive geologic features and can be combined into groups or subdivided into member or units.

Term	Definition
Fugitive Dust	Airborne particulate matter typically associated with disturbance of unpaved haul roads, wind erosion of exposed surfaces, and other activities in which soil is removed and redistributed.
FutureGen Industrial Alliance (Alliance)	A non-profit organization created to benefit the public interest and the interests of science through research, development, and demonstration of near-zero emissions coal technology. Formed to partner with the Department of Energy on the FutureGen Initiative. Current members include Alpha Natural Resources, Inc.; Anglo American, SA; Joy Global, Inc.; Peabody Energy Corporation; and Xstrata PLC.
FutureGen Initiative	A $1 billion, 10-year demonstration project initiated by President Bush in 2003 to create the world's first coal-based, zero emissions electricity and hydrogen power plant to support other federal initiatives, including the National Climate Change Technology Initiative (2001) and the Hydrogen Fuel Initiative (2003).
Gas Quality Control System	Collection of oxy-combustion facility components that treat flue gas generated during the combustion process to remove pollutants, recover heat, and prepare the flue gas for the compression and purification unit.
Greenhouse Gas	Gas that contributes to the greenhouse effect by absorbing and remitting infrared radiation and ultimately warming the atmosphere. Greenhouse gases include water vapor, carbon dioxide, ozone, methane, nitrous oxide, and several classes of halogenated substances that contain fluorine, chlorine, or bromine (including chlorofluorocarbons).
Hazardous Air Pollutant	Air pollutants that are not covered by ambient air quality standards, but may present a threat of adverse human health effects or adverse environmental effects, and are specifically listed in 40 CFR 61.01.
Hazardous Waste	Solid waste that exhibits at least one of four characteristics (ignitability, corrosivity, reactivity, or toxicity), or that is specifically listed by the U.S. Environmental Protection Agency as a hazardous waste; but is not specifically exempted in the U.S. Environmental Protection Agency regulations. Hazardous waste is regulated under the Resource Conservation and Recovery Act Subtitle C.
Historic Resource	Prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places.
Hydrated Lime	**A white powder obtained when lime (a mixture of calcium-containing inorganic materials, predominantly carbonates, oxides, and hydroxides) is heated and then mixed with water, or hydrated. Also known as calcium hydroxide. Among other uses, hydrated lime is an absorbent for the removal of acid gases.**

Term	Definition
Hydric Soil	A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic (oxygen-lacking) conditions that favor the growth and regeneration of water-adapted vegetation.
Injection Well	A deep well used to inject supercritical CO_2 into the injection zone for permanent geologic storage.
Injection Zone	A geologic formation, group of formations, or part of a formation that is of sufficient areal extent, thickness, porosity, and permeability to receive CO_2 through an injection well or wells associated with a geologic sequestration project.
Integrated Gasification Combined Cycle	A process that uses synthesis gas derived from coal to drive a gas combustion turbine and exhaust gas from the gas turbine to generate steam from water to drive a steam turbine. This technology was considered under the original FutureGen Initiative; however, it is not a component of the proposed project.
Lime	General term for calcium-containing inorganic materials, in which carbonates, oxides, and hydroxides predominate. Used as an absorbent for removal of acid gases.
Loam	A rich, friable soil containing a relatively equal mixture of sand and silt and a somewhat smaller proportion of clay.
Low-Income Population	Identified where households have an annual income below the poverty threshold, which was $22,050 for a family of four at the time of the 2010 Census.
Mainline Block Valve	Design feature of a pipeline that blocks flow at a certain point as to isolate and contain any line leak.
Minority	As defined by the Council on Environmental Quality, an individual who is American Indian or Alaskan Native; Black or African American; Asian; Native Hawaiian or Pacific Islander; or Hispanic or Latino.
Minority Population	Identified where either more than 50 percent of the population of the affected area is minority, or the affected area's minority population percentage is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.
Mitigation Measure	Measures taken to reduce adverse impacts on the environment.
Mt. Simon Formation	The major deep saline formation where CO_2 from the Meredosia Energy Center would be injected through deep injection wells. The Mt. Simon Formation is the primary formation that makes up the injection zone.

Term	Definition
National Ambient Air Quality Standards	Nationwide standards set up by the U.S. Environmental Protection Agency for widespread air pollutants, as required by Section 109 of the Clean Air Act. Currently, six pollutants are regulated: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide (i.e., the six criteria pollutants).
National Environmental Policy Act	Signed into law on January 1, 1970. U.S. statute that requires all federal agencies to consider the potential effects of proposed actions on the human and natural environment.
National Pollutant Discharge Elimination System	Provision of the Clean Water Act that prohibits discharge of pollutants into U.S. waters unless a permit allowing such a discharge is issued by the U.S. Environmental Protection Agency, a state, or where delegated, a tribal government on a Native American reservation.
National Register of Historic Places	The official list of the nation's historic places worthy of preservation. Authorized by the National Historic Preservation Act of 1966 and managed by the National Park Service. To be considered eligible, a property must meet the National Register Criteria for Evaluation, including the property's age, integrity, and significance.
No Action Alternative	The project baseline condition or future condition if no action is taken. Used to measure the effects of action alternatives.
Oxy-Combustion	The combustion of coal with a mixture of manufactured oxygen and recycled flue gas, versus atmospheric air, resulting in a gas by-product primarily comprised of CO_2.
Paleontological Resource	Any fossilized remains, traces, or imprints of organisms, preserved in or on the earth's crust, that are of paleontological interest and that provide information about the history of life on earth.
Particulate Matter	Fine liquid or solid particles such as dust, smoke, mist, fumes, or smog, found in air or emissions.
Pore Space	**The spaces within a rock body that are unoccupied by solid material. Pore space refers to voids between grains or crystals in rock formations, including spaces caused by cracks. As part of the FutureGen 2.0 Project, the pore space would be used for permanent geologic storage of CO_2.**
Potable Water	Water that is safe and satisfactory for drinking and cooking.
Prime Farmland	A special category of highly productive cropland that is recognized and described by the U.S. Department of Agriculture's Natural Resource Conservation Service and receives special protection under the Federal Farmland Protection Act.
Process Water Systems	The water intake structures and wells that would be used to supply water to the plant, and new water treatment systems to remove water impurities.

Term	Definition
Programmatic Agreement	A document that spells out the terms of a formal, legally binding agreement between an agency and other state or federal agencies. Two basic kinds: (1) describes the actions that will be taken by the parties in order to meet their environmental compliance responsibilities for a specific project; (2) establishes a process through which the parties will meet their compliance responsibilities for an agency program, a category of projects, or a particular type of resource.
Proposed Action	The activity, including the project and its related support activities, proposed to accomplish a federal agency's purpose and need.
Pulse Jet Fabric Filter	Component of the oxy-combustion gas quality control system facility that removes particulate matter (e.g., fly ash) from the flue gas discharged from the circulating dry scrubber.
Region of Influence	Defines the geographic extent of the area to be analyzed in the environmental impact statement for potential impacts to each respective resource area.
Saline	Water with high concentrations of salts (typically more than 10,000 parts per million dissolved solids), making it unsuitable for use.
Scoping	An early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action.
Scrubber	A device that removes noxious gases (such as sulfur dioxide) from flue gas by using absorbents suspended in a liquid solution.
Seismic	Pertaining to, characteristic of, or produced by earthquakes or earth vibrations.
Sensitive Receptor	Any specific resource (i.e., population or facility) that would be more susceptible to the effects of implementing the proposed action than would otherwise be. Includes, but is not limited to, asthmatics, children, and the elderly, as well as specific facilities, such as long-term health care facilities, rehabilitation centers, convalescent centers, retirement homes, residences, schools, playgrounds, and childcare centers.
Site Control Building	The building that would house the major operational components of the pipeline and the injection well site(s), including the instruments for monitoring and controlling the injection wells, pipeline operations, and site access **(for the dual-site scenario only)**.
Site Control and Maintenance Building	**The building that would house the major operational components of the pipeline and injection well site, including the instruments for monitoring, maintenance, and controlling the injection wells, pipeline operations, and site access (for the single-site scenario only).**

Term	Definition
Socioeconomics	An umbrella term that may refer broadly to the use of economics in the study of society. More narrowly, a discipline studying the reciprocal relationship between economic science on the one hand and social philosophy, ethics, and human dignity on the other.
Stratigraphic Well	An exploratory well drilled for the purpose of gathering geologic information on the composition and relative position of rock strata of an area. The Alliance completed a stratigraphic well at the CO_2 storage study area in December 2011 to collect data with which to characterize the geology and hydrogeology of the area to support the design and permitting of the project as well as the analysis of impacts in this environmental impact statement.
Supercritical CO_2	CO_2 usually behaves as a gas in air or as a solid in dry ice. If the temperature and pressure are both increased (above its supercritical temperature of 88ºF [31.1ºC] and 73 atmospheres [1073 pounds per square inch]), it can adopt properties midway between a gas and a liquid, such that it expands to fill its container like a gas, but has a density like that of a liquid.
Supervisory Control and Data Acquisition	The communication system that would transmit information and data about pipeline performance.
Temporary Barge Unloading Facility	The existing boat ramp area located north of the Meredosia Energy Center and southwest of the village of Meredosia that would be used to unload a number of large modules for the construction of the oxy-combustion facility.
Till	The unsorted sediment deposited directly by a glacier, which exhibits a wide range of particle sizes, from fine clay to rock fragments and boulders.
Trona	A naturally-occurring hydrated sodium carbonate mineral that is used in the gas quality control system to reduce sulfur trioxide concentrations in the flue gas and in the direct contact cooler polishing system to reduce sulfur dioxide at the compression and purification unit inlet.
Turbidity	The cloudiness or haziness of a fluid caused by individual particles (suspended solids) that are generally invisible to the naked eye, similar to smoke in air.
Viewshed	The land, water, cultural, and other aesthetic elements that are visible from a fixed vantage point.
Wastewater	A combination of liquid and water-carried wastes discharged from residences, commercial establishments, farms, and industrial facilities.
Watershed	A land area bounded by topography that drains water to a particular stream, river, or entire river system.
Well Maintenance and Monitoring System Buildings	The buildings that would contain equipment to supply the injection well with fluid to maintain annulus pressurization in order to prevent leakage from the injection well **(for the dual-site scenario only)**.

Term	Definition
Wetland	Those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

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