Illinois Basin – Decatur Project

CCS Regulatory Lessons Learned

Presented by

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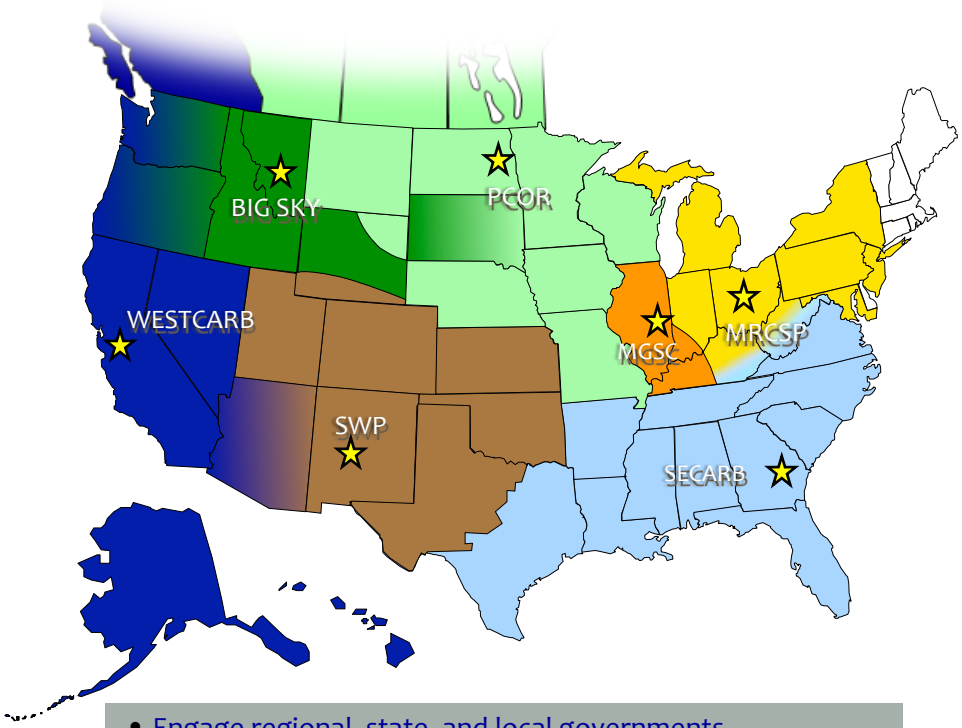
ILLINOIS STATE
GEOLOGICAL SURVEY
PRAIRIE RESEARCH INSTITUTE

Seven Regional Partnerships

400+ distinct organizations, 43 states, 4 Canadian Provinces



- Engage regional, state, and local governments
- Determine regional sequestration benefits
- Baseline region for sources and sinks
- Establish monitoring and verification protocols
- Address regulatory, environmental, and outreach issues
- Validate sequestration technology and infrastructure

Characterization Phase (2003-2005)

Search of potential storage locations and CO_2 sources	Found potential for 100's of years of storage

Validation Phase (2005-2011+)

19 injection tests in saline formations, depleted oil, unmineable coal seams, and basalt

Development Phase (2008-2018+)

Large scale injections	Commercial scale understanding	Regulatory, liability, ownership issues

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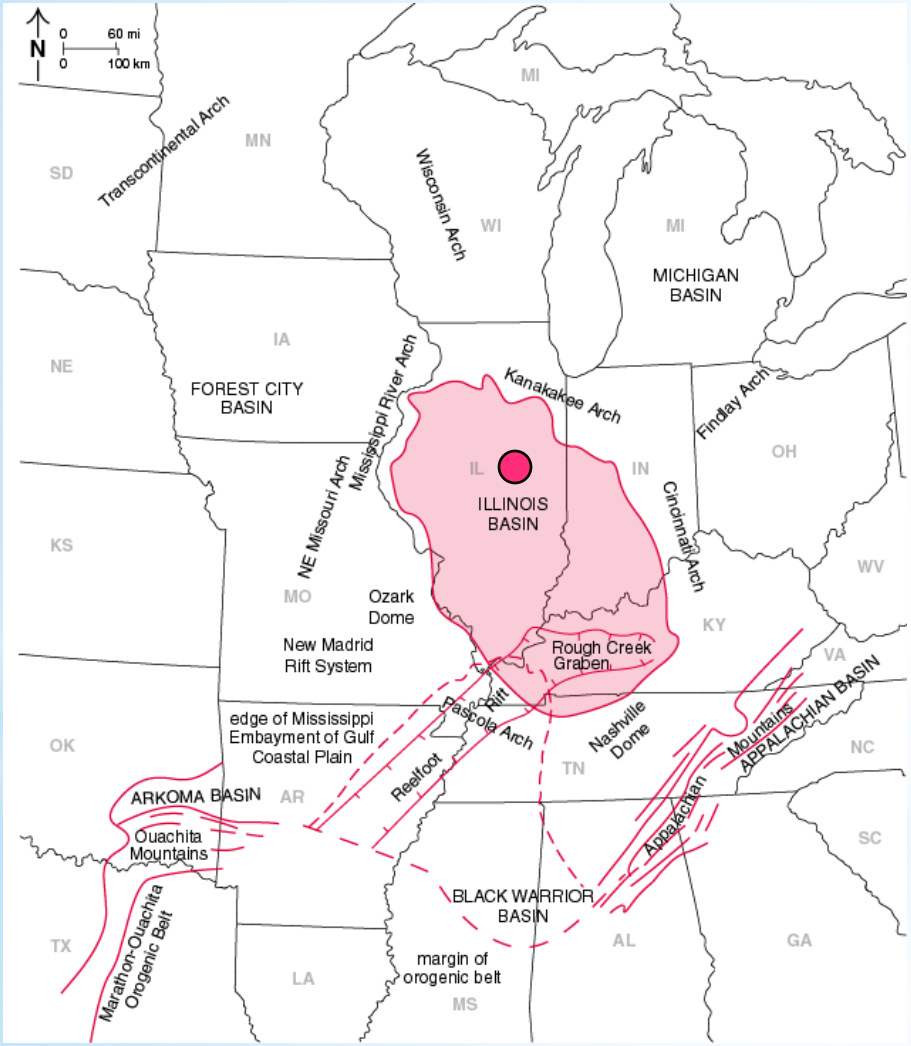
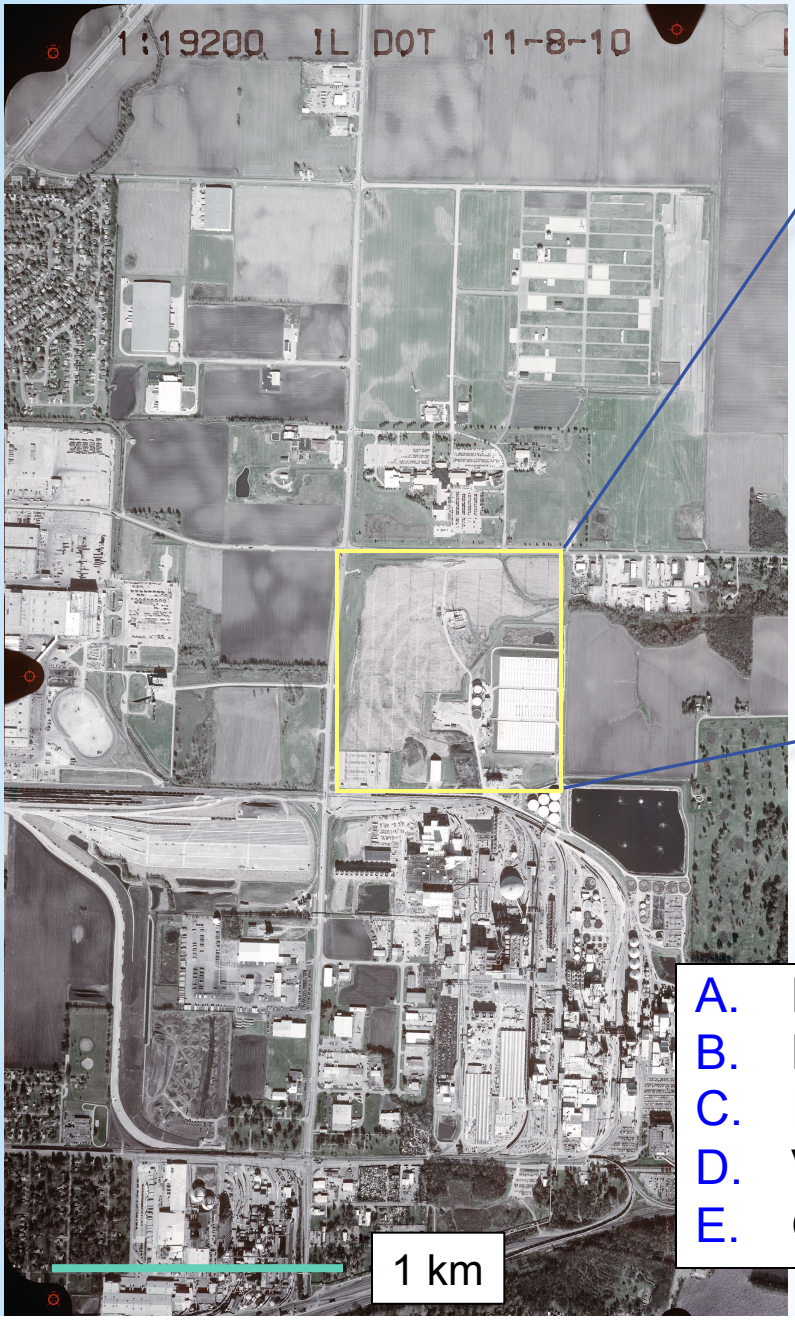
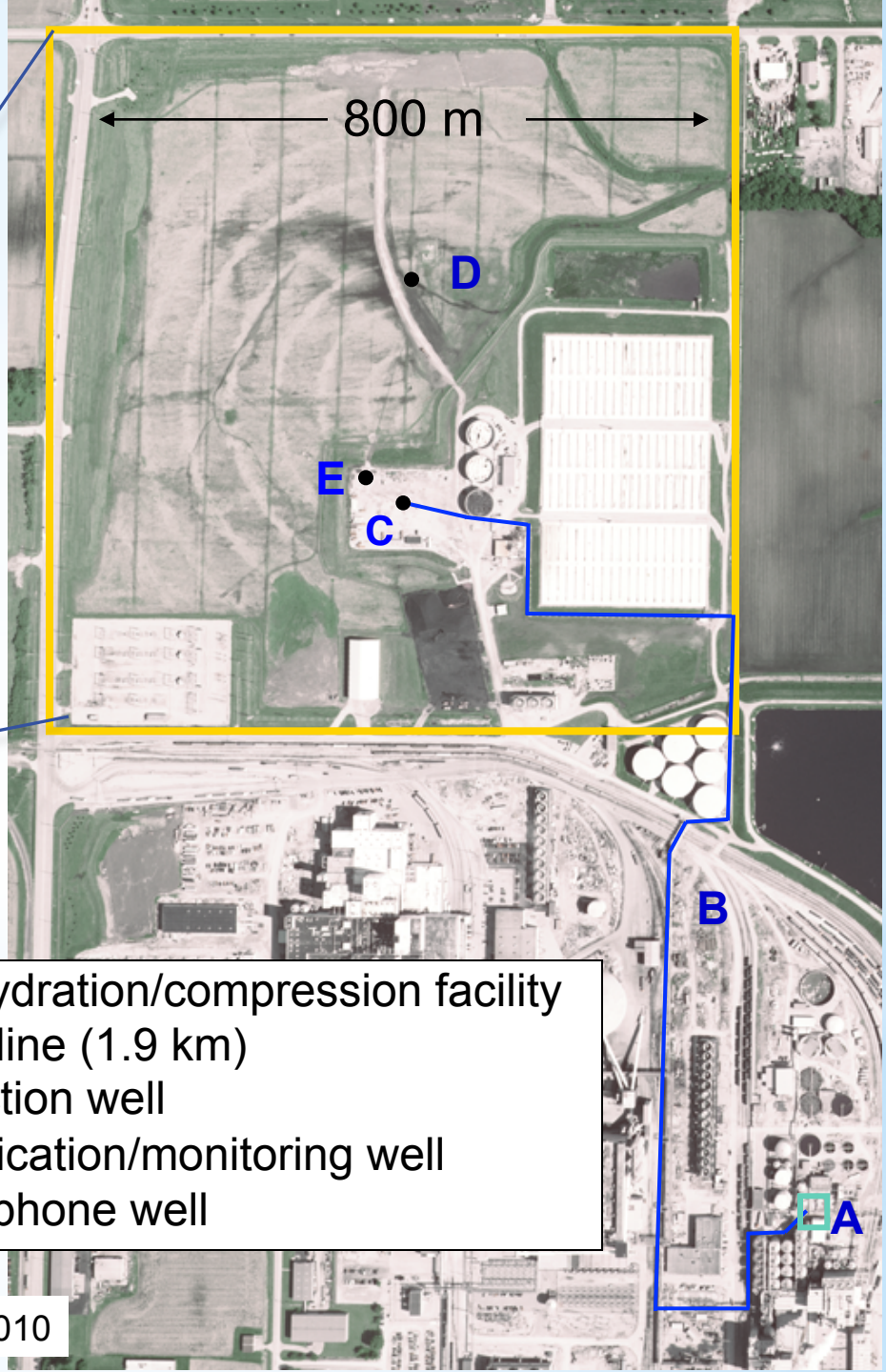


- Collaboration:
  - Midwest Geological Sequestration Consortium,
  - Archer Daniels Midland Company (ADM),
  - Schlumberger Carbon Services,
  - Additional subcontractors
- Objective:
  - Inject 1 million metric tons of anthropogenic carbon dioxide at a depth of ~2,130 m
  - Demonstrate geological carbon sequestration in a saline reservoir at a site in Decatur, IL

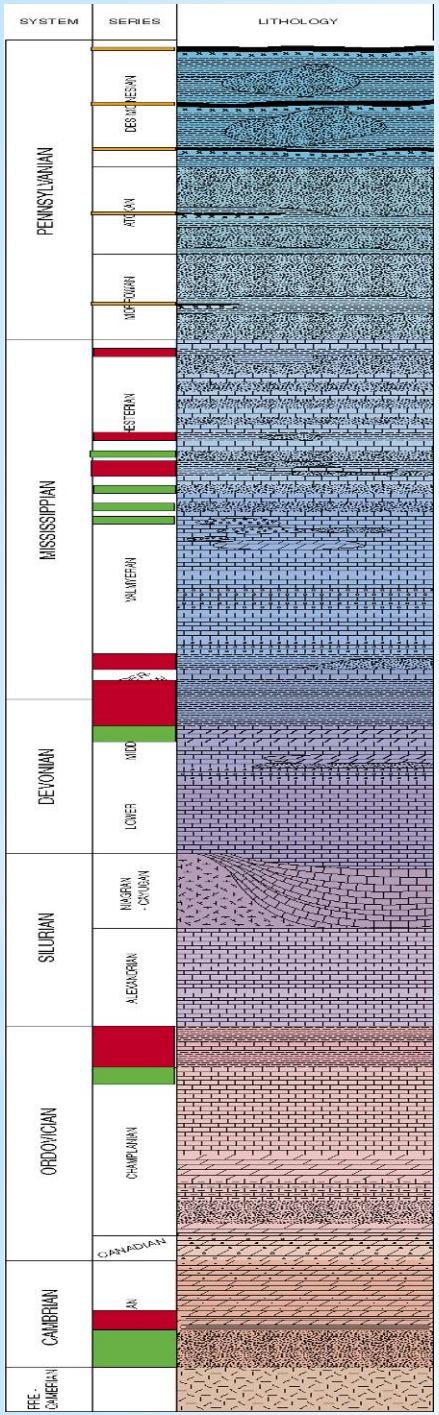




A. Dehydration/compression facility
B. Pipeline (1.9 km)
C. Injection well
D. Verification/monitoring well
E. Geophone well

photo by Illinois Dept. of Transportation, 8 November 2010

Illinois Basin Stratigraphic Column



Pennsylvanian coal seams

New Albany Shale

Back-up seals

Maquoketa Shale

St. Peter Sandstone

Eau Claire Shale – Primary Seal

Mt. Simon Sandstone - Reservoir

fluvial sandstones

Permitting Context

- Underground Injection Control (UIC) program under Safe Drinking Water Act – subsurface injection
- IBDP permitted as Class I – non hazardous by Illinois
- Submitted Jan 2008, permission to inject October 2011
  - Application, hearing, minor modification, major modification, completion reports, permission to inject
- Class VI – federal primacy
  - December 2010
  - Reapply
  - Awaiting response
  - Monitoring implications

IBDP Regulatory Lessons

- Regulations will drive monitoring activities
  - Ongoing and evolving
  - Research has not yet defined monitoring requirements
  - Researchers should consider obligation to evaluate commercial needs
- Environmental baseline essential regardless of regulatory requirements
  - Risk mitigation
  - Support CCS primary deployment goals
- Public engagement guidelines should be exceeded
  - Proactive approach increases transparency
  - Move beyond formal engagement requirements
- Provide balance of information – detail important, but can distract

IBDP Regulatory Lessons

- Modeling
  - Generation
  - Verification
- Proactively educate regulators
  - Engage early
  - Familiarize yourself with regulatory time clock
- Start early
- Seek out examples (publicly available)
- Remain flexible

Public Engagement – Communication of Risk Risk of Communication

- Effective public outreach can help identify main concerns
- Outreach provides no guarantee of public acceptance of CCS
- Outreach goal is well-informed stakeholders comfortable with potential project risks & benefits, and trust project team
- In absence of outreach effort, public forms own opinions of CCS
- Perceived risks no less "real" for implementing outreach and can rapidly transform into public opposition if ignored

Bottom-Up Approach to Public Engagement

- Engage multiple stakeholders in every way possible
- Be transparent and use permit requirements and public hearings to disseminate information
- Reach out to local opinion leaders: newspaper, electronic media, farm organizations, all levels of government, economic development officials, inform industry partner employees
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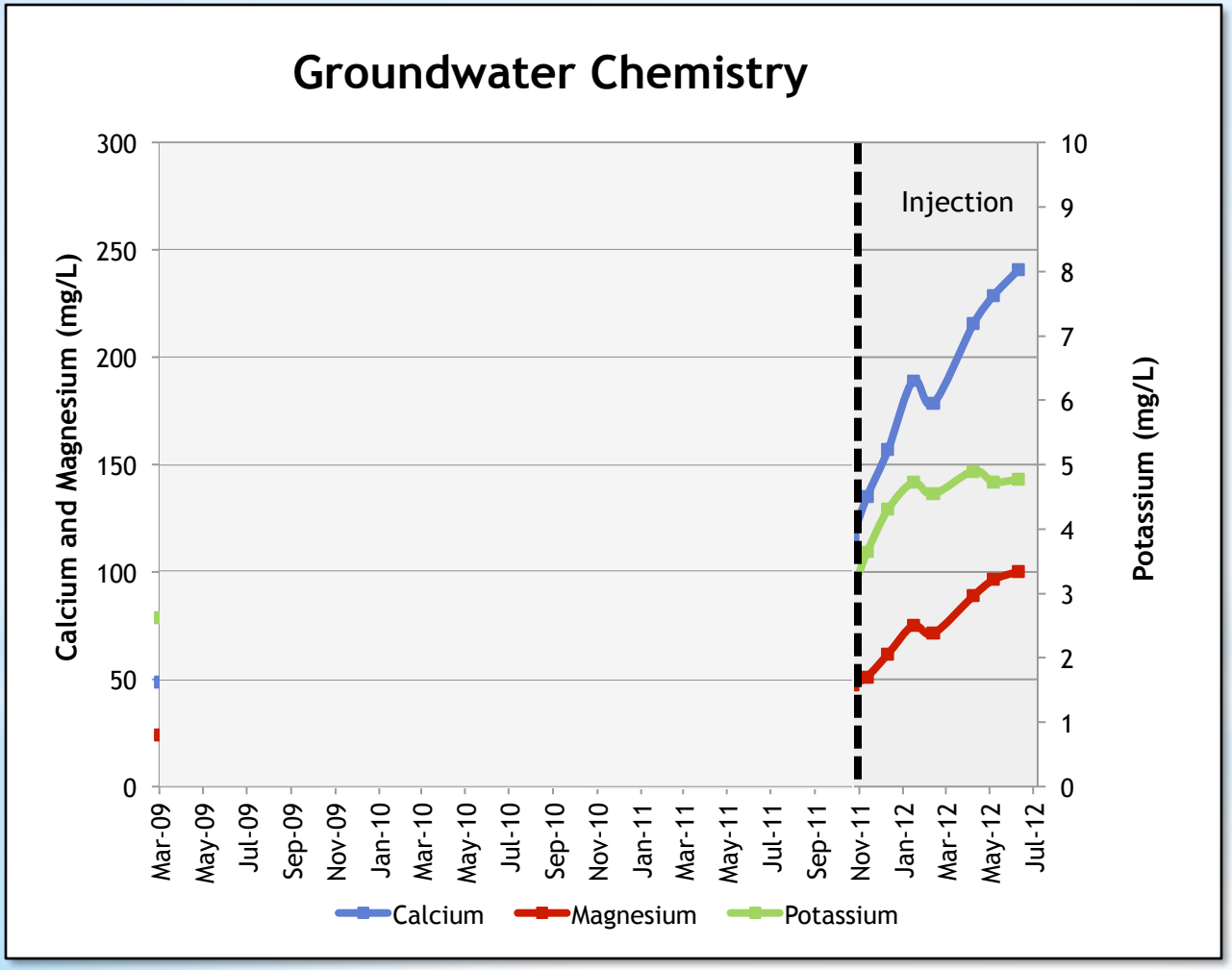
IBDP Environmental Monitoring Framework

Near Surface

Deep Subsurface

Atmos.	Soil and vadose zone	Shallow ground water	Above seal	Injection zone
Eddy covariance	CIR aerial imagery	Geophysical surveys	Geophysical surveys	Geophysical surveys
Meteorological conditions	InSAR and GPS	Geochemical sampling	Geochemical sampling	Geochemical sampling
Ambient CO_2	Soil gases	P/T monitoring	P/T monitoring	P/T monitoring
Tunable diode laser for CO_2	Soil CO_2 flux			
	Tunable diode laser for CO_2			

Baseline Is Important



- Increases in Nov 2009 and Nov 2011, but not Nov 2010
- One year of preinjection data not enough to show seasonal cycle

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