



Plains CO<sub>2</sub> Reduction (PCOR) Partnership  
Energy & Environmental Research Center (EERC)

## PLAINS CO<sub>2</sub> REDUCTION PARTNERSHIP PHASE III

### Quarterly Technical Progress Report Task 13 – Deliverable D58/D59

*(for the period October 1 – December 31, 2017)*

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## **PLAINS CO<sub>2</sub> REDUCTION PARTNERSHIP PHASE III**

### **Quarterly Technical Progress Report**

**October 1 – December 31, 2017**

### **EXECUTIVE SUMMARY**

The Plains CO<sub>2</sub> 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 (NETL) 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 (2007–2018) development phase, is an extension of the characterization (Phase I) and validation (Phase II) phases and is intended to confirm that commercial-scale CO<sub>2</sub> capture, transportation, and storage can be achieved safely, permanently, and economically over extended periods in the PCOR Partnership region.

This progress report presents an update of Phase III PCOR Partnership activities from October 1 through December 31, 2017. PCOR Partnership Phase III was extended to December 31, 2018. Effective October 5, 2017, William (Bill) Aljoe replaced Andrea Dunn as the PCOR Partnership Program Manager. The PCOR Partnership was pleased to add Statoil as a new partner in November 2017.

PCOR Partnership activities continued to focus on the preparation and submittal of comprehensive deliverables and participation in conferences/meetings and workshops. Writing continued on several deliverables detailing best practices and lessons learned, and “Best Practices Manual – Monitoring for CO<sub>2</sub> Storage” was submitted. Work continued on proposed papers for a planned special issue of the *International Journal of Greenhouse Gas Control* and abstracts for submission to Greenhouse Gas Control Technologies (GHGT)-14.

The 2017 PCOR Partnership Annual Membership Meeting and Workshop were held in Plano, Texas. In attendance were 98 attendees from 46 organizations. The workshop focused on best practices for monitoring and an interactive breakout activity on selecting monitoring techniques for different CO<sub>2</sub> storage scenarios. The membership meeting updated the attendees on current PCOR Partnership activities and lessons learned from the PCOR Partnership Program. A panel discussed where we are headed with carbon.

Ten tasks continued. In addition to the foregoing, regional model development continued, Web site updates continued, Bell Creek modeling and simulation activities continued, a site closure plan and the annual assessment report were submitted, responses to IEA Greenhouse Gas R&D Programme peer review recommendations were submitted to the DOE NETL Project Manager, and development of a paper on the major research focuses for water and carbon capture and storage continued.



## **PLAINS CO<sub>2</sub> REDUCTION PARTNERSHIP PHASE III**

### **Quarterly Technical Progress Report**

### **October 1 – December 31, 2017**

## **INTRODUCTION**

The Plains CO<sub>2</sub> 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 December 31, 2017, 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 (2007–2018): involves large-volume carbon storage demonstration tests

Phase III is divided into three budget periods (BPs), running from October 1, 2007, to December 31, 2018:

- BP3: October 1, 2007 – September 30, 2009
- BP4: October 1, 2009 – March 31, 2016
- BP5: April 1, 2016 – December 31, 2018

BP1 and BP2 were effective in Phase II.



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

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

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<sub>2</sub>), 2) facilitate the development of the infrastructure required to transport CO<sub>2</sub> 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<sub>2</sub>, 5) facilitate the establishment of a technical framework by which carbon credits can be monetized for CO<sub>2</sub> 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

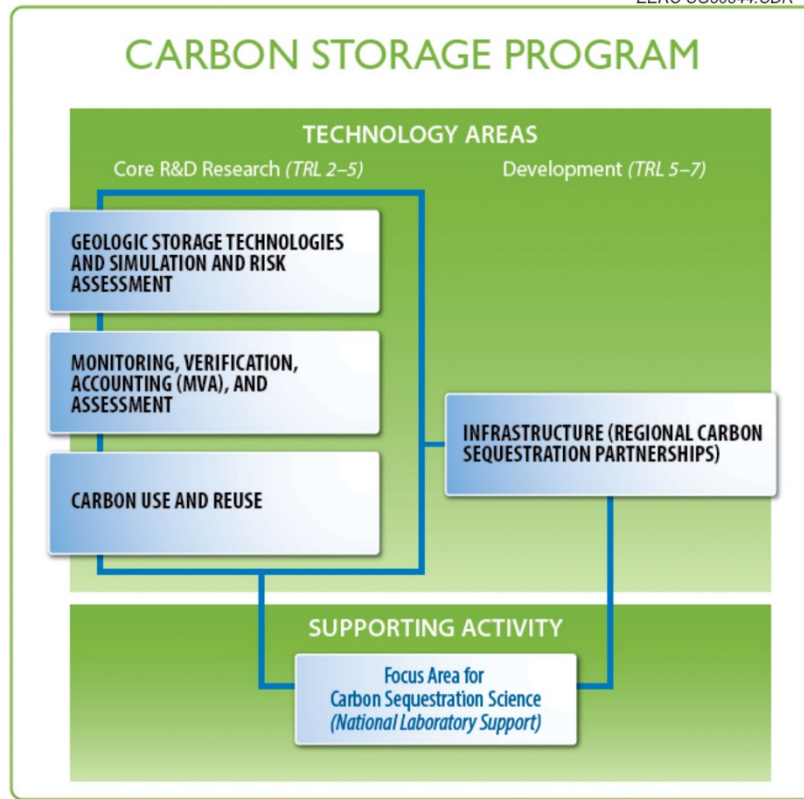


Figure 1. DOE Carbon Storage Program technology areas featuring regional partnerships (courtesy of DOE NETL; “TRL” stands for technology readiness level).

utilize the infrastructure of its region to maximize CO<sub>2</sub> injection volumes. A programmatic development phase (Phase III) goal is implementation of large-scale field testing involving at least 1 million tonnes of CO<sub>2</sub> per project. Each of the RCSP large-volume injection tests is designed to demonstrate that the CO<sub>2</sub> storage sites have the potential to store regional CO<sub>2</sub> 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 MVA activities associated with the Aquistore project near Estevan, Saskatchewan, Canada. The PCOR Partnership’s work concluded with Apache Canada Ltd. to further characterize the Zama Acid Gas Enhanced Oil Recovery (EOR), CO<sub>2</sub> 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).

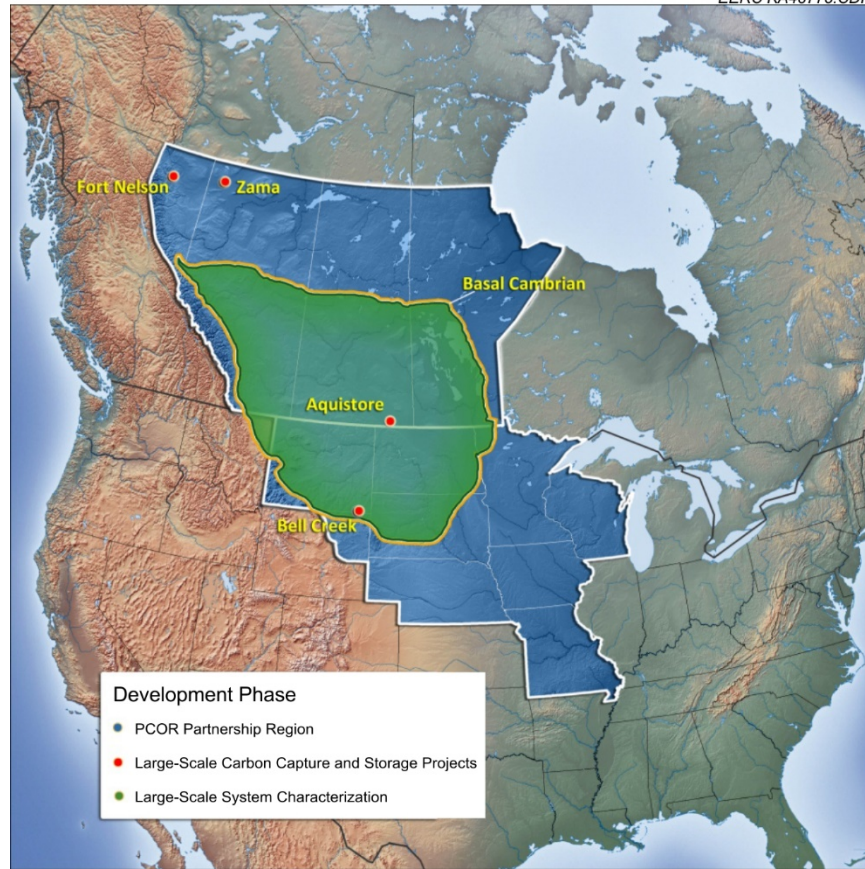


Figure 2. Location of large-scale sites with PCOR Partnership Phase III participation.

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<sub>2</sub> 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<sub>2</sub> 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 (completed); 5) Well Drilling and Completion (completed); 6) Infrastructure Development; 7) CO<sub>2</sub> 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<sub>2</sub> 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**

<b>Phase III Task Description</b>	<b>Task Leader</b>
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 (completed)	James A. Sorensen
Task 5 – Well Drilling and Completion (completed)	John A. Hamling
Task 6 – Infrastructure Development	Melanie D. Jensen
Task 7 – CO <sub>2</sub> 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 <sub>2</sub> 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:

- Continued activities to update the content of the **PCOR Partnership partners-only Decision Support System (DSS) Web site**, including the following:
  - Placed all 2017 PCOR Partnership Annual Membership Meeting and Workshop materials on the PCOR Partnership members-only DSS, including presentations, posters, and final agendas.
  - The 2016 PCOR Partnership Annual Membership Meeting to the PCOR Partnership Annual Meetings sections went live.
  - Continued work on the Bell Creek sections.
  - Created GIS (geographic information system) files for the latest update to the CO<sub>2</sub> emissions sources in the PCOR Partnership region (from Deliverable [D]1 – Review of Source Attributes) and prepared files for use in the PCOR Partnership members-only DSS interactive map.
- Continued activities to update the content of the **PCOR Partnership general database**, including the following:
  - Updated North Dakota, South Dakota, and Manitoba monthly production data.

- Updated North Dakota, South Dakota, Montana, Nebraska, Manitoba, and Saskatchewan well information.
- Continued database preventive maintenance of Petra projects.
- Continued work on integrating data for modeling and simulation efforts related to CO<sub>2</sub> storage in mature and depleted oil fields within the region, including the following:
  - Continued development of the Fryburg–Medora model, including compiled characterization data, digitized logs, and worked on importing core data from the North Dakota Geologic Survey.
  - Continued work on the Lodgepole static model by loading wells drilled from 2009 to present as well as associated logs. Picked tops. Began the structural model. Worked on defining facies criteria.
  - Revised pressure and fluid saturation property distributions in the Gooseneck Field model in preparation for CO<sub>2</sub> storage simulations. Completed history matching of cumulative oil, water, and gas production with an open boundary condition. Worked on simulations with a closed boundary.
  - Continued work on a Nebraska regional model.
- With regard to the **Williston Basin** CO<sub>2</sub> storage sink relative permeability laboratory characterization effort:
  - Continued modification to the value-added report based on additional internal review.
- With regard to the **Aquistore** project:
  - Submitted D93 entitled “Aquistore CO<sub>2</sub> Storage Project: Numerical Modeling and Simulation Update” on October 7, 2017, for review. Received approval on October 10, 2017.
  - Hosted PTRC CEO Dan MacLean on October 13, 2017. Discussed EERC and PTRC activities and provided a tour of the EERC facilities.
  - Sent a draft abstract for the 14th International Conference for Greenhouse Gas Control Technologies (GHGT-14) (to be held October 21–26, 2018, in Melbourne, Australia) to PTRC for review.
  - Participated in a Science and Engineering Research Committee (SERC) conference call December 8, 2017. SaskPower is planning a pull-tubing workover on the injection well. The distributed temperature system (DTS) devices have failed; therefore, there is currently no downhole data from the injector. Permission has been granted to continue operations.
  - As of November 7, 2017, 111,475 tonnes of CO<sub>2</sub> has been injected at the Aquistore site.
  - With regard to static **modeling** and dynamic predictive **simulation** activities:
    - ♦ Processed newly received injection data for October 2017.

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 2 – Public Outreach and Education

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

- Submitted fact sheet D14 entitled “PCOR Partnership – Demonstrating CO<sub>2</sub> Storage in the Northern Great Plains” on October 3, 2017, for review. Received approval with minor edits on October 4, 2017.
- Submitted a value-added fact sheet update entitled “Carbon Dioxide and Climate Change” on October 3, 2017, for review. Received approval on October 4, 2017.
- Submitted fact sheet D15 entitled “Bell Creek Project – Enhanced Oil Recovery with Associated CO<sub>2</sub> Storage” on October 7, 2017, for review. Received approval on October 10, 2017.
- Submitted value-added reports entitled “Household Energy and Carbon Web Pages Report” for the periods of April 1 – June 30, 2017, and July 1 – September 30, 2017, to DOE NETL for review on November 16, 2017. Received approval on November 17, 2017.
- During the quarter, the PCOR Partnership was represented by EERC personnel at 15 meetings/conferences and two workshops. Specifically, the PCOR Partnership outreach activities included nine oral presentations and one booth. The following quantities of PCOR Partnership outreach materials were distributed:
  - PCOR Partnership documentary entitled “Nature in the Balance: CO<sub>2</sub> Sequestration” – 6
  - PCOR Partnership documentary entitled “Reducing Our Carbon Footprint: The Role of Carbon Markets” – 6
  - PCOR Partnership documentary entitled “Out of the Air – Into the Soil” – 5
  - PCOR Partnership documentary entitled “Managing Carbon Dioxide: The Geologic Solution” – 1
  - PCOR Partnership documentary entitled “Global Energy and Carbon: Tracking Our Footprint” – 10
  - PCOR Partnership video training guide entitled “Installing a Casing-Conveyed Permanent Downhole Monitoring System” – 4
  - PCOR Partnership documentary entitled “The Bell Creek Story: CO<sub>2</sub> in Action” – 14
  - PCOR Partnership Atlas, 5th Edition – 29
- Updated the DOE-approved Bell Creek Test Site fact sheet (D15) incorporating the changes requested by Denbury.
- Continued writing text and revising layout for the draft updated Phase II Zama fact sheet.
- Updated a DOE-approved value-added fact sheet title to “Carbon Capture Utilization and Storage Outreach,” and printed copies for distribution at the PCOR Partnership Annual Meeting.
- **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:

- ◆ Participated in the monthly conference call on October 19, 2017. Topics included upcoming speakers for calls and the content of a feedback form for outreach leads regarding the OWG and the value of its activities since inception.
- ◆ Participated in the monthly conference call on November 16, 2017. Topics included discussion and assessment of comments from OWG members regarding the review of a draft summary of OWG activities and accomplishments since 2003, intended as input for a final activity report.
- ◆ Sent regrets regarding the monthly OWG conference call for December 21, 2017, but followed up, reviewed call summary, and noted action items.
- Continued work on D13 (Public Site Updates) due January 2018, including updated draft descriptions and categories for the Video Clip Library Web pages, reviewed and revised the content update plan.
- Continued efforts to update the **public Web site** ([www.undeerc.org/pcor](http://www.undeerc.org/pcor)), including the following:
  - Submitted a request for review and received approval on October 6, 2017, of updates to the PCOR Partnership public Web site. Approved updates went live on October 10, 2017, including the following:
    - ◆ CO<sub>2</sub> Sequestration Projects page: On the hover boxes, updated CO<sub>2</sub> injection information and added a “Project Status” line. Updated print-friendly PDF.
    - ◆ Aquistore: Updated text, replaced image with newer version on the PTRC Web site.
    - ◆ Boundary Dam Project: Updated text.
    - ◆ Fort Nelson Project: Updated text.
    - ◆ Weyburn–Midale: Updated text.
    - ◆ Climate Change, CO<sub>2</sub>, Sequestration page: Updated and revised text, subdivided bulleted hyperlinks into two categories.
  - The following went live on December 20, 2017:
    - ◆ Added fact sheets to the “North Dakota CCS Feasibility Study” pertaining to a Phase II CarbonSAFE (Carbon Storage Assessment and Facility Enterprise) project being conducted by the EERC.
    - ◆ New page entitled “Nebraska CCS Pre-Feasibility Study” pertaining to a Phase I CarbonSAFE project being conducted by the EERC.
    - ◆ Updated “PCOR Partnership Regional Atlas 5th Edition, Revised,” on the PCOR Partnership Regional Atlas Web page.
    - ◆ Added updated fact sheets, including Bell Creek Project – Enhanced Oil Recovery Resulting in Associated CO<sub>2</sub> Storage (D17) and PCOR Partnership Phase III – Demonstrating CO<sub>2</sub> Storage in the Northern Great Plains (D14).
  - Worked on programming needed to add video clips from “The Bell Creek Story – CO<sub>2</sub> in Action” to the Video Clip Library and update the “Carbon and CO<sub>2</sub>” page in a future update.
  - Worked on the planned public Web site technical upgrade, including the following:
    - ◆ Tested the ability to play videos on HTML5.
    - ◆ Continued work on the new template for the upgrade.
    - ◆ Held several internal discussions.
  - Continued ongoing identification and repair of broken links.

- Continued collaborative efforts with **Prairie Public Broadcasting (PPB)**, including the following:
  - Held conference calls with PPB on November 3 and 27, 2017, to discuss progress on Task 2 activities and the path forward.
  - With regard to **Documentary D22** (Coal Powered):
    - ◆ Reviewed and assessed comments by EERC staff members from the September 12, 2017, viewing of the draft documentary and from DOE. Addressed reviewer comments and technical issues for narrator content, interview statement content, and cover images.
    - ◆ Completed a full detailed review of the deliverable and drafted narration changes.
    - ◆ Sent video editing instructions to PPB.
    - ◆ Received a request from PCOR Partnership partner Lignite Energy Council (LEC) for a screening of the draft D22 product.
  - With regard to **Documentary D21** (The Bell Creek Story – CO<sub>2</sub> in Action):
    - ◆ Finalized edits for clips intended for use on the PCOR Partnership public Web site and in presentations. Prepared edits for PPB. PPB's submittal of the documentary to the National Educational Telecommunications Association (NETA) for national distribution is under way.
    - ◆ Performed an internal review of video clips for use on the PCOR Partnership public Web site and in presentations. Forwarded the clips to EERC senior PCOR Partnership managers for internal review.
- Information regarding the **site sessions/visits** to the PCOR Partnership public Web site included the following:
  - There were 9502 sessions/visits to the public Web site ([www.undeerc.org/pcor](http://www.undeerc.org/pcor)). Traffic increased over 32% from last quarter (7194 sessions/visits).
  - There were 8274 unique visitors to the public Web site, representing a 32% increase from last quarter (6273 visitors). In particular, over 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 9502 sessions/visits, 47% of the Web traffic was domestic, and 53% was international. Table 3 lists the top ten countries for visits to the PCOR Partnership Web site: United States, India, United Kingdom, Canada, Philippines, Australia, Pakistan, Malaysia, Germany, and Egypt. There was traffic from 140 countries overall (Figure 3).
  - There were 638 sessions/visits originating from within the PCOR Partnership region (a 60% increase from last quarter) (Figure 4). Approximately 70% of the regional visits originated from the United States, and 30% came from Canada. Visits from within the PCOR Partnership region represent almost 7% 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).



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

	<b>Country</b>	<b>Sessions/ Visits*</b>	<b>PCOR Partnership State/Province</b>	<b>Visits*</b>
1	United States	4439		
			North Dakota	125
			Wisconsin	90
			Minnesota	83
			Missouri	40
			Nebraska	33
			Wyoming	29
			Iowa	25
			Montana	19
			South Dakota	4
2	India	1107		
3	United Kingdom	765		
4	Canada	559		
			Alberta	84
			British Columbia	60
			Saskatchewan	25
			Manitoba	21
5	Philippines	240		
6	Australia	194		
7	Pakistan	148		
8	Malaysia	137		
9	Germany	99		
10	Egypt	87		
	Other 130 countries	1622		
<b>Total Sessions/Visits</b>		<b>9502</b>	<b>Total PCOR Partnership Visits</b>	<b>638</b>

\* Arranged by the number of visits to the site.

- 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 almost 86% 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,” “CO<sub>2</sub>,” and “CO<sub>2</sub> sequestration.”
  - Direct traffic consists of those visitors who bookmark or type a specific URL (e.g., [www.undeerc.org/pcor](http://www.undeerc.org/pcor)) into the Web address bar. It is likely that most of the direct traffic (10.2%) is from persons familiar with the PCOR Partnership.

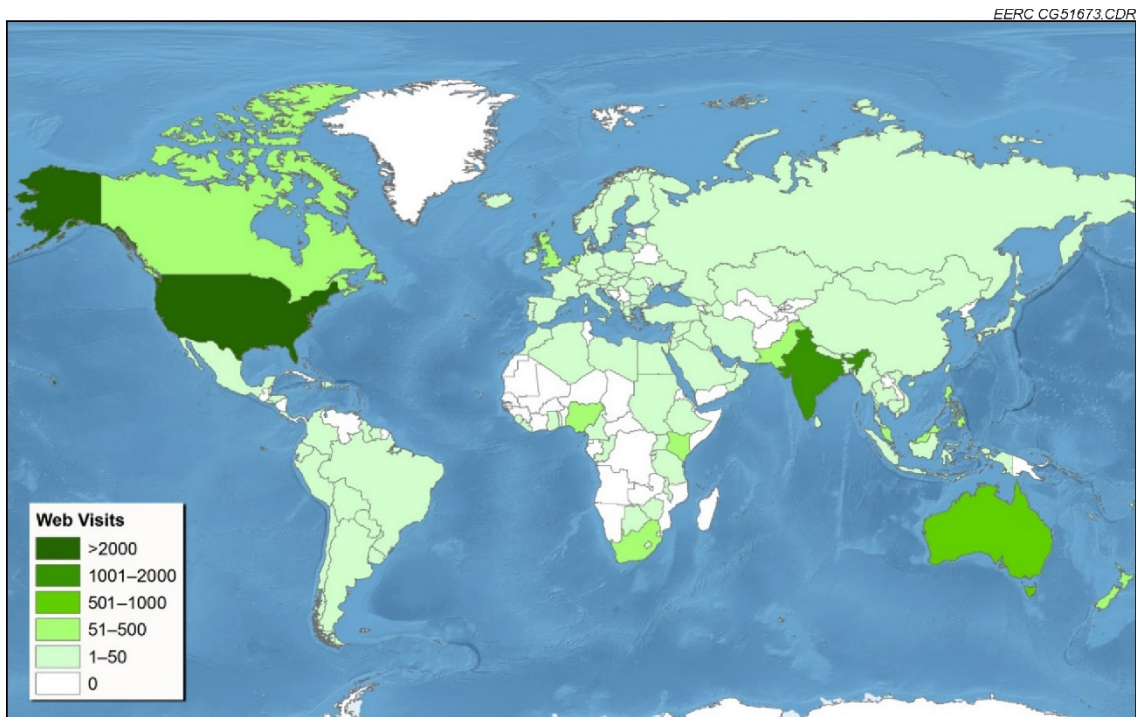


Figure 3. Map of PCOR Partnership Web site global traffic for this reporting period.

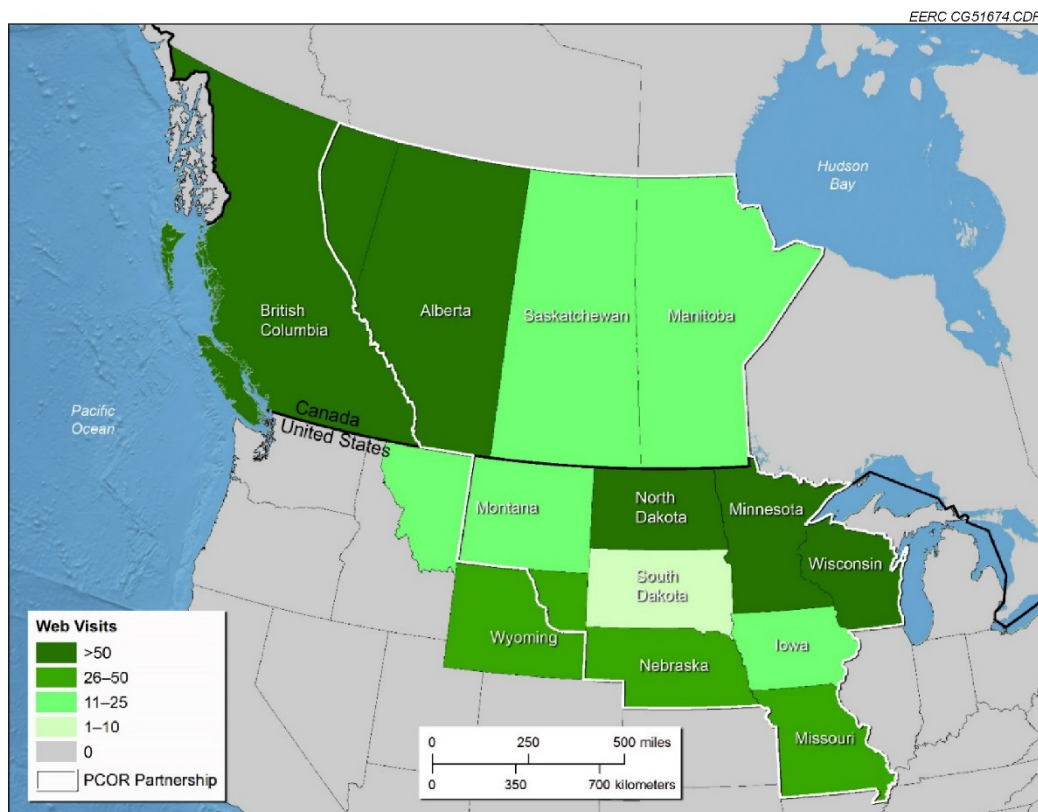


Figure 4. Map of PCOR Partnership Web site regional visits for this reporting period.

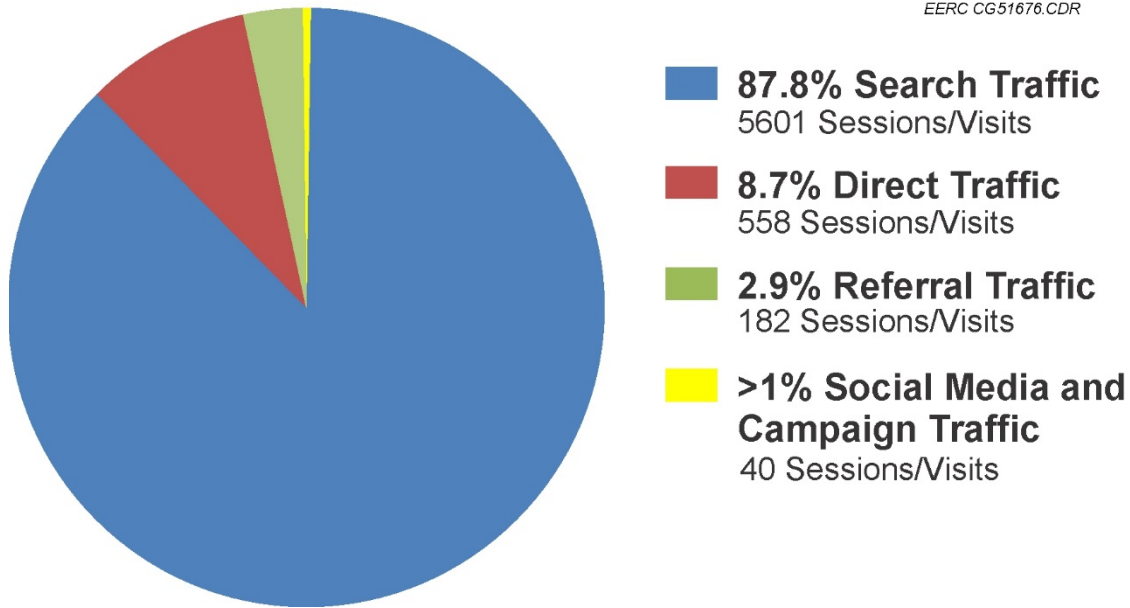


Figure 5. PCOR Partnership public Web site traffic sources for this reporting period.

- Referral site traffic (almost 3.4%) corresponds to the traffic directed to the PCOR Partnership Web page from other sites via links. The top referring Web sites were undeerc.org (EERC) and arthapedia.in (Indian economy and government Web site).
- Less than 1% of site traffic (39 visitors) resulted from teacher campaigns and social interactions, such as e-mail or social media sources (e.g., Facebook and YouTube).
- During this reporting period, the **nature of the sessions** to the PCOR Partnership public Web site included 16,992 page views (an increase of approximately 43% from last quarter); the top five pages viewed are listed in Table 4. These five pages make up almost 74% of total page views.
- 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. Two 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.
- During this reporting period, the PCOR Partnership received **public television exposure** from documentaries broadcast in Alaska. A total of ten broadcasts of "The Bell Creek Story: CO<sub>2</sub> in Action" aired. No broadcasts were televised in the PCOR Partnership region.

**Table 4. Top “Page Views” on the PCOR Partnership Public Web Site**

<b>Page Title</b>	<b>Page Views</b>	<b>% Page Views</b>	<b>Page</b>
What Is CO <sub>2</sub> Sequestration?	7357	43.3	<a href="http://www.undeerc.org/pcor/sequestration/whatissequestration.aspx">www.undeerc.org/pcor/sequestration/whatissequestration.aspx</a>
What Is CO <sub>2</sub> ?	2086	12.3	<a href="http://www.undeerc.org/pcor/sequestration/whatisco2.aspx">www.undeerc.org/pcor/sequestration/whatisco2.aspx</a>
Carbon Capture and Storage (CCS)	1305	7.7	<a href="http://www.undeerc.org/pcor/sequestration/ccs.aspx">www.undeerc.org/pcor/sequestration/ccs.aspx</a>
Terrestrial CO <sub>2</sub> Sequestration Projects	1263	7.4	<a href="http://www.undeerc.org/pcor/region/terrestrial/default.aspx">www.undeerc.org/pcor/region/terrestrial/default.aspx</a>
	580	3.4	<a href="http://www.undeerc.org/pcor/co2sequestrationprojects/default.aspx">www.undeerc.org/pcor/co2sequestrationprojects/default.aspx</a>

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

<b>Video</b>	<b>Video Length</b>	<b>Views</b>	<b>Est. Minutes Watched</b>	<b>Avg. View Duration</b>
The Phases of Oil Recovery – So Far	2:40	1053	1681	1:45
Reforestation in Brazil	4:41	957	2129	2:15
Reducing Our Carbon Footprint: The Role of Markets Documentary	26:49	571	2829	5:00
Installing a Casing-Conveyed Permanent Downhole Monitoring System	19:19	152	777	5:05
Reservoir Geology 101: Fluid in the Rocks	1:50	108	137	1:15

**Table 6. PCOR Partnership Videos on PPB YouTube Channel Accessed**

<b>Video</b>	<b>Video Length</b>	<b>Views</b>	<b>Est. Minutes Watched</b>
Global Energy and Carbon: Tracking Our Footprint	32:36	987	6733
Clean Development Mechanism Projects	1:56	311	249
CO <sub>2</sub> EOR and Geologic CO <sub>2</sub> Sequestration	3:13	241	449
The Bell Creek Story: CO <sub>2</sub> in Action	26:45	76	252
CO <sub>2</sub> Flooding and Geologic CO <sub>2</sub> Sequestration	3:13	59	40

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 3 – Permitting and NEPA Compliance**

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

- Participated in the Interstate Oil and Gas Compact Commission (IOGCC) Annual Meeting held September 30 – October 4, 2017, in Pittsburgh, Pennsylvania. Served as the cochair during two Safety and Environmental Committee meetings.
- Worked on reviewing information needed for Update 4 of D8 Permitting Review, due February 28, 2018.

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**

This task ended in Quarter 1 – BP5, Year 10 (March 2017).

### **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:

- Provided three nonconfidential EERC reports on research performed on membranes to a PCOR Partnership partner, as requested at the PCOR Partnership Annual Meeting.

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<sub>2</sub> 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 D51 entitled “Best Practices Manual – Monitoring for CO<sub>2</sub> Storage” on October 31, 2017, as a draft. This report is undergoing technical expert review with changes expected. A revised draft will be submitted.
- Held a project update meeting with Denbury representatives on October 23, 2017, in advance of the PCOR Partnership Annual Membership Meeting and Workshop. Topics of discussion included Bell Creek technical activities, pulsed-neutron log (PNL) logs, geophysics, InSAR (interferometric synthetic aperture radar), and the site closure/decommissioning plan.
- Attended the Midland CO<sub>2</sub> and ROZ (residual oil zone) conference held December 4–8, 2017, in Midland, Texas. Presented “Life Cycle Analysis for CCS and CCUS [carbon capture, utilization, and storage]: Lessons Learned and Changing Paradigms.”
- Submitted three memos to the DOE Project Manager regarding official updated volumes of tonnes of CO<sub>2</sub> purchased for injection and tonnes of CO<sub>2</sub> stored at Bell Creek. At the end of BP4 (March 31, 2016), 2.979 million tonnes of CO<sub>2</sub> had been stored.
  - Submitted a memo on October 4, 2017. As of August 31, 2017, 4.220 million tonnes of total gas (composition of approximately 98% CO<sub>2</sub>) had been purchased for injection into the Bell Creek Field, equating to an estimated **4.158 million tonnes of CO<sub>2</sub> stored**.
  - Submitted a memo on December 6, 2017. As of October 31, 2017, 4.425 million tonnes of total gas (composition of approximately 98% CO<sub>2</sub>) had been purchased for injection into the Bell Creek Field, equating to an estimated **4.362 million tonnes of CO<sub>2</sub> stored**.
  - Submitted a memo on December 21, 2017. As of November 30, 2017, the most recent month of record, 4.599 million tonnes of total gas (composition of approximately 98% CO<sub>2</sub>) had been purchased for injection into the Bell Creek Field, equating to an estimated **4.536 million tonnes of CO<sub>2</sub> stored**.
- Continued work on a planned special issue of the *International Journal of Greenhouse Gas Control* (IJGGC) focused on associated storage. Task 9 team members continued to write text for several of the potential papers.
- Continued to draft abstracts for submission to GHGT-14, to be held October 21–26, 2018, in Melbourne, Australia.
- Based on mutual agreement with the DOE Project Manager, the PCOR Partnership plans to submit update to D69 (Best Practices for Modeling and Simulation of CO<sub>2</sub> Storage), which was submitted May 31, 2017, and to D51 (Best Practices Manual – Monitoring for CO<sub>2</sub> Storage), which was submitted October 31, 2017, that incorporate additional technical expert reviewer perspectives and findings. Met to discuss the path forward for revisions. Continued work on revisions to lessons learned, recommended best practices, case studies, and text.
- Met internally to begin developing a provisional plan to upload pertinent PCOR Partnership data to the NETL’s Energy Data eXchange (EDX) in 2018.
- Continued **Bell Creek** site activities, including the following:

- Used the most recent publicly available data to determine that cumulative CO<sub>2</sub> gas injection is 8,709,344 tonnes through October 31, 2017. This value represents the total gas injected, which includes purchase and recycle streams and is NOT corrected for a gas composition of approximately 98% CO<sub>2</sub> (Table 7).
- As of November 30, 2017, the most recent month of record, 4.599 million tonnes of total gas (composition of approximately 98% CO<sub>2</sub>) has been purchased for injection into the Bell Creek Field, equating to an estimated 4.536 million tonnes of CO<sub>2</sub> stored (Table 8), with the difference comprising other trace gases in the purchase gas stream. A separate method from that used to calculate estimated total gas injected was used to calculate cumulative associated CO<sub>2</sub> storage by correcting the gas purchase volume (approximately 98% CO<sub>2</sub>) obtained from Denbury's custody transfer meter with gas compositional data.

**Table 7. Bell Creek CO<sub>2</sub> Gas Injection Totals for October 2017 (cumulative totals May 2013 to October 2017)<sup>1</sup>**

	<b>October Injection</b>
Total, Mscf	4,423,275
Total, tons <sup>2</sup>	253,004
Total, tonnes <sup>3</sup>	229,745
Cumulative Total, Mscf <sup>4</sup>	167,681,006
Cumulative Total, tons <sup>2,4</sup>	9,591,089
Cumulative Total, tonnes <sup>3,4</sup>	8,709,344

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

<sup>1</sup> Total gas injection quantities are **NOT CORRECTED** for gas composition and include the combined purchased and recycled gas streams.

<sup>2</sup> Calculated utilizing a conversion of 17.483 Mscf/ton.

<sup>3</sup> Calculated utilizing a conversion of 19.253 Mscf/tonne.

<sup>4</sup> Cumulative totals are for the period from May 2013 to the month listed.

**Table 8. Cumulative Total Gas Purchased and Estimated Associated CO<sub>2</sub> Storage for the Bell Creek Field<sup>1</sup>**

	<b>November 2017 Gas Totals</b>
Monthly Total Gas Purchased, MMscf <sup>2</sup>	3360
Monthly Total Gas Purchased, million tons <sup>2</sup>	0.192
Monthly Total Gas Purchased, million tonnes <sup>2</sup>	0.174
Cumulative Total Gas Purchased, MMscf <sup>2,3</sup>	88,545
Cumulative Total Gas Purchased, million tons <sup>2,3</sup>	5.065
Cumulative Total Gas Purchased, million tonnes <sup>2,3</sup>	4.599
Cumulative Total CO <sub>2</sub> Stored, MMscf <sup>3,4</sup>	87,325
Cumulative Total CO <sub>2</sub> Stored, million tons <sup>3,4</sup>	4.995
Cumulative Total CO <sub>2</sub> Stored, million tonnes <sup>3,4</sup>	4.536

<sup>1</sup> Conversion factors of 17.483 Mscf/ton and 19.253 Mscf/tonne were used to calculate equivalent purchase and storage quantities.

<sup>2</sup> Total gas purchased **NOT CORRECTED** for gas composition.

<sup>3</sup> Cumulative totals are for the period from May 2013 to the month listed.

<sup>4</sup> Total CO<sub>2</sub> stored **CORRECTED** for gas composition.

- With regard to **injection-phase monitoring** efforts:
  - ◆ Continued reservoir pressure and distributed temperature monitoring of 05-06 OW (observation well) from the permanent downhole monitoring system using the casing-conveyed pressure–temperature gauges and fiber-optic DTS:
    - Near-continuous operation since April 2012.
  - ◆ Traveled to Bell Creek Field December 13–14, 2017, for attempted time-lapse PNL saturation log acquisition in two wells in Phase Area 4 in coordination with Denbury and Schlumberger. The logging was successfully completed in one of the two wells attempted. Logs were not successfully acquired in the second well; further attempts to obtain logs in the second well were abandoned because of elevated risk of the PNL tool becoming stuck.
- With regard to **injection-phase sampling** activities:
  - ◆ Completed collection of the eighth round of oil samples from a select group of wells in the Bell Creek Field on November 8, 2017. Working with Denbury on sample receipt to the EERC.
  - ◆ Contacted a Denbury representative to discuss possible additional oil sampling in Bell Creek Oil Field.
  - ◆ A summary of all oil and CO<sub>2</sub> gas stream samples collected for analyses to date is provided in Table 9.
  - ◆ Continued oil composition analyses of oil samples collected from Bell Creek Oil Field. Completed oil samples from Phase Area 1.
  - ◆ Worked on CO<sub>2</sub> pressure/flushing tests with Bell Creek crude oil on a sand bed to study the movement of hydrocarbons with CO<sub>2</sub>.
- With regard to **modeling** and **simulation** efforts:
  - ◆ Continued dynamic reservoir pressure and multiphase fluid flow simulation efforts. The modeling and simulation focus remains on Bell Creek Field Phase Areas 1–4. Accomplishments and activities include the following:
    - History matching of the updated simulation model is complete for Phase Areas 1–3. Predictive simulation is complete for Phase Areas 1 and 2. Long-term simulations of CO<sub>2</sub> migration are complete for Phase Areas 3–7. History matching of the simulation model is complete for the primary depletion, waterflooding, and CO<sub>2</sub>-flooding stages for Phase Area 4 using the simulation model based on the Version 3 geologic model.
    - Updated the production data in the Bell Creek Phase Area 4 simulation model to October 2017 and predicted the CO<sub>2</sub> plume distribution in Phase Area 4 to December 2017.
    - Updated the simulation model with refined dates for Bell Creek Phase Area 3 to cover the time span of seismic surveys.
    - Continued work on matching the simulation model to measured saturation values from PNLs.
    - Processed CO<sub>2</sub> saturation thickness data for all wells in Phase Area 1. The simulation results match well with the PNL data.



**Table 9. Oil and CO<sub>2</sub> Gas Stream Sampling and Analyses**

		Production Stream by Development Phase, Well <sup>1</sup>									
	Purchase/ Recycle <sup>1</sup>	Phase 1				Phase 3			Phase 4		
Date Sampled		56-14R	32-02	05-06	04-04	28-02	21-10	21-14	34-09	34-07	34-03
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			O	OG							
Mar 2015		G	G	G							
Apr 2015	PR										
Jun 2015		O	O	O							
Jul 2015	PR	G	G	G							
Sep 2015	PR										
Nov 2015		O		O							
Jan 2016	PR										
Apr/May 2016		O	O	O	O	O	O	O			
Jun/Jul 2016	PR	O		O	O	O	O	O			
Aug/Sep 2016		O	O		O	O	O	O	O		
Oct 2016				O							
Nov/Dec 2016 <sup>2</sup>	PR	O	O	O	O	O	O	O	O	O	O
Feb 2017 <sup>2</sup>		O	O		O	O	O	O	O	O	O
May 2017 <sup>2</sup>	PR	O	O	O	O	O	O	O	O	O	O
July 2017 <sup>2</sup>		O			O	O	O	O	O	O	O

<sup>1</sup> P = purchase CO<sub>2</sub> gas stream, R = recycle CO<sub>2</sub> gas stream, O = produced oil stream, and G = produced CO<sub>2</sub> gas stream.

<sup>2</sup> Oil samples collected but not yet analyzed.

- ◆ Continued work with the 2012/2014/2015 4-D seismic data set. Accomplishments and activities include the following:
  - Continued work on tying seismic attributes from the three sets of seismic difference data to the PNL well data. Worked on seismic inversion of the 2012 baseline and applied wavelet analysis to the 2012 baseline and 2014 monitor data.
- ◆ Continued work on updating the passive microseismic velocity model and refining parameters for magnitude and focal mechanism estimation. Accomplishments and activities include the following:
  - Processing progress was impeded by strong 60 Hz and other monochromatic noise. A new filter module for the MiVu software from GeoTomo arrived and was installed. Processing continued with the new workflow.
- ◆ Continued evaluating InSAR data in conjunction with pressure history data of injection wells in Phase Area 4 to improve the geomechanical modeling for use in ground surface deformation modeling and simulation. Set up the geomechanical model to estimate ground surface deformation through the forward modeling process.

- ◆ Reran the Phase Area 4 reservoir model, and compared the bottomhole pressure of some wells with the simulation results.

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 10 – Site Closure**

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

- Submitted D54 entitled “Bell Creek Test Site – Site Closure Plan” on December 28, 2017, for review. Received approval December 29, 2017.

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:

- Worked on an abstract to be submitted for consideration at GHGT-14 to be held October 21–26, 2018, in Melbourne, Australia. The DOE NETL Project Manager approved the use of a paper to be submitted to GHGT-14 as D73 (Monitoring and Fate of Stored CO<sub>2</sub>).

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:

- Submitted D57 entitled “Annual Assessment Report” on December 29, 2017, for 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 13 – Project Management**

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

- Extended PCOR Partnership Phase III to December 31, 2018, in Amendment 37, on October 1, 2017.
- Effective October 5, 2017, William (Bill) Aljoe replaced Andrea Dunn as the PCOR Partnership Program Manager.
- Statoil joined the PCOR Partnership in November 2017.
- Hosted the PCOR Partnership Annual Membership Meeting and Workshop October 24–26, 2017, in Plano, Texas.
  - EERC researchers representing each of the active tasks attended and/or participated in the workshop and meeting. This particular meeting and workshop had the highest attendance of non-EERC personnel to date. A total of 98 attendees (71 partners, presenters, or guests) from 46 organizations were in attendance (see Figure 6).
  - Hosted a half-day workshop, entitled “How Much Is Enough? Moving Toward a Commercial Approach to Monitoring CO<sub>2</sub> Geologic Storage,” on October 24, 2017, focused on best practices for monitoring learned from two ongoing CO<sub>2</sub> storage projects in the PCOR Partnership region. Concluded with an interactive breakout activity on selecting monitoring techniques for different CO<sub>2</sub> storage scenarios.
  - Hosted 1.5 days of presentations to update the attendees on current PCOR Partnership activities and lessons learned from the PCOR Partnership Program. Topics covered included DOE’s Fossil Energy Clean Coal Program, Project Tundra, capture technology, North Dakota Class VI primacy, the Petra Nova project, and the Bell Creek project. A panel, moderated by Mr. Chuck McConnell, Rice University, discussed where we are headed with carbon. Panel participants included Mr. Gerald Bachmeier, Red Trail Energy LLC; Ms. Stacey Dahl, Minnkota Power; Mr. Lynn Helms, North Dakota Industrial Commission (NDIC); and Mr. Dan MacLean, PTRC.



Figure 6. 2017 PCOR Partnership Annual Membership Meeting attendees.

- Hosted a PCOR Partnership Technical Advisory Board (TAB) meeting in conjunction with the PCOR Partnership Annual Membership Meeting and Workshop on October 24, 2017. Five TAB members were able to attend. Topics of discussion included ongoing efforts and deliverables and key messages of the PCOR Partnership.
- Attended the American Institute of Chemical Engineers (AIChE) Annual Meeting held October 29 – November 3, 2017, in Minneapolis, Minnesota. Presented “Geologic Storage of Carbon Dioxide in the Central Plains of North America.”
- Attended the 7th Carbon Sequestration Leadership Forum (CSLF) Ministerial Meeting held December 3–7, 2017, in Abu Dhabi, United Arab Emirates.
- Attended the Midland CO<sub>2</sub> and ROZ conference held December 4–8, 2017, in Midland, Texas.
- Attended the DOE NETL RCSP Permitting Lessons Learned meeting held December 12, 2017, in Washington, D.C.
- Received approval for D103 entitled “PCOR Partnership Best Practices Manual for Subsurface Technical Risk Assessment of Geologic CO<sub>2</sub> Storage Projects” on October 3, 2017.
- Submitted Milestone (M) 36 entitled “Technical Advisory Board Meeting Scheduled” on December 28, 2017, for review. Received approval December 29, 2017. The 2018 TAB meeting has been scheduled to be held April 9–11, 2018, in Miami, Florida.
- Submitted M65 entitled “PCOR Partnership Annual Membership Meeting and Workshop Held” on December 29, 2017, for review.
- Attended the Global CCS Symposium – Advancing a Path Forward held October 3–5, 2017, in Regina, Saskatchewan.
- Received recommendations resulting from the IEA Greenhouse Gas R&D Programme (IEAGHG) peer review of the Regional Carbon Sequestration Partnership Initiative Development Phase (Phase III) performed January 23–27, 2017. Completed preparation of draft responses. Submitted to the DOE NETL Project Manager for review.
- Continued work on a planned special issue of the IJGGC focused on associated storage. Team members continued to write text for potential papers related to all active tasks. Completed Elsevier’s EVISE editorial training.
- Continued to write abstracts for submission to GHGT-14 to be held October 21–26, 2018, in Melbourne, Australia. Abstracts are being written by team members from most active tasks.
- Responded to several inquiries received from PCOR Partnership members following the PCOR Partnership Annual Membership Meeting and Workshop. These inquiries included requests for copies of the workshop activity cards, presentations, the participant list, and PCOR Partnership products (e.g., figures, Best Practices Manuals). All requested materials were provided.
- Began compiling a list of potential conflicts/dates in preparation of planning for the 2018 PCOR Partnership Annual Membership Meeting and Workshop.
- Held a task leader meeting October 18, 2017. Topics discussed included planning for the 2017 PCOR Partnership Annual Membership Meeting and Workshop, deliverables, planned journal articles and conference papers, recent meeting attendance, and task updates.
- Held a task leader meeting November 29, 2017. Topics discussed included deliverables, planned journal articles and conference papers, recent and upcoming meeting attendance, and task updates.

- Held PCOR Partnership Annual Membership Meeting and Workshop planning meetings on October 6 and 13, 2017.
- Deliverables and milestones completed in October:
  - September monthly update
  - Task 1: D93 – Aquistore CO<sub>2</sub> Storage Project: Numerical Modeling and Simulation Update
  - Task 2: D14 – PCOR Partnership – Demonstrating CO<sub>2</sub> Storage in the Northern Great Plains
  - Task 2: D15 – Bell Creek Project – Enhanced Oil Recovery with Associated CO<sub>2</sub> Storage
  - Task 9: D51 – Best Practices Manual – Monitoring for CO<sub>2</sub> Storage
  - Task 13: D58/D59 – Quarterly Progress Report/Milestone Quarterly Report
- Deliverables and milestones completed in November:
  - October monthly update
- Deliverables and milestones completed in December:
  - November monthly update
  - Task 10: D54 – Bell Creek Test Site – Site Closure Plan
  - Task 12: D57 – Annual Assessment Report
  - Task 13: M36 – Technical Advisory Board Meeting Scheduled
  - Task 13: M65 – PCOR Partnership Annual Membership Meeting and Workshop 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:

- Attended the Asia-Pacific Economic Cooperation (APEC) Water-Energy Nexus Expert workshop held October 31 – November 1, 2017, in Atlanta, Georgia. The workshop was created to foster communication among APEC member nations on water-energy issues. Most attendees had background/expertise in the power generation industry. Topics discussed included water availability, alternate water sourcing, diverse regulatory regimes, and the presence or absence of national energy policy. Potential paths forward discussed included the development of an APEC-sponsored water-energy nexus working group, development of international training centers, or development of decision support tools.
- Continued development of the draft D107 (Journal Article or Topical Report – Major Research Focuses for Water and CCS). Added received input from other partnerships. The DOE NETL Project Manager approved the use of a paper to be submitted to GHGT-14 as D107.
- Distributed the notes from the June conference call and the WWG Annual Meeting held August 2, 2017. Provided the presentations from the annual meeting.

- Held the quarterly conference call for November 9, 2017. An update on the status of the final report/paper (D107) was provided, and other business was discussed.

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<sub>2</sub> 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 budget along with actual costs incurred and in-kind cost share reported are shown in Table 10. A spending plan for BP5 and actual incurred cost by quarter of cash funds for BP5 are provided in Figure 7 and Table 11.

**Table 10. Phase III Budget – BP5**

<b>Organization</b>	<b>Approved Budget, \$*</b>	<b>Actual Costs Incurred, \$</b>
DOE Share – Cash	13,946,212	10,382,590
Nonfederal Share	5,711,194	5,780,743
<b>Total</b>	<b>19,657,406</b>	<b>16,163,333</b>

\* As of Modification No. 38.

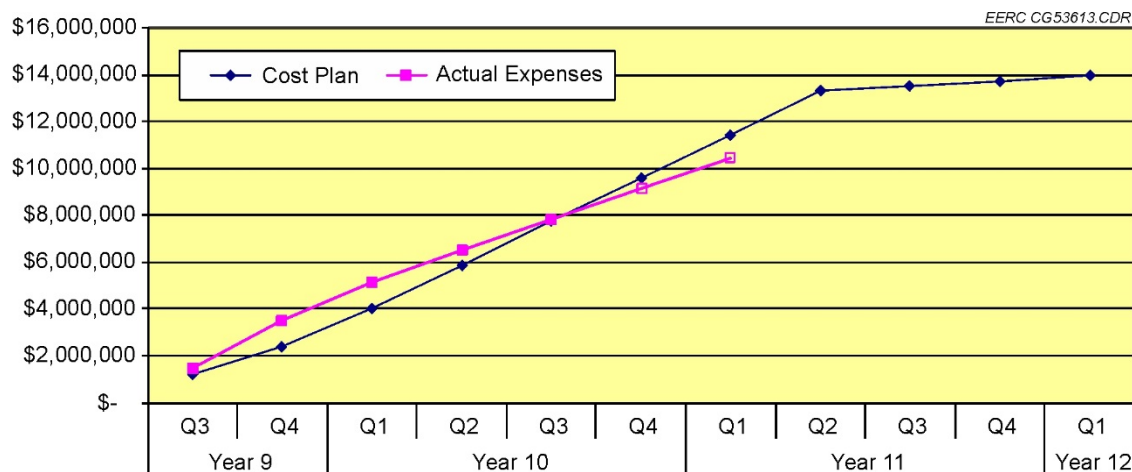


Figure 7. PCOR Partnership Phase III, BP5, Years 9–12 funding (cash only).

### **PHASE III SCHEDULE STATUS**

Table 12 lists all deliverables and milestones by quarter, with completion dates, through the end of the reporting period (see Table 13 for the Gantt chart for BP5, Years 9–12).

**Table 11. 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	\$ 1,623,146	\$ 4,028,934	\$ 1,855,986	\$ 5,884,920	\$ 1,855,986	\$ 7,740,906	\$ 1,855,986	\$ 9,596,892
Nonfederal Share	\$ -	\$ 2,411,971	\$ -	\$ 2,411,971	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Total Planned	\$ 2,250,000	\$ 65,285,408	\$ 2,250,000	\$ 67,535,408	\$ 1,202,894	\$ 1,202,894	\$ 1,202,894	\$ 2,405,788	\$ 1,623,146	\$ 4,028,934	\$ 1,855,986	\$ 5,884,920	\$ 1,855,986	\$ 7,740,906	\$ 1,855,986	\$ 9,596,892
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	\$ 1,623,146	\$ 5,083,286	\$ 1,362,782	\$ 6,446,068	\$ 1,342,971	\$ 7,789,039	\$ 1,319,336	\$ 9,108,375
Nonfederal Share	\$ (4,110)	\$ 2,991,641	\$ 10,655	\$ 3,002,296	\$ 7,501	\$ 7,501	\$ 30,340	\$ 37,841	\$ 10,788	\$ 48,629	\$ 530	\$ 49,159	\$ 14	\$ 49,173	\$ 217	\$ 49,390
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	\$ 1,633,934	\$ 5,131,915	\$ 1,363,312	\$ 6,495,227	\$ 1,342,985	\$ 7,838,212	\$ 1,319,553	\$ 9,157,765
Variance																
Federal Share	\$ 340,102	\$ 4,958,775	\$ (312,356)	\$ 4,646,419	\$ (294,317)	\$ (294,317)	\$ (760,035)	\$ (1,054,352)	\$ -	\$ (1,054,352)	\$ 493,204	\$ (561,148)	\$ 513,015	\$ (48,133)	\$ 536,650	\$ 488,517
Nonfederal Share	\$ 4,110	\$ (579,670)	\$ (10,655)	\$ (590,325)	\$ (7,501)	\$ (7,501)	\$ (30,340)	\$ (37,841)	\$ (10,788)	\$ (48,629)	\$ (530)	\$ (49,159)	\$ (14)	\$ (49,173)	\$ (217)	\$ (49,390)
Total Variance	\$ 344,212	\$ 4,379,105	\$ (323,011)	\$ 4,056,094	\$ (301,818)	\$ (301,818)	\$ (790,375)	\$ (1,092,193)	\$ (10,788)	\$ (1,102,981)	\$ 492,674	\$ (610,307)	\$ 513,001	\$ (97,306)	\$ 536,433	\$ 439,127

**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						
<b>Baseline Cost Plan</b>																
Federal Share	\$ 1,855,987	\$ 11,452,879	\$ 1,855,987	\$ 13,308,866	\$ 212,449	\$ 13,521,315	\$ 212,449	\$ 13,733,764	\$ 212,448	\$ 13,946,212						
Nonfederal Share	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -						
Total Planned	\$ 1,855,987	\$ 11,452,879	\$ 1,855,987	\$ 13,308,866	\$ 212,449	\$ 13,521,315	\$ 212,449	\$ 13,733,764	\$ 212,448	\$ 13,946,212						
<b>Actual Incurred Cost</b>																
Federal Share	\$ 1,274,215	\$ 10,382,590	\$ -	\$ -												
Nonfederal Share	\$ 20,159	\$ 69,549	\$ -	\$ -												
Total Incurred Cost	\$ 1,294,374	\$ 10,452,139	\$ -	\$ -												
<b>Variance</b>																
Federal Share	\$ 581,772	\$ 1,070,289	\$ -	\$ -												
Nonfederal Share	\$ (20,159)	\$ (69,549)	\$ -	\$ -												
Total Variance	\$ 561,613	\$ 1,000,740	\$ -	\$ -												



**Table 12. Phase III Milestones and Deliverables**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 1 – Quarter 1 (October–December 2007)</b>		
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
<b>Year 1 – Quarter 2 (January–March 2008)</b>		
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
<b>Year 1 – Quarter 3 (April–June 2008)</b>		
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
<b>Year 1 – Quarter 4 (July–September 2008)</b>		
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
<b>Year 2 – Quarter 1 (October–December 2008)</b>		
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 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 2 – Quarter 2 (January–March 2009)</b>		
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 <sub>2</sub> 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
<b>Year 2 – Quarter 3 (April–June 2009)</b>		
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
<b>Year 2 – Quarter 4 (July–September 2009)</b>		
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 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 3 – Quarter 1 (October–December 2009)</b>		
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
<b>Year 3 – Quarter 2 (January–March 2010)</b>		
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
<b>Year 3 – Quarter 3 (April–June 2010)</b>		
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
<b>Year 3 – Quarter 4 (July–September 2010)</b>		
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 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 4 – Quarter 1 (October–December 2010)</b>		
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
<b>Year 4 – Quarter 2 (January–March 2011)</b>		
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 <sub>2</sub> 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
<b>Year 4 – Quarter 3 (April–June 2011)</b>		
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 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 4 – Quarter 3 (April–June 2011) (continued)</b>		
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
<b>Year 4 – Quarter 4 (July–September 2011)</b>		
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 <sup>+</sup>	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
<b>Year 5 – Quarter 1 (October–December 2011)</b>		
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

<sup>+</sup> Name change requested September 28, 2011, and approved October 3, 2011.

Continued . . .

**Table 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 5 – Quarter 2 (January–March 2012)</b>		
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
<b>Year 5 – Quarter 3 (April–June 2012)</b>		
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 <sub>2</sub> 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 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 5 – Quarter 4 (July–September 2012)</b>		
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
<b>Year 6 – Quarter 1 (October–December 2012)</b>		
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
<b>Year 6 – Quarter 2 (January–March 2013)</b>		
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 <sub>2</sub> 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 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 6 – Quarter 3 (April–June 2013)</b>		
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 <sub>2</sub> 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
<b>Year 6 – Quarter 4 (July–September 2013)</b>		
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 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 6 – Quarter 4 (July–September 2013) (continued)</b>		
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 <sub>2</sub> Storage, and Monitoring Project Completed	9/30/13	9/24/13
<b>Year 7 – Quarter 1 (October–December 2013)</b>		
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
<b>Year 7 – Quarter 2 (January–March 2014)</b>		
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 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 7 – Quarter 2 (January–March 2014) (continued)</b>		
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
<b>Year 7 – Quarter 3 (April–June 2014)</b>		
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: Task 14 – 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 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 7 – Quarter 4 (July–September 2014)</b>		
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
<b>Year 8 – Quarter 1 (October–December 2014)</b>		
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 <sub>2</sub> 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
<b>Year 8 – Quarter 2 (January–March 2015)</b>		
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 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 8 – Quarter 3 (April–June 2015)</b>		
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 <sub>2</sub> 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 <sub>2</sub> Injected	6/30/15	6/30/15
<b>Year 8 – Quarter 4 (July–September 2015)</b>		
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 <sub>2</sub> 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
<b>Year 9 – Quarter 1 (October–December 2015)</b>		
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 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 9 – Quarter 2 (January–March 2016)</b>		
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 <sub>2</sub> Stored	3/31/16	3/22/16
<b>Year 9 – Quarter 3 (April–June 2016)</b>		
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 – WWG Conference Call Held	6/30/16	4/27/16
<b>Year 9 – Quarter 4 (July–September 2016)</b>		
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 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 9 – Quarter 4 (July–September 2016) (continued)</b>		
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 – WWG Conference Call Held	9/30/16	9/28/16
<b>Year 10 – Quarter 1 (October–December 2016)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/16	10/27/16
D21: Task 2 – Bell Creek Test Site 30-minute Documentary	10/31/16	10/31/16
D105: Task 9 – Comparison of Non-EOR and EOR Life Cycle Assessments	10/31/16	10/31/16
D15: Task 2 – Bell Creek Test Site Fact Sheet (update)	11/30/16	11/30/16
M52: Task 9 – Initial Analysis of Extended Pulsed-Neutron Logging Campaign Data Completed	11/30/16	11/29/16
D57: Task 12 – Project Assessment Annual Report	12/31/16	12/30/16
D81: Task 1 – Regional Carbon Sequestration Atlas (update)	12/31/16	12/30/16
D106: Task 14 – Special Issue of IJGGC – Nexus of Water and Carbon Capture and Storage	12/31/16	12/29/16
M23: Task 14 – WWG Conference Call Held	12/30/16	11/16/16
M24: Task 14 – WWG Annual Meeting Held	12/31/16	8/18/16
M36: Task 13 – Annual Advisory Board Meeting Scheduled	12/31/16	12/28/16
<b>Year 10 – Quarter 2 (January–March 2017)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/17	1/31/17
D22: Task 2 – Energy from Coal 60-minute Documentary	1/31/17	1/31/17
D76: Task 3 – Regional Regulatory Perspective	1/31/17	1/31/17
D35: Task 4 – Bell Creek Test Site – Best Practices Manual – Site Characterization	3/31/17	3/31/17
M23: Task 14 – WWG Conference Call Held	3/31/17	3/30/17
M60: Task 1 – Data Submitted to EDX	3/31/17	3/7/17
M63: Task 9 – Initial Analysis of Processed InSAR Data Completed	3/31/17	3/31/17

Continued . . .

**Table 12. Phase III Milestones and Deliverables (continued)**

Title/Description	Due Date	Actual Completion Date
<b>Year 10 – Quarter 3 (April–June 2017)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/17	4/27/17
D17: Task 2 – General Phase III Information PowerPoint Presentation (update)	5/31/17	5/31/17
D69: Task 9 – Best Practices Manual – Simulation Report	5/31/17	5/31/17
D85: Task 6 – Report – Opportunities and Challenges Associated with CO <sub>2</sub> Compression and Transportation During CCUS Activities	5/31/17	5/31/17
D101: Task 14 – WWG Web Site Content Update 1	5/31/17	5/23/17
D104: Task 9 – Analysis of Expanded Seismic Campaign	6/30/17	6/30/17
M64: Task 9 – Initial Analysis of Expanded Seismic Campaign Data Completed	6/30/17	6/27/17
M23: Task 14 – WWG Conference Call Held	6/30/17	6/28/17
M47: Task 2 – Bell Creek Test Site 30-minute Documentary Broadcast	6/30/17	6/19/17
<b>Year 10 – Quarter 4 (July–September 2017)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/17	7/27/17
D66: Task 9 – Bell Creek Test Site – Simulation Report (Update 6)	8/31/17	8/30/17
D81: Task 1 – PCOR Partnership Atlas (update)	8/31/17	8/31/17
D103: Task 13 – Best Practices Manual – Programmatic Risk Management	8/31/17	8/29/17
D1: Task 1 – Review of Source Attributes (update)	9/30/17	9/27/17
M23: Task 14 – WWG Conference Call Held	9/30/17	8/2/17
M55: Task 9 – Investigation of Crude Oil Compositional Changes during CO <sub>2</sub> EOR Completed	9/30/17	9/25/17
M62: Task 14 – Research Related to Water and CCS Nexus Completed	9/30/17	9/25/17
<b>Year 11 – Quarter 1 (October–December 2017)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/17	10/31/17
D14: Task 2 – General Phase III Fact Sheet (update)	10/31/17	10/7/17
D51: Task 9 – Best Practices Manual – Monitoring for CO <sub>2</sub> Storage and CO <sub>2</sub> EOR	10/31/17	10/31/17
D93: Task 1 – Geological Modeling and Simulation Report for the Aquistore Project (Update 3)	10/31/17	10/7/17
D15: Task 2 – Bell Creek Test Site Fact Sheet (update)	11/30/17	10/7/17

Continued . . .

**Table 12. Phase III Milestones and Deliverables (continued)**

<b>Title/Description</b>	<b>Due Date</b>	<b>Actual Completion Date</b>
<b>Year 11 – Quarter 1 (October–December 2017) (continued)</b>		
D54: Task 10 – Report – Site Closure Procedures	12/31/17	12/28/17
D57: Task 12 – Project Assessment Annual Report	12/31/17	12/29/17
M23: Task 14 – WWG Conference Call Held	12/31/17	11/9/17
M24: Task 14 – WWG Annual Meeting Held	12/31/17	8/2/17
M36: Task 13 – Annual Advisory Board Meeting Scheduled	12/31/17	12/28/17
M65: Task 13 – PCOR Partnership Annual Membership Meeting and Workshop Held	12/31/17	12/29/17
<b>Year 11 – Quarter 2 (January–March 2018)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	1/31/18	
D13: Task 2 – Public Site Updates	1/31/18	
D73: Task 11 – Bell Creek Test Site –Monitoring and Modeling Fate of CO <sub>2</sub> Progress Report	1/31/18	
D8: Task 3 – Permitting Review – Update 4	2/28/18	
D107: Task 14 – Journal Article or Topical Report – Major Research Focuses for Water and CCS	2/28/18	
M23: Task 14 – Monthly WWG Conference Call Held	3/31/18	
M66: Task 13 – Submission of Draft Papers on Associated Storage to Special Issue of <i>International Journal of Greenhouse Gas Control (IJGGC)</i>	3/31/18	
<b>Year 11 – Quarter 3 (April–June 2018)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	4/30/18	
M67: Task 13 – Annual PCOR Partnership Technical Advisory Board Meeting Held	6/30/18	
<b>Year 11 – Quarter 4 (July–September 2018)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	7/31/18	
M60: Task 1 – Data Submitted to EDX	9/30/18	
D62: Task 13 – Final Report	9/30/18	
<b>Year 12 – Quarter 1 (October–December 2018)</b>		
D58/D59: Task 13 – Quarterly Progress Report/Milestone Quarterly Report	10/31/18	
M61: Task 10 – Site Closure for Bell Creek Test Completed	12/31/18	

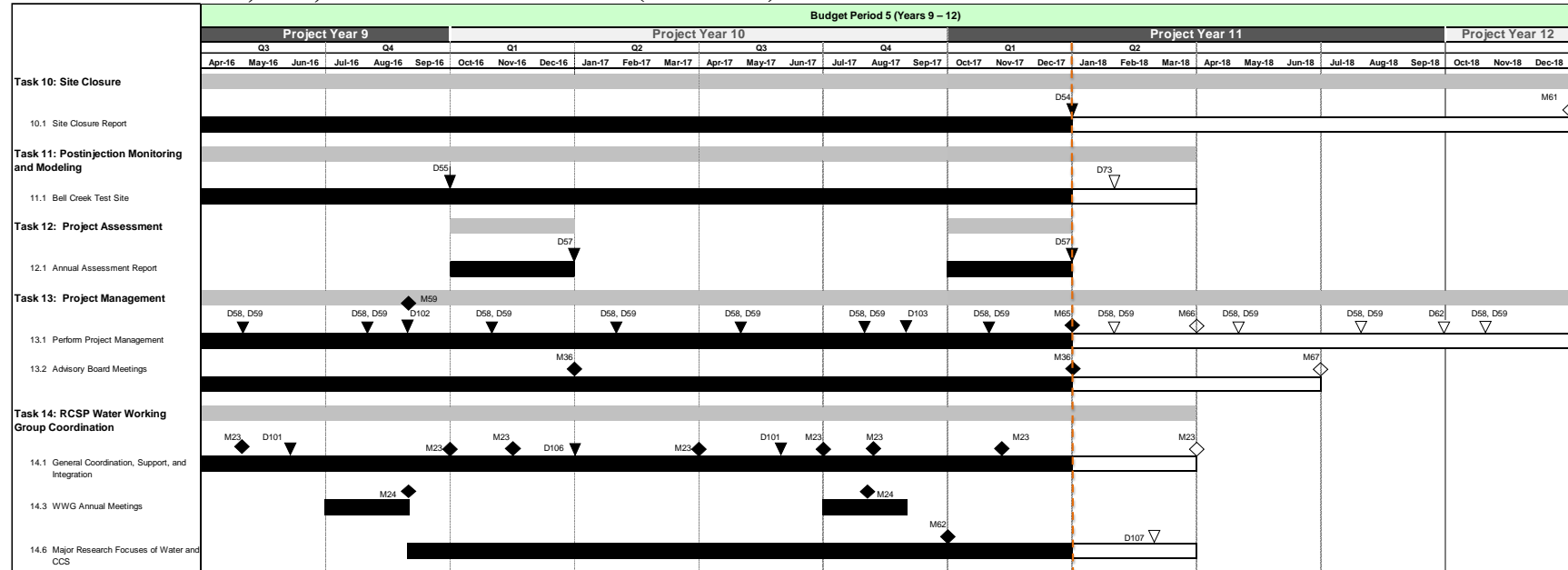


Table 13. Phase III, BP5, Years 9–12 Gantt Chart



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Table 13. Phase III, BP5, Years 9–12 Gantt Chart (continued)



Summary Task

Activity Bar

Progress Activity Bar

Time Now

Deliverable ▽

Milestone ◆

Key for Deliverables (D) ▼			Key for Milestones (M) ◆		
D1	Review of Source Attributes	D62	Final Report	M23	WWG Conference Call Held
D8	Permitting Review	D66	BC Test Site – Simulation Report	M24	WWG Annual Meeting Held
D13	Public Site Updates	D69	BC Test Site – Best Practices Manual – Simulation	M36	Annual Advisory Board Meeting Scheduled
D14	General Phase III Fact Sheet	D73	Report – Monitoring and Modeling Fate of Stored CO <sub>2</sub>	M47	BC Test Site 30-minute Video Broadcast
D15	BC Test Site Fact Sheet	D76	Regional Regulatory Perspective	M52	BC Test Site – Initial Analysis of Extended Pulsed-Neutron Logging Campaign Data Completed
D16	Fort Nelson Test Site Fact Sheet	D81	Regional Carbon Sequestration Atlas	M55	Investigation of Crude Oil Compositional Changes During CO <sub>2</sub> EOR Completed
D17	General Phase III Information PowerPoint Presentation	D85	Report – Opportunities and Challenges Associated with CO <sub>2</sub> Compression	M57	Life Cycle Analysis for EOR Completed
D21	BC Test Site 30-minute Documentary	D93	Report – Geological Modeling and Simulation for the Aquistore Project	M59	Adaptive Management Approach Best Practices Manual Completed
D22	Energy from Coal 60-minute Documentary	D101	WWG Web Site Content Update	M60	Data Submitted to EDX
D35	BC Test Site – Best Practices Manual – Site Characterization	D102	Best Practices Manual – Adaptive Management Approach	M61	Site Closure for Bell Creek Test Completed
D51	BC Test Site – Best Practices Manual – Monitoring for CO <sub>2</sub> Storage and CO <sub>2</sub> EOR	D103	Best Practices Manual – Programmatic Risk Management	M62	Research Related to Water and CCS Nexus Completed
D54	Report – Site Closure Procedures	D104	BC Test Site – Analysis of Expanded Seismic Campaign	M63	Initial Analysis of Processed InSAR Data Completed
D55	BC Test Site – Cost-Effective Long-Term Monitoring Strategies Report	D105	Comparison of Non-EOR and EOR Life Cycle Assessment	M64	Initial Analysis of Expanded Seismic Campaign Data Completed
D57	Project Assessment Annual Report	D106	Special Issue of IJGGC – Nexus of Water and Carbon Capture and Storage	M65	2017 PCOR Partnership Annual Meeting and Workshop Held
D58	Quarterly Progress Report	D107	Journal Article or Topical Report – Major Research Focuses of Water and CCS	M66	Submission of Draft Papers on Associated Storage to Special Issue of IJGGC
D59	Milestone Quarterly Report			M67	Annual PCOR Partnership Advisory Board Meeting Held

December-17

## PHASE III PRODUCTS OR TECHNOLOGY TRANSFER ACTIVITIES

During the reporting period, one abstract was accepted for presentation and nine oral presentations were given at 13 different meetings and conferences and two workshops. In addition, a quarterly progress report, eight deliverables/milestones (three draft and five approved), and three value-added products were completed. One deliverable from a previous quarter also received approval. For more detail, see the Meetings/Travel section.

### Abstracts

#### *Accepted for Presentation*

Hamling, J.A., 2017, Regional update of CCUS field projects within the PCOR Partnership region—improving the commercial viability of CO<sub>2</sub> storage through improved performance monitoring and operational management [abs.]: Carbon Capture, Utilization and Storage Conference, Nashville, Tennessee, March 19–22, 2018.

### Presentations

Azzolina, N.A., 2017, Life cycle analysis for CCS and CCUS—lessons learned and changing paradigms: Presented at the CO<sub>2</sub> & ROZ Conference Carbon Management Workshop, Midland, Texas, December 4–7, 2017.

Glazewski, K.A., 2017, How much monitoring is enough for storage?: Presented at the 2017 PCOR Partnership Annual Membership Workshop, Plano, Texas, October 24, 2017.

Gorecki, C.D., and Ayash, S.C., 2017, Plains CO<sub>2</sub> Reduction (PCOR) Partnership program highlights: Presented at the 2017 PCOR Partnership Annual Membership Meeting, Plano, Texas, October 25, 2017.

Hamling, J.A., 2017, Bell Creek project update: Presented at the 2017 PCOR Partnership Annual Membership Meeting, Plano, Texas, October 26, 2017.

Hamling, J.A., 2017, Developments in CO<sub>2</sub>, ethane, and rich gas EOR—a Williston Basin perspective: Presented at the CO<sub>2</sub> & ROZ Conference Carbon Management Workshop, Midland, Texas, December 4–7, 2017.

Hamling, J.A., Botnen, B.W., Burnison, S., Nakles, D.V., and Bosshart, N.W., 2017, Bell Creek project update: Presented at the Bell Creek Project Update Meeting with Denbury Resources, Plano, Texas, October 23, 2017.

Harju, J.A., 2017, CCS in the northern Great Plains—past, present, and future: Presented at the Midwest Regional Carbon Sequestration Partnership Annual Partners and Stakeholders Meeting, Washington, D.C., November 2, 2017.

Harju, J.A., 2017, Regional evaluation of the complete CCS value chain: Presented at the CSLF Technical Group Meeting, Abu Dhabi, United Arab Emirates, December 4, 2017.

Nakles, D.V., Peck, W.D., Wildgust, N., Hamling, J.A., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2017, Geologic storage of carbon dioxide in the central plains of North America: 2017 American Institute of Chemical Engineers (AIChE) Annual Meeting, Minneapolis, Minnesota, October 29 – November 3, 2017.

## **Deliverables/Milestones**

### ***Draft Submitted***

- Ensrud, J.R., Ayash, S.C., Wildgust, N., and Gorecki, C.D., 2017, PCOR Partnership annual membership meeting and workshop held: Plains CO<sub>2</sub> Reduction (PCOR) Partnership Phase III draft Task 13 Milestone 65 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, December.
- Glazewski, K.A., Aulich, T.R., Wildgust, N., Nakles, D.V., Azzolina, N.A., Hamling, J.A., Burnison, S.A., Livers-Douglas, A.J., Peck, W.D., Klapperich, R.J., Sorensen, J.A., Ayash, S.C., Stepan, D.J., Kalenze, N.S., Musich, M.A., Leroux, K.M., Pekot, L.J., and Gorecki, C.D., 2017, Best practices manual – monitoring for CO<sub>2</sub> storage: Plains CO<sub>2</sub> Reduction (PCOR) Partnership Phase III draft Task 9 Deliverable D51 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, October.
- Gorecki, C.D., Harju, J.A., Steadman, E.N., Heebink, L.V., Romuld, L., Hamling, J.A., Sorensen, J.A., Pekot, L.J., Daly, D.J., Jensen, M.D., Peck, W.D., Klapperich, R.J., Bosshart, N.W., Votava, T.F., Ayash, S.C., and Ensrud, J.R., 2017, Annual assessment report: Plains CO<sub>2</sub> Reduction (PCOR) Partnership Phase III draft Task 12 Deliverable D57 (October 1, 2016 – September 30, 2017) for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, December.

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- Crossland, J.L., Daly, D.J., Crocker, C.R., Wildgust, N., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2017, PCOR Partnership – demonstrating CO<sub>2</sub> storage in the northern Great Plains: Plains CO<sub>2</sub> Reduction (PCOR) Partnership Phase III Task 2 Deliverable D14 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, October.
- Dalkhaa, C., Pekot, L.J., Jiang, T., Oster, B.S., Bosshart, N.W., Sorensen, J.A., and Gorecki, C.D., 2017, Aquistore CO<sub>2</sub> storage project—numerical modeling and simulation update: Plains CO<sub>2</sub> Reduction (PCOR) Partnership Phase III Task 1 Deliverable D93 Update 3 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2017-EERC-10-08, Grand Forks, North Dakota, Energy & Environmental Research Center, October.
- Daly, D.J., Crocker, C.R., Crossland, J.L., Hamling, J.A., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2017, Bell Creek project – enhanced oil recovery resulting in associated CO<sub>2</sub>

storage: Plains CO<sub>2</sub> Reduction (PCOR) Partnership Phase III Task 2 Deliverable D15 fact sheet for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, October.

Glazewski, K.A., Botnen, B.W., Leroux, K.M., Kalenze, N.S., Klapperich, R.J., Wilson IV, W.I., Hamling, J.A., and Gorecki, C.D., 2017, Bell Creek test site – site closure plan: Plains CO<sub>2</sub> Reduction (PCOR) Partnership Phase III Task 10 Deliverable D54 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2017-EERC-12-11, Grand Forks, North Dakota, Energy & Environmental Research Center, December.

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Azzolina, N.A., Nakles, D.V., Ayash, S.C., Wildgust, N., Peck, W.D., and Gorecki, C.D., 2017, PCOR Partnership best practices manual for subsurface technical risk assessment of geologic CO<sub>2</sub> storage projects: Plains CO<sub>2</sub> Reduction (PCOR) Partnership Phase III Task 9 Deliverable D103 for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2017-EERC-10-21, Grand Forks, North Dakota, Energy & Environmental Research Center, August.

### **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., 2017, Plains CO<sub>2</sub> Reduction (PCOR) Partnership: Phase III monthly report (September 1–30, 2017) for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, October.

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., 2017, Plains CO<sub>2</sub> Reduction (PCOR) Partnership: Phase III monthly report (October 1–31, 2017) for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, November.

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., 2017, Plains CO<sub>2</sub> Reduction (PCOR) Partnership: Phase III monthly report (November 1–30, 2017) for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, December.

### *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., 2017, Plains CO<sub>2</sub> Reduction Partnership Phase III: Task 13 Deliverable D58/D59 quarterly technical progress report (July 1 – September 30, 2017) 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, October.

### **Value-Added Products**

#### *Draft Submitted and Approved*

Crossland, J.L., Daly, D.J., and Gorecki, C.D., 2017, Household energy and carbon Web pages report: Plains CO<sub>2</sub> Reduction (PCOR) Partnership Phase III value-added report (April 1 – June 30, 2017) for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2017-EERC-11-11, Grand Forks, North Dakota, Energy & Environmental Research Center, August.

Crossland, J.L., Daly, D.J., and Gorecki, C.D., 2017, Household energy and carbon Web pages report: Plains CO<sub>2</sub> Reduction (PCOR) Partnership Phase III value-added report (July 1 – September 30, 2017) for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, EERC Publication 2017-EERC-11-10, Grand Forks, North Dakota, Energy & Environmental Research Center, November.

Crossland, J.L., Daly, D.J., Crocker, C.R., Wildgust, N., Gorecki, C.D., Steadman, E.N., and Harju, J.A., 2017, Carbon capture, utilization, and storage outreach—practical and environmentally sound discussion of some of today’s hot topics: Plains CO<sub>2</sub> Reduction (PCOR) Partnership Phase III Task 2 value-added fact sheet for U.S. Department of Energy National Energy Technology Laboratory Cooperative Agreement No. DE-FC26-05NT42592, Grand Forks, North Dakota, Energy & Environmental Research Center, October.

### **MEETINGS/TRAVEL**

Representatives from the PCOR Partnership incurred travel costs for their participation in the following 13 meetings/conferences, two workshops, and one project management site trip:

- October 2–4, 2017: traveled to Pittsburgh, Pennsylvania, to attend the IOGCC Annual Meeting and the Environmental & Safety Committee Meeting.
- October 2–5, 2017: traveled to Regina, Saskatchewan, to attend the Global CCS Symposium – Advancing a Path Forward.
- October 4–5, 2017: traveled to Bismarck, North Dakota, to attend the LEC 2017 Fall Conference.

- October 22–27, 2017: traveled to Plano, Texas, to attend a meeting at Denbury headquarters; to host, attend, and present at the 2017 PCOR Partnership Annual Membership Meeting and Workshop; and to host the TAB meeting.
- October 30 – November 1, 2017: traveled to Atlanta, Georgia, to attend the APEC Water–Energy Nexus Expert Workshop.
- October 31 – November 3, 2017: traveled to Washington, D.C., to attend the Midwest Regional Carbon Sequestration Partnership Meeting and events.
- November 6–7, 2017: extended trip in Washington, D.C., to attend the CSLF Financing Task Force meeting.
- November 2–4, 2017: traveled to Minneapolis, Minnesota, to attend the AIChE 2017 annual meeting.
- November 30 – December 7, 2017: traveled to Abu Dhabi, United Arab Emirates, to present at and attend the CSLF 7th Ministerial Meeting.
- December 3–5, 2017: traveled to Midland, Texas, to attend the CO<sub>2</sub> and ROZ conference.
- December 11–13, 2017: traveled to Washington D.C., to attend the DOE RCSP Permitting Meeting.
- December 12–15, 2017: traveled to Gillette, Wyoming, for fieldwork logging at the Bell Creek site.

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