CarbonSAFE Illinois East Sub-Basin

Project Number DE-FE0029445

Hannes E. Leetaru

University of Illinois

U.S. Department of Energy

National Energy Technology Laboratory

Mastering the Subsurface Through Technology Innovation, Partnerships and Collaboration:
Carbon Storage and Oil and Natural Gas Technologies Review Meeting

August 1-3, 2017

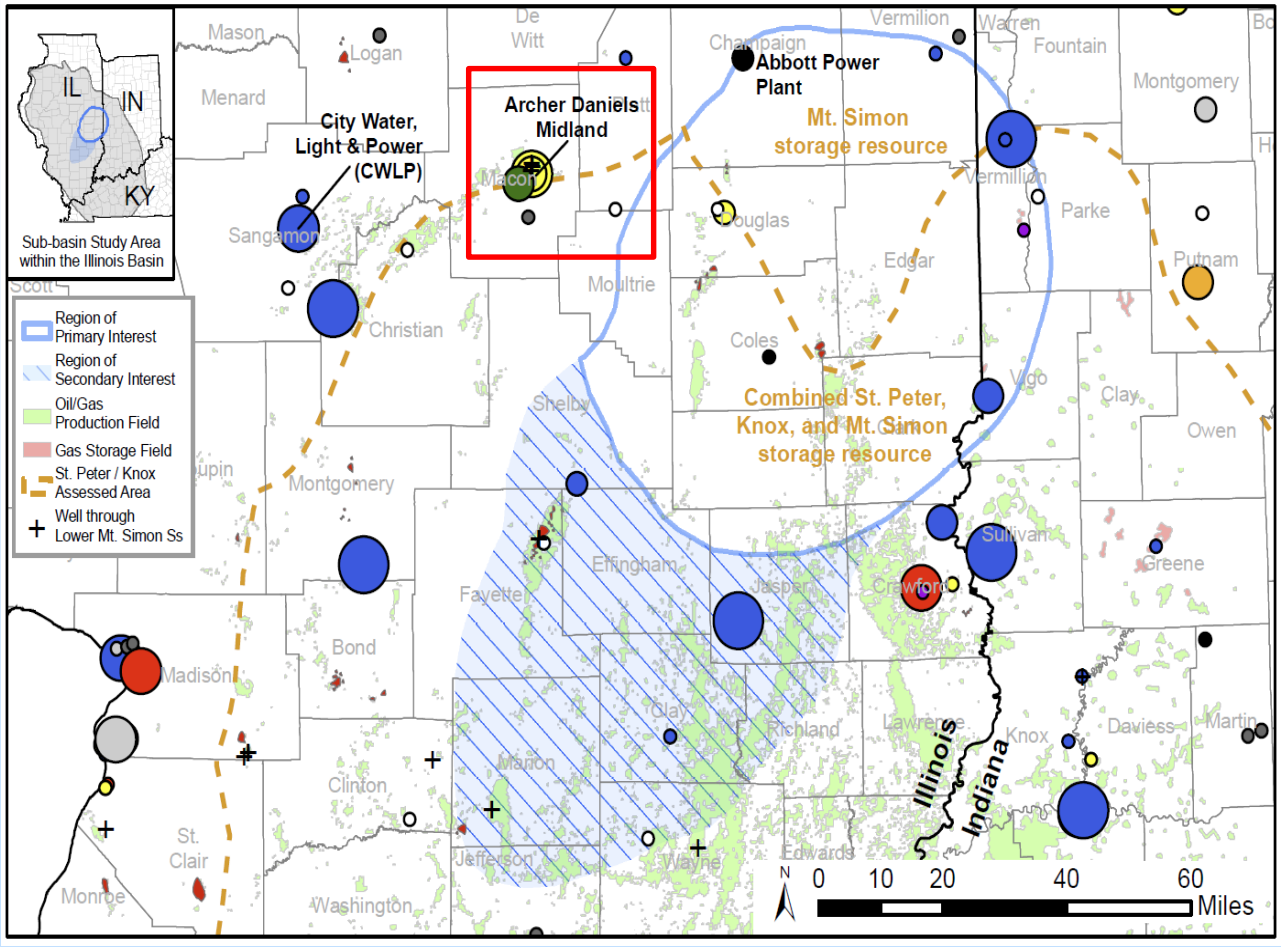
Presentation Outline

- Goals of Project
- Technical Status
- Accomplishments
- Lessons Learned
- Synergy Opportunities
- Project Summary

Goals of Project

- Project will conduct a pre-feasibility assessment for commercial-scale geologic carbon storage (CO_2) complexes in the East sub-basin of Illinois.
- Address gaps in experience and knowledge about scaling up from demonstration to commercial-scale storage for more than 50 million tonnes of CO_2 injection from one or more industrial sources

Location of East Sub-Basin



MGSC CO_2 sources

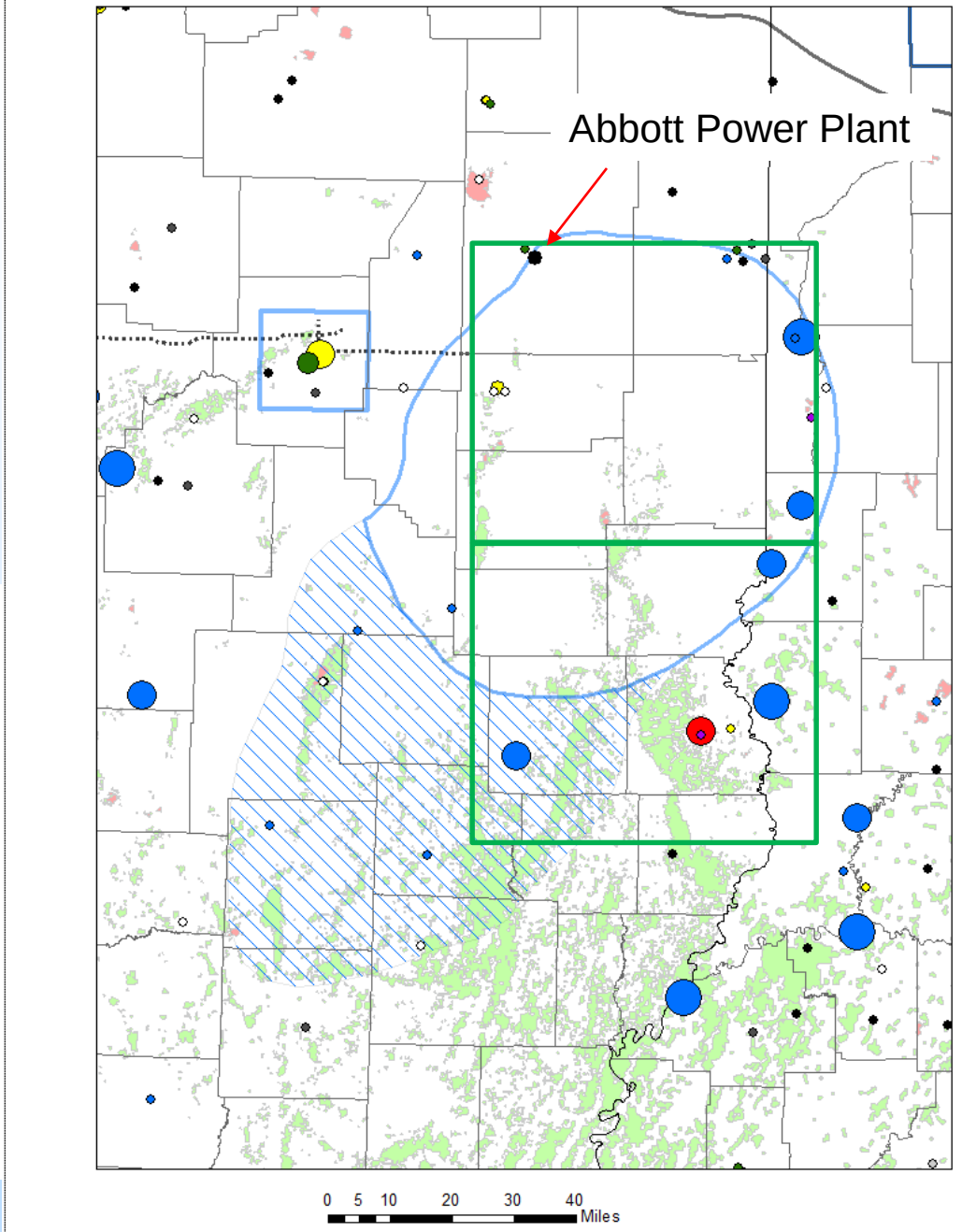
- Primary Aluminum
- Cement
- Chemical
- Agricultural Processing
- Ethanol
- Nat. Gas Processing/Distribution
- Petroleum Refineries
- Iron and Steel
- Industrial/Manufacturing
- Electricity Generation
- Other

Technical Status

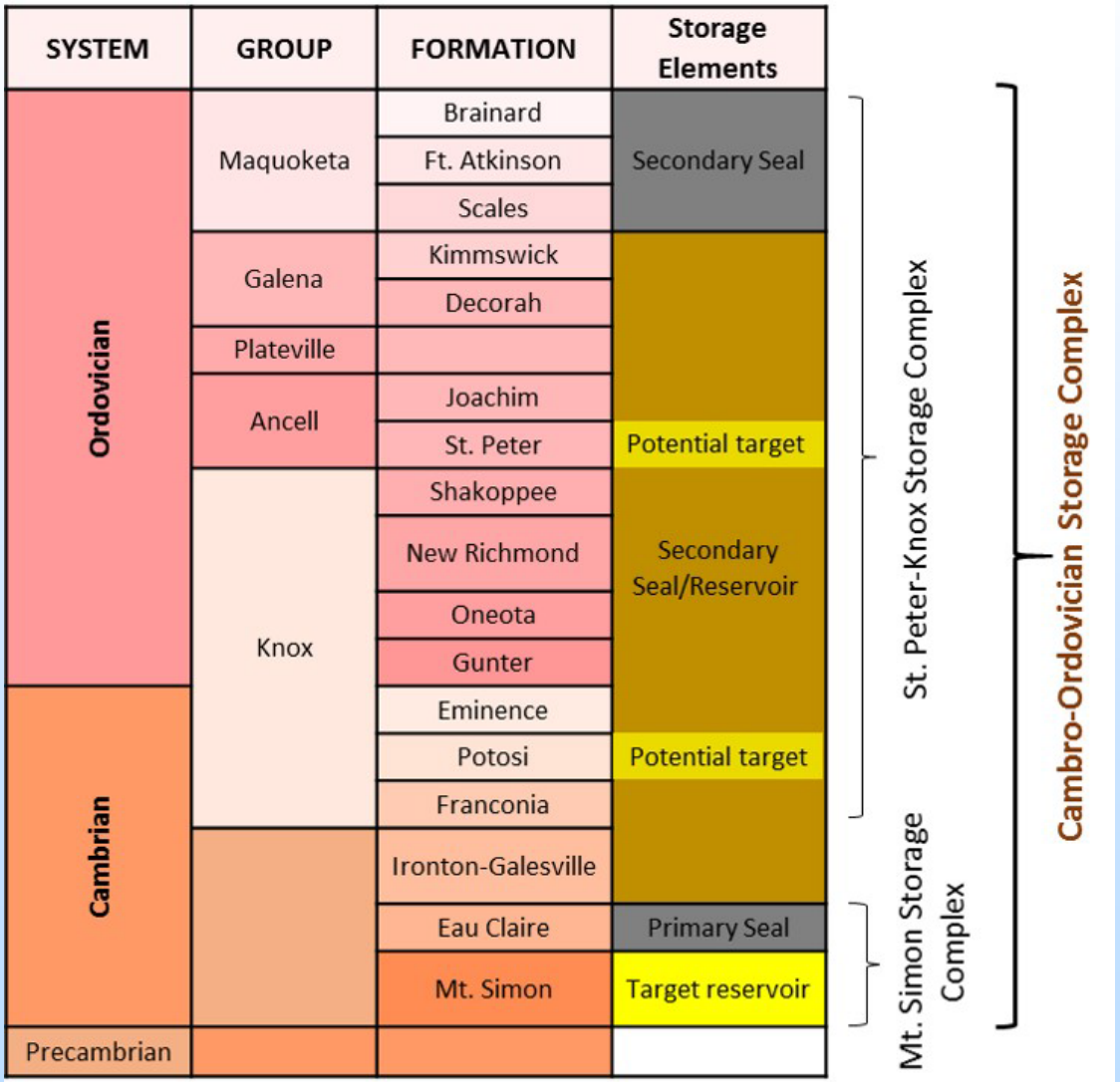
- A high-level technical evaluation of potential storage sites in the East sub-basin in Illinois is in progress.

- Evaluation includes subsurface characterization within the storage complex, risk identification, and an assessment of the potential industrial CO_2 source

Location of East Sub-Basin

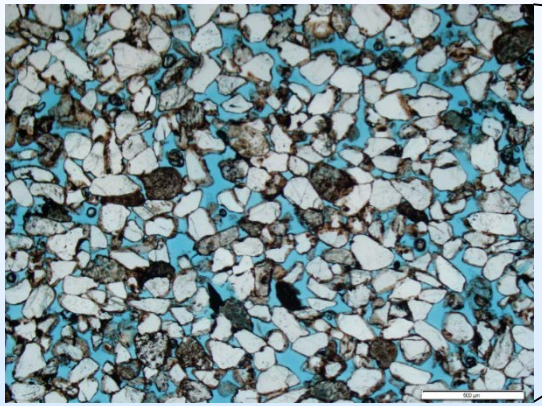


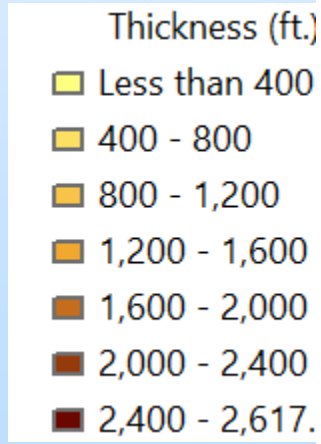
Stratigraphic column showing distribution of Storage Complexes present in the East sub-Basin

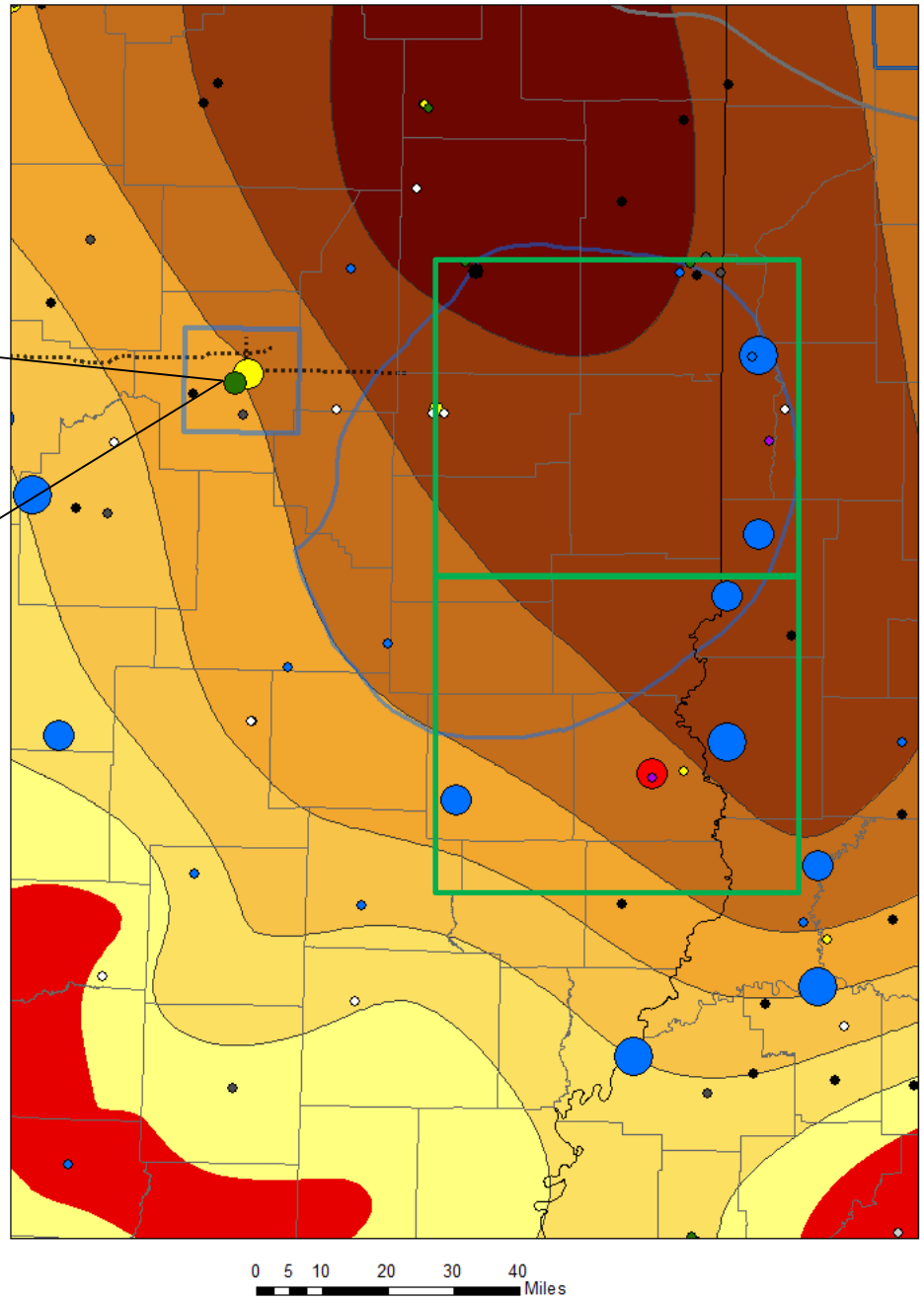


Thickness of the Mt. Simon Sandstone

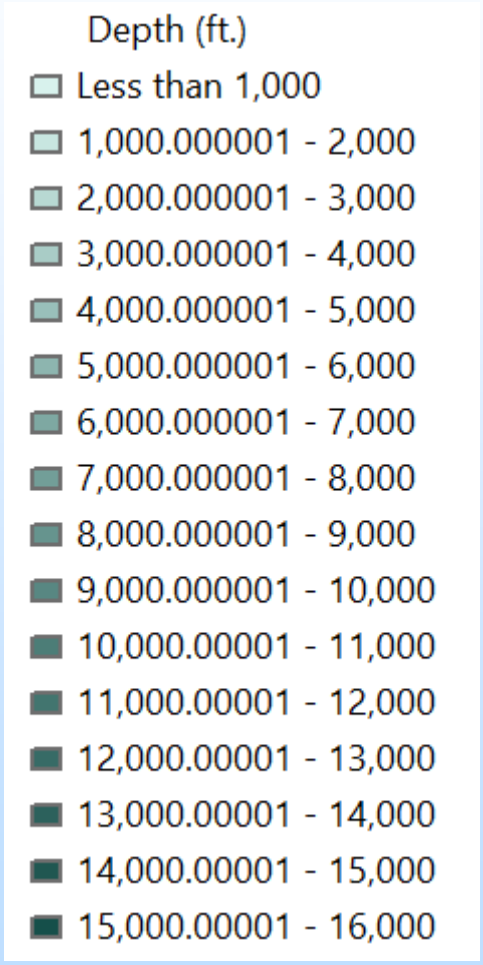
Mt. Simon can have up to 30% porosity

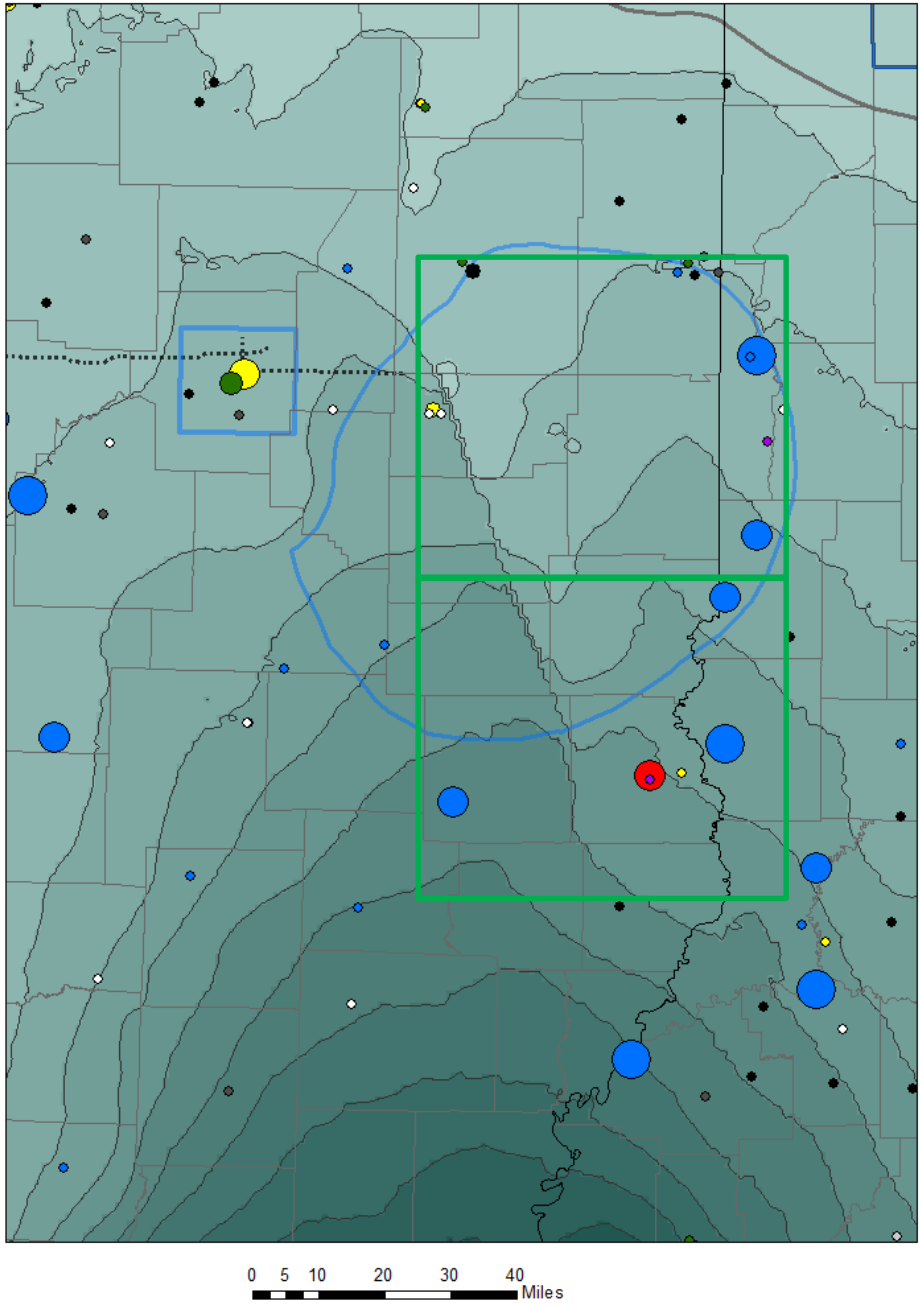






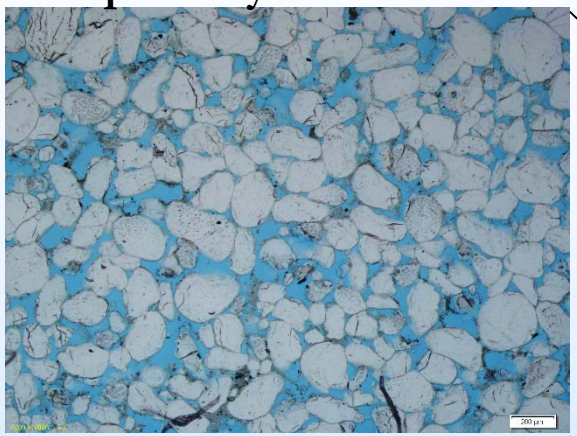
Elevation of the top of Mt. Simon Sandstone

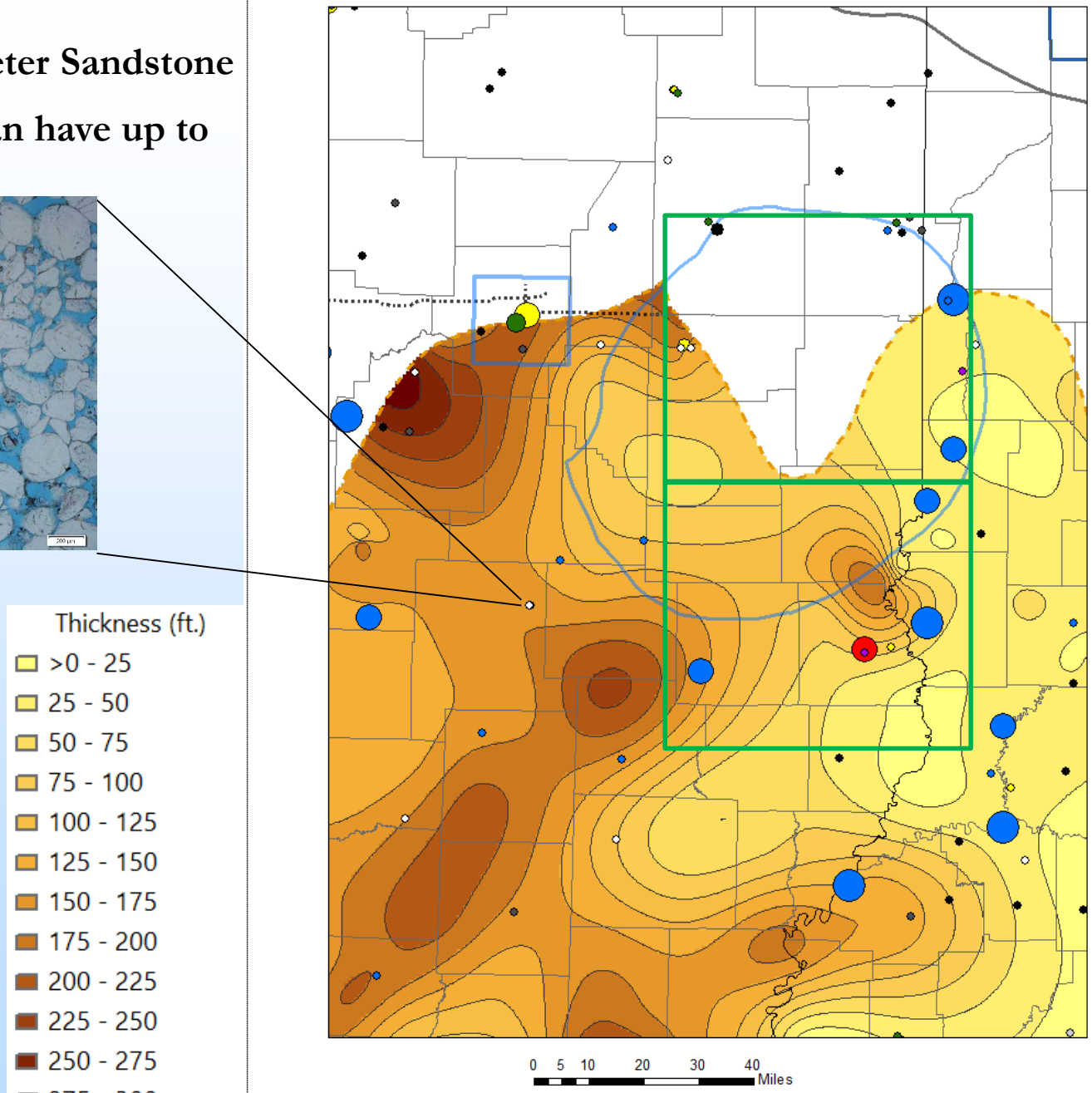




Thickness of the St. Peter Sandstone

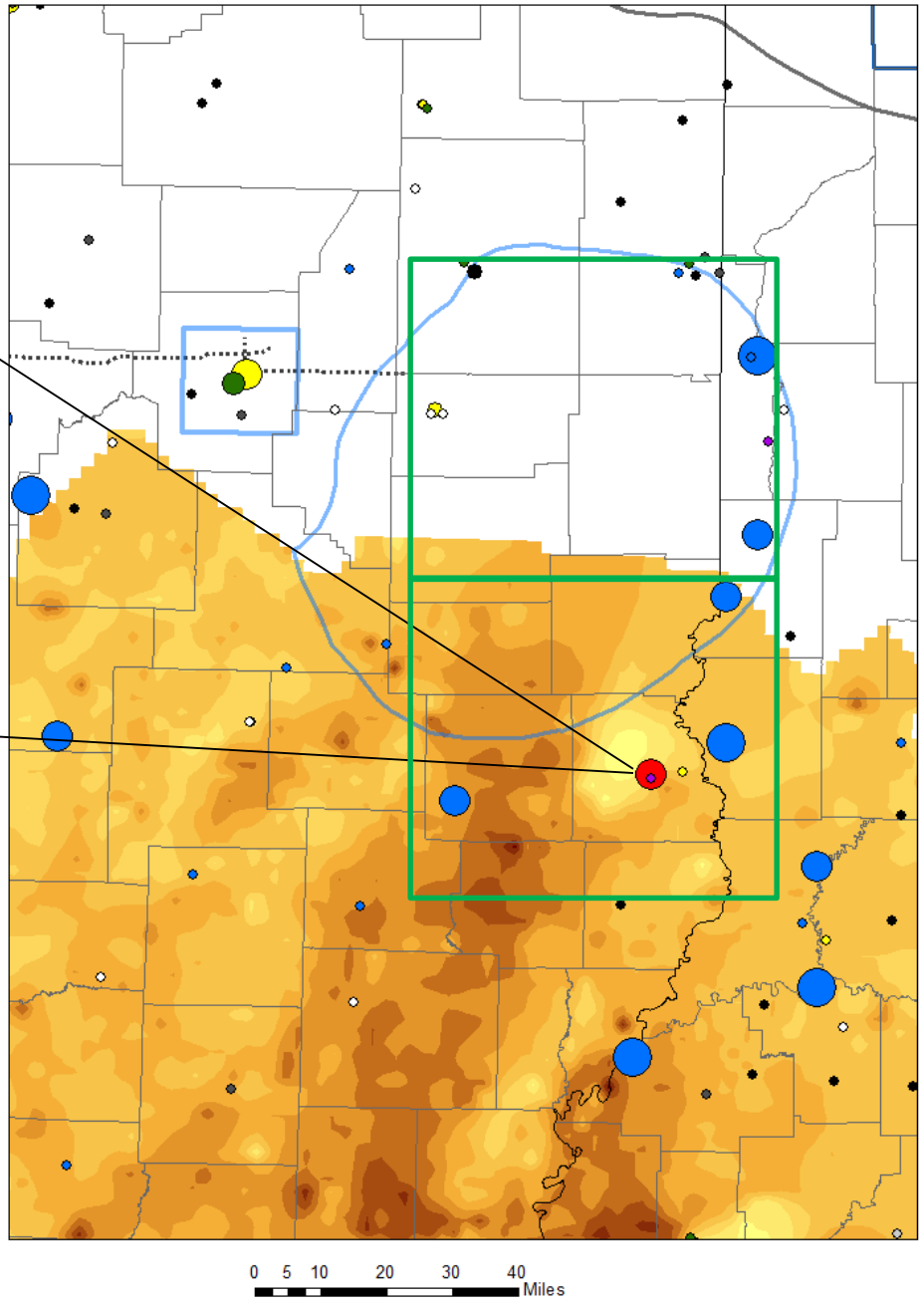
St. Peter Sandstone can have up to 25% porosity



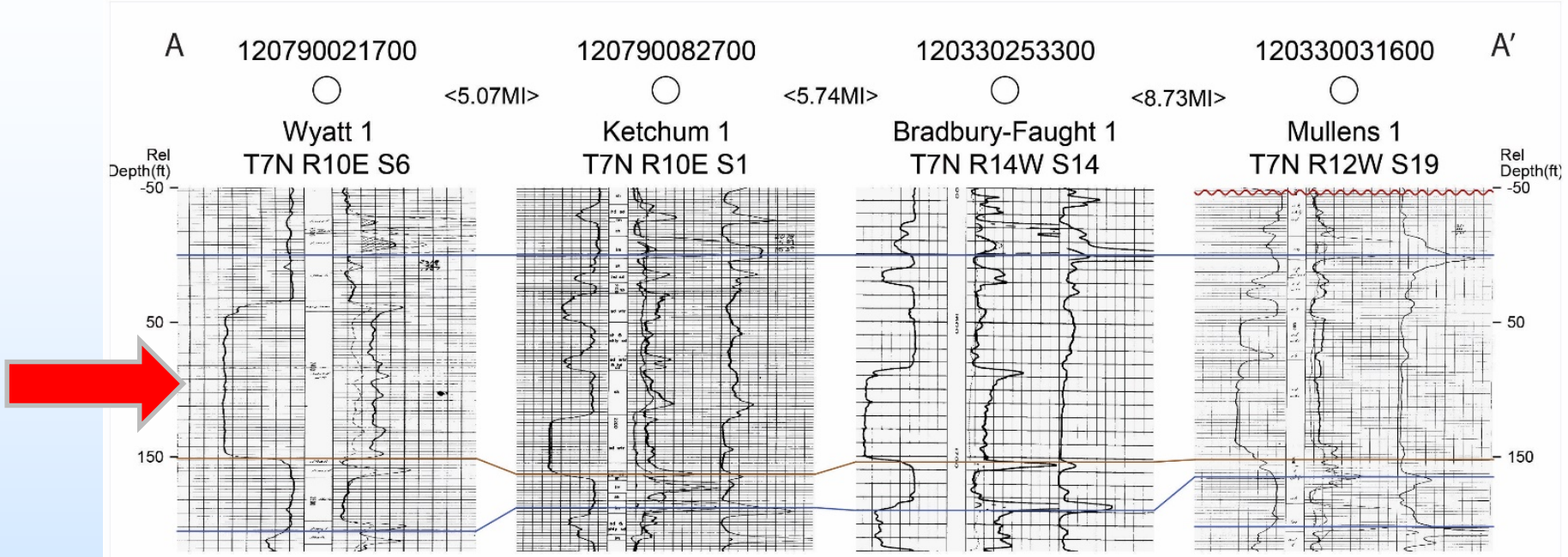


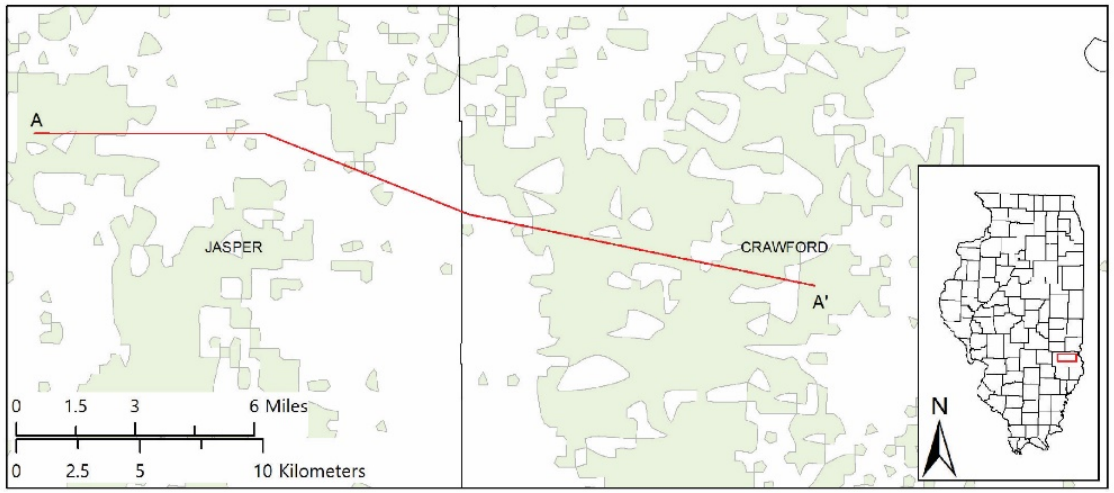
Thickness of the Cypress Sandstone

Thick Cypress can have up to 20% porosity

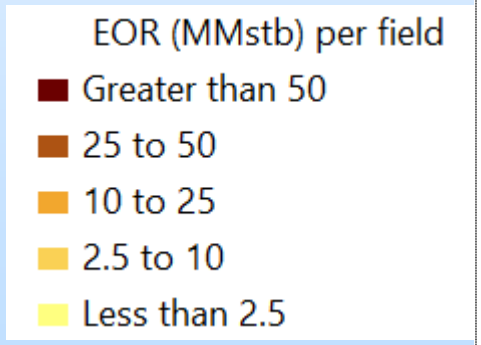


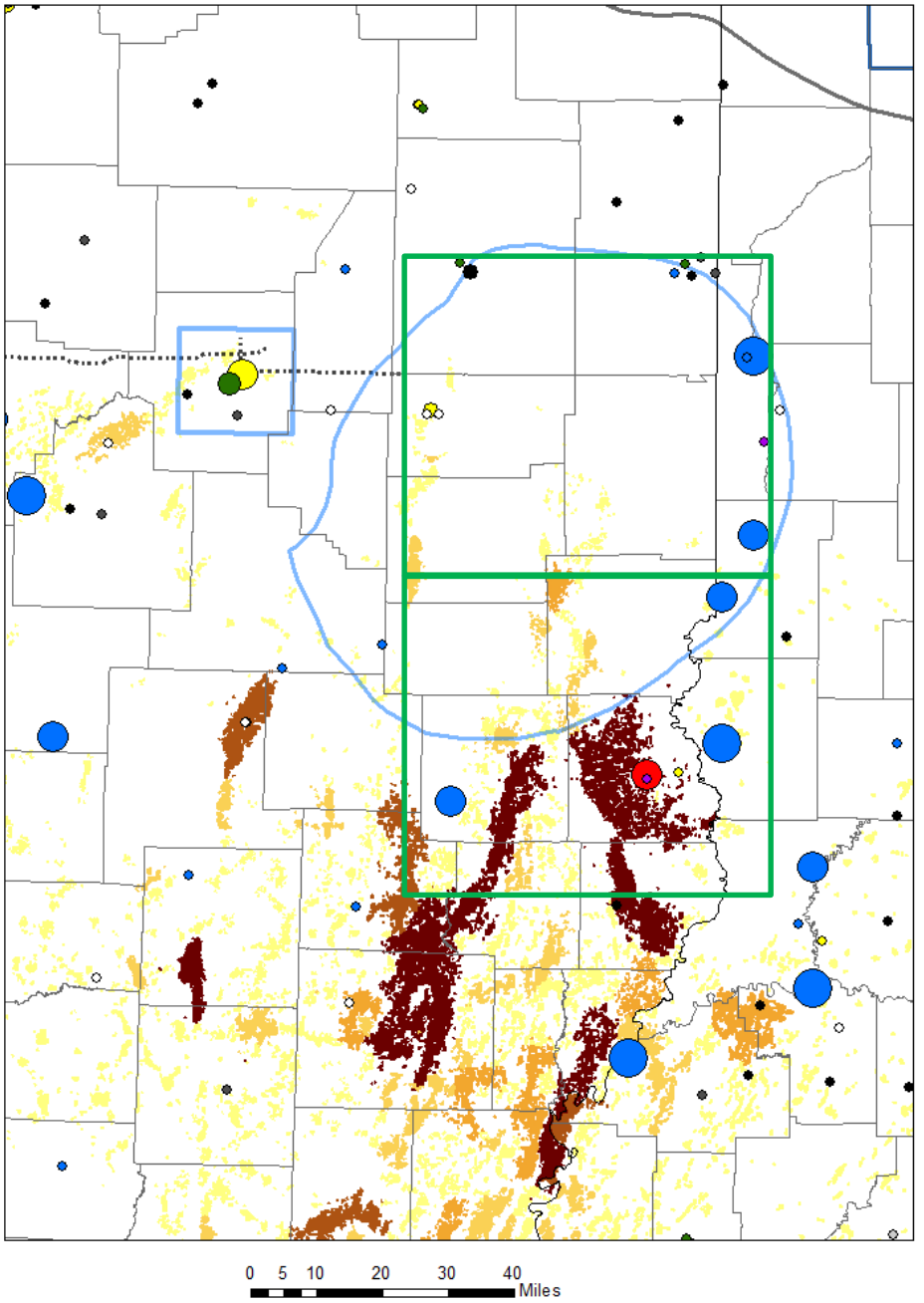
Cypress Saline Reservoir





Enhanced Oil Recovery





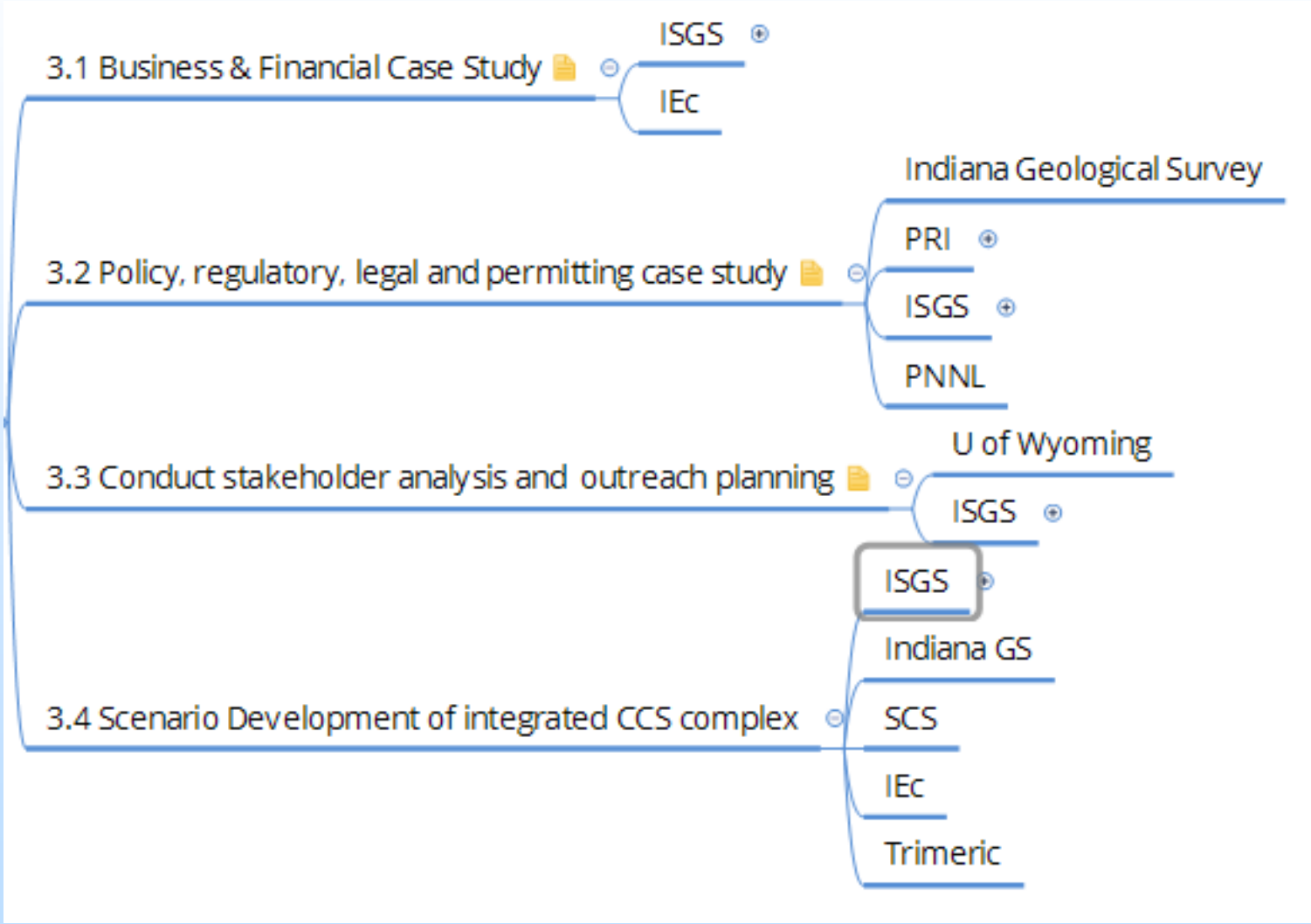
Accomplishments to Date

- Project kickoff meeting has been completed as a milestone.
- Updated the GIS layer showing all of the potential CO_2 sources in the states of Illinois and Indiana.
- Regional structure and isopach of key formations (seals and potential reservoirs) has been completed.
- Begin to evaluate the relative merits and/or risks of different focal areas within or near the main sub-basin study area; work from regional screening toward preliminary site candidates or Site Feasibility.
- Begin preliminary discussions with operators of the different sources

Progress on Tasks

Task #	Description	% Complete
1	Project management and planning	20
2	Establish CCS Coordination Team	50
3	Develop Plan to Address Challenges of Commercial-Scale CCS Project	0
4	Conduct High-Level Technical Sub-Basin Evaluation	30
5	CO_2 Source and Transportation Assessment	13
6	National Risk Assessment Partnership (NRAP) Screening	0

Task 3: Develop Plan to Address Challenges of commercial-scale CCS



Task 3 Develop Plan to Address Challenges of Commercial Scale CCS Project

- Literature search on other CCS project and their costs, benefits, and get estimates from other CCS projects.
- Use Illinois Basin Decatur Project (IBDP) as the model to understand permitting, regulatory and legal issues.
- Will use the IBDP as a model for identifying best practices for communication and engagement.
- Scenario Development of Integrated CCS Storage Complex will integrate all of the tasks of East Sub-Basin into a final report.

Lessons Learned

- Greatest challenge is making an economic model from storage into saline reservoirs
- A lack of deep well data near industrial CO_2 sources makes storage and injection analysis difficult

Synergy Opportunities

- There is an opportunity to work on the economic feasibility of CCS with the other participants in the CarbonSAFE program.
- Learn different approaches to evaluating potential sites for large scale CCS projects.
- Many of the industrial sources are along the Illinois-Indiana-Kentucky border motivating further collaboration between state research institutes
- National Risk Assessment Partnership (NRAP) Screening

Project Summary

- Data has been gathered and partly assessed for potential CCS sites near industrial CO_2 sources
- Based on available data, two sites have been selected for further evaluation.
- Subsurface characterization of potential storage complexes will commence
- Static and dynamic geologic models of storage complexes will be developed for commercial CCS deployment
- NRAP coordination is starting

Appendix

– These slides will not be discussed during the presentation, but are mandatory.

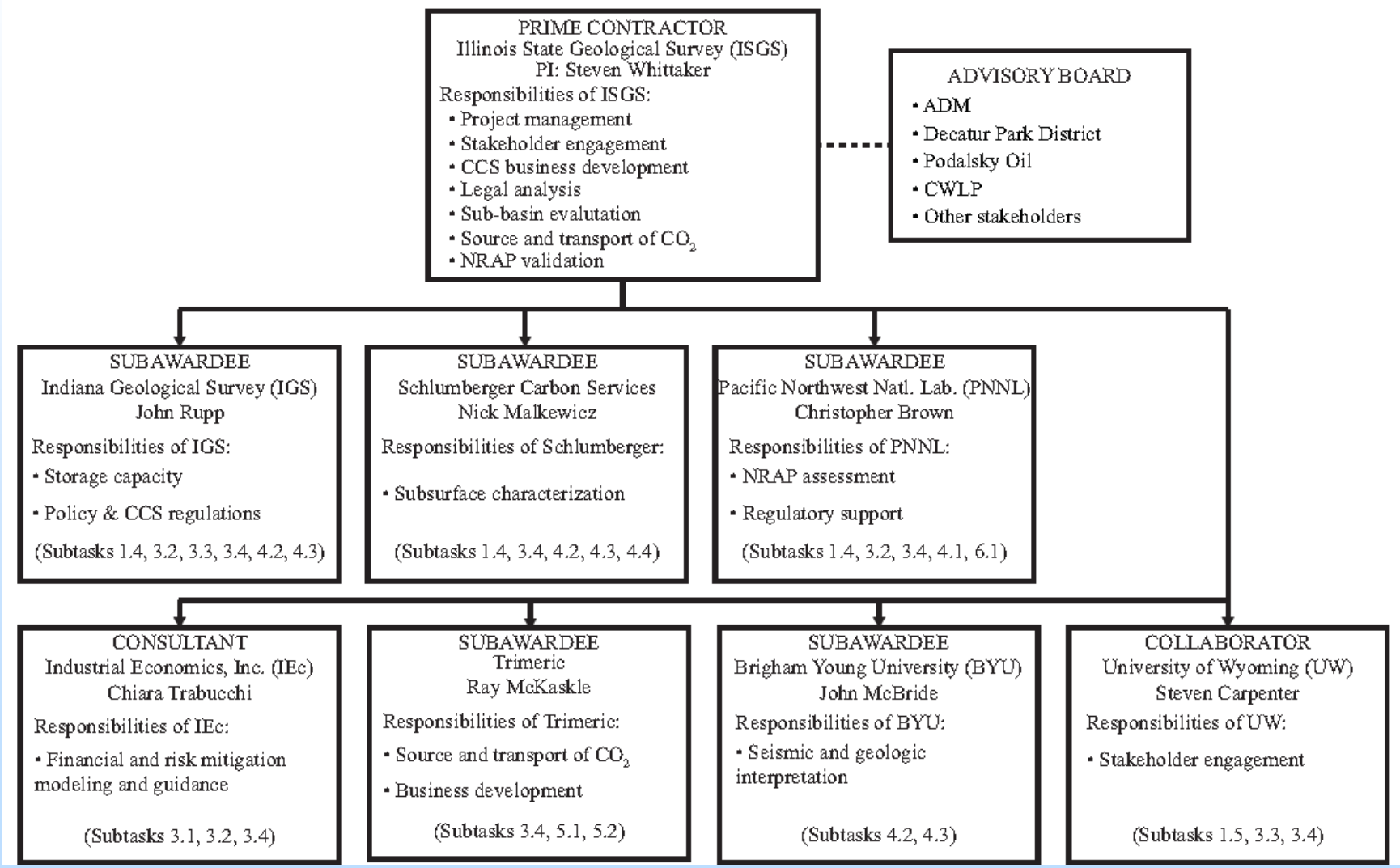
Benefit to the Program

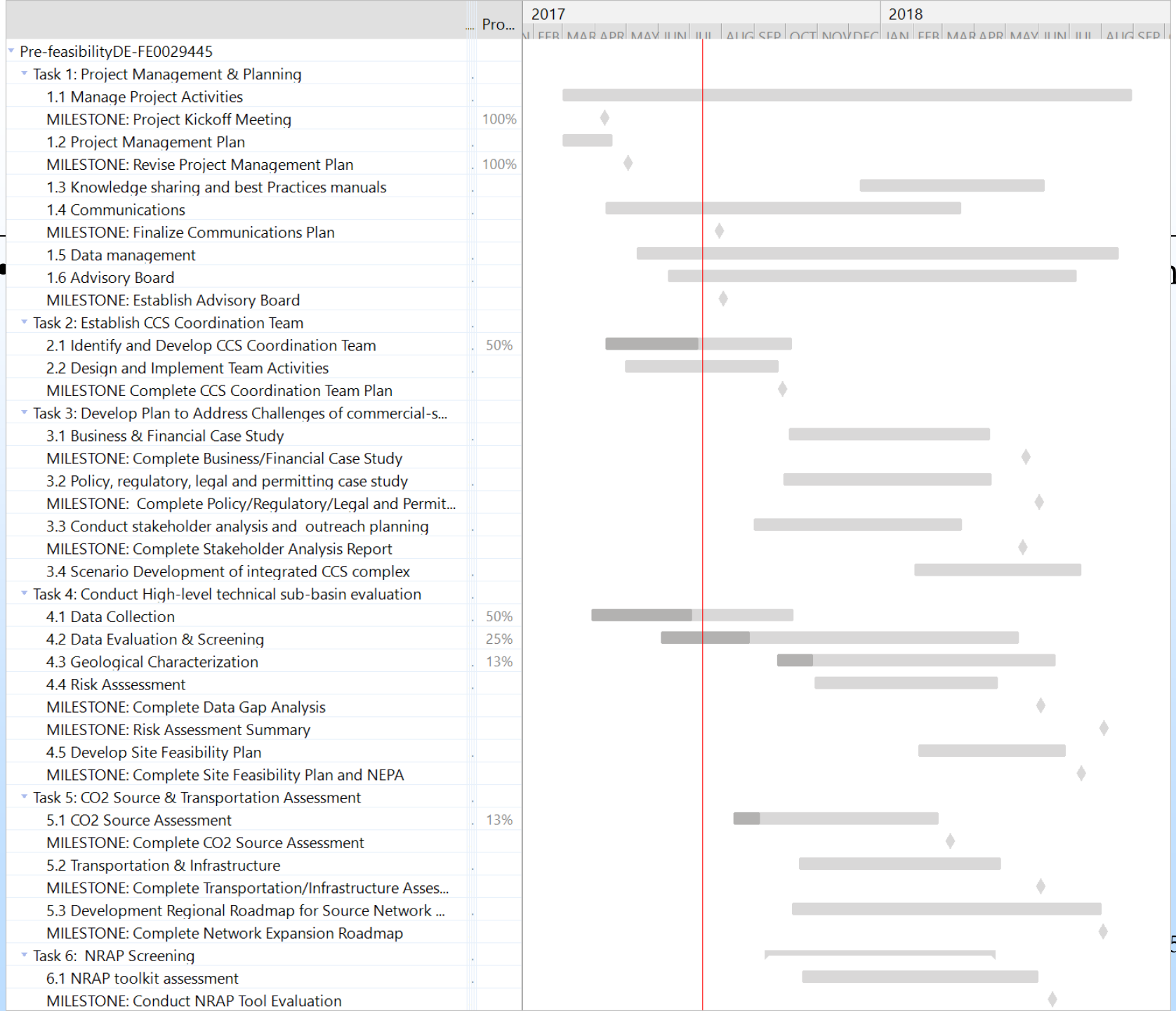
Identifying geological storage sites suitable for storage of over 50 million tonnes of CO_2 is essential for developing commercial-scale CCS projects to address greenhouse gas emissions from industrial sources. There are relatively few large carbon storage projects in deep saline reservoirs, and this gap in development knowledge will be addressed by the research in this project. Our work will address improving our storage capacity estimates to attain an industry standard of ±30% or better for investment decisions. The data from this study will be used within the NRAP Toolkits to move toward validating technologies to ensure storage permanence and to improve reservoir storage efficiency. The knowledge gained will contribute to best practice manuals about CCS technology and issues that will be of broad use to other sites and future commercialization efforts.

Project Overview
Goals and Objectives

- Describe the project goals and objectives in the Statement of Project Objectives.
  - Present information on how the project goals and objectives relate to the program goals and objectives.
  - Identify the success criteria for determining if a goal or objective has been met. These generally are discrete metrics to assess the progress of the project and used as decision points throughout the project.

Organization Chart




Pro...
2017
2018
Pre-feasibilityDE-FE0029445
Task 1: Project Management & Planning
1.1 Manage Project Activities
MILESTONE: Project Kickoff Meeting 100%
1.2 Project Management Plan
MILESTONE: Revise Project Management Plan 100%
1.3 Knowledge sharing and best Practices manuals
1.4 Communications
MILESTONE: Finalize Communications Plan
1.5 Data management
1.6 Advisory Board
MILESTONE: Establish Advisory Board
Task 2: Establish CCS Coordination Team
2.1 Identify and Develop CCS Coordination Team 50%
2.2 Design and Implement Team Activities
MILESTONE Complete CCS Coordination Team Plan
Task 3: Develop Plan to Address Challenges of commercial-s...
3.1 Business & Financial Case Study
MILESTONE: Complete Business/Financial Case Study
3.2 Policy, regulatory, legal and permitting case study
MILESTONE: Complete Policy/Regulatory/Legal and Permit...
3.3 Conduct stakeholder analysis and outreach planning
MILESTONE: Complete Stakeholder Analysis Report
3.4 Scenario Development of integrated CCS complex
Task 4: Conduct High-level technical sub-basin evaluation
4.1 Data Collection 50%
4.2 Data Evaluation & Screening 25%
4.3 Geological Characterization 13%
4.4 Risk Asssessment
MILESTONE: Complete Data Gap Analysis
MILESTONE: Risk Assessment Summary
4.5 Develop Site Feasibility Plan
MILESTONE: Complete Site Feasibility Plan and NEPA
Task 5: CO2 Source & Transportation Assessment
5.1 CO2 Source Assessment 13%
MILESTONE: Complete CO2 Source Assessment
5.2 Transportation & Infrastructure
MILESTONE: Complete Transportation/Infrastructure Asses...
5.3 Development Regional Roadmap for Source Network ...
MILESTONE: Complete Network Expansion Roadmap
Task 6: NRAP Screening
6.1 NRAP toolkit assessment
MILESTONE: Conduct NRAP Tool Evaluation

Bibliography

– No publications have been generated since project is just beginning implementing the research goals.