Pressure Management and Plume Control Strategies Through a Brine Extraction Storage Test (BEST) at the Devine Test Site (DTS) in Texas

Award Number: DE-FE0026137

Project Summary:

The project focused on the development of engineering strategies/approaches for managing changes in formation pressure by testing active brine extraction wells, passive pressure relief wells, and combinations of both, to control the pressure buildup in a formation resulting from carbon storage activities. Under each pressure management strategy, a complete life-cycle analysis for brine was developed along with brine handling strategies. The study included some laboratory and pre-pilot-scale work to obtain the design parameters for a second field testing phase at the Devine Test Site (DTS) in Texas.

Project Outcomes:

The geology at the DTS is favorable for geological carbon storage with the Hosston Formation identified as the target formation. This formation has typical high permeability values of 132 millidarcy (mD). Numerical modeling was performed to design the injection-extraction system. Three wells (injection, location, and observation wells) located at the apexes of an equilateral triangle were found to be the best configuration. An injection rate of ~5000 barrels per day (bpd) and extraction rate of 2500 bpd were calculated to be the most robust design given the uncertainty in injection interval thickness and system flow properties. An active system, in which fluids are actively brought to the surface, was found to meet the pressure objectives better than a passive system, in which extracted brine is directed to other zones without being produced to surface. Investigation into approaches for monitoring the pressure plume and the injected fluid plume yielded an approach using magnetic nanoparticles that can be illuminated using an electromagnetic logging tool and thus provide a 3-D image of the injected fluid plume. The overall conclusion of this analysis is that a Phase II field study at DTS using the brine extraction strategies described here to alleviate pressure build-up and control the plume during carbon dioxide (CO_2) injection is suggested.

Prime Performer:
University of Texas at Austin

Key Performers:
GE Global Research

Principal Investigator:
Seyyed Hosseini

Project Duration:
9/1/2015 – 8/31/2016

Performer Location:
Austin, Texas

Program:
Carbon Transport & Storage

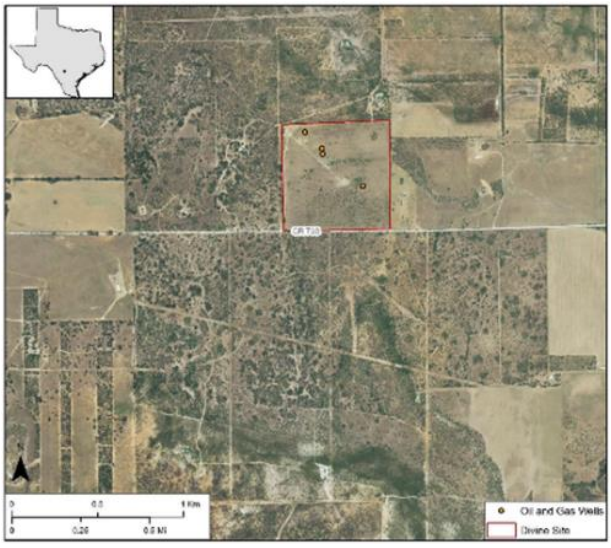

Figure 1: Aerial view of the proposed site, the Devine Test Site (DTS) outlined in red. The image also shows relatively flat topography and a county access road.

Presentations, Papers, and Publications

Final Report: Pressure Management and Plume Control Strategies Through a Brine Extraction Storage Test (BEST) at the Devine Test Site (DTS) in Texas (April 2016) – S. Hosseini, J.P. Nicot, R. Darvari, R. Costley, J. Lu, D. Sava, A. Goudarzi, P. Mickler, D. Banerji, K. Uhlman, S. Walden, T.F. Hentz, H.S. Hamlin, R. Ganjdanesh, A. Sun, S. Hovorka, B. Scanlon