



BELL CREEK TEST SITE – FIRST FULL-FIELD OPERATIONAL PHASE SOIL GAS- AND GROUNDWATER-SAMPLING EVENT COMPLETED

Plains CO₂ Reduction (PCOR) Partnership Phase III Task 9 – Milestone M43

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BELL CREEK TEST SITE – FIRST FULL-FIELD OPERATIONAL PHASE SOIL GAS- AND GROUNDWATER-SAMPLING EVENT COMPLETED

INTRODUCTION

The Plains CO₂ Reduction (PCOR) Partnership, led by the Energy & Environmental Research Center (EERC), is working with Denbury Resources, Inc. (Denbury), to investigate the efficacy of incidental carbon dioxide (CO₂) storage associated with large-scale injection (>1 million tons a year) of CO₂ into a deep clastic reservoir during CO₂ enhanced oil recovery (EOR). This study is being carried out at the Bell Creek oil field, which is operated by Denbury Onshore, LLC.

CO₂ for the study is obtained from the ConocoPhillips Lost Cabin gas-processing plant in Fremont County, Wyoming, and injected into a sandstone reservoir in the Lower Cretaceous Muddy (Newcastle) Formation at a depth of approximately 4500 feet (1372 meters). The plant supplies approximately 50 million cubic feet of CO₂ a day to the Bell Creek oil field. Injection will occur in a staged approach across the field. The activities at Bell Creek will inject an estimated 1 million metric tons of CO₂ annually, much of which will be incidentally stored in association with the EOR project.

The baseline water- and soil gas-monitoring program, which comprised six full-field quarterly events and five targeted monthly events, was carried out by the PCOR Partnership between November 2011 and April 2013. The majority of the sites sampled during the baseline monitoring program (Figure 1) were also targeted for the first full-field operational phase sampling event, which this milestone marks.

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Collection of groundwater and soil gas data was completed throughout the Bell Creek Field November 15, 2013, for the first annual operational sampling event. The following locations were sampled for water or soil gas monitoring:

- Water monitoring:
 - Fieldwide water chemistry analysis was established at:
 - ◆ Sixteen existing shallow groundwater wells.
 - ◆ Eight surface water locations.

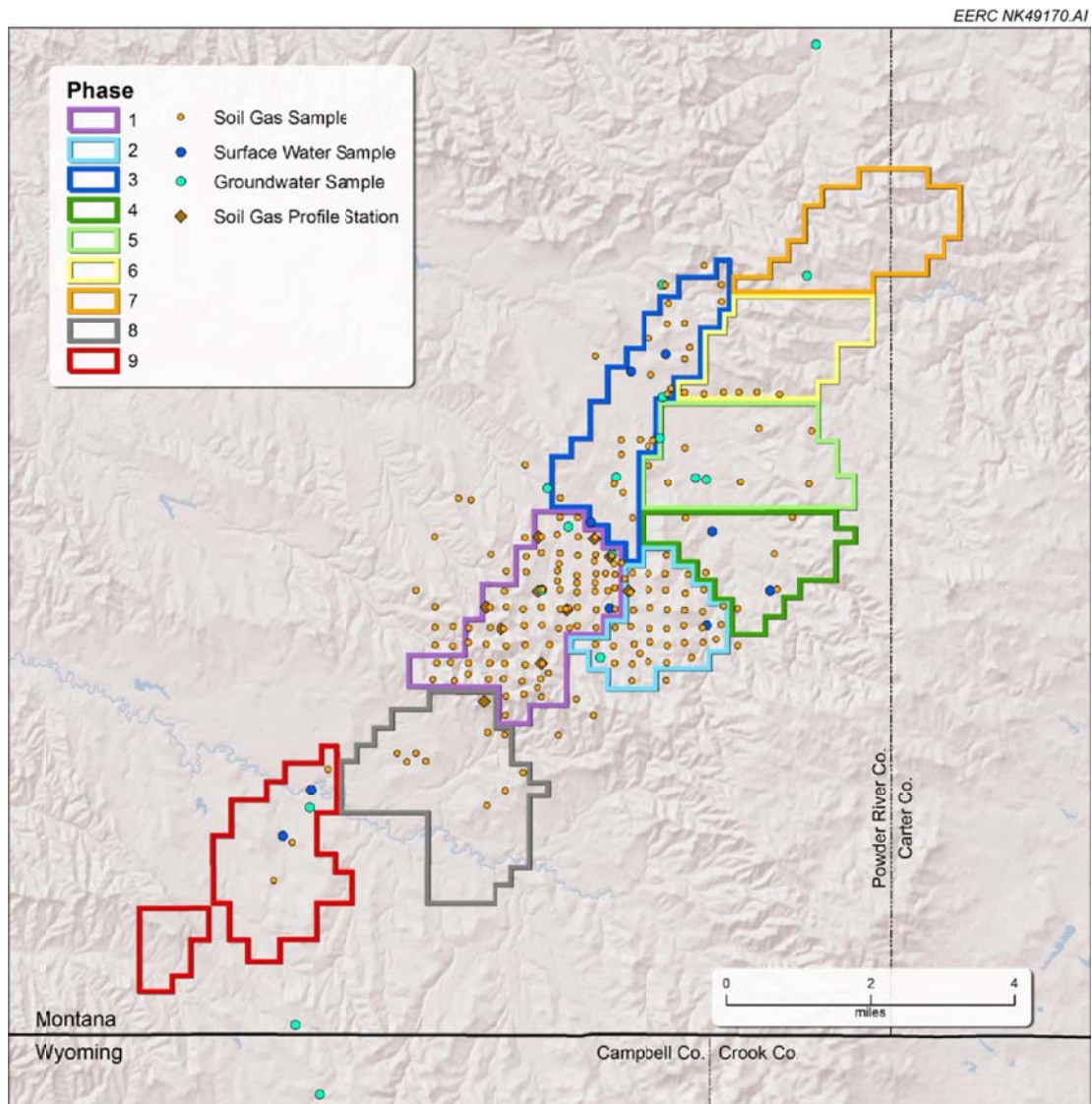


Figure 1. Soil gas- and groundwater-sampling locations collected for baseline monitoring activities between November 2011 and April 2013.

- ♦ Two purpose-built groundwater-monitoring wells screened in the Fox Hills Formation (the deepest regional underground source of drinking water).
- Soil gas monitoring:
 - Fieldwide soil gas concentrations established near:
 - ♦ One hundred twenty-four active (injection/production) well locations.
 - ♦ Ten interspaced (between active well) locations.
 - ♦ Forty-nine plugged and abandoned (P&A) well locations (sampled in a three-directional spot pattern at each location).
 - ♦ Five redrilled wells that were previously P&A well locations during baseline sampling (sampled in a three-directional spot pattern).

- ♦ Ten purpose-built fixed-location soil gas profile stations (sampled at depths of 3.5, 9, and 14 feet).

The newly acquired operational data sets will 1) provide a scientifically defensible data set to evaluate any deviation from baseline conditions, 2) assess variances in water chemistry and soil gas concentrations when compared to the baseline results, and 3) provide a means to identify and characterize the significance and source of anomalies (if present) when compared to baseline conditions. Select sites will be sampled monthly and as a full-field repeat annually during the operational monitoring phase of the project. Acquired data sets and the methodology developed at Bell Creek will allow future carbon capture utilization and storage operators to make informed decisions regarding site-specific monitoring programs at other commercial-scale injection sites throughout the region. The results of this and subsequent sampling events will be reported in future reports.