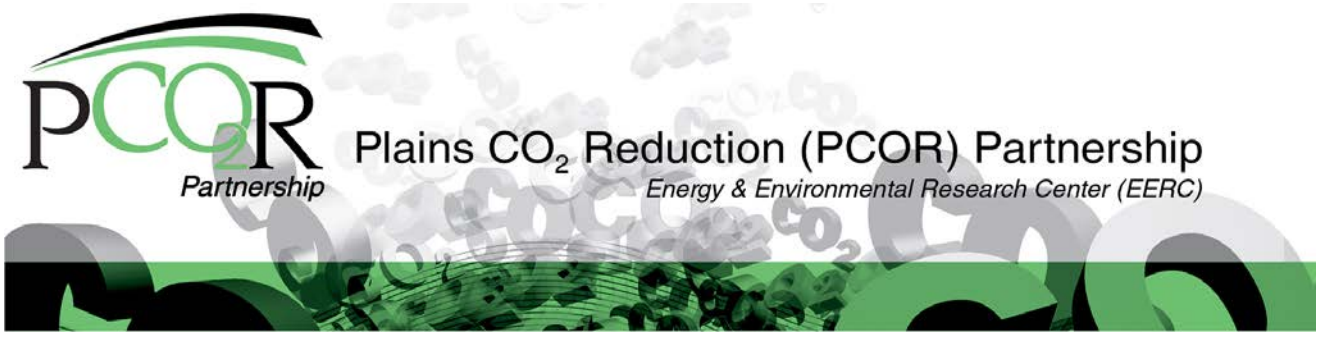

PLAINS CO_2 REDUCTION PARTNERSHIP PHASE III

Quarterly Technical Progress Report
Task 13 – Deliverable D58/D59

(for the period July 1 – September 30, 2016)

Prepared for:

Federal Information Tracking System (FITS)
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DOE Project Manager: Andrea M. Dunn
EERC Principal Investigator: Charles D. Gorecki

Prepared by:

Charles D. Gorecki
John A. Harju
Edward N. Steadman
Lucia Romuld
James A. Sorensen
Daniel J. Daly
John A. Hamling
Melanie D. Jensen
Wesley D. Peck
Ryan J. Klapperich
Loreal V. Heebink
Lawrence J. Pekot
Janelle R. Ensrud
Tami J. Votava

Energy & Environmental Research Center
University of North Dakota
15 North 23rd Street, Stop 9018
Grand Forks, ND 58202-9018

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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 5 began April 1, 2016.

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

The focus on extended and enhanced work, specifically in the Bell Creek activities, continued. As of July 31, 2016, 3.247 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 ***3.192 million tonnes of CO_2 stored***.

The 2016 PCOR Partnership Annual Membership Meeting and Workshop were held at the EERC. In attendance were 125 attendees from 49 organizations. The meeting consisted of one and a half days of presentations pertaining to current PCOR Partnership activities and subsequent projects attributed to the activities and lessons learned from the PCOR Partnership. The workshop featured presentations on CO_2 capture technology and geologic characterization for CO_2 storage and tours to highlight the EERC's CO_2 capture pilot facility and laboratories.

Ten tasks continued. In addition to the foregoing, the PCOR Partnership adaptive management approach best practices manual was submitted to DOE and the PCOR Partnership Technical Advisory Board; the PCOR Partnership Atlas update continued; modeling and simulation activities continued in support of the Aquistore and Bell Creek projects; numerous interviews were performed for two documentaries; compilation of the regulatory permitting document continued; Bell Creek-specific life cycle assessment model development continued; a long-term, cost-effective strategy for monitoring, verification, and accounting of associated CO_2 storage at the Bell Creek Field is being developed; 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
July 1 – September 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 September 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

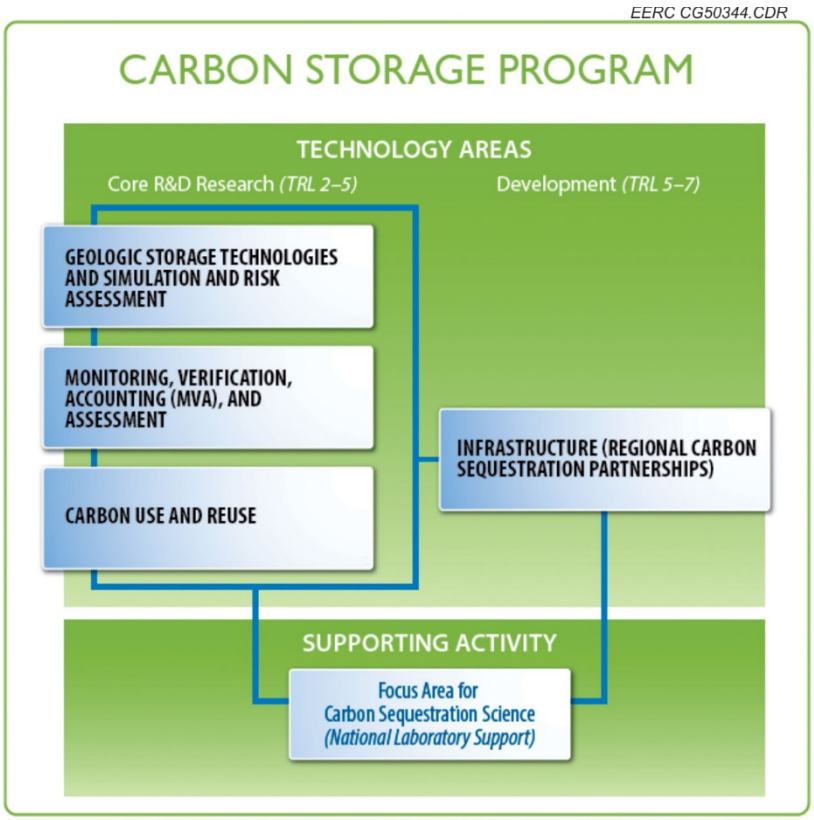

Figure 1. DOE Carbon Storage Program technology areas featuring regional partnerships (courtesy of Andrea Dunn, DOE NETL; "TRL" stands for technology readiness level).

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:

- Submitted a request on August 22, 2016, to extend Deliverable (D) 81, the PCOR Partnership Atlas update, to December 31, 2016. The request was approved August 24, 2016.
- Submitted D1 entitled "Review of Source Attributes" on September 29, 2016.
- Presented on well integrity in a presentation entitled "Well Integrity" at the IEA Greenhouse Gas R&D Programme (IEAGHG) CCS Summer School held July 17–23, 2016, in Regina, Saskatchewan, Canada.
- Presented "Important Site Selection Traits" as part of the "Carbon Capture and Sequestration (CCS) Technical Discussion Series: Site Selection" Webinar to the California Air Resources Board on September 26, 2016.
- Continued efforts to update D81, Regional Carbon Sequestration Atlas (update), including the following:
  - Added information and rearranged pages through Chapter 7.
  - Prepared draft text and data on EOR potential in the PCOR Partnership region for an update to the corresponding CO_2 EOR page.
  - Continued modifying the existing chapters with updated information.

  - Continued to create content (discussion of underground injection control wells and CO_2 storage) for the last remaining blank pages in the atlas.
  - Updated existing text and added new text material to Chapters 6 (CCS Deployment) and 7 (Path Forward).
  - Continued the internal review process.
- Prepared a map and accompanying table of current CO_2 capture projects (demonstration and commercial scale), including quantity of CO_2 captured, in the United States to fulfill a request by a PCOR Partnership member.
- Updated information and continued work on the partners-only Decision Support System (DSS) Web site, including the following:
  - Modified the pop-up boxes for the oilfield layer of the DSS interactive map. Discussed a time line with the EERC programmers to add features to the DSS interactive map. Seven saline layers and the associated storage values are ready for addition.
  - Created an outline to update the Bell Creek portion of the DSS with newer, previously approved content by DOE and Denbury. Future progress on this activity will include incorporation of more recent figures and content pertaining to site operations, CO_2 injection and storage estimates, site characterization, modeling, simulation, and MVA. The contents on each page will be streamlined to allow reports, presentations, and fact sheets to be readily accessible on the products database.
- 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 well, production, and injection information from each state's online resource as follows: added 271 new North Dakota wells and 13 new Montana wells.
  - Updated South Dakota, Manitoba, and British Columbia projects with well and production data, as available.
  - Worked on processing an updated Wyoming State well data set. Completed scan for additional Wyoming well logs. Worked on data compilation and download.
- Continued work on oilfield regional models, including the following:
  - Searched for North Dakota oil fields with no waterflood activities for characterization modeling efforts. Worked on digitizing well logs.
  - Searched for top and log data to construct a model of the Duperow Formation.
  - Modified the model to include the entire Beaver Creek Field. Assigned lithofacies to the wells, and upscaled the logs. Added permeability and porosity values.
  - Completed distributing properties in the Beaver Creek Field model.
  - Continued digitizing needed logs for the Gooseneck Field model.
- With regard to the **Williston Basin** CO_2 storage sink relative permeability laboratory characterization effort:
  - Completed relative permeability testing including brine permeability, CO_2 permeability, and CO_2/brine conditions on samples as follow:
    - Completed relative permeability testing as able on the first Mission Canyon sample. Testing was stopped after beginning the 30% CO_2 condition because of sample damage.

    - ♦ Completed relative permeability testing on a second Mission Canyon Formation sample. This sample tested more smoothly than the first Mission Canyon Formation sample.
  - A representative from North Dakota State University completed CT (computed tomography) scans for two post-relative permeability samples that were sent on July 1, 2016. The CT scans showed internal flow pathways that had developed through erosion/dissolving during relative permeability testing.
  - Generated relative permeability curves, with all testing complete.
  - Worked on the final value-added report and a technical paper to be submitted to the 13th International Greenhouse Gas Control Technologies (GHGT-13) Conference.
- With regard to the **Aquistore** project:
  - Presented an update on the Aquistore injection, field activities, and modeling and simulation work to the PCOR Partnership Technical Advisory Board (TAB) by WebEx on July 26, 2016.
  - Participated in a Science and Engineering Research Committee (SERC) conference call on July 27, 2016. Discussed the Aquistore Annual Technical Meeting prior to its being held on August 16, 2016.
  - Participated in a SERC conference call on August 10, 2016. Injection has resumed at a rate of 300–500 tonnes a day. Total CO_2 injection to date is approximately 78,500 tonnes.
  - Arranged and participated in a Webinar with Computer Modelling Group Ltd. (CMG) on August 2, 2016, to discuss Aquistore simulation and possible work on geomechanical modeling in GEM (Generalized Equation-of-State Model compositional reservoir simulation).
  - Presented a simulation update at the Aquistore Annual Technical Meeting held August 16, 2016, in Ottawa, Ontario, Canada.
  - Participated in a conference call on August 8, 2016, with representatives from CMG, the University of Alberta, and PTRC to discuss proposed modeling efforts. Such modeling would be complementary to the work performed at the EERC.
  - Continued work on a draft paper for the GHGT-13 Conference entitled "Numerical Modeling of the Aquistore CO_2 Storage Project," which was sent to PTRC for review.
  - Continued work on a draft paper and PowerPoint presentation 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.
  - As of September 27, 2016, 82,000 tonnes of CO_2 has been injected.
  - With regard to static **modeling** and dynamic predictive **simulation** activities:
    - ♦ Continued to download and process daily injection rate, pressure, and temperature data as available.
    - ♦ Constructed a new simulation model utilizing the new static model with seismic inversion data. Initial history match efforts suggest that the rock physical properties in the model may need to be modified.
    - ♦ Ran a predictive simulation utilizing the existing model at PTRC's request.

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

- No CO_2 had been injected into the Aquistore well from July 6, 2016, to July 28, 2016, and from August 11, 2016, to September 3, 2016. The volume of CO_2 captured from the flue gas stream at the capture plant was insufficient to satisfy the commitment to Cenovus and the Aquistore well. The first commitment is to Cenovus; therefore, CO_2 was not available for injection at the Aquistore well.

Task 2 – Public Outreach and Education

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

- Submitted an update on July 18, 2016, to the public PCOR Partnership Web site (www.undeerc.org/pcor) to provide access to a CO_2 EOR life cycle analysis (LCA) model for the paper submitted to the *International Journal of Greenhouse Gas Control* (IJGCC). Received approval on July 21, 2016. A new page and an updated page went live July 21, 2016.
- Submitted D13 (Public Site Updates) on July 21, 2016. Received approval on August 25, 2016.
- Submitted the value-added "Household Energy and Carbon Web Pages Report" for the April 1 – June 30, 2016, quarter on July 25, 2016. Received approval July 27, 2016.
- Submitted a draft value-added Phase II fact sheet update entitled "CO_2 Sequestration Test in a Deep, Unminable Lignite Seam" on August 25, 2016. Received approval on September 6, 2016.
- Submitted D16 – Fort Nelson Test Site fact sheet (update) on August 31, 2016. Received approval on September 6, 2016.
- During the quarter, the PCOR Partnership was represented by EERC personnel at 22 meetings/conferences and two workshops. Specifically, the PCOR Partnership outreach activities included 13 oral presentations, four recycled posters, one new poster, two recycled booths, and one new booth. The following quantities of PCOR Partnership outreach materials were distributed:
  - PCOR Partnership documentary entitled "Nature in the Balance: CO_2 Sequestration" – 5
  - PCOR Partnership documentary entitled "Reducing Our Carbon Footprint: The Role of Carbon Markets" – 4
  - PCOR Partnership documentary entitled "Out of the Air – Into the Soil" – 3
  - PCOR Partnership documentary entitled "Managing Carbon Dioxide: The Geologic Solution" – 12
  - PCOR Partnership documentary entitled "Global Energy and Carbon: Tracking Our Footprint" – 11
  - PCOR Partnership video training guide entitled "Installing a Casing-Conveyed Permanent Downhole Monitoring System" – 1
  - "Plains CO_2 Reduction Partnership Atlas, 4th Edition, Revised" – 43

- Continued preparation of drafts for the two outreach-related papers related to presentations accepted for the GHGT-13 Conference. One paper is being written in collaboration with PTRC.
- Completed draft updates for three fact sheets (PCOR Partnership Prospectus III, What Is the PCOR Partnership? and Aquistore).
- Completed a task-level review of the draft updated Phase II Zama fact sheet.
- Continued work on the value-added update of the Phase II Terrestrial fact sheet.
- Continued work on a draft of the Bell Creek Fact Sheet (D15).
- **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 Outreach Working Group (OWG) conference calls:
    - Provided written comments to the RCSP OWG lead for the agenda of the July OWG call.
    - Participated in the OWG call on July 21, 2016.
    - No calls were held in August or September.
- Continued efforts to update the **public Web site** (www.undeerc.org/pcor), including the following:
  - Continued work on future updates to several pages. Prepared print-friendly pages and video clip images. The changes made by the programmers are being reviewed.
  - 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:
    - Reviewed film, photos, and notes from the site-filming trip to the Bell Creek Field on June 28, 2016.
    - Continued concept review and script and interview question development.
    - Traveled to the PPB studios in Fargo, North Dakota, on August 22, 2016, to perform an interview with Tom Doll, an off-site team member, pertaining to CCS and CO_2 EOR processes, similarities and differences, and regulations.
    - Traveled to Billings, Montana, September 8–9, 2016, with the PPB film crew to interview Tom Richmond, former Director of the Montana Division of Oil and Gas Conservation.
    - Initiated postproduction editing of a Denbury-specific section of the documentary.
    - Conducted an interview with Nick Azzolina, The CETER Group (CETER), at the EERC on September 12, 2016.
    - Traveled to Fargo, North Dakota, to conduct an interview with Steve Melzer, Melzer Consulting, on September 13, 2016.
    - Held a conference call on September 26, 2016, with representatives from PPB to discuss the content of the script, overall progress, and the schedule.
    - Worked with PPB on identifying appropriate cover for the video.
  - With regard to D22, the Coal in the Modern Age 60-minute documentary:
    - Gathered additional background information focused on railroads and coal (past and present).

- ♦ Traveled to northern California on July 12–15, 2016, to interview Dr. Julio Friedmann (Lawrence Livermore National Laboratory) and perform location filming with PPB.
- ♦ Continued concept review and script and interview question development.
- ♦ Conducted an interview with Sean Adams, University of Florida, in Gainesville, Florida, on August 17, 2016. Reviewed two publications on coal use history by Sean Adams as a basis for preparing questions for the interview with the author.
- ♦ Initiated content review of three relevant books.
- ♦ Prepared the Sean Adams interview transcript for insertion into the script.

- Information regarding the **site sessions/visits** to the PCOR Partnership public Web site included the following:
  - There were 6381 sessions/visits to the public Web site (www.undeerc.org/pcor). Traffic decreased over 29% from last quarter (9043 sessions/visits). The reason for the significant decrease is unclear at this time.
  - There were 5553 unique visitors to the public Web site, representing a 29% decrease from last quarter (7861 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 6381 sessions/visits, 37.5% of the Web traffic was domestic and 62.5% was international. Table 3 lists the top ten countries for visits to the PCOR Partnership Web site: United States, India, Australia, Canada, United Kingdom, Philippines, Malaysia, New Zealand, Pakistan, and Kenya. There was traffic from 130 countries overall (Figure 3).
  - There were 424 sessions/visits originating from within the PCOR Partnership region (a 28% decrease from last quarter) (Figure 4). Approximately 64% of the regional visits originated from the United States, and 36% came from Canada. Visits from within the PCOR Partnership region represent approximately 6.6% 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 5), 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.

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	2393		
			North Dakota	94
			Minnesota	61
			Wisconsin	39
			Missouri	35
			Montana	12
			Iowa	11
			Nebraska	9
			Wyoming	7
			South Dakota	4
2	India	1256		
3	Australia	513		
4	Canada	311		
			Alberta	81
			British Columbia	36
			Saskatchewan	22
			Manitoba	13
5	United Kingdom	250		
6	Philippines	186		
7	Malaysia	98		
8	New Zealand	90		
9	Pakistan	77		
10	Kenya	64		
	Other 120 countries	1143		
Total Sessions/Visits		**6381**	**Total PCOR Partnership Visits**	**424**

*Arranged by the number of visits to the site.

- Referral site traffic (approximately 3%) corresponds to the traffic directed to the PCOR Partnership Web page from other sites via links. The top referring Web sites were from arthapedia.in, an Indian economy and government Web site (to What is CO_2 Sequestration page), and energy.gov (to the Home page).
- Less than 1% of site traffic (40 visitors) resulted from teacher campaigns and social interactions, such as e-mail or social media sources (e.g., Facebook and YouTube).

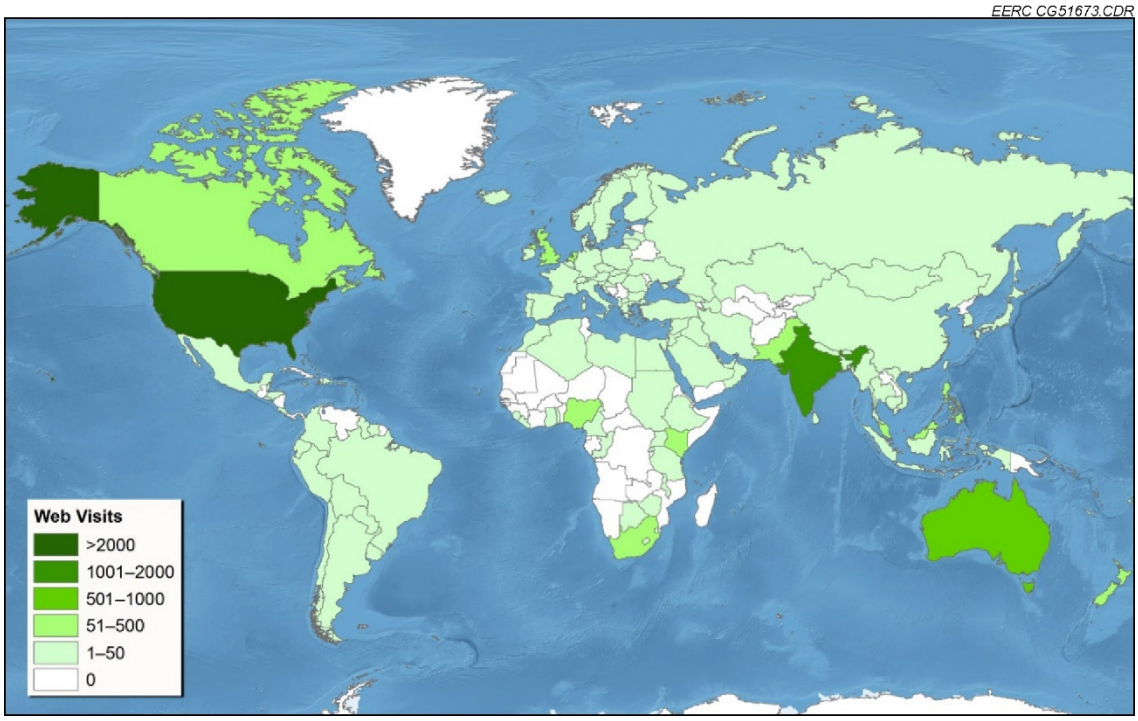

Figure 3. Map of PCOR Partnership Web site global traffic for this reporting period.

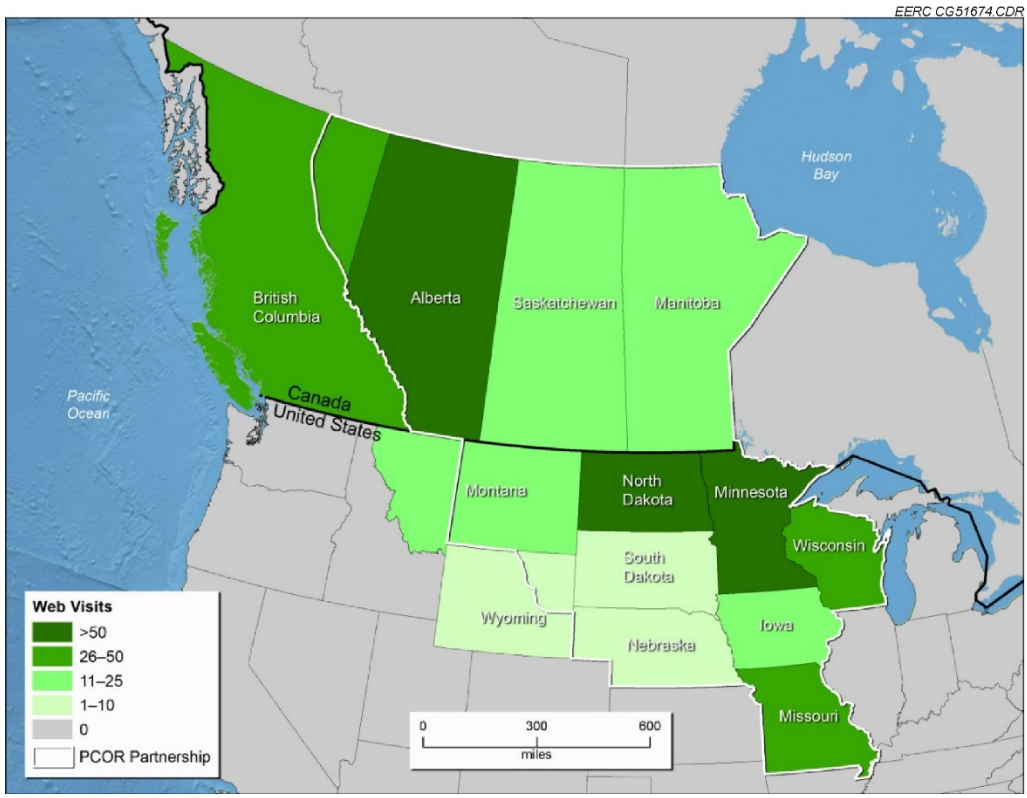

Figure 4. Map of PCOR Partnership Web site regional visits for this reporting period.

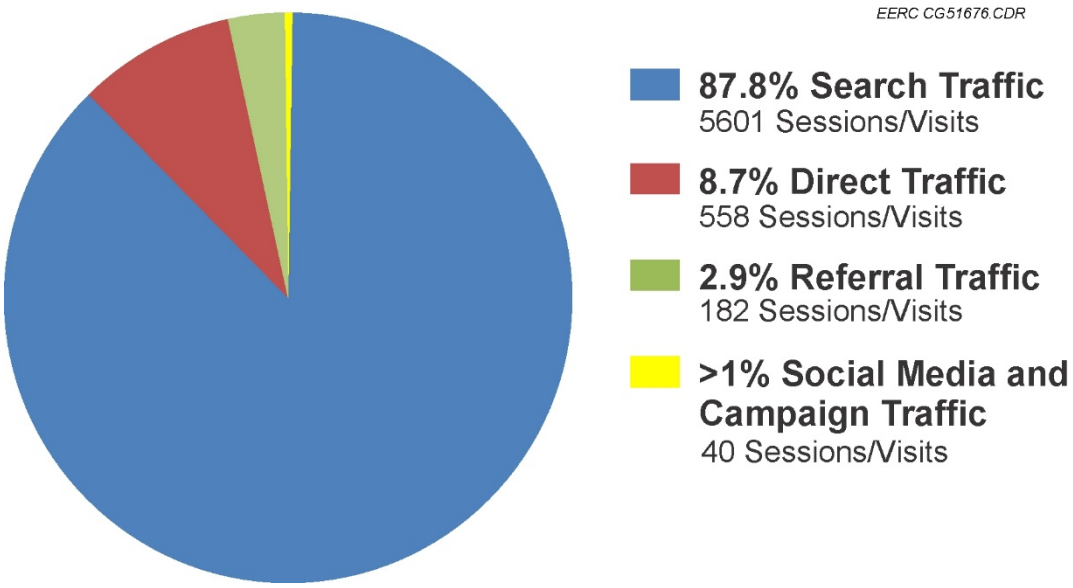

Figure 5. PCOR Partnership public Web site traffic sources for this reporting period.

- During this reporting period, the **nature of the sessions** to the PCOR Partnership public Web site included 9596 page views (a 23% decrease from last quarter); the top five pages viewed are listed in Table 4. These five pages make up about 70% of total page views.

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

Page Title	Page Views	% Page Views	Page
What Is CO_2 Sequestration?	4041	42.1	www.undeerc.org/pcor/sequestration/whatissequestration.aspx
What Is CO_2?	1713	17.9	www.undeerc.org/pcor/sequestration/whatisco2.aspx
Home Page	392	4.1	www.undeerc.org/pcor/default.aspx
CO_2 Sequestration Projects	337	3.5	www.undeerc.org/pcor/co2sequestrationprojects/default.aspx
Carbon and CO_2 on Earth	275	2.9	www.undeerc.org/pcor/sequestration/co2onearth.aspx

- All five full-length documentaries and 50 video clips taken from the documentaries have been uploaded to the EERC's YouTube channel. The top five accessed YouTube videos are listed in Table 5. Because of the volume of material, the videos were organized into seven playlists. Each video description includes one or more links to the PCOR Partnership public Web site. Three PCOR Partnership full-length documentaries are also on the PPB YouTube Channel. These are listed in Table 6. These videos can also be streamed on the PCOR Partnership public Web site.

Table 5. Top EERC PCOR Partnership-Related YouTube Channel Videos Accessed

Video	Video Length	Views	Est. Minutes Watched	Avg. View Duration
Reforestation in Brazil	4:41	623	1418	2:30
Reducing Our Carbon Footprint: The Role of Markets Documentary	26:49	494	2451	5:00
The Phases of Oil Recovery – So Far	2:40	375	638	2:10
Installing a Casing-Conveyed Permanent Downhole Monitoring System	19:19	115	597	5:20
Household Energy Around the World	5:34	69	190	3:20

Table 6. PCOR Partnership Documentaries on PPB YouTube Channel Accessed

Video	Video Length	Views	Est. Minutes Watched	Avg. View Duration
Global Energy and Carbon: Tracking Our Footprint	26:47	783	4640	6:30
Managing Carbon Dioxide: The Geologic Solution	26:47	79	525	7:00
Out of the Air and Into the Soil	27:02	46	183	4:00

- In addition to YouTube and the public Web site, PCOR Partnership documentaries and video clips are available on PBS Learning Media. This free, online media service was developed for K–12 educators to enhance learning through images, videos, etc., and provides teachers with the ability to create custom lesson plans based on this content. Table 7 lists the top five video clips viewed during this quarter on PBS Learning Media.
- PCOR Partnership documentaries and video clips have also been made available on the North Dakota Studies Web site at ndstudies.org. This Web site promotes the teaching of North Dakota history, geography, culture, and other subjects by providing lesson plans, videos, curriculum, and images for use by teachers, students, and the general public. Table 8 lists the top video clips viewed during this quarter on ndstudies.org.

Table 7. Top Five EERC PCOR Partnership-Related Videos Viewed on PBS Learning Media

Video	Video Length	Views
CO_2 and the Greenhouse Effect	1:40	27
Household Energy Around the World	5:34	15
Carbon Capture and Storage	6:13	15
Sequestration Potential in the Prairies	2:05	15
CO_2 Flooding and Geologic Sequestration	3:13	15

Table 8. Top EERC PCOR Partnership-Related Videos Viewed on North Dakota Studies

Video	Video Length	Views
Tracking Our Footprint	3:16	2
Reforestation in Brazil	4:41	1
Sequestering Carbon in Wetlands	3:08	1
Tracking Out Footprint – Electricity	1:04	1

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

- Sent a request to Andrea Dunn to move D22 from its current due date of July 31, 2016, to January 31, 2017. This request was approved.
- Continued a review of the PPB budget regarding the potential for additional travel for Documentary D22.
- Discussed potential interviews for Documentary D22 to take place in China with a PCOR Partnership representative who recently traveled to China.

Task 3 – Permitting and NEPA Compliance

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

- Submitted D8 entitled "Permitting Review – Update 3" on September 29, 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:
  - Reviewed "Regulation for Underground Storage of CO_2 Passed by U.S. States" by Holly Javedan, Massachusetts Institute of Technology.
  - Investigated current regulatory and legislative actions within the PCOR Partnership area.
  - Continued research on Canadian National Energy Board, British Columbia, Saskatchewan, Alberta, Manitoba, and U.S. Environmental Protection Agency (EPA) CCS and carbon capture, utilization, and storage regulations.
  - Continued task-level review and edit of the draft report.
  - Discussed the review with a consultant from CETER, including comments made by the PCOR Partnership TAB during the meeting held in conjunction with the PCOR Partnership Annual Membership Meeting and Workshop.
- Removed electrical panels and filed a sundry notice for the reclamation of the lignite site in Burke County, North Dakota. Notified a representative at the North Dakota Industrial Commission (NDIC) that the electrical panels have been removed.

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 4 – Site Characterization and Modeling

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

- Continued work on the PCOR Partnership Site Characterization Best Practices Manual (BPM) (D35):
  - Worked on the executive summary and reorganized the outline to better align with D102 – Adaptive Management Approach BPM (Task 13).
  - Updated the outline based on an internal review meeting. Incorporated suggestions into the outline regarding similarities/differences between EOR and saline storage practices.
- Worked on renewing several Schlumberger software licenses that expired. These licenses are needed to continue the static modeling work conducted under this task.
- **Bell Creek** test site activities included the following:
  - With regard to **modeling** efforts, the following activities occurred:
    - Worked on importing the processed fall 2015 seismic data into the model for interpretation.
    - Worked on conducting an attribute analysis of the fall 2015 seismic data.
    - Worked on generating seismic decomposition volume with Petrel in order to create images using the fall 2015 seismic data set.
    - Input perforated intervals for injection analysis into the model.
    - Worked on integrating relevant data into one Petrel project for petrophysical evaluation, including all pulsed-neutron log (PNL) wells and core data, which will be used to assess petrophysical properties for input into the Version 3 model.
    - Evaluated Bell Creek petrophysical properties for input into the Version 3 model, including shale volume, porosity logs, and facies 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).

Task 6 – Infrastructure Development

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

- By invitation, presented on CO_2 transport and worked as a mentor for the students at the IEAGHG CCS Summer School held July 17–23, 2016, in Regina, Saskatchewan, Canada.
- Attended the DOE NETL CO_2 Capture Technology Project Review Meeting on August 8–12, 2016, in Pittsburgh, Pennsylvania. Topics covered by the technical talks relevant to Task 6 included advances in technologies for pre- and postcombustion, oxycombustion, and compression.
- Continued work on an updated version of the 2011 CO_2 capture technologies overview value-added document:
  - Continued to incorporate technology updates and new technologies into the update.
  - Continued to edit text of the summary to reflect status changes, new vendor information, etc.
- Assisted the EERC's Emissions and Carbon Capture Group Lead on a PowerPoint presentation on CO_2 capture efforts at the EERC for the PCOR Partnership Annual Membership Meeting and Workshop.

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 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).

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 tonnes of CO_2 purchased for injection and tonnes of CO_2 stored at Bell Creek.
  - Submitted a memo on July 26, 2016, regarding official updated volumes of tonnes of CO_2 purchased for injection and tonnes of CO_2 stored at Bell Creek. As of June 30, 2016, the most recent month of record, 3.220 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 ***3.162 million tonnes of CO_2 stored***.
  - Submitted a memo on August 31, 2016, regarding official updated volumes of tonnes of CO_2 purchased for injection and tonnes of CO_2 stored at Bell Creek. As of July 31, 2016, the most recent month of record, 3.247 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 ***3.192 million tonnes of CO_2 stored***.

- Submitted a memo on September 20, 2016, verifying the most current injection numbers for Bell Creek, as requested by DOE NETL. The project has **injected 5,585,322 tonnes of CO_2** into the Muddy Sandstone as of July 31, 2016.
- Received approval on August 24, 2016, for a change of scope request and Milestone (M) 55 title change, which was submitted on August 4, 2016. The EERC and Denbury proposed to perform oil sampling and analysis activities at Bell Creek in lieu of tracer surveys. The title of M55 (formerly "Initial Tracer Analysis Completed") will be changed to "Investigation of Crude Oil Compositional Changes During CO_2 EOR Completed." The planned date of milestone completion is September 30, 2017.
- Submitted a revision of D66 (Bell Creek Test Site – Simulation Report [Update 4]) on August 25, 2016, with comments from Denbury incorporated. Update 4 of D66 was originally submitted for DOE review on August 27, 2015.
- Submitted the D66 (Bell Creek Test Site – Simulation Report [Update 5]) executive summary on August 31, 2016. The report is under concurrent review by Denbury.
- Presented "Adaptive Approach to Modeling and Monitoring 5 million tonnes of CO_2 Injection at the Bell Creek Oil Field" at the IEAGHG Modelling and Monitoring Network Meeting held July 7–8, 2016, in Edinburgh, Scotland. The presentation was sent to DOE under separate cover on July 5, 2016.
- The minimum miscibility pressure (MMP) paper 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" was formally accepted by *Energy and Fuels* after very minor revisions. The authors include Steven Hawthorne, David Miller, Lu Jin, and Charles Gorecki. The paper provides a simplification and evaluation of the capillary-rise/vanishing interfacial tension method to measure MMP. Approximately 80 MMP values were measured and reported for Bell Creek and Bakken crude oil with pure and mixed CO_2, ethane, and methane. The paper has been formally published in the online and printed versions and is citable (*Energy and Fuels, 30,* **2016**, pp. 6365–6372). Open access is also available.
- EERC personnel traveled along with representatives from Denbury to meet with two representatives from Arcis at the Arcis facilities in Calgary, Alberta, Canada, on July 18, 2016. The purpose of the meeting was to discuss and review final processing of the Bell Creek 3-D seismic data.
- Continued planning a geophysical logging workshop. This Schlumberger-led training will be held at the EERC on October 31 – November 4, 2016, and will cover tools, principles, applications, and processing of various geophysical logging techniques that can be used to collect data for modeling and MVA.
- Sent an image and caption illustrating a Bell Creek 4-D seismic amplitude test to William Aljoe (DOE) for inclusion in the DOE MVA BPM after receiving approval from Denbury.
- Sent GHGT-13 Conference papers on Bell Creek MVA, seismic, and MMP activities to Denbury for review. The titles and lead authors are as follows:
  - "Monitoring 3.2 million tons of CO_2 at the Bell Creek Oil Field" (John Hamling)
  - "4-D Seismic Monitoring of Injected CO_2 Enhances Geological Interpretation, Reservoir Simulation, and Production Operations" (Shaughn Burnison)
  - "Impact of CO_2 Impurity on MMP and Oil Recovery Performance of Bell Creek Oil Field" (Lu Jin)

- Continued work on LCA of oil produced during EOR compared with oil produced conventionally, including the following:
  - Finalized the spreadsheet LCA model posted on the PCOR Partnership public Web site by Task 2 personnel. A references tab was added, along with minor editing changes. Worked with a consultant from CETER to incorporate these changes. Work using this model is presented in a paper recently published by IJGGC, which directs readers to the PCOR Partnership Web page focused on the model. The EERC is pursuing open access for this paper.
  - Received data and information from Denbury that can be input into the site-specific Bell Creek Field LCA. Team members working on the Bell Creek Field LCA model coordinated to ensure that all information required to determine the CO_2 emissions (positive or negative) at the Bell Creek Field has been received from Denbury. Requested clarification/verification where necessary to ensure accuracy and understanding of supplied data.
  - Integrated the various parts of the Bell Creek-specific LCA model.
  - Performed quality assurance/quality control (QA/QC) on the Bell Creek-specific LCA upstream, gate-to-gate, and downstream models for accuracy to ensure accurate, representative results.
  - Obtained data on the monthly volumes of CO_2 provided by the Lost Cabin and Shute Creek gas-processing plants and compared to the GREET (Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation) model module prepared at the EERC using older, publicly available information. Agreement was quite good. Based on these data, the Bell Creek-specific LCA model work is being completed.
  - Incorporated information from Denbury into the spreadsheet and GREET models. Worked on adding these data to the draft LCA final report (D105).
- Continued **Bell Creek** site activities, including the following:
  - An update meeting is planned with Denbury on October 17, 2016, in Plano, Texas. Discussions will include the fall 2016 PNL program, a geophysics update, InSAR (interferometric synthetic aperture radar) analysis, a geomodeling and simulation update, the Bell Creek-specific LCA, and general topics.
  - Used the most recent publicly available data to determine that cumulative total CO_2 gas injection is 5,585,322 tonnes through July 31, 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 9).
  - As of July 31, 2016, the most recent month of record, 3.247 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 3.192 million tonnes of CO_2 stored (Table 10), 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.

Table 9. Bell Creek CO_2 Gas Injection Totals for July 2016 (cumulative totals May 2013 to July 2016)[1]

	July 2016 Injection
Total, Mscf	2,924,974
Total, tons[2]	167,304
Total, tonnes[2]	151,923
Cumulative Total, Mscf[2]	107,534,209
Cumulative Total, tons[2,3]	6,150,787
Cumulative Total,tonnes[2,3]	5,585,322

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/ton and 19.253 Mscf/tonnes.

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

Table 10. Cumulative Total Gas Purchased and Estimated Associated CO_2 Storage Volumes for the Bell Creek Field[1]

	July 2016 Gas Volume
Monthly Total Gas Purchased, MMscf[2]	509
Monthly Total Gas Purchased, million tons[2]	0.029
Monthly Total Gas Purchased, million tonnes[2]	0.026
Cumulative Total Gas Purchased, MMscf[2,3]	62,513
Cumulative Total Gas Purchased, million tons[2,3]	3.576
Cumulative Total Gas Purchased, million tonnes[2,3]	3.247
Cumulative Total CO_2 Stored, MMscf[3,4]	61,454
Cumulative Total CO_2 Stored, million tons[3,4]	3.515
Cumulative Total CO_2 Stored, million tonnes[3,4]	3.192

[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 CO_2 stored volumes are ***CORRECTED*** for gas composition.

- With regard to **modeling** and **simulation** efforts:
  - Consistent progress since April 2011.
  - History match is complete for Bell Creek Phases 1–3. Prediction simulation is complete for Bell Creek Phases 1 and 2. CO_2 migration simulation is complete for Bell Creek Phases 3–7.
  - Analyzed production–injection data for the whole Bell Creek Field for CO_2 flooding. Integrated the processed CO_2-flooding data through April 2016 into the Bell Creek Phase 3 simulation model, and adjusted the simulation model to match the production data.
  - Generated simulation results for use in D66.
  - Successfully matched the CO_2-flooding history for Phase 3.

- Worked on designing new continuous CO_2 injection (CCI) and water alternating gas (WAG) predictive simulation cases for oil production and CO_2 storage prediction.
- Generated plots for CO_2 flooding and associated storage performance analysis for the entire field, including oil production, water production and injection, and gas production, injection, and storage.
- Constructed ten simulation cases with the main impurities observed in recycled gas using the seven-component PVT (pressure, volume, temperature) model in the Bell Creek Phase 1 and 2 areas for long-term performance prediction and comparison.
- Continued processing prediction/injection historical data for wells in Bell Creek Phase 4 and the nearby area and developing a simulation model to be used for history match and prediction simulation of the Bell Creek Phase 4 area.

– With regard to **injection-phase seismic** efforts:
  - Continued passive seismic monitoring of 04-03 OW (observation well) using the borehole seismic array:
    - Near-continuous operation since May 22, 2013.
    - Passive seismic monitoring of 04-03 OW using the borehole seismic array has ceased because of equipment failure. Failure date is undetermined at this time.
  - Continued working with the processed fall 2015 seismic monitor data received from Denbury:
    - Worked to add Montana State Plane and NAD 1927 UTM coordinates to the headers of the newly arrived Bell Creek 3-D seismic data sets. The EERC has legacy work on the seismic data using these two coordinate systems. For reasons unknown, the new data came to the EERC as NAD 83 UTM 13N, a different projection from what had been provided in the past.
    - Loaded data into the processing/interpretation software (after coordinate conversion).
    - Worked on QA/QC of the data.
    - Created preliminary 4-D images showing reservoir and time-lapse differences.
    - Continued well tie and horizon interpretation.
    - Continued interpretation by integration with well logs.
    - Compared processed results for two baseline reprocessed data sets; additional detail is identified in the new seismic map.
    - Worked on developing a revised Bell Creek 4-D surface seismic difference map.
    - Created 4-D difference maps from each of the single vintage data sets, and started prestack analysis to investigate isolating the pressure component from the CO_2 response on the difference displays.
  - Resumed Bell Creek microseismic data processing. Testing parameters to improve signal-to-noise ratio and to detect seismic events.
  - Downloaded geographic information system (GIS) files for use with InSAR analysis from TRE Canada.

– With regard to **injection-phase PNL** activities:
  - Developed prioritized list of 16 target wells for logging as part of the fall 2016 enhanced PNL program. Plans for the PNL program will be discussed with Denbury as part of the agenda for an October 17, 2016, update meeting in Plano, Texas.

– With regard to **injection-phase sampling** activities:

- Travel for Bell Creek activities:
  - Staff traveled to Gillette, Wyoming on July 18–22, 2016, to distribute landowner packages and collect samples. Specifics include the following:
    - Completed distribution of final landowner packages. Key summaries and landowner letters were provided for each landowner.
    - Delivered a release notification letter for the Fox Hills Formation monitoring wells to the landowner.
    - Collected oil samples with a representative from Denbury from the following wells: 56-14R, 32-02, 05-06, 04-04, 28-02, 21-10, and 21-14.
    - Collected purchase/recycle CO_2 gas samples from the Bell Creek Field.
  - Staff traveled to Gillette, Wyoming on July 25–29, 2016, for soil gas profile station and Fox Hills Formation monitoring well sampling.
  - Collected the third round of Bell Creek oil samples for oil compositional monitoring on September 19–22, 2016, with a representative from Denbury from the following wells: 21-14, 04-04, 28-02, 56-14R, 21-10, and 32-02.
- A summary of all oil and CO_2 gas stream samples collected for analyses to date is provided in Table 11.
- Completed processing the field meter readings of Fox Hills Formation monitoring wells (two samples total) from May 2016.

Table 11. Oil and CO_2 Gas Stream Sampling and Analyses

		Production Stream by Development Phase, Well[1]							
		Phase 1				Phase 3			Phase 4
Date Sampled	Purchase/ Recycle[1]	56-14R	32-02	05-06	04-04	28-02	21-10	21-14	34-09
Jan 2014		O	O	O					
Mar 2014		O	O						
May 2014	P	O	O	O					
Jun 2014	PR	O	O	O					
Jul 2014	PR	O	O	O					
Sep 2014	PR	OG	OG	O					
Oct 2014	PR	O	O						
Nov/Dec 2014		OG	OG	G					
Jan 2015[2]			O	OG					
Mar 2015		G	G	G					
Apr 2015	PR								
Jun 2015[2]		O	O	O					
Jul 2015	PR	G	G	G					
Sep 2015	PR								
Nov 2015[2]		O		O					
Jan 2016	PR								
Apr/May 2016[2]		O	O	O	O	O	O	O	
Jun/Jul 2016[2]	PR	O		O	O	O	O	O	
Aug/Sep 2016[2]		O	O		O	O	O	O	O

[1] P = purchase CO_2 gas stream, R = recycle CO_2 gas stream, O = produced oil stream, and G = produced CO_2 gas stream.
[2] Oil samples collected but not yet analyzed.

- Completed analyses of purchase/recycle CO_2 gas samples from the Bell Creek Field sampling trip July 18–22, 2016.
- Completed gas chromatography (GC) of soil gas bags collected on the July 25–29, 2016, field trip. Completed processing of the handheld meter and field GC data.
- Created a Bell Creek soil gas sample GeoPDF map based on available data.
- 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.
  - Traveled to the Bell Creek Field on July 11–13, 2016, to download DTS unit and MOREVision data, which included the following:
    - DTS data: March 23 – July 11, 2016 (these are the first acquired data since the unit was repaired March 23, 2016).
    - MOREVision data: October 31, 2015 – February 29, 2016 and March 23 – July 11, 2016.
    - QA/QC and data processing are under way.
- Continued analyzing the CO_2-dominated "miscible" phase data generated for crude oil at several different pressures.
- Tested WINPROP modeling options as a way to validate experimental data from the vanishing interfacial tension (VIT) technique. This technique is used to determine MMP for oil with various gases. Continued investigating the feasibility of using equation of state to mimic the VIT–MMP experimental process.

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

- Data were received from Denbury, allowing for the completion of the Bell Creek Field-specific LCA models.
- 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 borehole seismic array for passive seismic monitoring of 04-03 OW is currently nonoperational as the SuperMicro Linux personal computer that controls the recording drives fails to recognize them, making recording impossible. The SuperMicro was brought to the EERC in late September 2016 for diagnostics and reconditioning. Reinstallation will occur at a convenient time after repair. The downhole equipment appears to be intact and functional.

Task 10 – Site Closure

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

- No activity this quarter.

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 11 – Postinjection Monitoring and Modeling

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

- Submitted D55 entitled "Bell Creek Test Site – Development of Cost-Effective Long-Term Monitoring Strategy" on September 30, 2016. The report was sent to Denbury for concurrent review.

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 12 – Project Assessment

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

- Worked on compilation of the annual report.

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 13 – Project Management

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

- Hosted the PCOR Partnership Annual Membership Meeting and Workshop on September 13–15, 2016, at the EERC in Grand Forks, North Dakota.
  - Hosted a Premeeting Workshop on September 13, 2016, with presentations on CO_2 capture technology and laboratory-based geologic characterization for CO_2 storage.

Provided tours to highlight the EERC's CO_2 capture pilot facility, mineralogy/core characterization, geomechanical characterization, and gas/fluid characterization capabilities.
  - Hosted one and a half days of presentations pertaining to current PCOR Partnership activities and lessons learned from the PCOR Partnership Program. PCOR Partnership partners presented on related CO_2 storage activities in the region. Presented the 2016 PCOR Partnership Pioneer Award to Wayne Rowe, Schlumberger Carbon Services (Figure 6).
  - The final attendance was 125 attendees (64 partners, presenters, or guests and 61 EERC employees) from 49 organizations (Figure 7).

- Hosted a PCOR Partnership TAB meeting on September 13, 2016, prior to the PCOR Partnership Premeeting Workshop. TAB members who were attending the PCOR Partnership Annual Membership Meeting participated. Seven of the nine members of TAB attended. Topics discussed included PCOR Partnership BPMs, regulatory permitting deliverables, and the upcoming peer review.
- Received approval on August 9, 2016, to adjust the Bell Creek milestones from the 2013 IEAGHG (FY2014) expert review to match the current PCOR Partnership BP5 due dates of the BPMs associated with the milestones.
- Presented "Plains CO_2 Reduction Partnership: Bell Creek Field Project" at the Mastering the Subsurface Through Technology Innovation & Collaboration: Carbon Storage & Oil & Natural Gas Technologies Review Meeting in Pittsburgh, Pennsylvania, on August 18, 2016, and attended other presentations and posters throughout the meeting.
- Attended the National Risk Assessment Partnership (NRAP) Risk Assessment Tools Workshop in Pittsburgh, Pennsylvania, on August 15, 2016.
- Presented a PCOR Partnership overview entitled "The Plains CO_2 Reduction Partnership: Developing Technologies for CCS Deployment in Central North America" on August 31, 2016, at the 35th International Geological Congress held August 27 – September 4, 2016, in Cape Town, South Africa.
- Presented a PCOR Partnership overview entitled "The Plains CO_2 Reduction Partnership: Carbon Management Through the Development of Technologies for CCS Deployment" at the second U.S.–China Clean Coal Industry Forum (CCIF) in Ordos, Inner Mongolia, China, held September 9–10, 2016.
- Presented, by request, at the North Dakota Building Trades Convention in Bismarck, North Dakota, on September 29, 2016.
- Held a TAB WebEx on July 26, 2016. An update on the Aquistore injection, field activities, and modeling and simulation work was presented. Seven of the nine TAB members were able to participate and provided feedback on the work presented.
- Submitted D102/M59 entitled "Best Practice for the Commercial Deployment of Carbon Dioxide Geologic Storage: Adaptive Management Approach" on August 31, 2016. A copy of this report was sent to each PCOR Partnership TAB member for concurrent review. Received feedback from PCOR Partnership TAB members Lynn Helms and Stefan Bachu. Once all comments from TAB have been received, a revised version of the document will be issued.

Figure 6. 2016 PCOR Partnership Pioneer Award winner, Wayne Rowe, Schlumberger Carbon Services, with John Harju, Charles Gorecki, and Ed Steadman, EERC.

Figure 7. Participants at the 2016 PCOR Partnership Annual Membership Meeting and Workshop.

- Held a task leader meeting on July 13, 2016. Topics discussed included recent and upcoming conference participation, Bell Creek and Aquistore project updates, PCOR Partnership Annual Membership Meeting and Workshop planning, and task leader updates.
- Received offers for seven EERC staff working on the PCOR Partnership project to cochair sessions at the GHGT-13 Conference in November 2016. These invitations were accepted by Charlie Gorecki, John Hamling, Larry Pekot, Dan Daly, Nick Bosshart, Jim Sorensen, and Neil Wildgust.
- Held a task leader meeting on September 6, 2016. Topics discussed included Bell Creek and Aquistore project updates, PCOR Partnership Annual Membership Meeting and Workshop planning, and task leader updates.
- Deliverables and milestones completed in July:
  - June monthly update
  - Task 2: D13 – Public Site Updates
  - Task 13: D58/D59 – Quarterly Progress Report/Milestone Quarterly Report
- Deliverables and milestones completed in August:
  - July monthly update
  - Task 2: D16 – Fort Nelson Test Site fact sheet (update)
  - Task 9: D66 – Bell Creek Test Site – Simulation Report (Update 5)
  - Task 13: D102/M59 – Best Practice for the Commercial Deployment of Carbon Dioxide Geologic Storage: Adaptive Management Approach
- Deliverables and milestones completed in September:
  - August monthly update
  - Task 1: D1 – Review of Source Attributes
  - Task 3: D8 – Permitting Review – Update 3
  - Task 11: D55 – Bell Creek Test Site – Development of Cost-Effective Long-Term Monitoring Strategy
  - Task 14: M23 – Monthly WWG Conference Call Held

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:

- With regard to the Special Issue of IJGGC on the "Nexus of Water and Carbon Capture and Storage":
  - Finalized revisions, and approved seven of the remaining eight articles. One article remained in revision as of the end of this reporting period.
  - Continued final revisions to the introduction article with a consultant from CETER.
  - Compiled an initial list of existing publications to include in the Special Issue, and discussed with a consultant from CETER.

- Distributed WWG meeting notes from the April 2016 conference call.
- Held the quarterly conference call on September 28, 2016. Topics included the following:
  - Reviewed the annual meeting and discussed feedback, which was mostly positive.
  - Provided the group with an update on the status of the virtual IJGGC Special Issue, which is still in progress. Discussed a time line for completion of the issue.
  - Requested WWG members review the WWG Web site.
  - Discussed the final WWG deliverable (D107, due February 2018) and a time line for drafting an outline.
- Provided Andrea McNemar, DOE NETL, with an update on WWG activities via phone conversation.
- Hosted the WWG Annual Meeting on August 18, 2016, in Pittsburgh, Pennsylvania, as a side meeting during the NETL Mastering the Subsurface Through Technology Innovation & Collaboration: Carbon Storage & Oil & Natural Gas Technologies Review Meeting. Fifteen individuals participated in the meeting, approximately one-half of whom were WWG members. Presentations were given on the recently awarded brine extraction and storage test (BEST) projects by Robert Trautz of the Electric Power Research Institute and John Hamling of the EERC. Challenges, potential solutions, and opportunities of both projects were discussed by the group. A novel water treatment technology for high-salinity brines was presented by Vikas Khanna of the University of Pittsburgh. Advantages, disadvantages, and economics of the methodology were discussed by the group.
- Distributed the WWG Annual Meeting notes and presentation files on September 1, 2016. Discussed action items with a consultant from CETER.
- Followed up with a DOE NETL representative from the Innovative Energy & Water Process Team regarding potential sources for data on CCS produced water quality in North Dakota. Worked on reviewing a draft manuscript on treating CCS-extracted brines for the representative.

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 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 12. A spending plan for BP5 and actual incurred cost by quarter of cash funds for BP5 are provided in Figure 8 and Table 13.

Table 12. Phase III Budget – BP5

Organization	Approved Budget,* $	Actual Costs Incurred, $
DOE Share – Cash	9,668,307	3,460,140
Nonfederal Share	5,711,194	5,612,385
Total	15,379,501	9,072,525

*As of Modification No. 34.

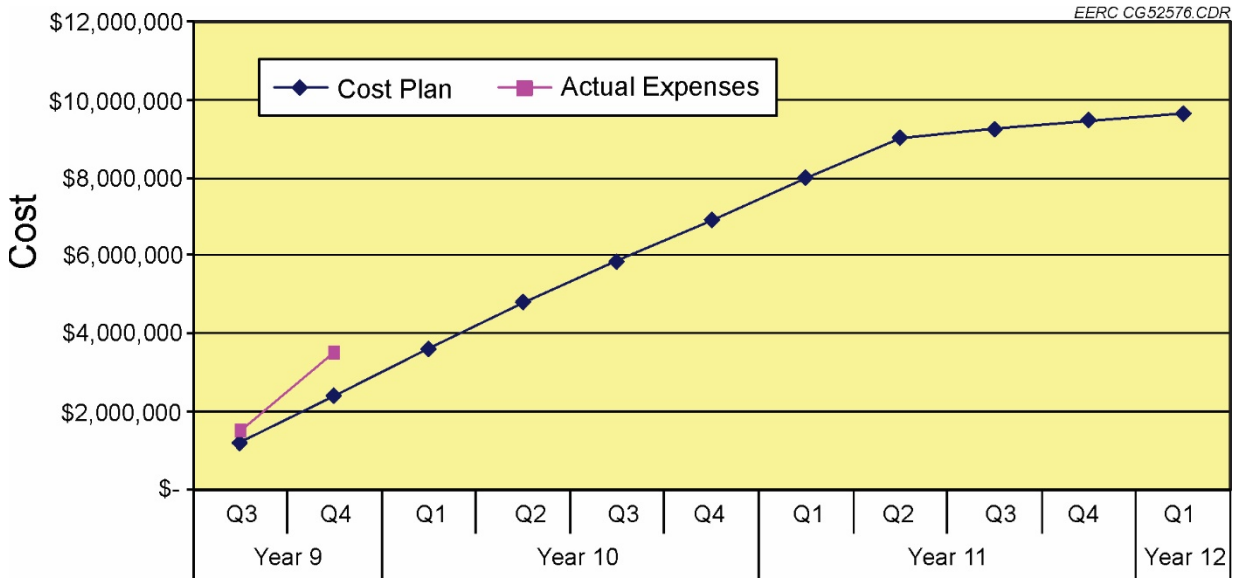

Figure 8. PCOR Partnership Phase III, BP5, Years 9–12 funding (cash only).

PHASE III SCHEDULE STATUS

Table 14 lists all deliverables and milestones by quarter, with completion dates, through the end of the reporting period (see Table 15 for the Gantt chart for BP5, Years 9–12).

Table 13. 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	$1,962,929	$ 3,460,140								
Nonfederal Share	$ (4,110)	$ 2,991,641	$ 10,655	$ 3,002,296	$ 7,501	$ 7,501	$ 30,340	$ 37,841								
Total Incurred Cost	$ 1,905,788	$ 60,906,303	$ 2,573,011	$ 63,479,314	$ 1,504,712	$ 1,504,712	$1,993,269	$ 3,497,981								
Variance																
Federal Share	$ 340,102	$ 4,958,775	$ (312,356)	$ 4,646,419	$ (294,317)	$ (294,317)	$ (760,035)	$ (1,054,352)								
Nonfederal Share	$ 4,110	$ (579,670)	$ (10,655)	$ (590,325)	$ (7,501)	$ 2,404,470	$ (30,340)	$ 2,374,130								
Total Variance	$ 344,212	$ 4,379,105	$ (323,011)	$ 4,056,094	$ (301,818)	$ 2,110,153	$ (790,375)	$ 1,319,778								

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 14. 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 14. 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 14. 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 14. 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 14. 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 14. 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 14. 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 14. 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 (Interstate Oil and Gas Compact Commission) 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 14. 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 14. 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 14. 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 14. 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 14. 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 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	7/29/16
D13: Task 2 – Public Site Updates	7/31/16	7/21/16
D16: Task 2 – Fort Nelson Test Site Fact Sheet (update)	8/31/16	8/29/16
D66: Task 9 – Bell Creek Test Site – Simulation Report (update)	8/31/16	8/31/16
D102: Task 13 – Best Practices Manual – Adaptive Management Approach	8/31/16	8/31/16
M59: Task 9 – Completed the PCOR Partnership Adaptive Management Approach Best Practices Manual	8/31/16	8/31/16

Continued . . .

Table 14. 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	9/29/16
D8: Task 3 – Permitting Review – Update 3	9/30/16	9/29/16
D55: Task 11 – Bell Creek Test Site – Cost-Effective Long-Term Monitoring Strategies Report	9/30/16	9/30/16
M23: Task 14 – Monthly WWG Conference Call Held	9/30/16	9/28/16
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	
D81: Task 1 – Regional Carbon Sequestration Atlas (update)	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	
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	

Continued . . .

Table 14. Phase III Milestones and Deliverables (continued)

Title/Description	Due Date	Actual Completion Date
Year 10 – Quarter 3 (April–June 2017)		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/17	
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/17	
D69: Task 9 – Bell Creek Test Site – Best Practices Manual – Simulation Report	5/31/17	
D85: Task 6 – Report – Opportunities and Challenges Associated with CO_2 Compression and Transportation During CCUS Activities	5/31/17	
D101: Task 14 – WWG Web Site Content Update 1	5/31/17	
D104: Task 9 – Analysis of Expanded Seismic Campaign	6/30/17	
M23: Task 14 – Monthly WWG Conference Call Held	6/30/17	
M47: Task 2 – Bell Creek Test Site 30-Minute Documentary Broadcast	6/30/17	
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/17	

Table 15. Phase III, BP5, Years 9–12 Gantt Chart

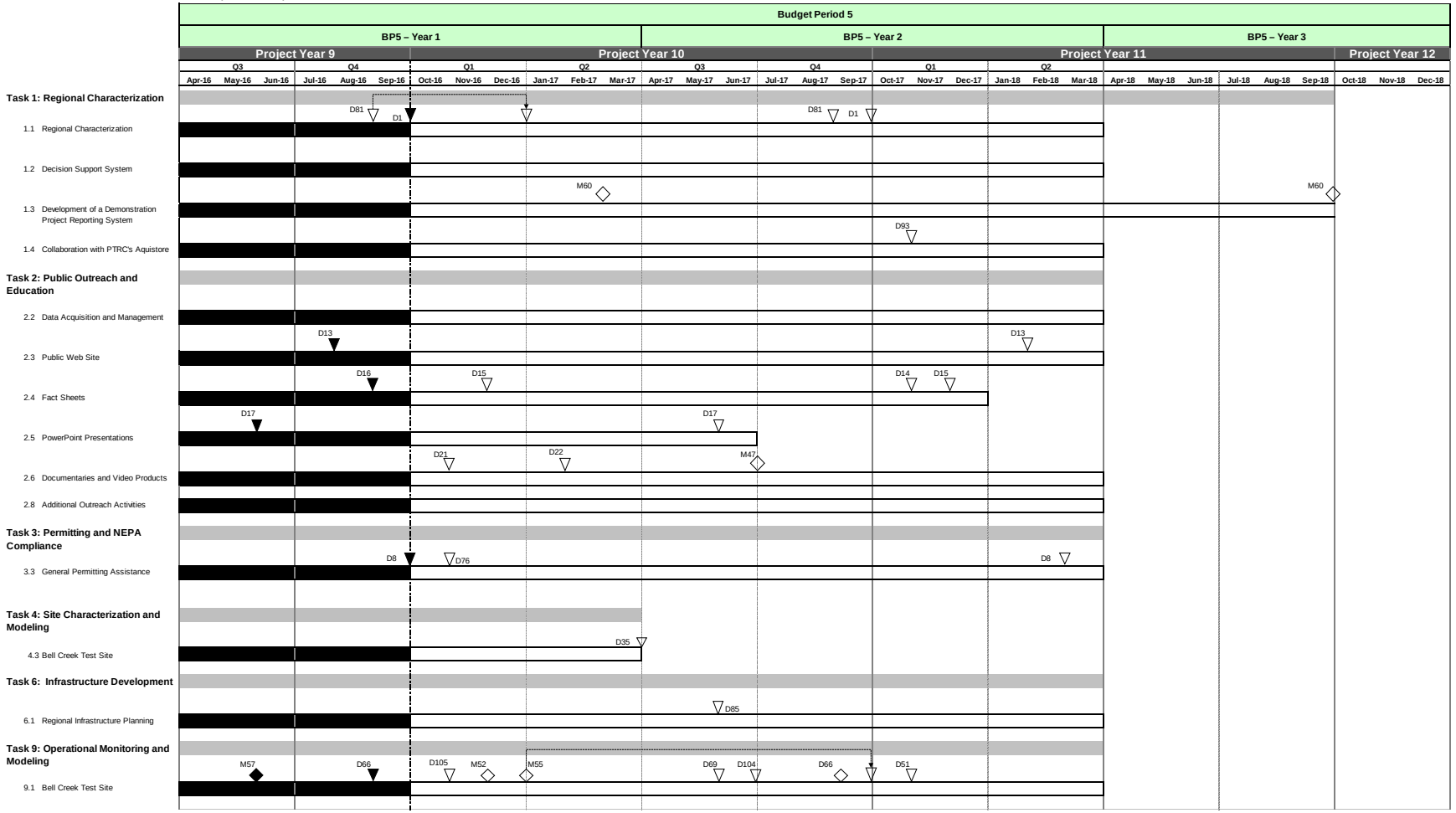

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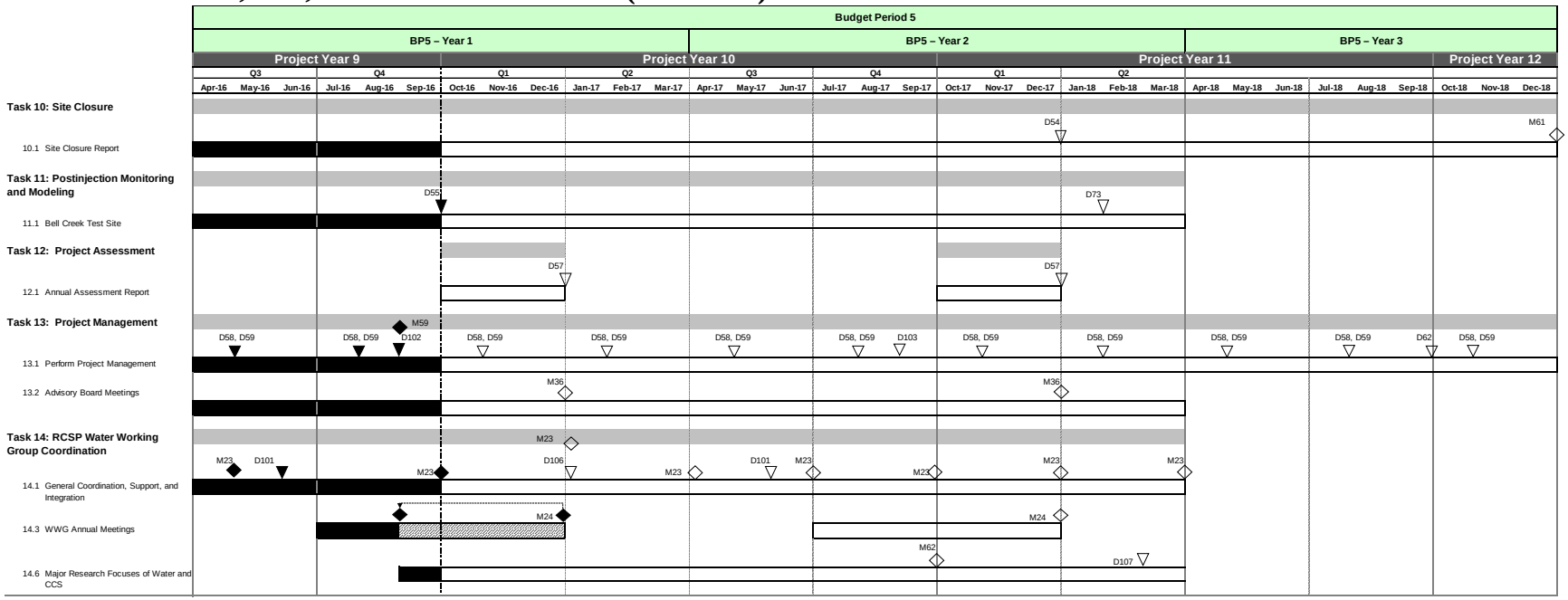
Table 15. Phase III, BP5, Years 9–12 Gantt Chart (continued)



Summary Task | Activity Bar | Progress Activity Bar | Time Now | Deliverable | Milestone

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	Investigation of Crude Oil Compositional Changes During CO_2 EOR 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, three abstracts were accepted for presentation and ten oral presentations were given at 22 different meetings and conferences. In addition, a quarterly progress report, seven deliverables/milestones (five draft and two approved), and two value-added products were completed. A deliverable from a previous quarter also received approval. In addition to the products cited below, staff also undertook five project management site trips and participated in two workshops. For more detail, see the Meetings/Travel section.

Abstracts

Accepted for Presentation

Burnison, S.A., 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—carbon management through the development of technologies for CCS deployment [abs.]: 2nd Clean Coal Industry Forum (CCIF), Ordos, Inner Mongolia, September 9–10, 2016.

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.

Presentations

Ayash, S.C., and Gorecki, C.D., 2016, Lasting impacts of the Plains CO_2 Reduction (PCOR) Partnership Program: Presented at the 2016 Plains CO_2 Reduction (PCOR) Partnership Annual Membership Meeting and Workshop, Grand Forks, North Dakota, September 13–15, 2016.

Ayash, S.C., and Gorecki, C.D., 2016, Plains CO_2 Reduction (PCOR) Partnership Program Technical Advisory Board (TAB) meeting: Presented at the 2016 Plains CO_2 Reduction (PCOR) Partnership Annual Membership Meeting and Workshop, Grand Forks, North Dakota, September 13–15, 2016.

Burnison, S.A., and Gorecki, C.D, 2016, The Plains CO_2 Reduction Partnership—carbon management through the development of technologies for CCS deployment: Presented at the 2nd Clean Coal Industry Forum (CCIF), Ordos, Inner Mongolia, September 9–10, 2016.

Gorecki, C.D., 2016, Plains CO_2 Reduction Partnership—Bell Creek Field project: Presented at Mastering the Subsurface Through Technology Innovation and Collaboration: Carbon Storage and Oil and Natural Gas Technologies Review Meeting, Pittsburgh, Pennsylvania, August 16–18, 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: Presented

at the 2nd Combined Meeting of the Modelling and Monitoring Networks, Edinburgh, United Kingdom, July 6–8, 2016.

Klapperich, R.J., 2016, RCSP Water Working Group annual meeting: Presented at the Regional Carbon Sequestration Partnerships RCSP Water Working Group Annual Meeting, Pittsburgh, Pennsylvania, August 17, 2016.

Peck, W.D., and Gorecki, C.D., 2016, The Plains CO_2 Reduction Partnership—developing technologies for CCS deployment in central North America: Presented at the 35th International Geological Congress, Cape Town, South Africa, August 27 – September 4, 2016.

Pekot, L.J., 2016, An update of Aquistore CO_2 storage simulation: Presented at the Aquistore Annual General Meeting, Ottawa, Ontario, August 16–17, 2016.

Pekot, L.J., 2016, An update of Aquistore CO_2 storage simulation: Webinar for the Plains CO_2 Reduction (PCOR) Partnership Technical Advisory Board, July 26, 2016.

Steadman, E.N., 2016, What have we learned along the CCS trail? A different perspective: Presented at the 2016 Plains CO_2 Reduction (PCOR) Partnership Annual Membership Meeting and Workshop, Grand Forks, North Dakota, September 13–15, 2016.

Deliverables/Milestones

Draft Submitted

Ayash, S.C., Nakles, D.V., Peck, W.D., Sorensen, J.A., Glazewski, K.A., Aulich, T.R., Klapperich, R.J., Azzolina, N.A., and Gorecki, C.D., 2016, Best practice for the commercial deployment of carbon dioxide geologic storage—adaptive management approach: Plains CO_2 Reduction (PCOR) Partnership Phase III draft Task 13 Deliverable D102/Milestone M59 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, August.

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Value-Added Products

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Progress Reports

Monthlies

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 (June 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, July.

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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 (April 1 – June 30, 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, July.

Meeting Minutes

Klapperich, R.J., and Tennyson, M., 2016, Minutes—Regional Carbon Sequestration Partnerships Water Working Group conference call: April 27, 2016.

MEETINGS/TRAVEL

Representatives from the PCOR Partnership incurred travel costs for their participation in the following 19 meetings/conferences, two workshops, and five project management site trips in this reporting period:

- July 2–9, 2016: traveled to Edinburgh, Scotland, to attend the IEAGHG Modeling and Monitoring Network Conference and field trip.
- July 11–13, 2016: traveled to Glendive, Montana, for data download from MOREVision and DTS units at the Bell Creek observation well.
- July 12–15, 2016: traveled to San Francisco, California, for location shoots and to conduct interviews for the upcoming coal documentary (D22).
- July 16–24, 2016: traveled to Regina, Saskatchewan, to attend and present at the IEAGHG International Interdisciplinary Carbon Capture & Sequestration Summer School.
- July 17–19, 2016: traveled to Calgary, Alberta, for meetings with Arcis.
- July 18–22, 2016: traveled to Miles City, Montana, to collect oil samples from Denbury staff.

- July 19–21, 2016: traveled to Bismarck, North Dakota, to attend the WBI Energy Customer Meeting and the NDIC Special Session.
- July 25–29, 2016: traveled to Gillette, Wyoming, to sample soil gas profile stations and Fox Hills Formation monitoring wells.
- August 7–12, 2016: traveled to Pittsburgh, Pennsylvania, to attend the DOE NETL CO_2 Capture Technology Project Review Meeting.
- August 14–19, 2016: traveled to Pittsburgh, Pennsylvania, to attend and present at the Mastering the Subsurface Through Technology Innovation and Collaboration: Carbon Storage & Oil and Natural Gas Technologies Review Meeting, to attend the associated NRAP Risk Assessment Tools Workshop, and to host the WWG Annual Meeting.
- August 15–17, 2016: traveled to Ottawa, Ontario, Canada, to attend the Aquistore Annual Technical Meeting.
- August 16–18, 2016: traveled to Gainesville, Florida, with PPB to conduct an interview with a coal historian for the coal documentary.
- August 22, 2016: traveled to Fargo, North Dakota, to the PPB offices to conduct an interview for the coal documentary.
- August 22–26, 2016: off-site staff member traveled to the EERC offices in Grand Forks, North Dakota, for meetings and to work on upcoming deliverables.
- August 27 – September 2, 2016: traveled to Cape Town, South Africa, to attend and present at the 35th International Geological Congress.
- September 6–13, 2016: traveled to Ordos, China, to present at the second U.S.–China CCIF.
- September 8–10, 2016: traveled to Billings, Montana, to conduct an interview with Tom Richmond for the Bell Creek documentary (D21).
- September 12 and 19, 2016: traveled to Kenmare, North Dakota, to remove electrical panels still on-site.
- September 12–16, 2016: off-site staff member traveled to the EERC offices in Grand Forks, North Dakota, to attend the PCOR Partnership Annual Membership Meeting and Workshop and to work on upcoming deliverables.
- September 13, 2016: traveled to Fargo, North Dakota, to conduct an interview with Steve Melzer for the Bell Creek documentary (D21).
- September 19–21, 2016: traveled to Minot, North Dakota, to attend the North Dakota Petroleum Council's Annual Meeting.
- September 19–23, 2016: traveled to Gillette, Wyoming, for oil sampling at the Bell Creek site.
- September 23, 2016: traveled to Fargo, North Dakota, for meetings with PPB to discuss the upcoming documentaries.
- September 29, 2016: traveled to Bismarck, North Dakota, to present at the North Dakota Building Trades Convention.

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