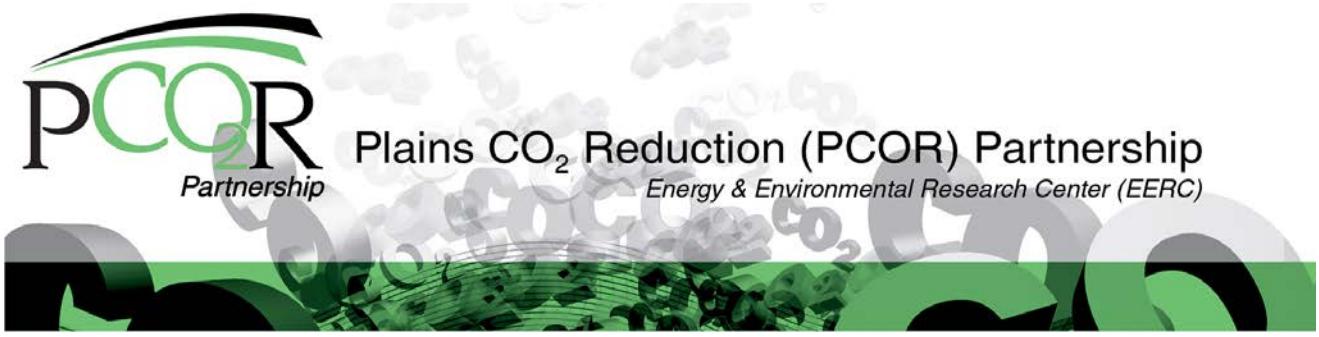

PLAINS CO_2 REDUCTION PARTNERSHIP PHASE III

Quarterly Technical Progress Report
Task 13 – Deliverable D58/D59

(for the period April 1 – June 30, 2016)

Prepared for:

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National Energy Technology Laboratory
U.S. Department of Energy

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EXECUTIVE SUMMARY

The Plains CO_2 Reduction (PCOR) Partnership is one of seven Regional Carbon Sequestration Partnerships competitively awarded by the U.S. Department of Energy (DOE) National Energy Technology Laboratory in 2003 as part of a national plan to mitigate greenhouse gas emissions. The PCOR Partnership is led by the Energy & Environmental Research Center at the University of North Dakota and continues to include stakeholders from the public and private sector in Phase III. The PCOR Partnership region includes all or part of nine U.S. states and four Canadian provinces.

Phase III, the multiyear (2007–2017) development phase, is an extension of the characterization (Phase I) and validation (Phase II) phases and is intended to confirm that commercial-scale CO_2 capture, transportation, and storage can be achieved safely, permanently, and economically over extended periods in the PCOR Partnership region. Budget Period (BP) 5 began April 1, 2016.

This progress report presents an update of Phase III PCOR Partnership activities from April 1 through June 30, 2016.

Petro Harvester Oil & Gas, LLC; Red Trail Energy, LLC; Tundra Oil and Gas; and General Electric Global Research Oil & Gas Technology Center joined the PCOR Partnership as paying members, all in the first 3 months of BP5. The BP4 focus on extended and enhanced work, specifically in the Bell Creek activities, continued. As of March 31, 2016, ***corresponding to the end of BP4***, 3.034 million tonnes of total gas (composition of approximately 98% CO_2) had been purchased for injection into the Bell Creek Field since May 2013, equating to an estimated ***2.979 million tonnes of CO_2 stored***. Processed fall 2015 seismic monitor data were received from Denbury Onshore LLC, and interpretation and modeling began. Oil samples were collected for compositional monitoring.

Outreach was a focus of the tasks, including conference/meeting attendance and presentations and submission of conference abstracts and journal articles. Nine PCOR Partnership abstracts were accepted to the 13th International Greenhouse Gas Control Technologies Conference; eight will be presented. Planning continued for the 2016 PCOR Partnership Annual Membership Meeting and Workshop.

Nine tasks continued, and Tasks 10 and 11 were initiated. In addition to the foregoing, PCOR Partnership best practices manuals (BPMs) are under development, collaboration continued on DOE BPMs, the PCOR Partnership Atlas update continued, modeling and simulation activities were performed in support of the Aquistore and Bell Creek projects, laboratory efforts focused on the Williston Basin, compilation of the regulatory permitting document continued, and review of articles for the Special Issue of the *International Journal of Greenhouse Gas Control* continued.

PLAINS CO_2 REDUCTION PARTNERSHIP PHASE III
Quarterly Technical Progress Report
April 1 – June 30, 2016

INTRODUCTION

The Plains CO_2 Reduction (PCOR) Partnership is one of seven regional partnerships operating under the U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL) Regional Carbon Sequestration Partnerships (RCSP) Program. The PCOR Partnership is led by the Energy & Environmental Research Center (EERC) at the University of North Dakota (UND) in Grand Forks, North Dakota, and includes stakeholders from the public and private sectors. The membership, as of June 30, 2016, is listed in Table 1. The PCOR Partnership region includes all or part of nine states (Iowa, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, Wisconsin, and Wyoming) and four Canadian provinces (Alberta, British Columbia, Manitoba, and Saskatchewan).

The RCSP Program is part of NETL's Carbon Storage Program (Figure 1) and is a government–industry effort tasked with determining the most suitable technologies, regulations, and infrastructure needs for carbon capture and storage (CCS) on the North American continent.

The PCOR Partnership Program is being implemented in three phases:

- Phase I – Characterization Phase (2003–2005): characterized opportunities for carbon sequestration
- Phase II – Validation Phase (2005–2009): conducted small-scale field validation tests
- Phase III – Development Phase (2007–2017): involves large-volume carbon storage demonstration tests

Phase III is divided into three budget periods (BPs), running from October 1, 2007, to September 30, 2017:

- BP3: October 1, 2007 – September 30, 2009
- BP4: October 1, 2009 – March 31, 2016
- BP5: April 1, 2016 – September 30, 2017

BP1 and BP2 were effective in Phase II.

Table 1. PCOR Partnership Membership Phase III (October 1, 2007 – present, inclusive)

DOE NETL
UND EERC
Abengoa Bioenergy New Technologies
Air Products and Chemicals, Inc.
Alberta Department of Energy
Alberta Department of Environment
Alberta Innovates – Technology Futures
ALLETE
Ameren Corporation
American Coalition for Clean Coal Electricity
American Lignite Energy
Apache Canada Ltd.
Aquistore
Baker Hughes Incorporated
Basin Electric Power Cooperative
BillyJack Consulting Inc.
Biorecro AB
Blue Source, LLC
BNI Coal, Ltd.
British Columbia Ministry of Energy, Mines, and Petroleum Resources
British Columbia Oil and Gas Commission
C12 Energy, Inc.
The CETER Group, Ltd.
Computer Modelling Group Ltd.
Continental Resources, Inc.
Dakota Gasification Company
Denbury Resources Inc.
Eagle Operating, Inc.
Eastern Iowa Community College District
Enbridge Inc.
Encore Acquisition Company
Energy Resources Conservation Board/ Alberta Geological Survey
Environment Canada
Excelsior Energy Inc.
General Electric Global Research Oil & Gas Technology Center
Great Northern Project Development, LP
Great River Energy
Halliburton
Hess Corporation
Huntsman Corporation
Husky Energy Inc.
Indian Land Tenure Foundation
Interstate Oil and Gas Compact Commission
Iowa Department of Natural Resources
Lignite Energy Council
Manitoba Geological Survey
Marathon Oil Company
MBI Energy Services
MEG Energy Corporation
Melzer Consulting
Minnesota Power
Minnkota Power Cooperative, Inc.
Missouri Department of Natural Resources
Missouri River Energy Services
Montana–Dakota Utilities Co.
Montana Department of Environmental Quality
National Commission on Energy Policy
Natural Resources Canada
Nebraska Public Power District
North American Coal Corporation
North Dakota Department of Commerce Division of Community Services
North Dakota Department of Health
North Dakota Geological Survey
North Dakota Industrial Commission Department of Mineral Resources, Oil and Gas Division
North Dakota Industrial Commission Lignite Research, Development and Marketing Program
North Dakota Industrial Commission Oil and Gas Research Council
North Dakota Natural Resources Trust
North Dakota Petroleum Council
North Dakota Pipeline Authority
Omaha Public Power District
Otter Tail Power Company
Outsource Petrophysics, Inc.
Oxand Risk & Project Management Solutions
Peabody Energy
Petro Harvester Oil & Gas
Petroleum Technology Research Centre
Petroleum Technology Transfer Council
Pinnacle, a Halliburton Service
Prairie Public Broadcasting
Pratt & Whitney Rocketdyne, Inc.
Praxair, Inc.
Ramgen Power Systems, Inc.
Red Trail Energy, LLC
RPS Energy Canada Ltd.
Saskatchewan Ministry of Industry and Resources
SaskPower
Schlumberger
Sejong University
Shell Canada Limited
Spectra Energy
Suncor Energy Inc.
TAQA North, Ltd.
TGS Geological Products and Services
Tundra Oil and Gas
University of Alberta
University of Regina
WBI Energy, Inc.
Weatherford Advanced Geotechnology
Western Governors' Association
Westmoreland Coal Company
Wisconsin Department of Agriculture, Trade and Consumer Protection
Wyoming Office of State Lands and Investments
Xcel Energy

The overall mission of the Phase III program is to 1) gather characterization data to verify the ability of the target formations to store carbon dioxide (CO_2), 2) facilitate the development of the infrastructure required to transport CO_2 from sources to the injection sites, 3) facilitate sensible development of the rapidly evolving North American regulatory and permitting framework, 4) develop opportunities for PCOR Partnership partners to capture and store CO_2, 5) facilitate the establishment of a technical framework by which carbon credits can be monetized for CO_2 stored in geologic formations, 6) continue collaboration with other RCSPs, and 7) provide outreach and education for CCS stakeholders and the general public.

In Phase III, the PCOR Partnership is building on the information generated in its characterization (Phase I) and validation (Phase II) phases. The PCOR Partnership plans to fully

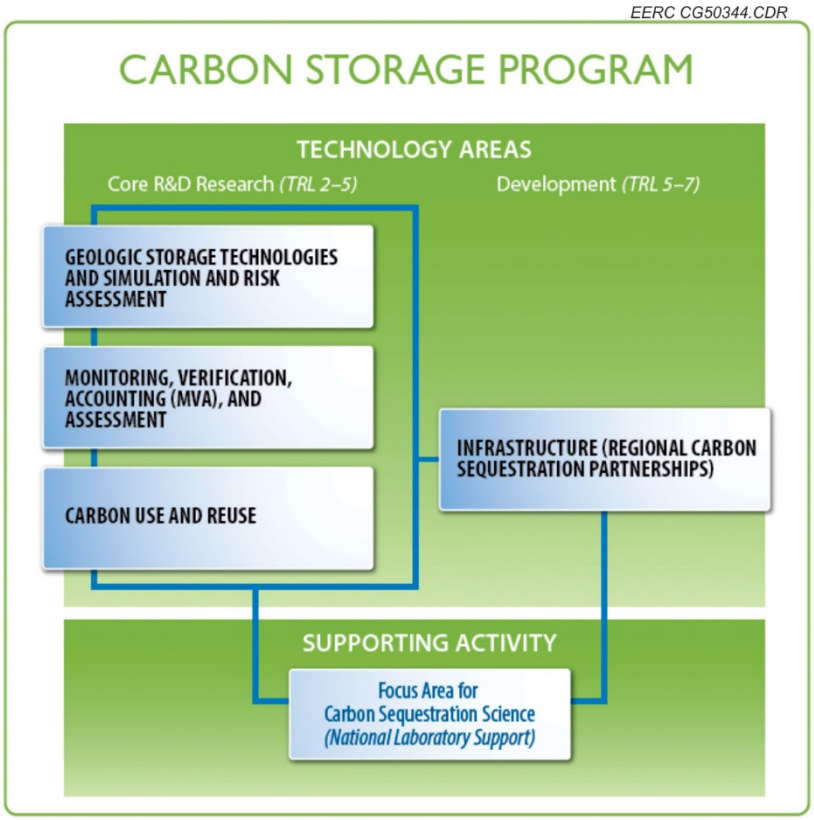


Figure 1. DOE Carbon Storage Program technology areas featuring regional partnerships (courtesy of Andrea Dunn, DOE NETL; "TRL" stands for technology readiness level).

utilize the infrastructure of its region to maximize CO_2 injection volumes. A programmatic development phase (Phase III) goal is implementation of large-scale field testing involving at least 1 million metric tons of CO_2 a project. Each of the RCSP large-volume injection tests is designed to demonstrate that the CO_2 storage sites have the potential to store regional CO_2 emissions safely, permanently, and economically for hundreds of years.

The PCOR Partnership is working with Denbury Onshore LLC (Denbury) in the Denbury-operated Bell Creek oil field in Powder River County in southeastern Montana. The PCOR Partnership has also conducted a feasibility study for Spectra Energy Transmission's (Spectra's) Fort Nelson gas-processing facility, situated near Fort Nelson, British Columbia, Canada. In addition, the PCOR Partnership is collaborating with the Petroleum Technology Research Centre (PTRC) on site characterization, risk assessment, and monitoring, verification, and accounting (MVA) activities associated with the Aquistore Project near Estevan, Saskatchewan, Canada. The PCOR Partnership's work has concluded with Apache Canada Ltd. to further characterize the Zama Acid Gas Enhanced Oil Recovery (EOR), CO_2 Storage, and Monitoring Project in Alberta, Canada, as well as its work on a multiyear, binational characterization effort of the basal Cambrian system (Figure 2).

Figure 2. Location of large-scale sites with PCOR Partnership Phase III participation.

The PCOR Partnership's objectives for the demonstration projects are as follows: 1) conduct a successful Bell Creek demonstration to verify that the region's large number of oil fields have the potential to store significant quantities of CO_2 in a safe, economical, and environmentally responsible manner and 2) support Spectra's feasibility study of a Fort Nelson demonstration to verify the economic feasibility of using the region's carbonate saline formations for safe, long-term CO_2 storage. During Phase III, the PCOR Partnership will continue to refine storage resource estimates and evaluate other factors relevant to regional storage goals.

The PCOR Partnership plans to achieve its Phase III mission through a series of 16 tasks: 1) Regional Characterization; 2) Public Outreach and Education; 3) Permitting and National Environmental Policy Act (NEPA) Compliance; 4) Site Characterization and Modeling; 5) Well Drilling and Completion (completed); 6) Infrastructure Development; 7) CO_2 Procurement (completed); 8) Transportation and Injection Operations (completed); 9) Operational Monitoring and Modeling; 10) Site Closure; 11) Postinjection Monitoring and Modeling; 12) Project Assessment; 13) Project Management; 14) RCSP Water Working Group (WWG) Coordination; 15) Further Characterization of the Zama Acid Gas EOR, CO_2 Storage, and Monitoring Project (completed); and 16) Characterization of the Basal Cambrian System (completed). Table 2 lists the responsibility matrix for these 16 tasks.

Table 2. Phase III Responsibility Matrix

Phase III Task Description	Task Leader
Task 1 – Regional Characterization	Wesley D. Peck
Task 2 – Public Outreach and Education	Daniel J. Daly
Task 3 – Permitting and NEPA Compliance	Charles D. Gorecki
Task 4 – Site Characterization and Modeling	James A. Sorensen
Task 5 – Well Drilling and Completion (completed)	John A. Hamling
Task 6 – Infrastructure Development	Melanie D. Jensen
Task 7 – CO_2 Procurement (completed)	John A. Harju
Task 8 – Transportation and Injection Operations (completed)	Melanie D. Jensen
Task 9 – Operational Monitoring and Modeling	John A. Hamling and Lawrence J. Pekot
Task 10 – Site Closure	John A. Hamling
Task 11 – Postinjection Monitoring and Modeling	John A. Hamling and Lawrence J. Pekot
Task 12 – Project Assessment	Loreal V. Heebink
Task 13 – Project Management	Charles D. Gorecki
Task 14 – RCSP WWG Coordination	Ryan J. Klapperich
Task 15 – Further Characterization of the Zama Acid Gas EOR, CO_2 Storage, and Monitoring Project (completed)	Charles D. Gorecki
Task 16 – Characterization of the Basal Cambrian System (completed)	Wesley D. Peck

PROGRESS OF WORK

Task 1 – Regional Characterization

Significant accomplishments for Task 1 for the reporting period included the following:

- Attended and presented two presentations at the North America Energy Ministers Trilateral (NAEMT) Meeting in Mexico City and Villahermosa, Mexico, held April 11–15, 2016. The presentations were entitled "Implementing Carbon Capture and Storage: An Overview of the Plains CO_2 Reduction Partnerships Bell Creek Project" and "Practical Learnings About CO_2 Storage in North America."
- Attended and presented at the ESRI Petroleum GIS Conference held April 26–27, 2016, in Houston, Texas. The presentation discussed and gave examples of how the EERC uses geographic information system (GIS) technology in carbon capture, utilization, and storage (CCUS)/CCS research activities.
- Attended the Research Experience in Carbon Sequestration (RECS) Course in Birmingham, Alabama, held June 12–20, 2016. The program offers graduate students and early career professionals hands-on field research experience in areas related to CCUS and is hosted by Southern Company and the Southeast Carbon Sequestration Partnership.
- Attended the 2016 ESRI GIS User Conference in San Diego, California, held June 27–30, 2016.

- Participated in a Webinar on June 20, 2016, hosted by DOE NETL to introduce the newest National Risk Assessment Partnership (NRAP) tools on the Energy Data Exchange (EDX) workspace: the Multiple Source Leakage Reduced-Order Model (MSLR) and the Ground Motion Prediction Applications to Potential Induced Seismicity (GMPIS).
- Continued efforts to update Deliverable (D) 81, Regional Carbon Sequestration Atlas (update), including the following:
  - Continued updating and adding text, statistics, and figures through Chapter 6. Topics included the Fort Nelson, Bell Creek, and Aquistore projects; geologic storage; green oil; and regulatory issues.
  - Continued updating CO_2 sources.
  - Updated CCS projects in the PCOR Partnership region.
  - Updated list of completed, current, and planned global CCS projects.
  - Continued task-level review and applied comments.
  - Worked on text and figures on the topic of life cycle analysis (LCA). Discussed a figure with a consultant from The CETER Group (CETER).
  - Worked on carbon market research.
  - Compiled CO_2 EOR tax incentive information for Colorado, Montana, Wyoming, Texas, Louisiana, North Dakota, and Oklahoma.
- Participated in a conference call with a science policy fellow at the Institute for Defense Analyses (IDA) Science and Technology Policy Institute, a group that is preparing the 2016 National Earth Observations Assessment. His team is working on an update to the National Earth Observations Assessment and wanted to discuss the usefulness of the data sets used to populate both the PCOR Partnership CO_2 sources database and the oil and gas characterization database. The usefulness and our satisfaction with each data set were scored.
- Responded to a question from the IDA Science and Technology Policy Institute. They wanted to ensure that they had accurately represented the PCOR Partnership rating of the relative impacts of Earth-observing data sources used in our work with the National Carbon Sequestration Database and Geographic Information System (NATCARB).
- Updated the CO_2 Sources database with 2014 U.S. Environmental Protection Agency (EPA) data.
- Worked with a summer intern to select potential oil fields for production-based CO_2 storage calculations.
- Updated information and continued work on the partners-only Decision Support System (DSS) Web site.
- Continued activities to update the content of the **PCOR Partnership general database**, including the following:
  - Updated North Dakota and Montana Petra projects with the latest general well information from each state's online resource as follows: added 208 new North Dakota wells and nine new Montana wells.
  - Updated North Dakota production and injection data.
  - Updated South Dakota, Manitoba, and Saskatchewan projects with well and production data, as available.
  - Updated information on existing wells, such as current operator, status, etc.

  - Continued downloading well logs from the Wyoming Oil and Gas Conservation Commission Web site. Began rescanning API (American Petroleum Institute) well number files to detect and record Log ASCII Standard (LAS) files within the PCOR Partnership region. Finalized the process to fully import the updated Wyoming well list into Petra.
- Continued preparation of draft value-added document on efforts assessing data from the PCOR Partnership DSS on large point sources and potential sinks.
- With regard to the **Williston Basin** CO_2 Storage Sink Relative Permeability laboratory characterization effort:
  - Performed relative permeability testing including brine permeability, CO_2 permeability, and CO_2/brine conditions on samples from the following formations:
    - Broom Creek Formation
    - Lodgepole Formation (limestone)
  - Stopped relative permeability testing of the fourth sample (vuggy Lodgepole Formation limestone) partway through the testing after continual pressure issues.
  - Initiated relative permeability testing for the sixth sample (Mission Canyon Formation).
  - Continued to work with the data from previous samples.
- With regard to the **Aquistore** project:
  - Received approval for D93 entitled "Geological Modeling and Simulation Report for the Aquistore Project" on April 6, 2016.
  - Submitted an abstract entitled "A Numerical Simulation Update of the Aquistore CO_2 Storage Project" to be presented at the 2016 American Institute of Chemical Engineers (AIChE) Annual Meeting being held November 13–18, 2016.
  - Attended Computer Modelling Group's (CMG's) 37th Technical Symposium held June 13–14, 2016, in Calgary, Alberta, Canada. Presented on history matching in a presentation entitled "An Update of Aquistore CO_2 Storage Simulation."
  - Attended a CMOST Workshop held June 15–17, 2016, in Calgary, Alberta, Canada.
  - Participated in the Science and Engineering Research Committee (SERC) conference call on May 18, 2016. Presented on the history match modeling efforts, our interpretations of changes in injectivity that have been observed, and the results of spinner and pulsed-neutron log (PNL) surveys by WebEx.
  - Participated in a SERC conference call on June 1, 2016.
  - Received an analysis report for the recent PNL of the injection well from a PTRC representative.
  - Received results of PNL and spinner log on the injection well run in February 2016 from a Schlumberger Carbon Services representative. Results are inconsistent, with the spinner log indicating 30% of injection CO_2 entering the basal Deadwood perforations; however, the PNL does not report significant CO_2 saturation for this interval.
  - Held monthly internal Aquistore update meetings.
  - As of June 30, 2016, 72,000 metric tons of CO_2 has been injected.
  - With regard to static **modeling** and dynamic predictive **simulation** activities:
    - Continued to download and process daily injection and pressure data as available.
    - Incorporated hourly field injection data.

- ♦ Worked on a history match of the field pressure, including the injector and observation well pressure responses.
- ♦ Ran the thermal-incorporated simulation, using changes in the downhole temperature in the wellbore model to evaluate any differences in the results. Reprocessed daily average rate for faster, more accurate thermal simulation.
- ♦ Worked on modifications and testing of a new grid system to shorten the simulation run time.
- ♦ Modified the model to match recent field performance:
  - Worked on a model with a new grid system and uniformly sized cells. Evaluated a pressure buildup effect in the model.
  - Analyzed field pressure data.
- ♦ Conducted preliminary simulations to investigate reservoir performance and storage at higher injection rates.

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- Relative permeability testing of the fourth sample (vuggy Lodgepole limestone) was stopped part way through the testing after continual pressure issues. The testing that was completed will be used in the data interpretation.
- An e-mail server issue had prevented the receipt of daily injection and pressure data from the Aquistore project and was fixed April 27, 2016.

Task 2 – Public Outreach and Education

Significant accomplishments for Task 2 for the reporting period included the following:

- Submitted a value-added fact sheet update entitled "CO_2 "Huff 'n' Puff" Validation Test" on April 7, 2016, for review. Received approval on April 27, 2016.
- Submitted a value-added report entitled "Household Energy and Carbon Web Pages Report" on May 6, 2016, regarding visitor activity to the North Dakota Department of Commerce Division of Community Services-funded Household Energy and Carbon Web pages linked to the PCOR Partnership Web site. Received approval on May 31, 2016.
- Submitted D17 entitled "General Phase III Information PowerPoint Presentation (Update 7)" on May 31, 2016. Received approval on June 8, 2016.
- Received approval for D11 entitled "Outreach Action Plan (Update 2)" on June 9, 2016.
- During the quarter, the PCOR Partnership was represented by EERC personnel at 16 meetings/conferences and four workshops. Specifically, the PCOR Partnership outreach activities included 12 oral presentations. The following quantities of PCOR Partnership outreach materials were distributed:
  - PCOR Partnership documentary entitled "Nature in the Balance: CO_2 Sequestration" – 3
  - PCOR Partnership documentary entitled "Reducing Our Carbon Footprint: The Role of Carbon Markets" – 2
  - PCOR Partnership documentary entitled "Out of the Air – Into the Soil" – 17

  - PCOR Partnership documentary entitled “Managing Carbon Dioxide: The Geologic Solution” – 127
  - PCOR Partnership documentary entitled “Global Energy and Carbon: Tracking Our Footprint” – 126
  - PCOR Partnership video training guide entitled “Installing a Casing-Conveyed Permanent Downhole Monitoring System” – 1
  - “Plains CO_2 Reduction Partnership Atlas, 4th Edition, Revised” – 143
- Continued activities associated with **education and teacher education** seminars. The PCOR Partnership outreach team participated in two teacher training workshops and education conferences. These activities included introducing PCOR Partnership materials (DVDs, atlas, Web site awareness) to educators in K–12 schools. A total of 111 teachers representing 89 different school districts in five states in the PCOR Partnership region were in attendance. Six of the teachers (5%) had previously heard a PCOR Partnership outreach presentation at a different workshop. Figure 3 shows the geographic distribution of the teachers who received materials by their corresponding school districts for the region. The education seminars included:
  - A 1-day science teacher conference hosted by the North Dakota Teachers Association 2016 Spring Collaborative Conference STEM (Science, Technology, Engineering, and Mathematics) Networking Sessions on April 21, 2016, in Grand Forks, North Dakota. Provided the teachers with PCOR Partnership outreach materials.

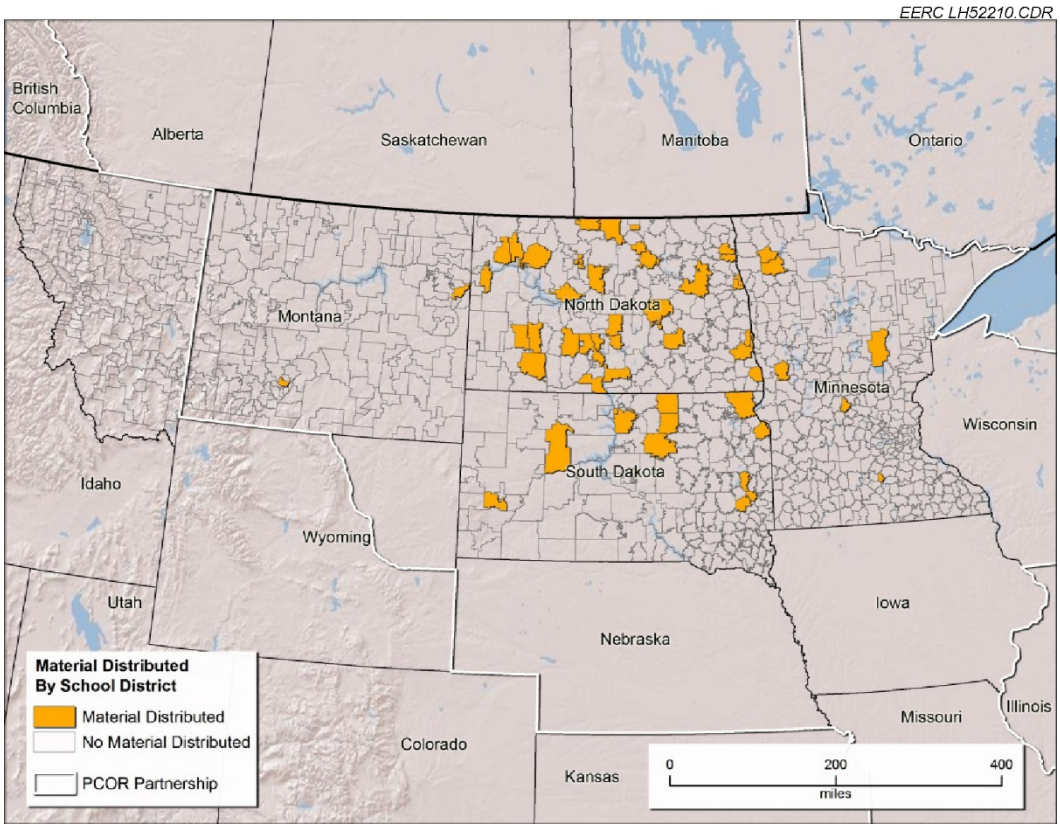


Figure 3. Distribution of teachers who received materials by school district this reporting period.

  - A 4-day coal-centric workshop presented by the North Dakota Lignite Energy Council (LEC) June 14–17, 2016, in Bismarck, North Dakota. Presented on CCS and the PCOR Partnership. Distributed outreach packet (atlas, PowerPoint, and DVDs).
- Received notification on June 14, 2016, that the abstracts entitled "Regionwide and Project-Level Outreach – The PCOR Partnership Approach" and "Engaging Teachers to Facilitate Learning – PCOR Partnership Outreach in Action" were accepted for oral and poster presentations, respectively, for the 13th International Greenhouse Gas Control Technologies Conference (GHGT-13) in Lausanne, Switzerland, November 14–18, 2016. The poster was withdrawn.
- Notified of a paper presentation opportunity in China in late November 2016 related to the Outreach Working Group (OWG).
- Continued revisions to the updated Phase II Lignite fact sheet based on review comments. The fact sheet is under internal review.
- Provided a copy of the PCOR Partnership Outreach Action Plan (update) (D11) to the coordinator of the OWG.
- Responded to an inquiry from a partner regarding CO_2 volumes for the Bell Creek demonstration.
- **Conference call** activity this quarter, included the following:
  - No monthly Aquistore outreach advisory group phone calls were held this quarter.
  - With regard to the monthly RCSP Program OWG conference calls:
    - Participated in the monthly call on April 28, 2016. Discussions included the status of the DOE Outreach Best Practices Manual (BPM) update and a number of technical and policy references dealing with the status of CCS with respect to the Paris Agreement on Climate Change.
    - The monthly call was canceled for May 2016.
    - Responded to an inquiry by Sarah Wade, lead for the RCSP OWG, on scheduling and topics for upcoming meetings and conference calls.
    - Participated in the monthly conference call on June 16, 2016. The subject was outreach budgets.
- Continued efforts to update the **public Web site** (www.undeerc.org/pcor), including the following:
  - Continued work on content for D13 (Public Site Update) for the PCOR Partnership public Web site:
    - Completed research on event tracking to include in the standard operating procedures (SOPs) contained in the appendix of D13.
    - Continued updating the SOP contained in the appendix of D13.
    - Completed a draft of the document.
  - Received approval from PCOR Partnership management for the following Web site actions:
    - Add a new landing page for partners.
    - Upgrade the look for select pages ("What Is CO_2 Sequestration?" and "What Is CO_2?") and content (Technical Reports, Terrestrial Sequestration, and Wetlands pages).
  - Several PCOR Partnership public Web site items went live on May 17, 2016, including:
    - Replaced the General Phase III PCOR Partnership fact sheet.

    - ♦ Replaced several broken links.
    - ♦ Uploaded several existing fact sheets to improve search engine optimization parameters.
    - ♦ Added a button for the 2016 PCOR Partnership Annual Membership Meeting registration.
  - – Continued work on future updates, including the following:
    - ♦ Worked on the development of a new Web page for the Task 9 LCA model.
    - ♦ Prepared technical reports for uploading to the public PCOR Partnership Web site based on the search engine optimization SOPs.
  - – Continued ongoing identification and repair of broken links.
- Continued collaborative efforts with **Prairie Public Broadcasting (PPB)**, including the following:
  - – With regard to D21, the Bell Creek Story 30-minute documentary:
    - ♦ Entered discussions to schedule an interview with Dan Cole of Denbury in conjunction with another meeting on May 12, 2016, at the EERC. The interview did not occur because Mr. Cole was unable to attend the meeting.
    - ♦ Finalized arrangements and traveled to the Bell Creek oil field site on June 28, 2016, with PPB personnel for filming, including aerial filming of the field and pipeline route.
    - ♦ Continued script development.
  - – With regard to D22, the Coal in the Modern Age 60-minute documentary:
    - ♦ Prepared 20 pages of draft script for the introduction of the first industrial revolution in the United States, 15 pages of draft script for the development of the second industrial revolution, and 30 pages of draft script for the use of coal today and in the future. Met with PPB in Fargo, North Dakota, on April 8 and April 22, 2016, to review the script and the produced video materials.
    - ♦ Conducted Web and literature searches for suitable historical photos and video for use in documentary D22.
    - ♦ Researched domestic lighting, cooking, and heating in greater detail to bolster sections of the script.
    - ♦ Traveled to Fargo, North Dakota, to meet with PPB personnel on May 10, 2016. Reviewed the rewritten second draft of the script (68 pages) and the video material that had been produced from the script.
    - ♦ Prepared a third draft of the script (60 pages) based on comments from PPB.
    - ♦ Traveled to Fargo, North Dakota, to meet with PPB personnel on May 18, 2016. Produced the 50-minute narrative based on the second draft of the script.
    - ♦ Reviewed sources, identified likely interviews, and revised portions of the script in response to an internal review session held at the EERC on May 20, 2016.
    - ♦ Contacted a representative from North American Coal Corporation with respect to an interview but decided not to pursue the interview based on feedback from reviewers.
    - ♦ Continued script development and revisions, including additional research, based on internal review sessions.
    - ♦ Discussed content and next steps with EERC senior PCOR Partnership managers, including potential interviewees and scheduling.

    - ♦ Discussed itinerary and arrangements for a mid-July 2016 California trip to conduct an interview with Dr. Friedmann at Lawrence Livermore National Laboratory (LLNL) and shoot locations in the area. Developed interview questions.
    - ♦ Traveled to the Gillette, Wyoming, area June 27–29, 2016, for filming, including aerial filming of surface coal mines and power plants.
- Information regarding the **site sessions/visits** to the PCOR Partnership public Web site included the following:
  - There were 9043 sessions/visits to the public Web site (www.undeerc.org/pcor). Traffic increased approximately 17% from last quarter (7721 sessions/visits). Approximately 24% of visitors came to the site using a mobile device or tablet (no change from last quarter).
  - There were 7861 unique visitors to the public Web site, representing a 19% increase from last quarter (6611 visitors). In particular, 86% of these visitors were new to the Web site (visitors whose visit was marked as a first-time visit in this quarter).
  - Of the 9043 sessions/visits, 42% of the Web traffic was domestic and 58% was international. Table 3 lists the top ten countries for visits to the PCOR Partnership Web site: the United States, India, Australia, United Kingdom, Canada, Philippines, Malaysia, South Africa, Pakistan, and Mexico, which has not been in the top ten since 2011. There was traffic from 135 countries overall (Figure 4).
  - There were 589 sessions/visits originating from within the PCOR Partnership region (a 10% decrease from last quarter, with declining visits from both North Dakota and Alberta) (Figure 5). Approximately 61% of the regional visits originated from the United States, and 39% came from Canada. Visits from within the PCOR Partnership region represent approximately 6.5% of the overall traffic to the public Web site (it should be noted that the totals are exaggerated to some degree because the visit location data were aggregated at the state and province levels, even though the PCOR Partnership region formally includes only portions of British Columbia, Montana, and Wyoming).
- During this reporting period, a breakdown of how visitors came to the PCOR Partnership Web site, also referred to as **traffic sources** (Figure 6), was determined and is provided below:
  - Search traffic refers to the use of search engines such as Google, Bing, and Yahoo. Search traffic accounted for 88% of the overall traffic that came to the public Web site. Google Analytics provides keywords that visitors used to find the public Web site. The top three search phrases were "carbon sequestration," "what is CO_2," and "CO_2 sequestration."
  - Direct traffic consists of those visitors who bookmark or type a specific URL (e.g., www.undeerc.org/pcor) into the Web address bar. It is likely that most of the direct traffic (over 8.8%) is from persons familiar with the PCOR Partnership.
  - Referral site traffic (over 2%) corresponds to the traffic directed to the PCOR Partnership Web page from other sites via links. The top three referring Web sites were from energy.gov (to the Home page), learn.ohiohipoint.com; a K–12 Web site (to What Is CO_2 Sequestration page) and arthapedia; an Indian economy and government Web site (to What Is CO_2 Sequestration page).
  - Less than 1% of site traffic (53 visitors) resulted from teacher campaigns and social interactions, such as e-mail or social media sources (e.g., Facebook and YouTube).

Table 3. Sessions/Visit Activity from the Top Ten Countries and the PCOR Partnership Region

	Country	Sessions/ Visits*	PCOR Partnership State/Province	Visits*
1	United States	3823		
			Minnesota	94
			North Dakota	73
			Wisconsin	60
			Missouri	52
			Iowa	29
			Nebraska	17
			Montana	14
			South Dakota	12
			Wyoming	9
2	India	1234		
3	Australia	588		
4	United Kingdom	567		
5	Canada	549		
			British Columbia	106
			Alberta	87
			Saskatchewan	25
			Manitoba	11
6	Philippines	136		
7	Malaysia	115		
8	South Africa	94		
9	Pakistan	79		
10	Mexico	75		
	Other 125 countries	1783		
Total Sessions/Visits		**9043**	**Total PCOR Partnership Visits**	**589**

*Arranged by the number of visits to the site.

- During this reporting period, the **nature of the sessions** to the PCOR Partnership public Web site included 12,472 page views (a 14% decrease from last quarter); the top five pages viewed are listed in Table 4. These five pages make up about 77% of total page views.
- During this reporting period, the PCOR Partnership received **public television exposure** from documentaries broadcast in the PPB region in four states and one Canadian province. A total of three broadcasts aired, with "Out of the Air into the Soil: Land Practices That Reduce Atmospheric Carbon," "Managing Carbon Dioxide: The Geological Solution," and "Global Energy and Carbon: Tracking our Footprint" each airing once.

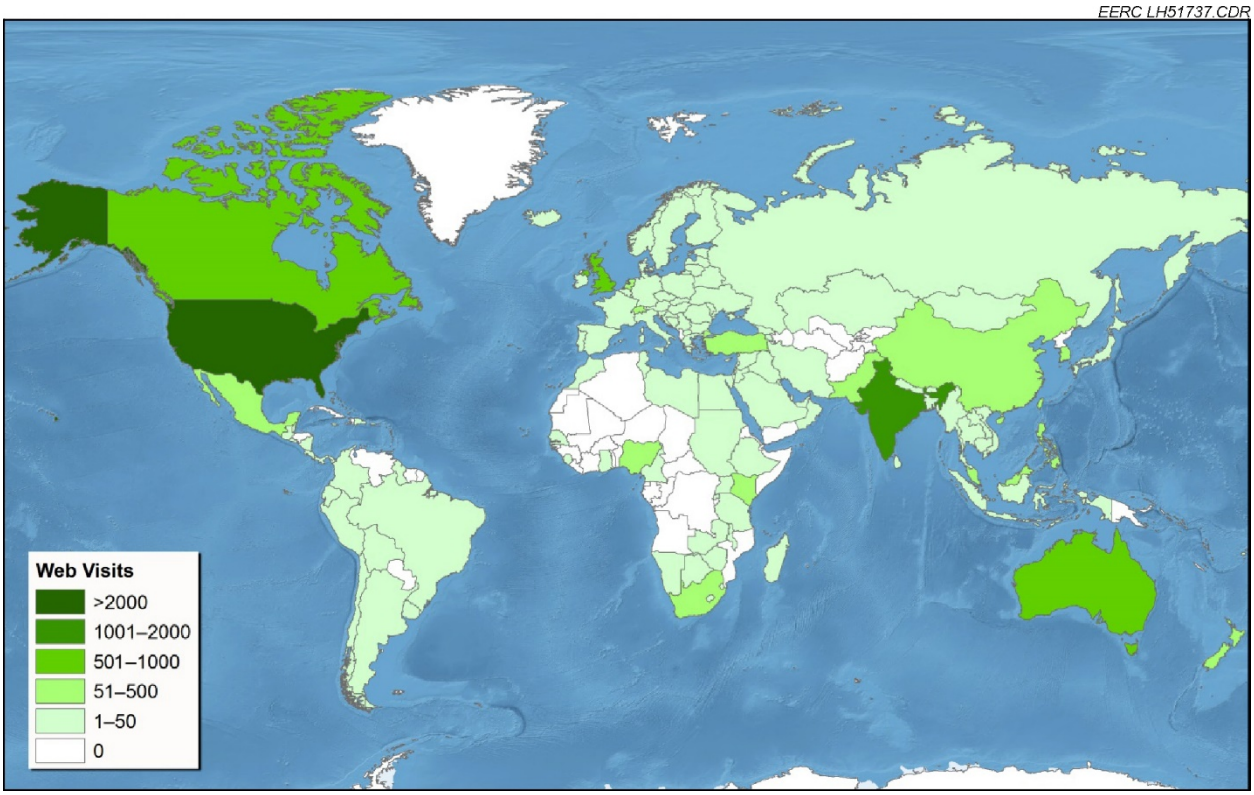


Figure 4. Map of PCOR Partnership Web site global traffic for this reporting period.

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- Because of interview-scheduling challenges, the July 31, 2016, production due date for D22 will not be met. An extension will be discussed with Andrea Dunn in July 2016.

Task 3 – Permitting and NEPA Compliance

Significant accomplishments for Task 3 for the reporting period included the following:

- Attended the Interstate Oil and Gas Compact Commission (IOGCC) Annual Business Meeting in Denver, Colorado, on May 16–17, 2016. Topics of interest included new and proposed rules and regulations, marginal wells and their challenges, and EOR and CO_2 storage in mature marginal oil wells.
- Attended the Williston Basin Petroleum Conference (WBPC) Annual Meeting in Bismarck, North Dakota, on May 24–26, 2016.
- Continued working on the regulatory permitting document for the PCOR Partnership region (D76 – Regional Regulatory Perspective). The goal of this document is to help PCOR Partnership states and provinces through the permitting process:

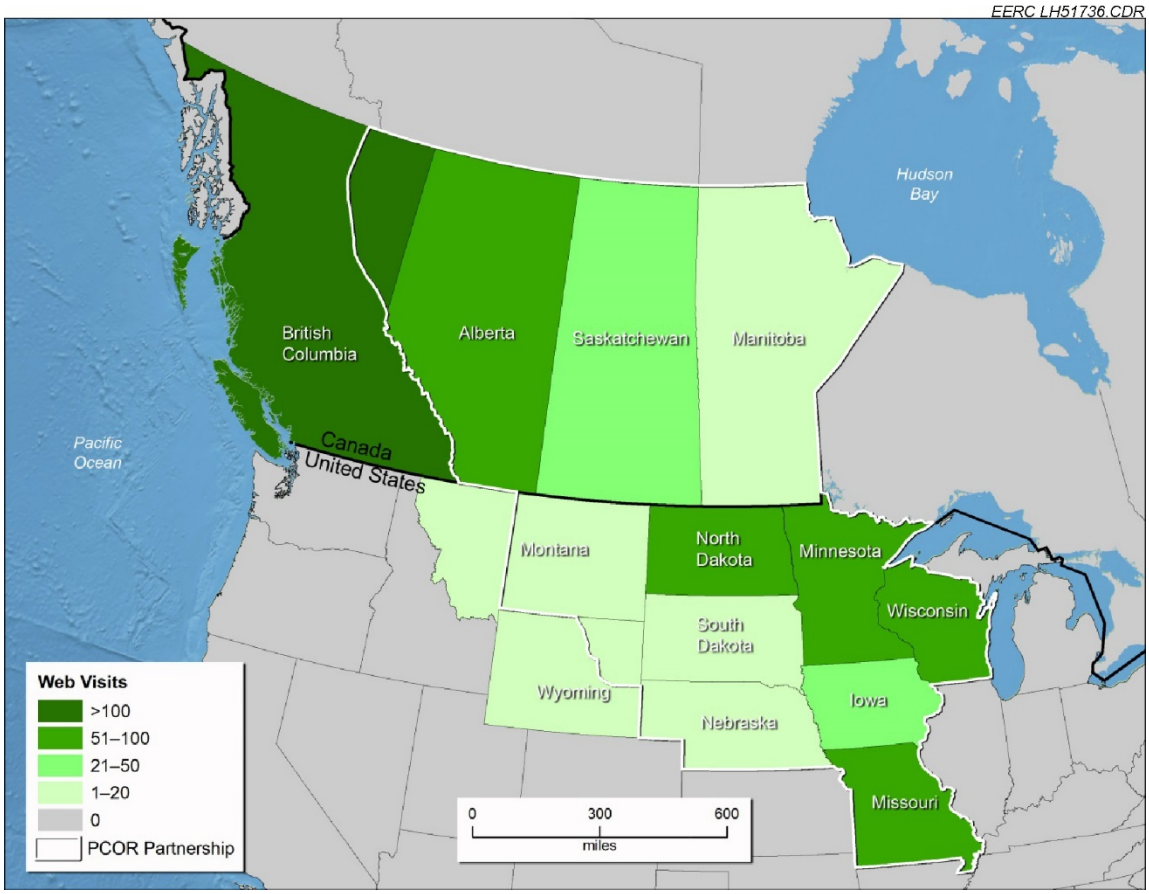


Figure 5. Map of PCOR Partnership Web site regional visits for this reporting period.

  - Continued compiling rules, regulations, and statutes crosswalks and flowcharts for various scenarios of CCS geologic storage including CO_2 EOR for each of the PCOR Partnership states and provinces:
    - Continued regulatory crosswalk data gathering for the state of Missouri.
    - Edited crosswalk documents.
  - Continued review of the preliminary outline and draft introduction text prepared by a consultant from CETER.
  - Discussed document development with a consultant from CETER.
  - Reviewed and discussed the first draft with a consultant from CETER and a senior EERC manager.
  - Reviewed Alberta, Canada, regulations on CCS.
- Met to discuss D76 progress, the upcoming IOGCC meeting, and the PCOR Partnership Annual Membership Meeting.
- Reviewed comments on the regulatory portion of the PCOR Partnership Regional Carbon Sequestration Atlas, and researched California carbon markets and offsets.

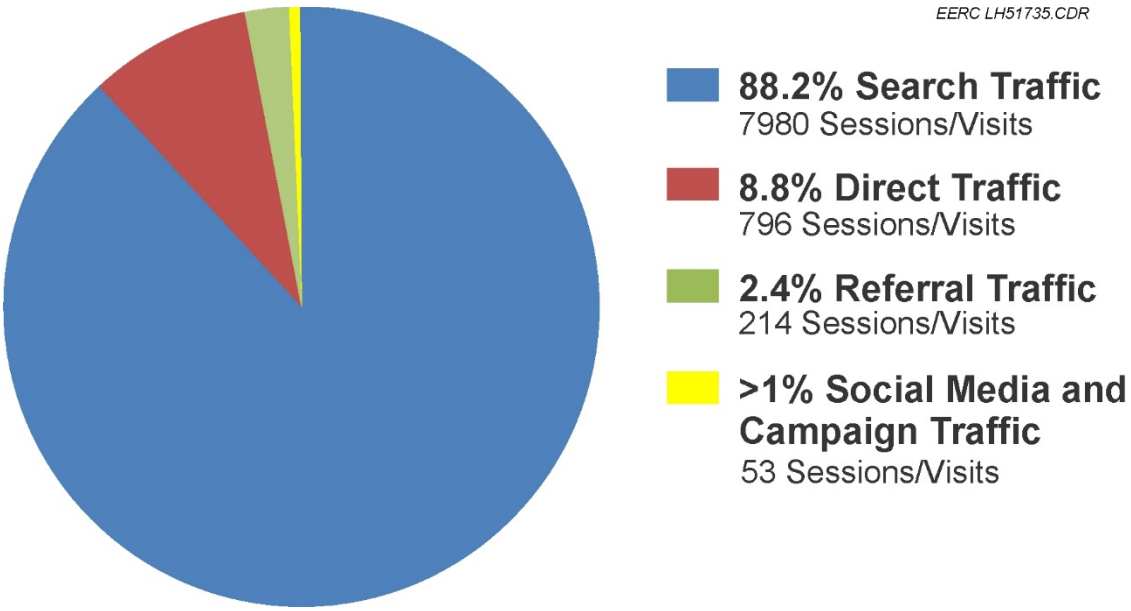


Figure 6. PCOR Partnership public Web site traffic sources for this reporting period.

Table 4. Top "Page Views" on the PCOR Partnership Public Web Site

Page Title	Page Views	% Page Views	Page
What Is CO_2 Sequestration?	6834	53.2	www.undeerc.org/pcor/sequestration/whatissequestration.aspx
What Is CO_2?	1685	13.1	www.undeerc.org/pcor/sequestration/whatisco2.aspx
CO_2 Sequestration Projects	416	3.2	www.undeerc.org/pcor/co2sequestrationprojects/default.aspx
Home Page	360	2.8	www.undeerc.org/pcor/default.aspx
Carbon and CO_2 on Earth	330	2.6	www.undeerc.org/pcor/sequestration/co2onearth.aspx

- Prepared for participation in the IOGCC Annual Conference. The planned participation at the Groundwater Protection Council (GWPC) meeting is in conflict with the PCOR Partnership Annual Membership Meeting.

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- Although planning was initiated in April 2016 for a 2016 PCOR Partnership Regulatory Roundup, it was determined that this meeting is not essential at this time. Future Regulatory Roundup meetings may be held based on need and interest from potential participants.

Task 4 – Site Characterization and Modeling

Significant accomplishments for Task 4 for the reporting period included the following:

- Received approval on April 5, 2016, for D36 entitled "Bell Creek Wellbore Integrity Study" as submitted to DOE on March 30, 2016, upon completion of Denbury review. No changes were requested by Denbury or DOE. D36 was initially submitted to DOE on May 19, 2014.
- Submitted D33/Milestone (M) 12 entitled "Bell Creek Test Site – Preinjection Geochemical Report" on May 2, 2016, as a final version. D33/M12 was originally approved by DOE on January 30, 2014, with one change requested. Denbury reviewed the document, changes were made, and Denbury approved the changes.
- Attended the CMG-hosted Webinar on April 6, 2016, entitled "Advanced Parallelization Techniques to Optimize and Boost Simulator & Hardware Performance." The knowledge gained will be used in the geomechanical simulation efforts.
- Continued work on the PCOR Partnership Site Characterization BPM (D35):
  - Prepared a development schedule.
  - Prepared and revised outline based on review team recommendations and to ensure continuity between other PCOR Partnership BPMs.
  - Drafted an executive summary.
  - Held several internal meetings focused on content development.
- **Bell Creek** test site activities included the following:
  - With regard to **modeling** efforts, the following activities occurred:
    - Completed the Bell Creek regional (county-size) model containing the Muddy Formation. This model has been developed to increase our understanding of the long-term (hundreds to thousands of years) fate of injected CO_2, in terms of potential for migration and accumulation within the reservoir (Figure 7).
    - Completed the Bell Creek near-surface model which contains the shallow aquifer units (Hell Creek and Fox Hills Formations) in the greater Bell Creek Field region. This model will be used to better understand the risk and potential impacts (assisting in early detection) of unintended CO_2 saturation in the shallow subsurface (Figures 8 and 9). Work included the following:
      - Researched the petrophysics of the Hell Creek and Fox Hills Formations.
      - Completed structural, facies, and petrophysical property-modeling efforts for the Hell Creek and Fox Hills Formations.
      - Researched potential chemical reactions and rates between CO_2 and various lithologies/mineralogies, which may be useful in any future geochemical simulations to better understand what impacts, if any, unintended CO_2 saturation may have in the shallow subsurface. This information may also serve to guide any future near-surface MVA measures related to early detection.
    - Worked with Bell Creek seismic data for use in modeling efforts, including extracting geobodies and relating seismic and well log signatures to facies interpretations for depositional environments. Created 4-D seismic difference displays for use in modeling, simulation, and presentations.
    - Continued work on the Version 3 facies model, including reviewing previous depositional environment interpretation using seismic data.

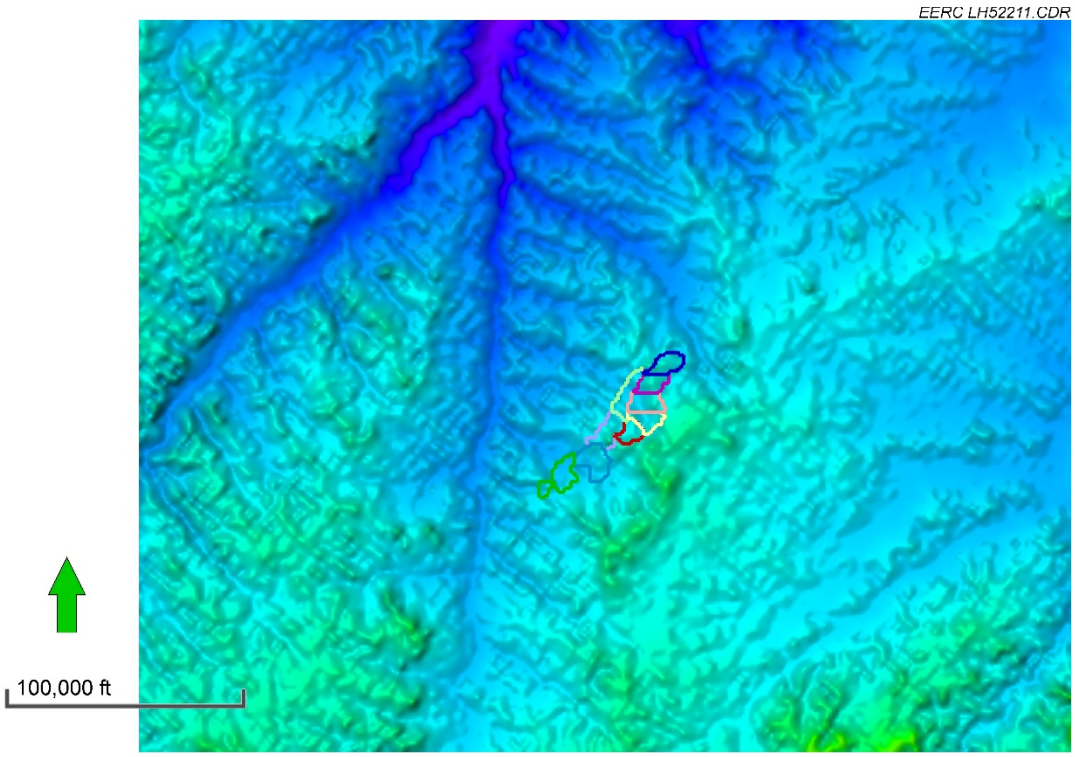


Figure 7. Areal extent of the Bell Creek regional model.

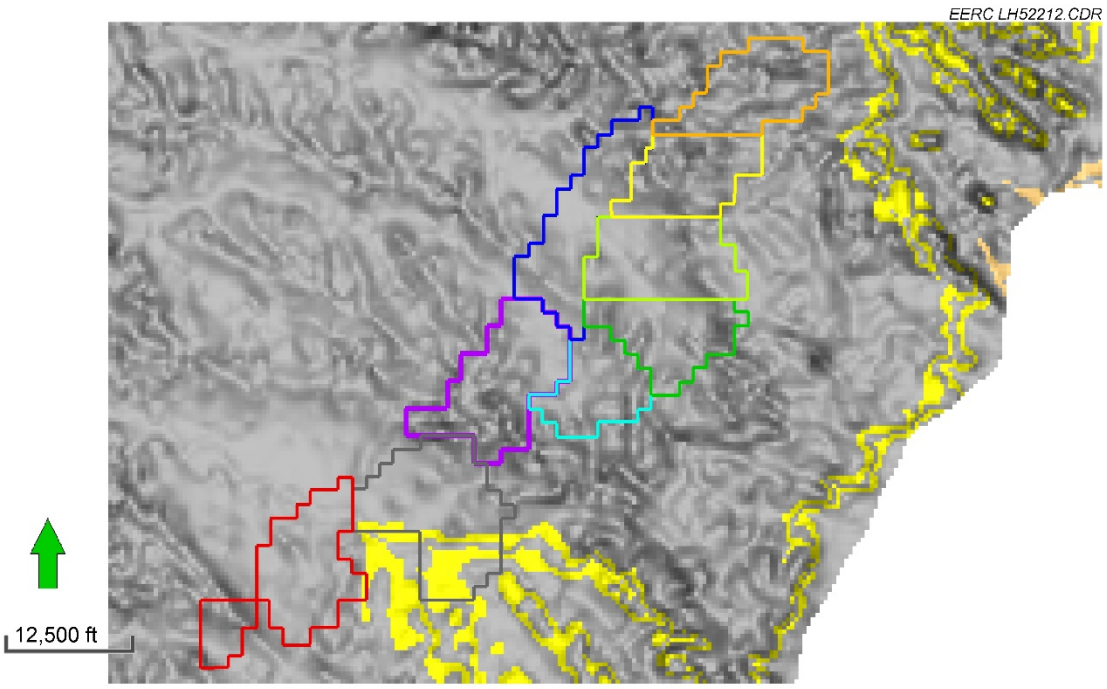


Figure 8. Areal extent of the Bell Creek near-surface model. The area to the southeast is characterized by outcrops and exposure at the ground surface.

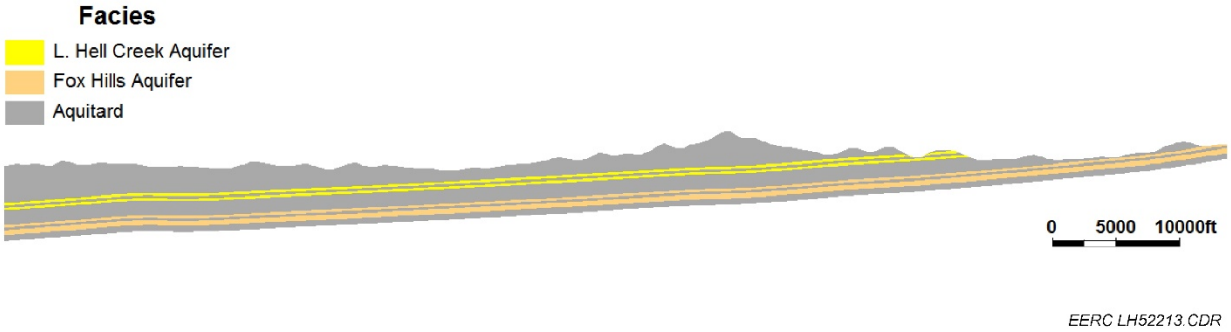


Figure 9. Cross-sectional view of the Bell Creek near-surface model showing the vertical relation of aquifer and aquitard units of the Hell Creek and Fox Hills Formations. (vertical exaggeration of 10×.)

- ♦ Placed "hard" (measured) petrophysical property data in bins determined by our revised facies interpretation (according to our updated understanding of the Muddy Formation deposition) in the Version 3 facies model. This process will highlight specific differences between well log-interpreted facies and enable petrophysical property distributions to occur in a specific manner. The Fall 2015 seismic monitor data have been received and are being used to inform facies-modeling activities in the northern end of the Bell Creek Field (Phases 3–7).
- ♦ Continued work on improving the 3-D mechanical earth model (MEM), including the following:
  - ▪ Obtained geomechanical modeling data from processed PNL, density, and synthetic sonic logs.
  - ▪ Continued to improve the geomechanical properties (Poisson's ratio and Young's modulus) with logs.

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- All activities are on schedule, and there were no problems or delays during the reporting period.

Task 5 – Well Drilling and Completion

This task ended in Quarter 3 – BP4, Year 7 (June 2014).

- Received final approval for D44 entitled "Bell Creek Test Site – Drilling and Completion Activities Report" on April 5, 2016. No changes were requested by Denbury or DOE. D44 was initially submitted to DOE on May 30, 2014.
- Submitted the final report for D42 entitled "Bell Creek Test Site – Injection Experimental Design Package" on April 5, 2016, upon completion of Denbury's review, which required

no changes. D42 was initially submitted to DOE on October 30, 2013, and approved February 11, 2014.

Task 6 – Infrastructure Development

Significant accomplishments for Task 6 for the reporting period included the following:

- Submitted the *Energy & Environmental Science* manuscript on June 15, 2016. This was a reformat of the manuscript that was included in the value-added report entitled "Assessing Temporary Storage Options to Manage Variable-Rate CO_2 Emissions for Use During Enhanced Oil Recovery."
- Attended the free Webcast entitled "The Effects of Volatility on the Natural Gas Markets…and Implications for Coal," put on by the American Coal Council on April 14, 2016.
- Accepted an invitation to present information on CO_2 pipelines at the International Energy Agency Greenhouse Gas R&D Programme (IEAGHG) CCS Summer School to be held July 20–24, 2016, in Regina, Saskatchewan, Canada. Prepared slides for the presentation. The task lead will present the information and mentor attendees.
- Continued work on an updated version of the 2011 CO_2 capture technologies overview value-added document:
  - Reviewed mineralization technologies to determine update/elimination needs.
  - Continued to incorporate and edit the chemical absorption technology updates. References, especially those available online, were checked to ensure that the links are not broken. New references were added as appropriate. Figures were updated or replaced, as necessary.
- Provided information about an electrochemical CO_2 capture technology to a partner.

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- Received word that the manuscript submitted to *Energy & Environmental Science* was rejected for publication in that journal. The manuscript will be retooled based on reviewer comments and will be submitted to another journal for possible publication. Currently, the most likely candidate journal is the *International Journal of Greenhouse Gas Control* (IJGGC).

Task 7 – CO_2 Procurement

This task ended Quarter 4, BP4, Year 6 (September 2013).

Task 8 – Transportation and Injection Operations

This task ended Quarter 4, BP4, Year 8 (September 2015).

- Received final approval for D49 entitled "Bell Creek Test Site – Transportation and Injection Operations Report" on March 31, 2016.

Task 9 – Operational Monitoring and Modeling

Significant accomplishments for Task 9 for the reporting period included the following:

- Submitted two memos regarding official updated volumes of metric tons of CO_2 purchased for injection and metric tons of CO_2 stored at Bell Creek.
  - As of February 29, 2016, 2.974 million tonnes of total gas (composition of approximately 98% CO_2) has been purchased for injection into the Bell Creek Field, equating to an estimated 2.920 million tonnes of CO_2 stored.
  - As of April 30, 2016, the most recent month of record, 3.100 million tonnes of total gas (composition of approximately 98% CO_2) has been purchased for injection into the Bell Creek Field, equating to an estimated 3.044 million tonnes of CO_2 stored.
- Submitted M57 entitled "Life Cycle Analysis for Primary and Secondary Enhanced Oil Recovery at the Bell Creek Field Completed" on May 26, 2016. Received approval on May 31, 2016.
- Submitted LCA journal article entitled "How Green Is My Oil? A Detailed Look at Greenhouse Gas Accounting for CO_2–Enhanced Oil Recovery (CO_2–EOR) Sites" to DOE prior to resubmission to IJGGC. The article was published on June 21, 2016, in Volume 51, August 2016, pages 369–379. The authors include Nicholas A. Azzolina and David V. Nakles of CETER; Wesley D. Peck, John A. Hamling, Charles D. Gorecki, Scott C. Ayash, and Thomas E. Doll of the EERC; and L. Stephen Melzer of Melzer Consulting.
- Submitted an abstract entitled "Lessons Learned in Near-Surface Monitoring for Large-Scale CO_2 Storage" to be presented at the 2016 AIChE Annual Meeting being held November 13–18, 2016. The abstract was accepted.
- Prepared and submitted an abstract and accompanying presentation entitled "Adaptive Approach to Modeling and Monitoring 5 million tonnes of CO_2 Injection at the Bell Creek Oil Field" to be presented at the IEAGHG Modelling and Monitoring Network Meeting to be held July 7–8, 2016, in Edinburgh, Scotland.
- Based on a discussion with Sarah Forbes of DOE Headquarters, contact was made with a representative of the California Area Resources Board. The PCOR Partnership volunteered to present for a WebEx on May 12, 2016, pertaining to development of qualification methods for the California Low Carbon Fuel Standard, specifically addressing maintaining wellbore integrity throughout CCS. Participated in the California Area Resource Board CCS Technical Discussion Series: Well Mechanical Integrity Technical Discussion Webinar held May 12, 2016. Presented on the topic of risk and criteria for legacy wells and tools for well integrity.
- Attended the WBPC Annual Meeting in Bismarck, North Dakota, on May 24–26, 2016. Attendance was focused on PCOR Partnership outreach, identifying CCS opportunities within the PCOR Partnership region, and identifying technology providers and vendors with applications to CCS.
- Attended CMG's 37th Technical Symposium held June 13–14, 2016, in Calgary, Alberta, Canada. Presented on Bell Creek simulation and history matching in a presentation entitled "A Systematic Simulation Study of CO_2 Flooding in the Bell Creek Oil Field."
- Attended the American Rock Mechanics Symposium (ARMA) in Houston, Texas, June 26–29, 2016, as well as workshops June 24–25, 2016.

- Worked on planning a logging workshop. This workshop will be led by Schlumberger at the EERC and will include logging tools, applications, principles, processing, and interpretation.
- With regard to DOE BPMs:
  - Upon request from the NETL review, revised a figure caption related to a sidebar provided for the DOE MVA BPM.
  - DOE Operating Carbon Storage Projects BPM:
    - Submitted final revisions to the BPM lead on April 1, 2016.
    - Submitted cover photo selections to the BPM lead on June 15, 2016.
- Continued modification of the outline on D51, the PCOR Partnership MVA BPM (Monitoring for CO_2 Storage and CO_2 EOR):
- Continued revision of D66 (Bell Creek Test Site – Simulation Report [Update 4]) based on comments from Denbury, including oil–water relative permeability curves, discussion of liquid–gas relative permeability hysteresis effect, sweep efficiency, and seismic description.
- Continued work on the LCA of oil produced during EOR compared with oil produced conventionally:
  - Submitted a list of requested values to Denbury regarding the Lost Cabin Gas Plant and the Bell Creek Field. These values, if available, will improve the accuracy of the LCA of Bell Creek Field oil production via EOR. Delivery of the requested data is pending availability, compilation, and release from Denbury.
  - Collected information for the Bell Creek Field-specific LCA models.
  - Worked with the internal outreach group to prepare a Web page for the LCA spreadsheet model to place on the public PCOR Partnership Web site. Work conducted using this model was presented in the IJGGC article published on June 21, 2016. An overview tab was added to the spreadsheet to give basic information about the model and include the EERC disclaimer and DOE acknowledgment and disclaimer.
- Worked on fluid characterization and equation of state (EOS) data requested from the editor of the minimum miscibility pressure (MMP) paper submitted to *Energy & Fuels*. The paper submitted is entitled "Rapid and Simple Capillary-Rise/Vanishing Interfacial Tension Method to Determine Crude Oil Minimum Miscibility Pressure: Pure and Mixed CO_2, Methane, and Ethane." The authors include Steven B. Hawthorne, David J. Miller, Lu Jin, and Charles D. Gorecki. The paper provides a simplification of the capillary-rise/vanishing interfacial tension method to measure MMP.
- Continued **Bell Creek** site activities, including the following:
  - Sent vendor agreement renewals to Denbury and Schlumberger through 2017.
  - As of March 31, 2016, ***corresponding to the end of BP4***, publicly available data were used to determine that ***cumulative total CO_2 gas injection were 4,863,587 metric tons***. This value represents the total gas volume injected, which includes purchase and recycle streams and is NOT corrected for a gas composition of approximately 98% CO_2.
  - As of March 31, 2016, ***corresponding to the end of BP4***, 3.034 million tonnes of total gas (composition of approximately 98% CO_2) had been purchased for injection into the Bell Creek Field, equating to an estimated ***2.979 million tonnes of CO_2 stored***.

– Used the most recent publicly available data to determine that cumulative total CO_2 gas injection is 5,058,454 metric tons through April 30, 2016. This value represents the total gas volume injected, which includes purchase and recycle streams and is NOT corrected for a gas composition of approximately 98% CO_2 (Table 5).

Table 5. Bell Creek CO_2 Gas Injection Totals for April 2016 (cumulative totals May 2013 to April 2016)[1]

	April 2016 Injection
Total, Mscf	3,751,764
Total, U.S. tons[2]	214,595
Total, metric tons[2]	194,866
Cumulative Total, Mscf[2]	97,390,408
Cumulative Total, U.S. tons[2,3]	5,570,578
Cumulative Total, metric tons[2,3]	5,058,454

Source: Montana Board of Oil and Gas (MBOG) database.

[1] There has been a lag in posting of injection/production volumes to the MBOG database. Total gas injection volumes are ***NOT CORRECTED*** for gas composition and include the combined purchased and recycled gas streams.

[2] This was calculated utilizing a conversion of 17.483 Mscf/U.S. ton and 19.253 Mscf/metric ton.

[3] Cumulative totals are for the period from May 2013 to the month listed.

– As of April 30, 2016, the most recent month of record, 3.100 million tonnes of total gas (composition of approximately 98% CO_2) has been purchased for injection into the Bell Creek Field, equating to an estimated 3.004 million tonnes of CO_2 stored (Table 6), with the difference comprising other trace gases in the purchase gas stream. A separate methodology from that used to calculate total gas injected was used to calculate a cumulative associated CO_2 storage volume estimate by correcting the gas purchase volume (approximately 98% CO_2) obtained from Denbury's custody transfer meter with gas compositional data.
– Held conference call with Denbury to review a first look at time-lapse InSAR data processing. Preliminary results for Bell Creek Phase 4 show promise. TRE Canada is working on methodology and interpretation of Bell Creek Phases 1–3. Results are anticipated to be provided to the EERC in July 2016.
– With regard to **modeling** and **simulation** efforts:
  ♦ Consistent progress since April 2011.
  ♦ Continued 4-D vertical seismic profile (VSP) analysis and interpretation, including adjustment to the horizons interpretation and generation of data slices of 4-D VSP differences and comparing 4-D VSP maps with 4-D surface seismic difference maps.
  ♦ Worked on seismic and well log interpretation for geologic modeling of Phases 3–5 of the Bell Creek Field.

Table 6. Cumulative Total Gas Purchased and Estimated Associated CO_2 Storage Volumes for the Bell Creek Field[1]

	April 2016 Gas Volume
Monthly Total Gas Purchased, MMscf[2]	1271
Monthly Total Gas Purchased, million tons[2]	0.073
Monthly Total Gas Purchased, million tonnes[2]	0.066
Cumulative Total Gas Purchased, MMscf[2,3]	59,689
Cumulative Total Gas Purchased, million tons[2,3]	3.414
Cumulative Total Gas Purchased, million tonnes[2,3]	3.100
Cumulative Total CO_2 Stored, MMscf[3,4]	58,604
Cumulative Total CO_2 Stored, million tons[3,4]	3.352
Cumulative Total CO_2 Stored, million tonnes[3,4]	3.044

[1] Conversion factors of 17.483 Mscf/ton and 19.253 Mscf/tonne were used to calculate volumes.
[2] Total gas purchased volumes are ***NOT CORRECTED*** for gas composition.
[3] Cumulative totals are for the period from May 2013 to the month listed.
[4] Total gas CO_2 stored volumes are ***CORRECTED*** for gas composition.

- ♦ Matched waterflooding history of Bell Creek Field Phase 3 in the regional model. The open boundary and sharp change of water injection rate made the matching process difficult as more uncertainties were involved in the process.
- ♦ Constructed and worked on a long-term CO_2 migration model at reservoir scale for the Bell Creek oil field based on the Version 2 geologic model with coarse cells. The purpose of the model is to see how CO_2 migrates in the reservoir over 5000 years. Started testing the two simulation cases focusing on gravity effect. Started running two simulation cases with different CO_2 storage amounts (8 and 15 million tons). Initial results show the overall migration is slow, with plume distribution controlled by the reservoir properties and structure.
- ♦ Initiated testing of several simulation cases on a new cluster node based on the Windows system versus the Linux system on the old node. Compared simulation speeds and found a notable improvement in speed of 25%. Reviewed and compared several simulation results from the simulation cluster.
- ♦ Discussed grid upscaling and sensitivity in CMG Builder with a representative from CMG.
- ♦ Worked on the CO_2 flooding simulation model for Bell Creek Phase 3, tuning simulation settings to improve the running speed. Successfully debugged issues during the CO_2 flooding stage in the simulation model.
- ♦ History-matched production and injection through April 2016.
- ♦ Processed CO_2 flooding data from November 2014 to January 2016 for the Bell Creek Phase 3 simulation model. The data will be used in Update 5 of the D66 Report "Bell Creek Test Site – Simulation Report" due August 31, 2016.

– With regard to **injection-phase seismic** efforts:

- ♦ Received processed Fall 2015 seismic monitor data from Denbury. The data cover part of the Bell Creek Phase 2 area and all of Bell Creek Phases 3–6.
- ♦ Continued passive seismic monitoring of 04-03 OW (observation well) using the borehole seismic array:
  - ▪ Near-continuous operation since May 22, 2013.

        - Two full hard drives were replaced and returned to the EERC from the Bell Creek Field.
- With regard to **injection-phase PNL** activities:
    - No activity.
- With regard to **injection-phase sampling** activities:
    - Travel for Bell Creek activities:
        - Traveled to Miles City, Montana, for fieldwork at the Bell Creek test site April 4–7, 2016. Distributed landowner packages for all groundwater-monitoring activities that occurred after August 2015.
        - Staff traveled to Gillette, Wyoming, to perform Bell Creek oil compositional monitoring during a sampling trip the week of May 16, 2016. Sampled Wells 56-14R, 05-06, 04-04, 28-02, 21-10, and 21-14. Four other wells were not sampled because of no production. Samples will continue to be collected every 5–6 weeks unless otherwise noted. A summary of all oil and CO_2 gas stream samples collected for analyses to date is provided in Table 7.

Table 7. Oil and CO_2 Gas Stream Sampling and Analyses

Stream(s)	Dates Sampled
Production: Oil[1]	Jan 2014, March 2014,[2] May 2014, June 2014, July 2014, Sept 2014, Oct 2014,[2] Jan 2015,[2,3] May 2015,[3,4] June 2015,[3] Nov 2015,[3,5] May 2016[6]
Production: CO_2 Gas[1]	Sept 2014,[2] Nov/Dec 2014, Jan 2015,[7] March 2015, July 2015
Purchase/Recycle: CO_2 Gas[8]	May 2014,[9] June 2014, July 2014, Sept 2014, Oct 2014, April 2015, July 2015, Sept 2015, Jan 2016

[1] Wells 56-14R, 32-02, and 05-06 unless otherwise noted.
[2] Wells 56-14R and 32-02 only.
[3] Samples collected but not analyzed.
[4] Wells 32-02 and 05-06 only.
[5] Wells 56-14R and 05-06 only.
[6] Wells 56-14R, 05-06, 04-04, 28-02, 21-10, and 21-14.
[7] Well 05-06 only.
[8] Both purchase and recycle streams unless otherwise noted.
[9] Purchase stream only.

        - Staff traveled to Gillette, Wyoming, the week of May 23, 2016, for sample collection and site maintenance.
    - Continued reservoir pressure and distributed temperature monitoring of 05-06 OW from the permanent downhole monitoring (PDM) system using the casing-conveyed pressure–temperature gauges (PTGs) and fiber-optic distributed temperature system (DTS):
        - Operation has been near-continuous since April 2012.
        - All systems are fully operational.
    - Continued "miscible"-phase sampling of Bell Creek crude oil at various conditions.

- ♦ Collected 21 soil gas sample bags and associated field readings at ten soil gas profile stations in the Bell Creek Field on May 24, 2016. Analyzed and processed data.
- ♦ Collected field readings from the two Fox Hills groundwater-monitoring wells during the May 25, 2016, sampling event. Analyzed and processed data.
- ♦ Final landowner packages have been printed for distribution to landowners. Key summaries, landowner letters, and consistent formatting are provided for each landowner. A Denbury representative has approved the packages for distribution, which will occur in the coming weeks.

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- Completion of the Bell Creek Field-specific LCA models is delayed until the requested data are received from Denbury.
- The Borehole Seismic Array's Linux computer, which controls the data-recording media, stopped responding and failed to boot when the operating system disk filled up with data records written to it instead of to the normal recording media. This matter was discovered and repaired the week of April 4, 2016.
- Removal of the borehole seismic array's Linux computer from the rack during computer repair the week of April 4, 2016, resulted in a loose connection with the global positioning system (GPS) antenna, which could result in an inability to collect data or control the system remotely. On May 25, 2016, the Linux computer was raised by putting it on blocks, removing any stress applied to the antenna cable. This temporary fix appears to be holding up well.
- Following the elimination of D53 "Fort Nelson Test Site – Best Practices Manual – Monitoring for CO_2 Storage in a Brine Formation" from the scope of work, it was proposed to use D100 "Fort Nelson Test Site – Best Practices Manual – Feasibility Study" as satisfaction for the completion of IEAGHG 2011 PCOR Partnership Peer Review Milestone R4, due March 31, 2016. Additionally, it was proposed to use the publication of the RCSP BPMs as satisfaction for the completion of IEAGHG 2011 PCOR Partnership Peer Review Milestone R6, due September 2017. Final word has not been received from DOE.
- The distribution of the final landowner packages and a release document for the Fox Hills monitoring was delayed to ensure the review and approval process was complete.

Task 10 – Site Closure

This task was initiated in Project Year 9, Quarter 3, BP5 Year 1 (April 2016).

Significant accomplishments for Task 10 for the reporting period included the following:

- No activity this quarter.

Task 11 – Postinjection Monitoring and Modeling

This task was initiated in Project Year 9, Quarter 3, BP5 Year 1 (April 2016).

Significant accomplishments for Task 11 for the reporting period included the following:

- No activity this quarter.

Task 12 – Project Assessment

Significant accomplishments for Task 12 for the reporting period included the following:

- No activity this quarter.

Task 13 – Project Management

Significant accomplishments for Task 13 for the reporting period included the following:

- Petro Harvester Oil & Gas, LLC; Red Trail Energy, LLC; Tundra Oil and Gas; and General Electric Global Research Oil & Gas Technology Center joined the PCOR Partnership as paying members.
- Attended the 2016 Midwest Carbon Sequestration Science Conference in Champaign, Illinois, May 16–17, 2016. The Midwest Geological Sequestration Consortium (MGSC), the Sequestration Training and Education Program (STEP), and Schlumberger Carbon Services hosted the knowledge-sharing event focused on accomplishments at the Illinois Basin – Decatur Project in Decatur, Illinois. The PCOR Partnership program manager presented a "Lessons Learned" PowerPoint presentation in a panel discussion.
- Attended WBPC held May 24–26, 2016, in Bismarck, North Dakota. Presented work performed under multiple tasks.
- Attended and presented at the 5th U.S.–China Symposium on CO_2 Emission Control held in Hangzhou, China, June 5–7, 2016. The PCOR Partnership program manager and a researcher attended this conference and presented. The presentation gave an overview of the PCOR Partnership's CO_2 storage activities.
- Presented an overview of the PCOR Partnership program in a presentation entitled "The Plains CO_2 Reduction (PCOR) Partnership: Guiding CCS Deployment in Central North America" at the Annual CCUS Conference held June 14–16, 2016, in Tysons, Virginia.
- Presented an update of the PCOR Partnership to Andrea McNemar during her visit to the EERC on June 21, 2016.
- Attended the 2016 Carbon Sequestration Leadership Forum (CSLF) Mid-Year Meeting held June 27–30, 2016, in London, United Kingdom.
- Received confirmation that nine PCOR Partnership abstracts have been accepted for GHGT-13. One was withdrawn, as it was accepted as a poster; therefore, eight will be presented.
- Reviewed and commented on the current draft of the DOE Simulation and Risk Assessment BPM. The comments were submitted to DOE on April 1, 2016, along with text for specific sections of the document as requested. A second request for comments

and additional text was received from the authors of the BPM. The document was reviewed and comments provided by the requested due date of April 27, 2016.

- Provided suggestions for cover images for the DOE Simulation and Risk Assessment BPM. These were sent to the DOE points of contact for this document.
- Participated in a DOE BPM synergy Webinar on April 21, 2016. Discussions included the remaining text needs and time line to complete the documents.
- Worked on D102 – Adaptive Management Approach BPM, including the following:
  - Revised the document outline.
  - Held several phone calls with a consultant from CETER to discuss the outline and vision for the document.
  - Prepared a draft document of definitions, which is under internal review.
- Held the PCOR Partnership Technical Advisory Board (TAB) meeting April 5–6, 2016, in New Orleans, Louisiana. Topics discussed included ongoing work at the Bell Creek and Aquistore projects, outreach activities (including Bell Creek documentaries), BPMs, and the concept of a PCOR Partnership regional vision for inclusion in the next version of the atlas. TAB members in attendance included James Erdle, Lynn Helms, Ray Hattenbach, Steve Melzer, Neil Wildgust, Stefan Bachu, and Bill Jackson. Mike Jones, while not able to attend the meeting in person, was able to participate in the discussion on April 6, 2016, via phone. Other meeting attendees included Dave Nakles (facilitator) and EERC personnel Charles Gorecki, Jim Sorensen, Ed Steadman, John Harju, and Scott Ayash.
- Held a task leader meeting April 14, 2016. Topics discussed included the BP5 award; recently submitted journal articles; the TAB meeting held April 5–6, 2016; upcoming conference participation; Bell Creek and Aquistore project updates; recent interest in PCOR Partnership membership; and task leader updates.
- Held a task leader meeting May 3, 2016. Topics discussed included hiring and interviewing additional personnel, Bell Creek and Aquistore project updates, upcoming conferences and meetings, and individual task leader updates. Also discussed was the continued commercial interest in PCOR Partnership membership; three companies were discussing membership at the time of the task leader meeting.
- Continued planning the 2016 PCOR Partnership Annual Membership Meeting and Workshop. The workshop will be held September 13, 2016, and the annual meeting will be held September 14–15, 2016, in Grand Forks, North Dakota. Planning activities included the following:
  - The meeting Web site went live May 16, 2016 (http://www.undeerc.org/PCOR16/). sent an e-mail blast on May 18, 2016, announcing that registration is open.
  - Discussed topics including potential speakers, agenda, workshop topic, evening events, and sponsors.
- Responded to a partner's request regarding information on the PCOR Partnership Terrestrial Field Validation Test.
- Deliverables and milestones completed in April:
  - March monthly update
  - Task 13: D58/D59 – Quarterly Progress Report/Milestone Quarterly Report
- Deliverables and milestones completed in May:
  - April monthly update
  - Task 2: D17 – General Phase III Information PowerPoint Presentation (Update 7)

  - Task 9: M57 – Life Cycle Analysis for Primary and Secondary Enhanced Oil Recovery at the Bell Creek Field Completed
  - Task 14: D101 – Water Working Group Web Site Content Update
- Deliverables and milestones completed in June:
  - May monthly update

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- All activities are on schedule, and there were no problems or delays during the reporting period.

Task 14 – RCSP WWG Coordination

Significant accomplishments for Task 14 for the reporting period included the following:

- Submitted D101 entitled "Water Working Group Web Site Content Update" on May 31, 2016. Received approval on June 1, 2016.
- Created a draft outline for D107 (Journal Article or Topical Report – Major Research Focuses for Water and CCS).
- With regard to the Special Issue of IJGGC on the "Nexus of Water and Carbon Capture and Storage":
  - Made a formal agreement with Elsevier to complete the IJGGC Special Issue as a digital version.
  - Assigned reviewers to all three remaining papers.
  - Continued reviews and returned submissions to authors for revision as needed.
  - Reviewed revised submissions.
  - Discussed progress of reviews and the overview paper with a consultant from CETER. Provided comments.
  - Discussed and made revisions to the introductory manuscript with a consultant from CETER.
- Held quarterly conference call on April 27, 2016. The following topics were dicussed:
  - Update on status of Special Issue and associated submissions.
  - Goals for the upcoming year.
  - Potential ideas for the WWG Annual Meeting.
- Continued discussions with a consultant from CETER regarding the status of remaining submissions for the IJGGC Special Issue, the April conference call, and options for the WWG Annual Meeting.
- Discussed WWG activities with Andrea McNemar during her visit to the EERC on June 21, 2016.
- With regard to the WWG Annual Meeting:
  - Continued annual meeting agenda development.
  - Discussed potential ideas with Andrea McNemar.
  - Selected August 17, 2016, at the Sheraton Station Square in Pittsburgh, Pennsylvania, as a side meeting during NETL's 2016 Mastering the Subsurface Through Technology

Innovation and Collaboration: Carbon Storage and Oil and Natural Gas Technologies Review Meeting to be held August 16–18, 2016.
- Began development of agenda, meeting announcements, and signage.
- Discussed plans and potential visitors and presenters with a consultant from CETER.

Actual or anticipated problems, delays, or changes during the reporting period included the following:

- The IJGGC Special Issue has been converted into a "Virtual Special Issue," which will include the manuscripts submitted for this issue as well as previously published works focused on CCS and water issues. This decision also allows for the inclusion of three submitted manuscripts originally judged being a poor fit with the Special Issue's focus. The PCOR Partnership team is working with the authors and various reviewers to complete the revision process for all the remaining manuscripts and complete the virtual special issue by December 31, 2016.

Task 15 – Further Characterization of the Zama Acid Gas EOR, CO_2 Storage, and Monitoring Project

This task ended Quarter 2, BP4, Year 7 (February 2014).

Task 16 – Characterization of the Basal Cambrian System

This task ended Quarter 2, BP4, Year 7 (March 2014).

PHASE III COST STATUS

The approved BP5 (Modification No. 34) budget along with actual costs incurred and in-kind cost share reported are shown in Table 8. A spending plan for BP5 and actual incurred cost by quarter of cash funds for BP5 are provided in Figure 10 and Table 9.

Table 8. Phase III Budget – BP5

Organization	Approved Budget,* $	Actual Costs Incurred, $
DOE Share – Cash	9,668,307	1,497,211
Nonfederal Share	5,711,194	5,576,229
Total	15,379,501	7,073,440

*As of Modification No. 34.

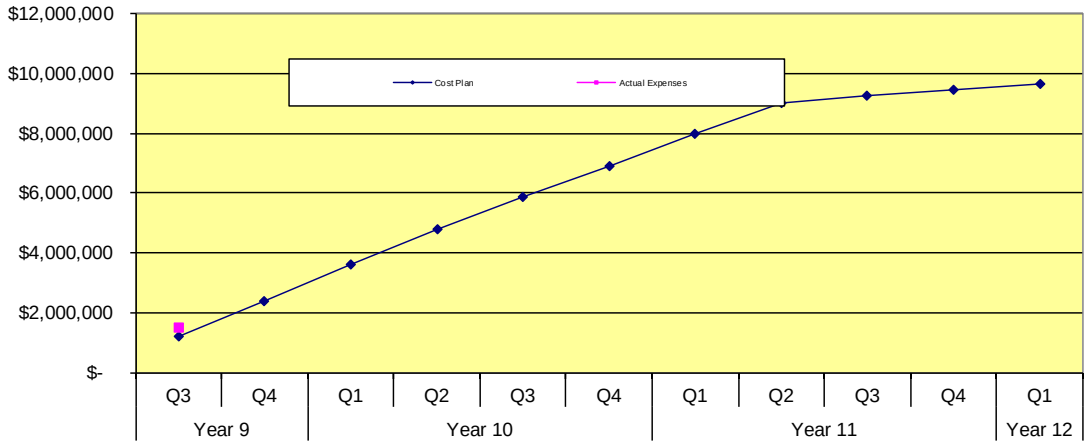


Figure 10. PCOR Partnership Phase III, BP5, Years 9–12 funding (cash only).

PHASE III SCHEDULE STATUS

Table 10 lists all deliverables and milestones by quarter, with completion dates, through the end of the reporting period (see Table 11 for the Gantt chart for BP5, Years 9–12).

Table 9. Phase III, BP5, Years 9–12 Spending Plan

Budget Period 4 | Budget Period 5

Baseline Reporting Quarter	Year 9								Year 10							
	Q1		Q2		Q3		Q4		Q1		Q2		Q3		Q4	
	Q1	Cum. BP Total	Q2	Cum. BP Total	Q3	Cum. BP Total	Q4	Cum. BP Total	Q1	Cum. BP Total	Q2	Cum. BP Total	Q3	Cum. BP Total	Q4	Cum. BP Total
Baseline Cost Plan																
Federal Share	$ 2,250,000	$ 62,873,437	$ 2,250,000	$ 65,123,437	$ 1,202,894	$ 1,202,894	$1,202,894	$ 2,405,788	$1,202,894	$ 3,608,682	$ 1,202,895	$ 4,811,577	$1,054,846	$ 5,866,423	$1,054,846	$ 6,921,269
Nonfederal Share	$ -	$ 2,411,971	$ -	$ 2,411,971	$ -	$ 2,411,971	$ -	$ 2,411,971	$ -	$ 2,411,971	$ -	$ 2,411,971	$ -	$ 2,411,971	$ -	$ 2,411,971
Total Planned	$ 2,250,000	$ 65,285,408	$ 2,250,000	$ 67,535,408	$ 1,202,894	$ 3,614,865	$1,202,894	$ 4,817,759	$1,202,894	$ 6,020,653	$ 1,202,895	$ 7,223,548	$1,054,846	$ 8,278,394	$1,054,846	$ 9,333,240
Actual Incurred Cost																
Federal Share	$ 1,909,898	$ 57,914,662	$ 2,562,356	$ 60,477,018	$ 1,497,211	$ 1,497,211										
Nonfederal Share	$ (4,110)	$ 2,991,641	$ 10,655	$ 3,002,296	$ 7,501	$ 7,501										
Total Incurred Cost	$ 1,905,788	$ 60,906,303	$ 2,573,011	$ 63,479,314	$ 1,504,712	$ 1,504,712										
Variance																
Federal Share	$ 340,102	$ 4,958,775	$ (312,356)	$ 4,646,419	$ (294,317)	$ (294,317)										
Nonfederal Share	$ 4,110	$ (579,670)	$ (10,655)	$ (590,325)	$ (7,501)	$ 2,404,470										
Total Variance	$ 344,212	$ 4,379,105	$ (323,011)	$ 4,056,094	$ (301,818)	$ 2,110,153										

Budget Period 5

Baseline Reporting Quarter	Year 11								Year 12							
	Q1		Q2		Q3		Q4		Q1							
	Q1	Cum. BP Total	Q2	Cum. BP Total	Q3	Cum. BP Total	Q4	Cum. BP Total	Q1	Cum. BP Total						
Baseline Cost Plan																
Federal Share	$ 1,054,846	$ 7,976,115	$ 1,054,846	$ 9,030,961	$ 212,449	$ 9,243,410	$ 212,449	$ 9,455,859	$ 212,448	$ 9,668,307						
Nonfederal Share	$ -	$ 2,411,971	$ -	$ 2,411,971	$ -	$ 2,411,971	$ -	$ 2,411,971	$ -	$ 2,411,971						
Total Planned	$ 1,054,846	$ 10,388,086	$ 1,054,846	$ 11,442,932	$ 212,449	$11,655,381	$ 212,449	$11,867,830	$ 212,448	$12,080,278						
Actual Incurred Cost																
Federal Share	$ -	$ -	$ -	$ -												
Nonfederal Share	$ -	$ -	$ -	$ -												
Total Incurred Cost	$ -	$ -	$ -	$ -												
Variance																
Federal Share	$ -	$ -	$ -	$ -												
Nonfederal Share	$ -	$ -	$ -	$ -												
Total Variance	$ -	$ -	$ -	$ -												

Table 10. Phase III Milestones and Deliverables

Title/Description	Due Date	Actual Completion Date
Year 1 – Quarter 1 (October–December 2007)		
D37: Task 4 – Fort Nelson Test Site – Geological Characterization Experimental Design Package	12/31/07	12/28/07
D63: Task 13 – Project Management Plan	12/31/07	12/28/07
M17: Task 4 – Fort Nelson Test Site Selected	12/31/07	12/28/07
Year 1 – Quarter 2 (January–March 2008)		
D38: Task 4 – Fort Nelson Test Site – Geomechanical Experimental Design Package	1/31/08	1/31/08
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/08	1/31/08
D11: Task 2 – Outreach Plan	3/31/08	3/31/08
D27: Task 3 – Environmental Questionnaire – Fort Nelson Test Site	3/31/08	4/02/08
D30: Task 4 – Williston Basin Test Site – Geomechanical Experimental Design Package	3/31/08	3/31/08
M1: Task 1 – Three Target Areas Selected for Detailed Characterization	3/31/08	3/20/08
M18: Task 4 – Fort Nelson Test Site Geochemical Work Initiated	3/31/08	3/19/08
Year 1 – Quarter 3 (April–June 2008)		
D14: Task 2 – General Phase III Fact Sheet	4/30/08	4/30/08
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/08	4/30/08
D17: Task 2 – General Phase III Information PowerPoint Presentation	5/30/08	5/30/08
M3: Task 3 – Start Environmental Questionnaire for Williston Basin Test Site	6/30/08	6/27/08
M6: Task 4 – Williston Basin Test Site Geochemical Work Initiated	6/30/08	6/30/08
M7: Task 4 – Williston Basin Test Site Geological Characterization Data Collection Initiated	6/30/08	6/30/08
Year 1 – Quarter 4 (July–September 2008)		
D12: Task 2 – Demonstration Web Pages on the Public Site	7/31/08	7/31/08
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/08	7/31/08
D1: Task 1 – Review of Source Attributes	9/30/08	9/26/08
M2: Task 1 – Demonstration Project Reporting System (DPRS) Prototype Completed	9/30/08	9/26/08
Year 2 – Quarter 1 (October–December 2008)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/08	10/31/08
D20: Task 2 – Documentary Support to PowerPoint and Web Site	12/31/08	12/31/08
D57: Task 12 – Project Assessment Annual Report	12/31/08	12/31/08

Continued . . .

Table 10. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 2 – Quarter 2 (January–March 2009)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/09	1/30/09
M21: Task 14 – Outline of White Paper on Nexus of CO_2 CCS and Water, Part Subtask 14.2 – White Paper on Nexus of CCS and Water	2/28/09	2/27/09
D24: Task 2 – PCOR Partnership Region Sequestration General Poster	3/31/09	3/31/09
Year 2 – Quarter 3 (April–June 2009)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/09	4/30/09
M23: Task 14 – Monthly WWG Conference Call Held	4/30/09	4/15/09
D2: Task 1 – First Target Area Completed	5/29/09	5/29/09
M23: Task 14 – Monthly WWG Conference Call Held	5/29/09	5/29/09
D16: Task 2 – Fort Nelson Test Site Fact Sheet	5/29/09	5/29/09
M24: Task 14 – WWG Annual Meeting Held	5/31/09	5/07/09
M23: Task 14 – Monthly WWG Conference Call Held	6/30/09	6/25/09
Year 2 – Quarter 4 (July–September 2009)		
M23: Task 14 – Monthly WWG Conference Call Held	Not applicable	Not required
D19: Task 2 – Fort Nelson Test Site PowerPoint Presentation	7/31/09	7/31/09
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/09	7/31/09
M22: Task 14 – Draft White Paper – Nexus of CCS and Water Available for Comments	8/17/09	8/18/09 (DOE) 8/21/09 (WWG)
M23: Task 14 – Monthly WWG Conference Call Held	8/31/09	8/25/09
D1: Task 1 – Review of Source Attributes	9/30/09	9/25/09
D3: Task 3 – Permitting Review – One State and One Province	9/30/09	9/30/09
D9: Task 1 – Updated DSS	9/30/09	9/29/09
D47: Task 6 – Report on the Preliminary Design of Advanced Compression Technology	9/30/09	9/30/09
D77: Task 13 – Risk Management Plan Outline	9/30/09	9/18/09
M4: Task 4 – Bell Creek Test Site Selected	9/30/09	9/30/09
M5: Task 4 – Bell Creek Test Site – Data Collection Initiated	9/30/09	9/30/09
M23: Task 14 – Monthly WWG Conference Call Held	9/30/09	9/22/09

Continued . . .

Table 10. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 3 – Quarter 1 (October–December 2009)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/30/09	11/02/09
D78: Task 14 – Final White Paper on the Nexus of CCS and Water	10/30/09	10/28/09
M23: Task 14 – Monthly WWG Conference Call Held	10/31/09	10/26/09
M23: Task 14 – Monthly WWG Conference Call Held	11/30/09	11/16/09
D57: Task 12 – Project Assessment Annual Report	12/31/09	12/31/09
M23: Task 14 – Monthly WWG Conference Call Held	12/31/09	Waived by DOE
Year 3 – Quarter 2 (January–March 2010)		
D13: Task 2 – Public Site Updates	1/15/10	1/15/10
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/10	1/29/10
M23: Task 14 – Monthly WWG Conference Call Held	1/31/10	1/6/10
D79: Task 14 – Water Resource Estimation Methodology Document	2/28/10	Waived by DOE
M23: Task 14 – Monthly WWG Conference Call Held	2/28/10	2/25/10
D11: Task 2 – Outreach Plan	3/31/10	3/31/10
M23: Task 14 – Monthly WWG Conference Call Held	3/31/10	3/23/10
Year 3 – Quarter 3 (April–June 2010)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/10	4/30/10
M23: Task 14 – Monthly WWG Conference Call Held	4/30/10	4/28/10
M23: Task 14 – Monthly WWG Conference Call Held	5/31/10	5/13/10
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	6/30/10	6/30/10
D19: Task 2 – Fort Nelson Test Site PowerPoint Presentation (update)	6/30/10	6/29/10
M23: Task 14 – Monthly WWG Conference Call Held	6/30/10	6/23/10
M24: Task 14 – WWG Annual Meeting Held	6/30/10	5/13/10
Year 3 – Quarter 4 (July–September 2010)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/10	7/29/10
M23: Task 14 – Monthly WWG Conference Call Held	7/31/10	7/28/10
M23: Task 14 – Monthly WWG Conference Call Held	8/31/10	8/31/10
D1: Task 1 – Review of Source Attributes	9/30/10	9/20/10
D52: Task 9 – Fort Nelson Test Site – Site Characterization, Modeling, and Monitoring Plan	9/30/10	9/30/10
M9: Task 4 – Bell Creek Test Site Geological Model Development Initiated	9/30/10	9/30/10
M23: Task 14 – Monthly WWG Conference Call Held	9/30/10	Waived by DOE

Continued . . .

Table 10. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 4 – Quarter 1 (October–December 2010)		
D87: Task 4 – Bell Creek Test Site – Geomechanical Experimental Design Package	10/30/10	10/29/10
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/10	10/29/10
M23: Task 14 – Monthly WWG Conference Call Held	10/31/10	10/26/10
M23: Task 14 – Monthly WWG Conference Call Held	11/30/10	Waived by DOE
D57: Task 12 – Project Assessment Annual Report	12/31/10	12/23/10
M23: Task 14 – Monthly WWG Conference Call Held	12/31/10	12/13/10
Year 4 – Quarter 2 (January–March 2011)		
M8: Task 4 – Bell Creek Test Site Wellbore Leakage Data Collection Initiated	1/15/11	1/14/11
D31: Task 4 – Bell Creek Test Site – Geological Characterization Experimental Design Package	1/31/11	1/27/11
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/11	1/31/11
M23: Task 14 – Monthly WWG Conference Call Held	1/31/11	1/19/11
M28: Task 4 – Bell Creek Geological Experimental Design Package Completed	1/31/11	1/27/11
D15: Task 2 – Bell Creek Test Site Fact Sheet	2/28/11	2/28/11
M23: Task 14 – Monthly WWG Conference Call Held	2/28/11	Waived by DOE
D10: Task 1 – Demonstration Project Reporting System Update	3/31/11	3/25/11
D18: Task 2 – Bell Creek Test Site PowerPoint Presentation (update)	3/31/11	3/31/11
D26: Task 2 – Fort Nelson Test Site Poster	3/31/11	3/31/11
D28: Task 3 – Environmental Questionnaire – Bell Creek Test Site	3/31/11	3/30/11
D85: Task 6 – Report – Opportunities and Challenges Associated with CO_2 Compression and Transportation During CCS Activities	3/31/11	3/31/11
M23: Task 14 – Monthly WWG Conference Call Held	3/31/11	3/22/11
Year 4 – Quarter 3 (April–June 2011)		
M30: Task 5 – Bell Creek Test Site Baseline MVA Initiated	4/01/11	3/24/11
M23: Task 14 – Monthly WWG Conference Call Held	4/30/11	4/21/11
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/11	4/29/11
D88: Task 13 – Programmatic Risk Management Plan	4/30/11	4/29/11
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/11	5/31/11
D34: Task 4 – Bell Creek Test Site – Baseline Hydrogeological Final Report	5/31/11	5/31/11

Continued . . .

Table 10. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 4 – Quarter 3 (April–June 2011) (continued)		
M23: Task 14 – Monthly WWG Conference Call Held	5/31/11	5/5/11
D19: Task 2 – Fort Nelson Test Site PowerPoint Presentation (update)	6/30/11	6/30/11
M23: Task 14 – Monthly WWG Conference Call Held	6/30/11	6/23/11
M24: Task 14 – WWG Annual Meeting Held	6/30/11	5/5/11
Year 4 – Quarter 4 (July–September 2011)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/11	7/28/11
M23: Task 14 – Monthly WWG Conference Call Held	7/31/11	7/26/11
D29: Task 3 – Permitting Action Plan	8/31/11	8/31/11
D66: Task 9 – Bell Creek Test Site – Simulation Report	8/31/11	8/31/11
D67: Task 9 – Fort Nelson Test Site – Simulation Report	7/31/11	8/31/11
M23: Task 14 – Monthly WWG Conference Call Held	8/31/11	8/24/11
D1: Task 1 – Review of Source Attributes	9/30/11	9/21/11
D4: Task 1 – Permitting Review – Basic EPA Requirements[+]	9/30/11	9/30/11
D9: Task 1 – Updated DSS	9/30/11	9/23/11
D25: Task 2 – Bell Creek Test Site Poster	9/30/11	9/30/11
D50: Task 9 – Bell Creek Test Site – Site Characterization, Modeling, and Monitoring Plan	9/30/11	9/30/11
M23: Task 14 – Monthly WWG Conference Call Held	9/30/11	Waived by DOE
M31: Task 9 – Bell Creek Test Site – Site Characterization, Modeling, and Monitoring Plan Completed	9/30/11	9/30/11
M33: Task 16 – Basal Cambrian Baseline Geological Characterization Completed	9/30/11	9/29/11
Year 5 – Quarter 1 (October–December 2011)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/11	10/31/11
M23: Task 14 – Monthly WWG Conference Call Held	10/31/11	10/26/11
M23: Task 14 – Monthly WWG Conference Call Held	11/30/11	11/30/11
D57: Task 12 – Project Assessment Annual Report	12/31/11	12/30/11
M23: Task 14 – Monthly WWG Conference Call Held	12/31/11	Waived by DOE
M34: Task 16 – Basal Cambrian Static Geological Model Completed	12/31/11	12/21/11

[+] Name change requested September 28, 2011, and approved October 3, 2011.

Continued . . .

Table 10. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 5 – Quarter 2 (January–March 2012)		
M16: Task 4 – Bell Creek Test Site – Initiation of Production and Injection Simulation	1/13/12	12/29/11
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/12	1/31/12
D65: Task 4 – Fort Nelson Test Site – Site Characterization Report	1/31/12	1/31/12
D81: Task 1 – Regional Carbon Sequestration Atlas (update)	1/31/12	1/31/12
M23: Task 14 – Monthly WWG Conference Call Held	1/31/12	1/19/12
M29: Task 4 – Fort Nelson Site Characterization Report Completed	1/31/12	1/31/12
D91: Task 16 – Report – Geological Characterization of the Basal Cambrian System in the Williston Basin	2/29/12	2/29/12
M23: Task 14 – Monthly WWG Conference Call Held	2/29/12	2/28/12
D5: Task 1 – Second Target Area Completed	3/31/12	3/30/12
D18: Task 2 – Bell Creek Test Site PowerPoint Presentation (update)	3/31/12	3/30/12
M10: Task 4 – Bell Creek Test Site Wellbore Leakage Data Collection Completed	3/31/12	3/12/12
M36: Task 13 – Annual Advisory Board Scheduled	3/31/12	3/28/12
M23: Task 14 – Monthly WWG Conference Call Held	3/31/12	3/27/12
Year 5 – Quarter 3 (April–June 2012)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/12	4/30/12
M23: Task 14 – Monthly WWG Conference Call Held	4/30/12	Waived by DOE
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/12	5/31/12
M23: Task 14 – Monthly WWG Conference Call Held	5/31/12	5/31/12
D19: Task 2 – Fort Nelson Test Site PowerPoint Presentation (update)	6/30/12	6/29/12
D41: Task 4 – Fort Nelson Test Site – Geochemical Report	6/30/12	6/29/12
D84: Task 6 – Report – A Phased Approach to Building Pipeline Network for CO_2 Transportation During CCS	6/30/12	6/29/12
M23: Task 14 – Monthly WWG Conference Call Held	6/30/12	6/28/12
M24: Task 14 – WWG Annual Meeting Held	6/30/12	5/3/12
M32: Task 4 – Fort Nelson Geochemical Report Completed	6/30/12	6/29/12

Continued . . .

Table 10. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 5 – Quarter 4 (July–September 2012)		
D13: Task 2 – Public Site Updates	7/31/12	7/31/12
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/12	7/31/12
D67: Task 9 – Fort Nelson Test Site – Simulation Report	7/31/12	7/31/12
M23: Task 14 – Monthly WWG Conference Call Held	7/31/12	7/24/12
D66: Task 9 – Bell Creek Test Site – Simulation Report	8/31/12	8/31/12
M23: Task 14 – Monthly WWG Conference Call Held	8/31/12	8/30/12
D1: Task 1 – Review of Source Attributes	9/30/12	9/28/12
D10: Task 1 – DPRS Update	9/30/12	9/28/12
M23: Task 14 – Monthly WWG Conference Call Held	9/30/12	9/27/12
Year 6 – Quarter 1 (October–December 2012)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/12	10/31/12
M23: Task 14 – Monthly WWG Conference Call Held	10/31/12	10/25/12
M23: Task 14 – Monthly WWG Conference Call Held	11/30/12	11/28/12
D57: Task 12 – Project Assessment Annual Report	12/31/12	12/28/12
M23: Task 14 – Monthly WWG Conference Call Held	12/31/12	Waived by DOE
Year 6 – Quarter 2 (January–March 2013)		
D32: Task 4 – Bell Creek Test Site – Geomechanical Final Report	1/31/13	1/31/13
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/13	1/31/13
M23: Task 14 – Monthly WWG Conference Call Held	1/31/13	1/16/13
D14: Task 2 – General Phase III Fact Sheet (update)	2/28/13	2/28/13
M23: Task 14 – Monthly WWG Conference Call Held	2/28/13	2/28/13
D85: Task 6 – Report – Opportunities and Challenges Associated with CO_2 Compression and Transportation During CCS Activities	3/31/13	Waived by DOE (journal article)
D89: Task 16 – Report – Geochemical Evaluation of the Basal Cambrian System	3/31/13	3/28/13
D99: Task 14 – Water/CCS Nexus-Related Fact Sheet	3/31/13	3/22/13
M23: Task 14 – Monthly WWG Conference Call Held	3/31/13	3/28/13
M36: Task 13 – Annual Advisory Board Meeting Scheduled	3/31/13	3/27/13

Continued . . .

Table 10. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 6 – Quarter 3 (April–June 2013)		
D15: Task 2 – Bell Creek Test Site Fact Sheet (update)	4/15/13	3/25/13
D16: Task 2 – Fort Nelson Test Site Fact Sheet (update)	4/30/13	Waived by DOE
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/13	4/30/13
M14: Task 4 – Bell Creek Test Site Geological Characterization Data Collection Completed	4/30/13	4/30/13
M23: Task 14 – Monthly WWG Conference Call Held	4/30/13	4/25/13
M35: Task 16 – Basal Cambrian Dynamic Capacity Estimation Completed	4/30/13	4/30/13
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/13	5/31/13
D43: Task 5 – Bell Creek Test Site – Monitoring Experimental Design Package	5/31/13	5/31/13
M23: Task 14 – Monthly WWG Conference Call Held	5/31/13	5/30/13
M27: Task 5 – Bell Creek Test Site – MVA Equipment Installation and Baseline MVA Activities Completed	5/31/13	5/31/13
M23: Task 14 – Monthly WWG Conference Call Held	6/30/13	6/27/13
M26: Task 9 – Bell Creek Test Site – CO_2 Injection Initiated	6/30/13	May 2013 – sent 6/25/13
M37: Task 3 – IOGCC Task Force Subgroup Meeting 2 Held	5/9/13	5/29/13
M42: Task 3 – Findings and Recommendations of the Operational and Postoperational Subgroups Presented to the Carbon Geologic Storage (CGS) Task Force	6/30/13	6/20/13 – sent 6/28/13
Year 6 – Quarter 4 (July–September 2013)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/13	7/31/13
D33: Task 4 – Bell Creek Test Site – Geochemical Final Report	7/31/13	7/31/13
M12: Task 4 – Bell Creek Test Site Geochemical Work Completed	7/31/13	7/31/13
M23: Task 14 – Monthly WWG Conference Call Held	7/31/13	7/25/13
D64: Task 4 – Bell Creek Test Site – Site Characterization Report	8/31/13	8/29/13
D66: Task 9 – Bell Creek Test Site – Simulation Report	8/31/13	8/30/13
D81: Task 1 – Regional Carbon Sequestration Atlas (update)	8/31/13	5/1/13
M23: Task 14 – Monthly WWG Conference Call Held	8/31/13	Waived by DOE

Continued . . .

Table 10. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 6 – Quarter 4 (July–September 2013) (continued)		
D1: Task 1 – Review of Source Attributes	9/30/13	9/5/13
D6: Task 3 – Permitting Review – Update 1	9/30/13	9/24/13
D48: Task 7 – Bell Creek Test Site – Procurement Plan and Agreement Report	9/30/13	9/24/13
D90: Task 16 – Report – Wellbore Evaluation of the Basal Cambrian System	9/30/13	9/5/13
D94:Task 2 – Aquistore Project Fact Sheet	9/30/13	9/30/13
D95: Task 2 – Aquistore Project Poster	9/30/13	9/30/13
D98: Task 3 – Report – Findings, Recommendations, and Guidance of CGS Task Force	9/30/13	8/30/13
M23: Task 14 – Monthly WWG Conference Call Held	9/30/13	9/30/13
M38: Task 3 – IOGCC Task Force Wrap-Up Meeting Held	9/30/13	8/16/13 – sent 9/5/13
M39: Task 3 – IOGCC Task Force Editing Subgroup Meeting Held	9/30/13	6/3/13 – sent 9/5/13
M40: Task 15 – Further Characterization of the Zama Acid Gas EOR, CO_2 Storage, and Monitoring Project Completed	9/30/13	9/24/13
Year 7 – Quarter 1 (October–December 2013)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/13	10/31/13
D42: Task 5 – Bell Creek Test Site – Injection Experimental Design Package	10/31/13	10/30/13
D99: Task 14 – Water–CCS Nexus-Related Fact Sheet	10/31/13	10/31/13
M23: Task 14 – Monthly WWG Conference Call Held	10/31/13	10/31/13
M23: Task 14 – Monthly WWG Conference Call Held	11/30/13	11/21/13
M23: Task 14 – Monthly WWG Conference Call Held	12/31/13	Waived by DOE
M24: Task 14 – WWG Annual Meeting Held	12/31/13	8/19/13
M43: Task 9 – Bell Creek Test Site – First Full-Repeat Sampling of the Groundwater-Soil Gas-Monitoring Program Completed	12/31/13	11/15/13 – sent 12/13/13
Year 7 – Quarter 2 (January–March 2014)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/14	1/31/14
D57: Task 12 – Project Assessment Annual Report	1/31/14	1/31/14
M23: Task 14 – Monthly WWG Conference Call Held	1/31/14	1/28/14
M41: Task 6 – Decision to Incorporate Ramgen Compression Technology into Bell Creek Project	1/31/14	1/29/14

Continued . . .

Table 10. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 7 – Quarter 2 (January–March 2014) (continued)		
D86: Task 15 – Updated Regional Implementation Plan for Zama	2/28/14	2/28/14
M23: Task 14 – Monthly WWG Conference Call Held	2/28/14	2/27/14
D24: Task 2 – PCOR Partnership Region Sequestration General Poster (update)	3/31/14	3/27/14
D36: Task 4 – Bell Creek Test Site – Wellbore Leakage Final Report	3/31/14	3/19/14
D92: Task 16 – Report – Storage Capacity and Regional Implications for Large-Scale Storage in the Basal Cambrian System	3/31/14	3/27/14
D93: Task 1 – Geological Modeling and Simulation Report for the Aquistore Project	3/31/14	3/25/14
D96: Task 4 – Bell Creek Test Site – 3-D Seismic and Characterization Report	3/31/14	3/27/14
M23: Task 14 – Monthly WWG Conference Call Held	3/31/14	3/25/14
M36: Task 13 – Annual Advisory Board Meeting Scheduled	3/31/14	3/4/14 – sent 3/25/14
M44: Task 9 – Bell Creek Test Site – First 3-D VSP Repeat Surveys Completed	3/31/14	3/1/14 – sent 3/25/14
Year 7 – Quarter 3 (April–June 2014)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/14	4/30/14
M23: Task 14 – Monthly WWG Conference Call Held	4/30/14	4/24/14
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/14	5/30/14
D101: Task14 – WWG Web Site Content Update	5/31/14	5/30/14
M23: Task 14 – Monthly WWG Conference Call Held	5/31/14	5/21/14
D44: Task 5 – Bell Creek Test Site – Drilling and Completion Activities Report	6/30/14	5/30/14
M23: Task 14 – Monthly WWG Conference Call Held	6/30/14	6/26/14
M45: Task 9 – Bell Creek Test Site – First Full-Repeat of Pulsed Neutron Logging Campaign Completed	6/30/14	6/9/14
M46: Task 9 – Bell Creek Test Site – 1 Year of Injection Completed	6/30/14	6/26/14

Continued…

Table 10. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 7 – Quarter 4 (July–September 2014)		
D13: Task 2 – Public Site Updates	7/31/14	7/29/14
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/14	7/31/14
M23: Task 14 – Monthly WWG Conference Call Held	7/31/14	7/17/14 WebEx
D66: Task 9 – Bell Creek Test Site – Simulation Report	8/31/14	8/27/14 Exec. Sum.
M23: Task 14 – Monthly WWG Conference Call Held	8/31/14	Waived by DOE
D1: Task 1 – Review of Source Attributes	9/30/14	9/24/14
D7: Task 1 – Third Target Area Completed	9/30/14	9/26/14
D93: Task 1 – Geological Modeling and Simulation Report for the Aquistore Project	9/30/14	9/30/14
D100: Task 9 – Fort Nelson Test Site – Best Practices Manual – Feasibility Study	9/30/14	9/30/14
M23: Task 14 – Monthly WWG Conference Call Held	9/30/14	9/30/14
Year 8 – Quarter 1 (October–December 2014)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/14	10/31/14
D99: Task 14 – Water/CCS Nexus-Related Fact Sheet	10/31/14	10/31/14
M23: Task 14 – Monthly WWG Conference Call Held	10/31/14	10/28/14
M48: Task 9 – Bell Creek Test Site – 1 Million Metric Tons of CO_2 Injected	10/31/14	10/29/14
M23: Task 14 – Monthly WWG Conference Call Held	11/30/14	11/25/14
D57: Task 12 – Project Assessment Annual Report	12/31/14	12/30/14
M24: Task 14 – WWG Annual Meeting Held	12/31/14	8/11/14
Year 8 – Quarter 2 (January–March 2015)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/15	1/30/15
D32: Task 4 – Bell Creek Test Site – Geomechanical Report (Update 1)	1/31/15	1/28/15
M23: Task 14 – Monthly WWG Conference Call Held	1/31/15	1/27/15
M23: Task 14 – Monthly WWG Conference Call Held	2/28/15	2/26/15
D25: Task 2 – Bell Creek Test Site Poster (update)	3/31/15	2/5/15
M23: Task 14 – Monthly WWG Conference Call Held	3/31/15	3/25/15
M36: Task 13 – Annual Advisory Board Meeting Scheduled	3/31/15	3/31/15

Continued . . .

Table 10. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 8 – Quarter 3 (April–June 2015)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/15	4/29/15
M23: Task 14 – Monthly WWG Conference Call Held	4/30/15	4/28/15
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/15	6/1/15
M23: Task 14 – Monthly WWG Conference Call Held	5/30/15	5/28/15
D85: Task 6 – Report – Opportunities and Challenges Associated with CO_2 Compression and Transportation During CCUS (carbon capture, utilization, and storage) Activities (update)	5/31/15	5/29/15
M23: Task 14 – Monthly WWG Conference Call Held	6/30/15	6/23/15
M49: Task 9 – Bell Creek Test Site – 1.5 Million Metric Tons of CO_2 Injected	6/30/15	6/30/15
Year 8 – Quarter 4 (July–September 2015)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/15	7/31/15
M23: Task 14 – Monthly WWG Conference Call Held	7/31/15	Waived by DOE
M50: Task 9 – Bell Creek Test Site – 2 Years of Near-Surface Assurance Monitoring Completed	7/31/15	7/21/15
D66: Task 9 – Bell Creek Test Site – Simulation Report	8/31/15	8/27/15 Exec. Sum.
M23: Task 14 – Monthly WWG Conference Call Held	8/31/15	Waived by DOE
M51: Task 9 – Bell Creek Test Site – Initial Analysis for First Large-Scale Repeat Pulsed-Neutron Logging Campaign Post-Significant CO_2 Injection Completed	8/31/15	8/31/15
D1: Task 1 – Review of Source Attributes (update)	9/30/15	9/23/15
D8: Task 3 – Permitting Review – Update 2	9/30/15	9/30/15
D49: Task 8 – Bell Creek Test Site – Transportation and Injection Operations Report	7/31/15	9/29/15
M23: Task 14 – Monthly WWG Conference Call Held	9/30/15	9/30/15
Year 9 – Quarter 1 (October–December 2015)		
D59/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/15	10/31/15
M23: Task 14 – Monthly WWG Conference Call Held	10/31/15	10/29/15
M23: Task 14 – Monthly WWG Conference Call Held	11/30/15	Waived by DOE
D57: Task 12 – Project Annual Assessment Report	12/31/15	12/31/15
M24: Task 14 – WWG Annual Meeting Held	12/31/15	8/20/15
M53: Task 9 – Expanded Baseline and Time-Lapse 3-D Surface Seismic Survey Completed	12/31/15	12/17/15

Continued . . .

Table 10. Phase III Milestones and Deliverables (continued)

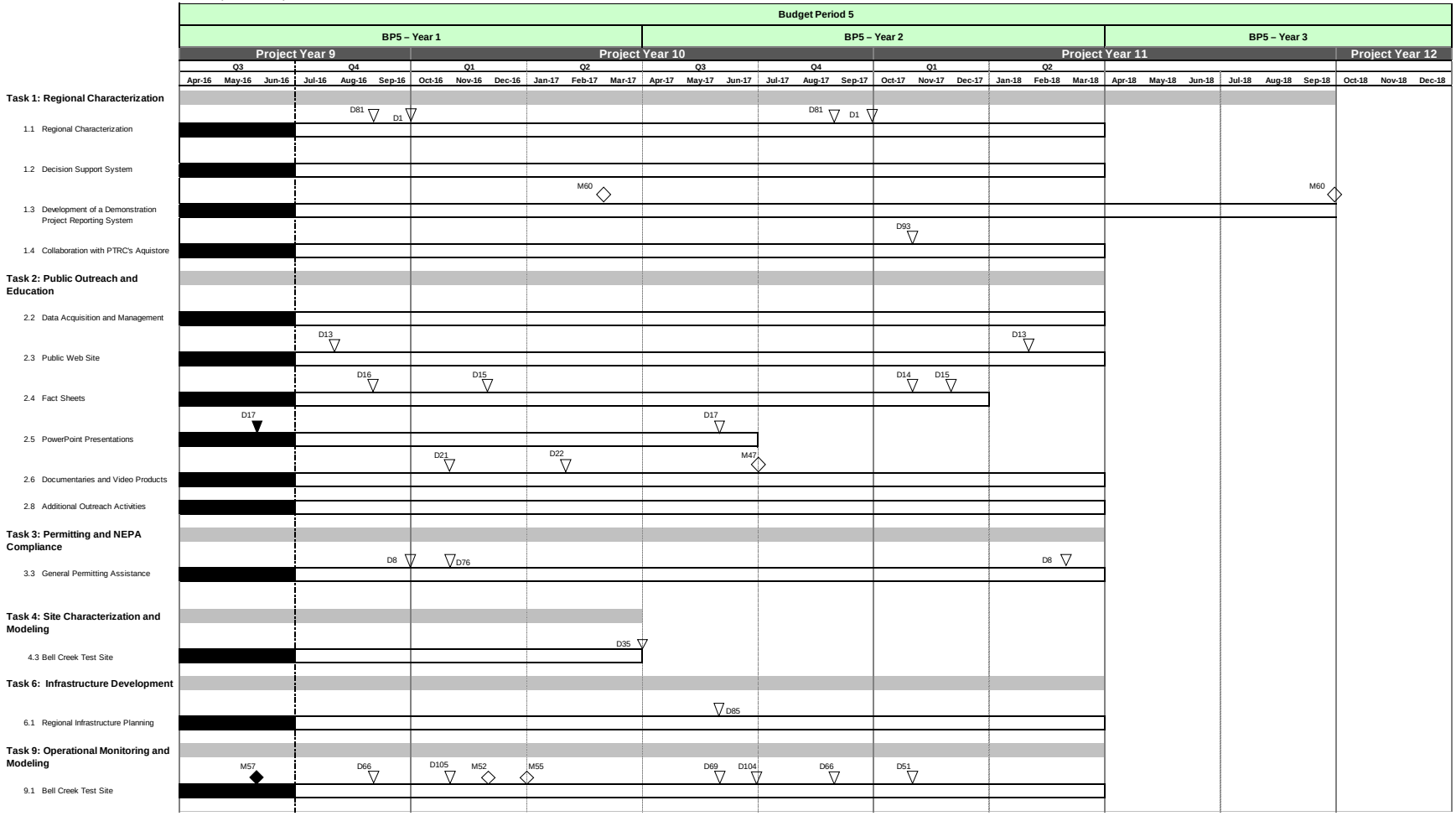
Title/Description	Due Date	Actual Completion Date
Year 9 – Quarter 2 (January–March 2016)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/16	1/31/16
M23: Task 14 – Monthly WWG Conference Call Held	1/31/16	1/27/16
M54: Task 9 – Initial Processing and Analysis of Historic InSAR Data Completed	1/31/16	1/26/16
D14: Task 2 – General Phase III Fact Sheet (update)	2/29/16	2/26/16
D93: Task 1 – Geological Modeling and Simulation Report for the Aquistore Project (Update 2)	2/29/16	2/29/16
M23: Task 14 – Monthly WWG Conference Call Held	2/29/16	Waived by DOE
D11: Task 2 – Outreach Plan (update)	3/31/16	3/28/16
D45: Task 6 – Bell Creek Test Site – Infrastructure Development Report	3/31/16	3/31/16
M23: Task 14 – Monthly WWG Conference Call Held	3/31/16	Waived by DOE
M36: Task 13 – Annual Advisory Board Meeting Scheduled	3/31/16	3/31/16
M56: Task 9 – Life Cycle Analysis for Primary and Secondary Recovery Oil Completed	3/31/16	3/31/16
M58: Task 9 – Bell Creek Test Site – Completion of 2.75 Million Metric Tons of CO_2 Stored	3/31/16	3/22/16
Year 9 – Quarter 3 (April–June 2016)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/16	4/29/16
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/16	5/31/16
D101: Task 14 – WWG Web Site Content Update 1	5/31/16	5/31/16
M57: Task 9 – Life Cycle Analysis for EOR (enhanced oil recovery) at the Bell Creek Field Completed	5/31/16	5/26/16
M23: Task 14 – Monthly WWG Conference Call Held	6/30/16	4/27/16
Year 9 – Quarter 4 (July–September 2016)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/16	
D13: Task 2 – Public Site Updates	7/31/16	
D16: Task 2 – Fort Nelson Test Site Fact Sheet (Update)	8/31/16	
D66: Task 9 – Bell Creek Test Site – Simulation Report (update)	8/31/16	
D81: Task 1 – Regional Carbon Sequestration Atlas (update)	8/31/16	
D102: Task 13 – Best Practices Manual – Adaptive Management Approach	8/31/16	
M59: Task 9 – Completed the PCOR Partnership Adaptive Management Approach Best Practices Manual	8/31/16	

Continued . . .

Table 10. Phase III Milestones and Deliverables (continued)

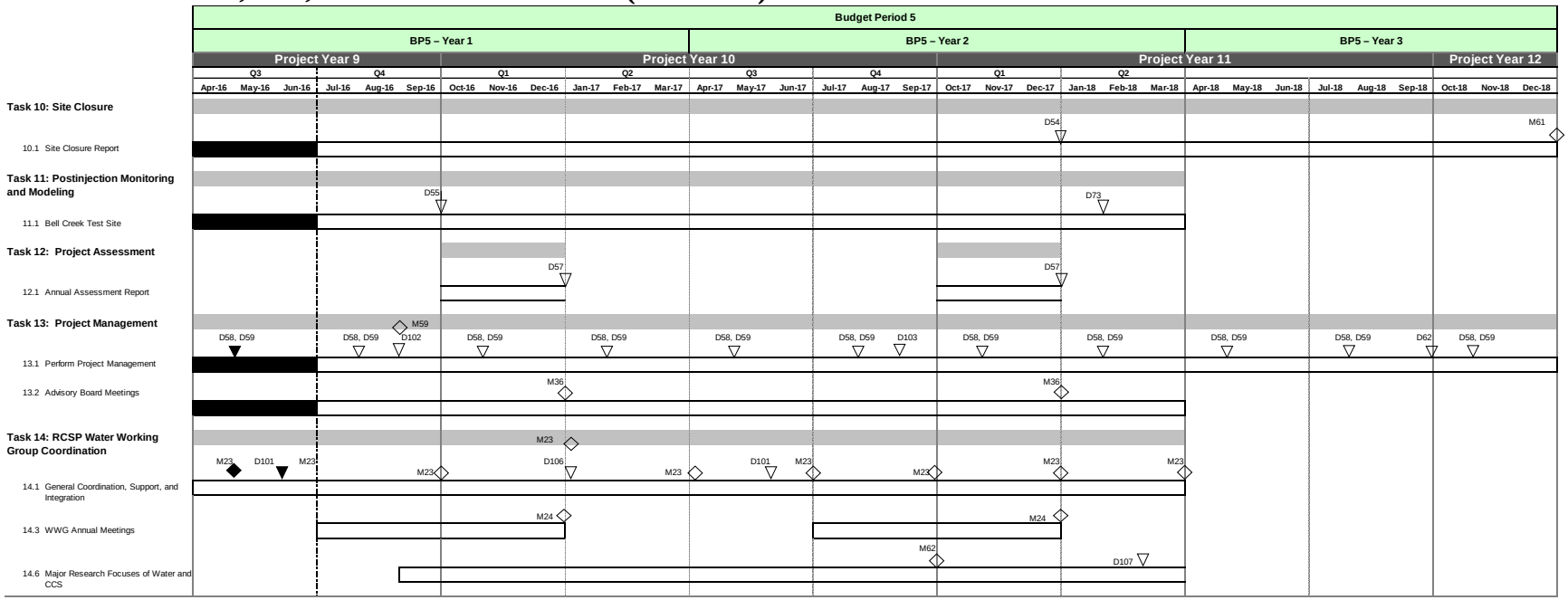
Title/Description	Due Date	Actual Completion Date
Year 9 – Quarter 4 (July–September 2016) (Continued)		
D1: Task 1 – Review of Source Attributes (update)	9/30/16	
D8: Task 3 – Permitting Review – Update 3	9/30/16	
D55: Task 11 – Bell Creek Test Site – Cost-Effective Long-Term Monitoring Strategies Report	9/30/16	
M23: Task 14 – Monthly WWG Conference Call Held	9/30/16	
Year 10 – Quarter 1 (October–December 2016)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/16	
D21: Task 2 – Bell Creek Test Site 30-minute Documentary	10/31/16	
D76: Task 3 – Regional Regulatory Perspective	10/31/16	
D105: Task 9 – Comparison of Non-EOR and EOR Life Cycle Assessments	10/31/16	
D15: Task 2 – Bell Creek Test Site Fact Sheet (Update)	11/30/16	
M52: Task 9 – Initial Analysis of Extended Pulsed-Neutron Logging Campaign Data Completed	11/30/16	
D57: Task 12 – Project Assessment Annual Report	12/31/16	
D106: Task 14 – Special Issue of IJGGC – Nexus of Water and Carbon Capture and Storage	12/31/16	
M23: Task 14 – Monthly WWG Conference Call Held	12/30/16	
M24: Task 14 – WWG Annual Meeting Held	12/31/16	
M36: Task 13 – Annual Advisory Board Meeting Scheduled	12/31/16	
M55: Task 9 – Initial Tracer Analysis Completed	12/31/16	
Year 10 – Quarter 2 (January–March 2017)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/17	
D22: Task 2 – Energy from Coal 60-minute Documentary	1/31/17	
M60: Task 1 – Data Submitted to EDX	2/28/17	
D35: Task 4 – Bell Creek Test Site – Best Practices Manual – Site Characterization	3/31/17	
M23: Task 14 – Monthly WWG Conference Call Held	3/31/17	

Table 11. Phase III, BP5, Years 9–12 Gantt Chart



Continued . . .

Table 11. Phase III, BP5, Years 9–12 Gantt Chart (continued)



Key for Deliverables (D)			
D1	Review of Source Attributes	D62	Final Report
D8	Permitting Review	D66	BC Test Site – Simulation Report
D13	Public Site Updates	D69	BC Test Site – Best Practices Manual – Simulation
D14	General Phase III Fact Sheet	D73	Report – Monitoring and Modeling Fate of Stored CO_2
D15	BC Test Site Fact Sheet	D76	Regional Regulatory Perspective
D16	Fort Nelson Test Site Fact Sheet	D81	Regional Carbon Sequestration Atlas
D17	General Phase III Information PowerPoint Presentation	D85	Report – Opportunities and Challenges Associated with CO_2 Compression
D21	BC Test Site 30-Minute Documentary	D93	Report – Geological Modeling and Simulation for the Aquistore Project
D22	Energy from Coal 60-Minute Documentary	D101	WWG Web Site Content Update
D35	BC Test Site – Best Practices Manual – Site Characterization	D102	Best Practices Manual – Adaptive Management Approach
D51	BC Test Site – Best Practices Manual – Monitoring for CO_2 Storage and CO_2 EOR	D103	Best Practices Manual – Programmatic Risk Management
D54	Report – Site Closure Procedures	D104	BC Test Site – Analysis of Expanded Seismic Campaign
D55	BC Test Site – Cost-Effective Long-Term Monitoring Strategies Report	D105	Comparison of Non-EOR and EOR Life Cycle Assessment
D57	Project Assessment Annual Report	D106	Special Issue of IJGGC – Nexus of Water and Carbon Capture and Storage
D58	Quarterly Progress Report	D107	Journal Article or Topical Report – Major Research Focuses of Water and CCS
D59	Milestone Quarterly Report		

Key for Milestones (M)	
M23	WWG Conference Call Held
M24	WWG Annual Meeting Held
M36	Annual Advisory Board Meeting Scheduled
M47	BC Test Site 30-Minute Video Broadcast
M52	BC Test Site – Initial Analysis of Extended Pulsed-Neutron Logging Campaign Data Completed
M55	BC Test Site – Initial Tracer Analysis Completed
M57	Life Cycle Analysis for EOR Completed
M59	Adaptive Management Approach Best Practices Manual Completed
M60	Data Submitted to EDX
M61	Site Closure for Bell Creek Test Completed
M62	Research Related to Water and CCS Nexus Completed

PHASE III PRODUCTS OR TECHNOLOGY TRANSFER ACTIVITIES

During the reporting period, four abstracts were submitted for presentation, ten were accepted, and 14 oral presentations were given at 16 different meetings and conferences. In addition, a quarterly progress report, three deliverables/milestones (three draft and eight approved), two value-added products, and one journal article (rejected) were completed. In addition to the products cited below, staff also undertook five project management site trips and participated in four workshops. For more detail, see the Meetings/Travel section.

Abstracts

Submitted

Jiang, T., Pekot, L.J., Peck, W.D., Sorensen, J.A., and Gorecki, C.D., 2016, A numerical simulation update of the Aquistore CO_2 storage project [abs.]: 2016 AIChE Annual Meeting, San Francisco, California, November 13–18, 2016.

Leroux, K.M., Glazewski, K.A., Kalenze, N.S., Botnen, B.W., Stepan, D.J., Klapperich, R.J., and Hamling, J.A., 2016, Lessons learned in near-surface monitoring for large-scale CO_2 storage [abs.]: 2016 AIChE Annual Meeting, San Francisco, California, November 13–18, 2016.

Submitted and Accepted for Presentation

Gorecki, C.D., Steadman, E.N., Harju, J.A., Hamling, J.A., Sorensen, J.A., Peck, W.D., Daly, D.J., Jensen, M.D., Pekot, L.J., Klapperich, R.J., Heebink, L.V., and Ayash, S.C., 2016, The Plains CO_2 Reduction Partnership—demonstrating geologic storage of carbon dioxide [abs.]: 5th U.S.–China Symposium on CO_2 Emission Control, Hangzhou, China, June 5–7, 2016.

Hamling, J.A., Leroux, K.M., Glazewski, K.A., and Bosshart, N.W., 2016, Adaptive approach to modeling and monitoring 5 million tonnes of CO_2 injection at the Bell Creek oil field [abs.]: 2nd Combined Meeting of the Modelling and Monitoring Networks, Edinburgh, United Kingdom, July 6–8, 2016.

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Daly, D.J., Crossland, J.L., Crocker, C.R., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2016, Regionwide and project-level outreach – the PCOR Partnership approach [abs]: 13th International Conference on Greenhouse Gas Control Technologies (GHGT-13), Lausanne, Switzerland, November 14–18, 2016.

Gorecki, C.D., Ayash, S.C., Peck, W.D., Hamling, J.A., Sorensen, J.A., Daly, D.J., Jensen, M.D., Klapperich, R.J., Heebink, L.V., Pekot, L.J., Steadman, E.N., and Harju, J.A., 2016, The Plains CO_2 Reduction Partnership—developing technologies for CCS deployment in central North America [abs.]: 35th International Geological Congress, Cape Town, South Africa, August 27 – September 4, 2016.

Hamling, J.A., Azzolina, N.A., Peck, W.D., Gorecki, C.D., Melzer, L.S., and Nakles, D.V., 2016, How green is my oil? A detailed look at carbon accounting for CO_2 enhanced oil recovery sites

(CO_2 EOR) [abs.]: 13th International Conference on Greenhouse Gas Control Technologies (GHGT-13), Lausanne, Switzerland, November 14–18, 2016.

Hamling, J.A., Klapperich, R.J., Kalenze, N.S., Bosshart, N.W., Stepan, D.J., Burnison, S.A., Leroux, K.M., Glazewski, K.A., Gorecki, C.D., and Richards, T.L., 2016, Monitoring 2.5 million tonnes of CO_2 at the Bell Creek oil field [abs.]: 13th International Conference on Greenhouse Gas Control Technologies (GHGT-13), Lausanne, Switzerland, November 14–18, 2016.

Hawthorne, S.B., Miller, D.J., Sorensen, J.A., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2016, Effects of reservoir temperature and percent levels of methane and ethane on CO_2/oil MMP values as determined using vanishing interfacial tension/capillary rise [abs.]: 13th International Conference on Greenhouse Gas Control Technologies (GHGT-13), Lausanne, Switzerland, November 14–18, 2016.

Jin, L., Pekot, L.J., Hawthorne, S.B., Gobran, B., Greeves, A., Bosshart, N.W., Jiang, T., Hamling, J.A., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2016, Impact of CO_2 impurity on MMP and oil recovery performance of Bell Creek oil field [abs.]: 13th International Conference on Greenhouse Gas Control Technologies (GHGT-13), Lausanne, Switzerland, November 14–18, 2016.

Salako, O., Burnison, S.A., Hamling, J.A., Reed, S., and Gorecki, C.D., 2016, 4-D seismic monitoring of injected CO_2 enhances geological interpretation, reservoir simulation, and production operations [abs.]: 13th International Conference on Greenhouse Gas Control Technologies (GHGT-13), Lausanne, Switzerland, November 14–18, 2016.

Smith, S.A., Beddoe, C.J., Zacher, E.J., Heebink, L.V., Kurz, B.A., Peck, W.D., and Gorecki, C.D., 2016, Relative permeability of Williston Basin CO_2 storage targets [abs.]: 13th International Conference on Greenhouse Gas Control Technologies (GHGT-13), Lausanne, Switzerland, November 14–18, 2016.

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Jiang, T., Pekot, L.J., Jin, L., Peck, W.D., Gorecki, C.D., and Worth, K., 2016, Numerical modeling of the Aquistore CO_2 storage project [abs.]: 13th International Conference on Greenhouse Gas Control Technologies (GHGT-13), Lausanne, Switzerland, November 14–18, 2016.

Accepted for Poster and Withdrawn

Daly, D.J., Crocker, C.R., Crossland, J.L., Gorecki, C.D., and Steadman, E.N., 2016, Engaging teachers to facilitate learning – PCOR Partnership outreach in action [abs]: 13th International Conference on Greenhouse Gas Control Technologies (GHGT-13), Lausanne, Switzerland, November 14–18, 2016.

Presentations

Ayash, S.C., and Gorecki, C.D., 2016, Plains CO_2 Reduction (PCOR) Partnership, oil and gas activities, and other EERC projects: Presented to Petro Harvester personnel, Grand Forks, North Dakota, March 9, 2016.

Ayash, S.C., Gorecki, C.D., Hamling, J.A., Peck, W.D., Pekot, L.J., and Nakles, D.V., 2016, 2016 PCOR Partnership Technical Advisory Board meeting: Presented at the 5th Annual Plains CO_2 Reduction Partnership Technical Advisory Board Meeting, New Orleans, Louisiana, April 4–5, 2016.

Daly, D.J., and Crocker, C.R., 2016, Climate change/carbon management: Presented at the North Dakota Science Teachers Association Spring 2016 Conference, Grand Forks, North Dakota, April 21, 2016.

Daly, D.J., and Crocker, C.R., 2016, Energy and CO_2 management—carbon capture and storage: Presented at the 2016 Lignite Education Seminar, Bismarck, North Dakota, May 9–10, 2016.

Gorecki, C.D., 2016, Panel discussion—lessons learned on Phase III activities: Presented at the Midwest Carbon Sequestration Science Conference, Champaign, Illinois, May 16–17, 2016.

Gorecki, C.D., Ayash, S.C., 2016, PCOR Partnership project review and updates: Presented to U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL) personnel, Grand Forks, North Dakota, June 21, 2016.

Gorecki, C.D., and Ayash, S.C., 2016, The Plains CO_2 Reduction (PCOR) Partnership—demonstrating geologic storage of carbon dioxide: Presented at the 5th U.S.–China Symposium on CO_2 Emission Control, Hangzhou, China, June 5–7, 2016.

Gorecki, C.D., Jin, L., and Pekot, L.J., 2016, A systematic simulation study of CO_2 flooding in the Bell Creek oil field: Presented at the Computer Modelling Group Technical Symposium, Calgary, Alberta, June 13–14, 2016.

Klapperich, R.J., 2016, EERC CO_2 EOR and saline storage research through the PCOR Partnership and other EERC projects: Presented to African Carbon Energy Africary – South Africa personnel, Grand Forks, North Dakota, May 17, 2016.

Nakles, D.V., Azzolina, N., Peck, W.D., Hamling, J.A., Gorecki, C.D., Ayash, S.C., Doll, T.E., and Melzer, L.S., 2016, How green is my oil? A detailed look at GHG accounting for CO_2 EOR sites: Presented at the Carbon Capture, Utilization & Storage Conference, Tysons, Virginia, June 14–16, 2016.

Peck, W.D., and Gorecki, C.D., 2016, Practical learnings about CO_2 storage in North America?: Presented at the North American Energy Ministers Trilateral (NAEMT) Meeting – Carbon Capture, Utilization and Storage, Mexico City, Mexico, April 12–13, 2016.

Peck, W.D., Hamling, J.A., and Gorecki, C.D., 2016, Implementing carbon capture and storage—an overview of the Plains CO_2 Reduction Partnership's Bell Creek project: Presented at the North American Energy Ministers Trilateral (NAEMT) Meeting – Best Practices for CO_2-EOR with CCS Workshop, Villahermosa, Mexico, April 14, 2016.

Pekot, L.J., 2016, An update of Aquistore CO_2 storage simulation: Presented at the Computer Modelling Group Technical Symposium, Calgary, Alberta, June 13–14, 2016.

Steadman, E.N., Gorecki, C.D., and Ayash, S.C., 2016, The Plains CO_2 Reduction (PCOR) Partnership—guiding CCS deployment in central North America: Presented at the Carbon Capture, Utilization & Storage Conference, Tysons, Virginia, June 14–16, 2016.

Deliverables/Milestones

Draft Submitted and Approved

Daly, D.J., Crocker, C.R., and Crossland, J.L., 2016, General audience CO_2 sequestration outreach PowerPoint presentation: Plains CO_2 Reduction (PCOR) Partnership Phase III Task 2 Deliverable D17 (update 7) for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, June.

Jensen, M.D., Schlasner, S.A., Hamling, J.A., Leroux, K.M., Gorecki, C.D., and Azzolina, N.A., 2016, Life cycle analysis for primary and secondary enhanced oil recovery at the Bell Creek Field completed: Plains CO_2 Reduction (PCOR) Partnership Phase III Task 9 Milestone M57 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2016-EERC-06-02, Grand Forks, North Dakota, Energy & Environmental Research Center, May.

Klapperich, R.J., and Gorecki, C.D., 2016, Water Working Group Web site content update: Plains CO_2 Reduction (PCOR) Partnership Phase III Task 14 Deliverable D101 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2016-EERC-06-01, Grand Forks, North Dakota, Energy & Environmental Research Center, May.

Approved

Heebink, L.V., Smith, S.A., Hamling, J.A., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2014, Bell Creek test site – drilling and completion activities report: Plains CO_2 Reduction (PCOR) Partnership Phase III Task 5 Deliverable D44 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2016-EERC-04-04, Grand Forks, North Dakota, Energy & Environmental Research Center, June.

Kurz, B.A., Heebink, L.V., Eylands, K.E., Smith, S.A., Hamling, J.A., Klapperich, R.J., Thompson, J.S., Stepan, D.J., Botnen, B.W., Pu, H., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2013, Bell Creek test site – preinjection geochemical report: Plains CO_2 Reduction (PCOR) Partnership Phase III Task 4 Deliverable D33 Milestone M12 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2016-EERC-03-08, Grand Forks, North Dakota, Energy & Environmental Research Center, July.

Jensen, M.D., Hamling, J.A., and Gorecki, C.D., 2015, Bell Creek test site – transportation and injection operations report: Plains CO_2 Reduction Partnership Phase III Task 8 Deliverable D49 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2016-EERC-04-03, Grand Forks, North Dakota, Energy & Environmental Research Center, September.

Jiang, T., Pekot, L.J., Jin, L., Peck, W.D., and Gorecki, C.D., 2016, Geologic modeling and simulation report for the Aquistore project: Plains CO_2 Reduction (PCOR) Partnership Phase III Task 1 Deliverable D93 (update 2) for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2016-EERC-04-06, Grand Forks, North Dakota, Energy & Environmental Research Center, February.

Laumb, J.D., Klapperich, R.J., Hamling, J.A., Glazewski, K.A., Kalenze, N.S., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2014, Bell Creek wellbore integrity study: Plains CO_2 Reduction (PCOR) Partnership Phase III Task 4 Deliverable D36 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2016-EERC-04-05, Grand Forks, North Dakota, Energy & Environmental Research Center, March.

Value-Added Products

Draft Submitted and Approved

Crossland, J.L., Daly, D.J., Crocker, C.R., and Gorecki, C.D., 2016, Household energy and carbon Web pages report value-added report for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2016-EERC-06-03, Grand Forks, North Dakota, Energy & Environmental Research Center, June.

Daly, D.J., Crocker, C.R., Crossland, J.L., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2016, CO_2 "Huff 'n' Puff" validation test: Plains CO_2 Reduction (PCOR) Partnership Phase III value-added fact sheet for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, April.

Progress Reports

Monthlies

Gorecki, C.D., Steadman, E.N., Peck, W.D., Daly, D.J., Hamling, J.A., Jensen, M.D., Pekot, L.J., Harju, J.A., Heebink, L.V., and Klapperich, R.J., 2016, Plains CO_2 Reduction (PCOR) Partnership: Phase III monthly report (March 1–31, 2016) for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, April.

Gorecki, C.D., Steadman, E.N., Peck, W.D., Daly, D.J., Hamling, J.A., Jensen, M.D., Pekot, L.J., Harju, J.A., Heebink, L.V., and Klapperich, R.J., 2016, Plains CO_2 Reduction (PCOR) Partnership: Phase III monthly report (April 1–30, 2016) for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, May.

Gorecki, C.D., Steadman, E.N., Peck, W.D., Daly, D.J., Hamling, J.A., Jensen, M.D., Harju, J.A., Pekot, L.J., Heebink, L.V., Klapperich, R.J., and Ensrud, J.R., 2016, Plains CO_2 Reduction (PCOR) Partnership: Phase III monthly report (May 1–31, 2016) for U.S. Department of Energy

National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, June.

Quarterlies

Gorecki, C.D., Harju, J.A., Steadman, E.N., Romuld, L., Sorensen, J.A., Daly, D.J., Hamling, J.A., Jensen, M.D., Peck, W.D., Klapperich, R.J., Heebink, L.V., Pekot, L.J., Ensrud, J.R., and Votava, T.J., 2016, Plains CO_2 Reduction Partnership Phase III Task 13 Deliverable D58/D59 quarterly technical progress report (January 1 – March 31, 2016) for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592 and North Dakota Industrial Commission Contract Nos. FY08-LX111-162 and G-015-030, Grand Forks, North Dakota, Energy & Environmental Research Center, April.

Journal Article Submitted and Rejected

Schlasner, S.M., Jensen, M.D., Nakles, D.V., and Azzolina, N.A., 2016, Assessing temporary storage options to manage variable-rate CO_2 emissions for use during enhanced oil recovery: Energy & Environmental Science [submitted for publication].

Meeting Minutes

Ayash, S.C., and Nakles, D., 2016, Minutes—Summary of the 5th Annual Plains CO_2 Reduction Partnership Technical Advisory Board Meeting: New Orleans, LA, April 5–6, 2016.

MEETINGS/TRAVEL

Representatives from the PCOR Partnership incurred travel costs for their participation in the following 16 meetings/conferences, four workshops, and five project management site trips in this reporting period:

- April 3–6, 2016: Traveled to New Orleans, Louisiana, to host, present, and participate in the TAB Annual Meeting.
- April 6–8, 2016: Traveled to Washington, D.C., to attend the Carbon Capture Infrastructure Workshop.
- April 4–7, 2016: Traveled to Miles City, Montana, for site work at the Bell Creek Field.
- April 11–15, 2016: Traveled to Mexico City and Villahermosa, Mexico, to attend the NAEMT Carbon Capture Utilization & Sequestration Working Group Meeting.
- April 18–22, 2016: Off-site staff member traveled to the EERC offices in Grand Forks, North Dakota, for meetings and work on state and provincial regulation flowcharts and crosswalk documents.
- April 19–21, 2016: Traveled to Bismarck, North Dakota, to attend the LEC Spring Conference.
- April 22, 2016: Traveled to Fargo, North Dakota, to participate in meetings with PPB.
- April 25–28, 2016: Traveled to Houston, Texas, to attend the ESRI Petroleum GIS Conference.

- May 10, 2016: Traveled to Fargo, North Dakota, for planning and documentary script development meetings.
- May 14–18, 2016: Traveled to Denver, Colorado, to attend the IOGCC Annual Meeting.
- May 16–17, 2016: Traveled to Champaign, Illinois, to present at the 2016 Midwest Carbon Sequestration Science Conference.
- May 16–20, 2016: Traveled to Gillette, Wyoming, for Bell Creek sample collections.
- May 18, 2016: Traveled to Fargo, North Dakota, to work on the coal documentary with PPB.
- May 23–26, 2016: Traveled to Bismarck, North Dakota, to attend the WBPC.
- May 23–27, 2016: Traveled to Gillette, Wyoming, for sample collection and site maintenance.
- June 2-8, 2016: Traveled to Hangzhou, China, to attend and present at the 5th U.S.–China Symposium on CO_2 Emission Control Science Technology conference.
- June 8–16, 2016: Traveled to Tysons, Virginia, to attend and present at the Carbon Capture Utilization and Storage conference.
- June 10–19, 2016: Traveled to Calgary, Alberta, Canada, to attend the Computer Modelling Group Technical Symposium.
- June 12–21, 2016: Traveled to Birmingham, Alabama, to attend the Education in Carbon Capture, Utilization, and Storage training and conference.
- June 13–14, 2016: Traveled to Bismarck, North Dakota, to present at the LEC Teacher Seminar.
- June 23–30, 2016: Traveled to Houston, Texas, to attend ARMA 50th U.S. Rock Mechanics Symposium and workshops.
- June 24–30, 2016: Traveled to San Diego, California, to attend the ESRI User Conference.
- June 27–29, 2016: Traveled to Gillette, Wyoming, to film with PPB for documentary.
- June 27–30, 2016: Traveled to London, United Kingdom, to attend the 2016 CSLF Mid-Year Meeting.

Materials presented at these meetings are available to partners on the PCOR Partnership DSS Web site (www2.undeerc.org/website/pcorp/).