

## **Pre- and Post-Injection Vertical Seismic Profiling over the Southwest Regional Partnership's Phase II Fruitland Coal CO<sub>2</sub> Pilot**

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In this study we report on the results of pre- and postinjection vertical seismic profiles collected at the Southwest Regional Partnership (SWP) on Carbon Sequestration's San Juan Basin Fruitland Coal pilot test. The project is funded by the U.S. Department of Energy and is managed by the National Energy Technology Laboratory. The pilot test was undertaken in collaboration with ConocoPhillips as a joint enhanced coal-bed methane recovery test and demonstration of CO<sub>2</sub> sequestration in deep, unmineable coal seams. The SWP conducted the pilot in the Upper Cretaceous high- rate, Fruitland-production fairway southwest of the northwest-trending basin hinge. CO<sub>2</sub> injection began July 30, 2008 and continued through August 14, 2009. During the 12-month injection period, approximately 256 MMCF, equivalent to nearly 14,900 tons of CO<sub>2</sub>, were injected into the Fruitland coals.

The pre-injection, vertical seismic profiles were completed on June 3-4, 2008. The post-injection surveys were acquired on September 17, 2009: a month after CO<sub>2</sub> injection was completed. The monitor VSPs were not surveyed until the reservoir was pressured down. Both pre- and post-injection surveys included a zero offset VSP and three offset VSPs. The zero-offset source was located 114 ft from the injection well along a 245 degree azimuth. Long offset sources were located 1498 ft from the injection well along a 216 degree azimuth, 1693 ft along a 34 degree azimuth, and 1942 ft along an azimuth of 349 degrees.

Three component geophones were located at 50-ft intervals along the length of the borehole, extending from 500 ft to 2850 ft subsurface. Elemental analysis through the lower Fruitland reveals thick coal seams in the intervals 2950-2970 ft, 2975- 2986 ft, 3048-3060 ft, and 3111-3336 ft. CO<sub>2</sub> was injected into the lower Fruitland coal section below 2950 ft. Compression and shear-wave velocities were measured using Schlumberger's Sonic Scanner tool from 285 ft to 3132 ft subsurface. Density was also measured as part of the Platform Express run. Synthetic seismograms are used to tie subsurface geology to surface 3D seismic in the area and also to the VSP responses. Results from time lapse processing will be presented.