



Plains CO₂ Reduction (PCOR) Partnership
Energy & Environmental Research Center (EERC)

Plains CO₂ Reduction (PCOR) Partnership Monthly Update September 1–30, 2012

PHASE III ACTIVITIES

Task 1 – Regional Characterization (Wesley D. Peck)

Highlights

- Completed acquisition of updated cumulative oil production numbers for the fields and pools in the U.S. portion of the PCOR Partnership region, including Montana and South Dakota.
- Continued the collection of data for the Pine oil field (the south unit), and began collection of data for the Pennel oil field along the Cedar Creek Anticline in southeastern Montana.
- Began calculations to determine the CO₂ enhanced oil recovery (EOR) storage potential, and a report on the findings is also being prepared.
- Began preparations to visit the Billings office of the Montana Board of Oil and Gas to collect well file information on wells in the Pennel oil field.
- Attended the 2012 PCOR Partnership Annual Meeting (September 12 and 13, 2012), and presented at the Core Analysis Basics Workshop held on September 11, 2012. There were 62 participants (including 25 Energy & Environmental Research Center [EERC] employees) at the workshop.
- Began plans to update the latest edition of the PCOR Partnership Atlas.
- Submitted the annual update of the source attributes in the PCOR Partnership region, Deliverable (D) 1, on September 28, 2012.
- Submitted an update to the demonstration project reporting system (D10) located on the Decision Support System (DSS, © 2007–2012 EERC Foundation®) on September 28, 2012.

Task 2 – Public Outreach and Education (Daniel J. Daly)

Highlights

- Attended the Core Analysis Basics Workshop and 2012 PCOR Partnership Annual Meeting on September 11–13, 2012, in Milwaukee, Wisconsin.
- Displayed the poster entitled “Regional and Project-Based CCUS Outreach – The PCOR Partnership Experience,” prepared for the U.S. Department of Energy (DOE) Carbon Storage R&D Project Review Meeting, for the duration of the annual meeting.
- Hosted an exhibit booth featuring PCOR Partnership outreach materials at the 2012 North Dakota Library Association (NDLA) Annual Conference held September 19–22, 2012, in Fargo, North Dakota.

- Spent 2 days (September 4–6) filming 3-D seismic survey acquisition activities with Prairie Public Broadcasting (PPB) at the Bell Creek site for use in the Bell Creek Test Site 30-minute documentary (D21, due November 2014).
- Spent 4 days (September 18–21) filming pipeline construction activities with PPB near the Bell Creek site for use in the Bell Creek Test Site 30-minute documentary (D21, due November 2014).
- Continued preparation of a value-added video short, including a script revision and film edit, focused on smart casing installation for CO₂ capture and storage (CCS) reservoir monitoring.
- Upon request, e-mailed on September 20, 2012, several CCS project-specific slides of the Phase II Lignite field site validation project to Bob Wright of DOE.
- Participated in a conference call with the Regional Carbon Sequestration Partnership (RCSP) Outreach Working Group (OWG) regarding the paper and poster to be presented on message mapping at the upcoming 11th International Conference on Greenhouse Gas Technologies (GHGT-11) scheduled for November 18–22, 2012, in Kyoto, Japan.
- Began investigating methods to increase and track public Web site traffic using Google Analytics.
- Converted clips from the documentary entitled “Global Energy and Carbon: Tracking Our Footprint” for addition to the public Web site video clip library.
- Continued efforts to develop and populate the outreach tracking database including development of a new form to be used for logging data.
- Continued planning for Year 6 activities.
- Reviewed on September 28, 2012, the processed film footage taken by PPB and discussed the upcoming filming schedule.
- Upon request, provided an electronic copy of the outreach poster (D26) to Spectra Energy outreach personnel.
- Began review and assembly of materials for a fall PPB Teacher Training Institute entitled “Teaching About Energy & Our Carbon Footprint: Regional & Global Issues” scheduled for November 9–10, 2012, in Grand Forks.
- Participated in a conference call with Petroleum Technology Research Centre (PTRC) to determine the next steps for filming activities at Aquistore.
- Continued negotiations with SaskPower on a draft agreement for filming at the Boundary Dam project.

Task 3 – Permitting and NEPA (National Environmental Policy Act) Compliance (Lisa S. Botnen)

Highlights

- Attended the Core Analysis Basics Workshop and 2012 PCOR Partnership Annual Meeting held September 11–13, 2012, in Milwaukee, Wisconsin.
- Continued activities associated with the Interstate Oil and Gas Compact Commission (IOGCC) Carbon Geologic Storage (CGS) Task Force, including the following:
 - Held discussions with IOGCC personnel and Kevin Bliss Consulting.
 - Continued planning for a task force kickoff meeting scheduled for October 4, 2012, in Denver, Colorado.

- Held discussions with the North Dakota Industrial Commission (NDIC) regarding the status of the state's rules and primacy application for Class VI wells.
- On September 18, 2012, the North Dakota Department of Mineral Resources, Oil and Gas Division, filed a "Full Notice of Intent to Adopt and Amend Administrative Rules" and announced a public hearing on October 22, 2012, to address the proposed amendments to the North Dakota Administrative Code relating to the geologic storage of carbon dioxide (www.dmr.nd.gov/oilgas/FullNoticeC02.pdf).
- Began conducting an analysis of the Bell Creek monitoring, verification, and accounting (MVA) program in association with the reporting requirements under the U.S. Environmental Protection Agency Mandatory Greenhouse Gas Reporting Rule, Subpart RR – Geologic Sequestration of Carbon Dioxide.
- Began plans to attend the MVA Knowledge-Sharing Workshop at Denbury headquarters in Plano, Texas.
- With regard to the Lignite Site (Phase II) closure:
 - Continued efforts to monitor the site during the reclamation phase, including site visits on September 7 and 27, 2012.
 - Continued to review a draft value-added report on closure activities.

Task 4 – Site Characterization and Modeling (James A. Sorensen)

Highlights

- Attended the Core Analysis Basics Workshop and 2012 PCOR Partnership Annual Meeting on September 11–13, 2012, in Milwaukee, Wisconsin.
- Fort Nelson test site activities included the following:
 - Submitted on September 6, 2012, a brief project update for use in the next Carbon Sequestration Leadership Forum (CSLF) Strategic Plan Implementation Report (SPIR).
 - Modified the draft paper entitled "Overview, Status, and Future of the Fort Nelson CCS Project" for the upcoming GHGT-11.
 - Began preparation of a draft poster for GHGT-11.
 - Participated in a conference call with DOE regarding the lack of planned winter (2012–2013) activities for the Fort Nelson site.
- Bell Creek test site activities included the following:
 - Continued work on the fieldwide static geologic model, including quality assurance/quality control of the well locations, adding all Phase 9 boundaries, completing the porosity, and continuing the permeability.
 - Continued well log interpretation on the log suite from monitoring well 0506 OW.
 - Continued work on the fieldwide 3-D geomechanical model.
 - Began mining reservoir property and lab analysis data for use in further characterization and geologic modeling efforts.
 - Continued work on proposed SCAL (special core analysis) work plan.
 - Completed clay typing and mineral mapping of four sidewall core samples and prepared a short report currently undergoing in-house review.
 - Began compiling data for five U.S. Geological Survey core samples for clay typing and mineral mapping.
 - Received thin sections from Wagner Petrographic and have retaken all the photomicrographs.

Task 5 – Well Drilling and Completion (John A. Hamling)

Highlights

- Attended the Core Analysis Basics Workshop and 2012 PCOR Partnership Annual Meeting on September 11–13, 2012, in Milwaukee, Wisconsin.
- Began evaluation of a tracer flood study at Bell Creek as an MVA technique.
- Began initial review of a value-added permanent downhole monitoring installation video short.
- Sent a formal request to Denbury to install ten soil gas profile stations at Bell Creek to supplement the MVA program and continued cost and logistics planning.
- Continued planning and preparations for the November soil gas- and water-sampling event at Bell Creek.
- Continued preparation of a technical presentation about the Bell Creek surface and near-surface MVA program to be given to the PCOR Partnership Technical Advisory Board (TAB).
- Continued preparation of a mitigation plan under probable scenarios of vertical CO₂ migration.
- Continued work on a value-added preinjection surface water, groundwater, and soil gas baseline MVA sampling and analysis report including results.
- Modified the draft paper on the Bell Creek project for the upcoming GHGT-11.
- Completed review of nearly 600 well files for wells located in and surrounding the Bell Creek oil field, and compiled completions and reservoir property data into a database.
- Finalized the June landowner packages for distribution during the November sampling trip.
- Planned Year 6 activities.
- Prepared for participation in a MVA Knowledge-Sharing Workshop in Plano, Texas, hosted by Denbury.

Task 6 – Infrastructure Development (Melanie D. Jensen)

Highlights

- Attended the Core Analysis Basics Workshop and 2012 PCOR Partnership Annual Meeting on September 11–13, 2012, in Milwaukee, Wisconsin.
- Demonstrated the interactive capture technology tree on the partners-only DSS test Web site at the PCOR Partnership Annual Meeting in the “New for 2012” PCOR Partnership exhibit booth.
- Began study of a document from Det Norske Veritas entitled “Design and Operation of CO₂ Pipelines.”
- Prepared a short paper based on the phased approach to building a regional pipeline network report (D84). The paper will be given on October 31, 2012, at the American Institute of Chemical Engineers (AIChE) Annual Meeting in Pittsburgh, Pennsylvania.
- Modified the draft paper on the phased approach to building a CO₂ pipeline network for upcoming GHGT-11.
- Began design of the poster for presentation at GHGT-11.

- Began the biennial update to the report entitled “Opportunities and Challenges Associated with CO₂ Compression and Transport During CCS Activities” (D85). The first version was submitted in March 2011.

Task 7 – CO₂ Procurement (John A. Harju)

Highlights

- Attended the Core Analysis Basics Workshop and 2012 PCOR Partnership Annual Meeting on September 11–13, 2012, in Milwaukee, Wisconsin.
- Participated in ongoing project discussions with Denbury.

Task 8 – Transportation and Injection Operations (Melanie D. Jensen)

Highlights

- Continued to survey availability of Task 8 team members for a tour of the surface facilities at a Denbury EOR injection site.
- Continued reviewing information about EOR injection site surface facilities.

Task 9 – Operational Monitoring and Modeling (Charles D. Gorecki)

Highlights

- Modeling staff participated in various training courses at the 2012 TOUGH Symposium held September 17–22, 2012, at Lawrence Berkeley National Laboratory (LBNL) in Berkeley, California. The TOUGH family of codes is a suite of computer programs for the simulation of multiphase fluid and heat flows in porous and fractured media.
- Continued Fort Nelson site activities, including the following:
 - Continued work on a draft paper entitled “The Role of Static and Dynamic Modeling in the Fort Nelson CCS Project” for the upcoming GHGT-11.
 - Began work on a poster for the upcoming GHGT-11.
- Continued Bell Creek site activities, including the following:
 - Attended the Core Analysis Basics Workshop and 2012 PCOR Partnership Annual Meeting on September 11–13, 2012, in Milwaukee, Wisconsin.
 - Worked on the water saturation model.
 - Worked on the simulation scenario with hysteresis.
 - Continued work on prediction of new CO₂ injection scenarios.
 - Continued work on the tracer injection pattern design.
 - Continued work on the simulation case with CO₂ solubility in brine.
 - Held a monthly modeling and simulation meeting in-house on September 21, 2012.
 - Received notification on September 14, that a modeling staff member has been accepted to attend the Society of Petroleum Engineers Forum Series entitled “Novel Techniques for Reservoir Modeling” scheduled for November 4–9, 2012, in Santa Fe, New Mexico.
 - Drafted information on the Bell Creek modeling efforts for the DSS.
 - Received notification on September 18, that the abstract entitled “Mechanism of Subnormal Pressure Generation in the Bell Creek Oil Field and the Implications to CO₂ Storage” was selected for a knowledge-sharing electronic poster at the 6th International

Petroleum Technology Conference (IPTC) scheduled for March 26–28, 2013, in Beijing, China. A decision to accept or decline this opportunity is under review.

Task 10 – Site Closure (to be announced [TBA])

- This task is anticipated to be initiated in Quarter 1 – Budget Period (BP) 5, Year 9 (October 2015).

Task 11 – Postinjection Monitoring and Modeling (TBA)

- This task is anticipated to be initiated in Quarter 1 – BP5, Year 9 (October 2015).

Task 12 – Project Assessment (Katherine K. Anagnost)

Highlights

- The next assessment report is due December 31, 2012.

Task 13 – Project Management (Charles D. Gorecki)

Highlights

- Upon request, provided suggestions for a key milestone for each quarter for Program Year 6 (October 1, 2012 – September 30, 2013).
- Hosted the 2012 PCOR Partnership Annual Meeting and Workshop on September 11–13, 2012, in Milwaukee, Wisconsin. The workshop had 62 participants, and the annual meeting had 84 participants. Evaluations are currently being summarized.
- Held a short PCOR Partnership TAB breakfast meeting on September 12, 2012, in conjunction with the annual meeting in Milwaukee, Wisconsin. Topics discussed included an overview of the presentation to be given at the annual meeting, confidentiality agreements, upcoming WebEx topics, and plans for the next meeting.
- Participated in several conference calls with consultant BillyJack Consulting.
- Received notification on September 18 that the abstract entitled “The Plains CO₂ Reduction (PCOR) Partnership: CO₂ Sequestration Demonstration Projects Adding Value to the Oil and Gas Industry” was selected for a knowledge-sharing electronic poster at the 6th IPTC scheduled for March 26–28, 2013, in Beijing, China. A decision to accept or decline this opportunity is under review.
- Reviewed a journal article for the International Journal of Greenhouse Gas Control entitled “Estimating CO₂ Plume Size: A Correlation for Site Screening.”
- Provided requested information about the Phase II McGregor huff ‘n’ puff test to DOE.
- Provided a listing of proposed modifications to remaining deliverables and milestones, including changes to D42, D64, and D82.
- Continued planning for an interim financial closeout of the Phase II award in order to comply with the University of North Dakota’s records retention policy.
- Deliverables and milestones completed in September:
 - August monthly update
 - Task 1: D1 – Review of Source Attributes
 - Task 1: D10 – Demonstration Project Reporting System Update

- Task 14: M23 – Monthly Water Working Group (WWG) conference call held

Task 14 – Regional Carbon Sequestration Partnership WWG Coordination (Ryan J. Klapperich)

Highlights

- Distributed information for the September conference call, including information supporting the effort to develop a formal research agenda.
- Held the monthly conference call on September 27, 2012. Topics discussed included the development of a water resource protection fact sheet and distribution of tables of existing water and CCS research projects.
- Began assessment for water and CCS methodologies document.

Task 15 – Further Characterization of the Zama Acid Gas EOR, CO₂ Storage, and Monitoring Project (James A. Sorensen)

Highlights

- Submitted on September 6, 2012, a brief project update for use in the next CSLF SPIR.
- Modified the draft paper for GHGT-11 on the Zama F Pool simulation study, and began preparation of a poster.
- Obtained reservoir operational data and geologic characterization data for four additional pinnacles from Apache Canada.

Task 16 – Characterization of the Basal Cambrian System (Wesley D. Peck)

Highlights

- Attended the Core Analysis Basics Workshop and 2012 PCOR Partnership Annual Meeting on September 11–13, 2012, in Milwaukee, Wisconsin.
- Hosted a meeting of the Basal Aquifer Technical Committee on September 13, 2012, in Milwaukee, Wisconsin. Topics included updates on well integrity, the 3-D model, and injection scenarios.
- A preliminary 3-D model of the full extent of the Cambro-Ordovician saline system was presented in Milwaukee. Revisions to the model are under way.
- With regard to the geochemical investigation of potential interactions of injected CO₂ with rocks in the saline system, the following decisions were made:
 - The Lawrence Livermore database will be used for the PHREEQC modeling calculations. A request has been made to the Canadian Nuclear Waste Management Organization (NWMO) for the database that Bachu et al. used for their calculations. Calculations will move forward with the Lawrence Livermore database as it is not expected that the NWMO will share the database.
 - FactSage will be used to handle pressure variations as PHREEQC does not have this functionality.
 - The porosity input for the modeling will be determined based on experimental results obtained in the EERC's Applied Geology Laboratory.

- Fifteen samples (13 Deadwood and two Black Island) have been submitted for x-ray mineral mapping prior to CO₂ exposure. The CO₂ exposure experiments will take place for 30 days, immediately followed by a mapping analysis.
- Gas data for the Deadwood Black Island may be available. The gas may be low-Btu, high-CO₂-containing gas that will be important conditions to consider for the modeling effort.
- Modified the draft paper with input from Alberta Innovates – Technology Futures (AITF) for the upcoming GHGT-11.

Travel/Meetings

- September 4–6, 2012: Traveled to the Bell Creek oil field to film 3-D seismic acquisition activities with PPB in southeastern Montana.
- September 4–6, 2012: Presented at the 2012 CCS Binational Conference: Building a Business Case for CCS: Maintaining the Momentum for Large-Scale Demonstration Projects held September 5 in Regina, Saskatchewan, and participated in the field trip on September 6, to Estevan, Saskatchewan, to tour Aquistore and the Boundary Dam projects.
- September 7, 2012: Visited the (Phase II) Lignite site near Kenmare, North Dakota.
- September 9–13, 2012: Hosted the Core Analysis Basics Workshop and 2012 PCOR Partnership Annual Meeting at the InterContinental Hotel in Milwaukee, Wisconsin.
- September 11–15, 2012: Participated in TOUGH2 Training Course for Scientists and Engineers held at LBNL in Berkeley, California.
- September 11–22, 2012: Participated in the TOUGH 2012 Symposium and short courses held at LBNL in Berkeley, California.
- September 17–20, 2012: Traveled to the Bell Creek oil field with PPB to film pipeline construction activities.
- September 18–19, 2012: Traveled to the Bell Creek oil field for a site visit and to retrieve a vehicle previously damaged in a collision with a deer.
- September 20, 2012: Hosted an exhibit booth at the 2012 NDLA Annual Conference in Fargo, North Dakota.
- September 27, 2012: Visited the (Phase II) Lignite site near Kenmare, North Dakota.

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