DCP Midstream
Lea County, New Mexico

Zia Acid Gas Injection Well #1

DCP Midstream (DCP) contacted Geolex, Inc. ® (Geolex) to site, permit and provide geologic and regulatory oversight for the drilling and completion of two acid gas injection (AGI) wells at their new Zia II gas plant (the Plant) location in Lea County, New Mexico. The Plant was constructed concurrently during the drilling of Zia AGI #1, where the well is located on the Plant facility. Zia AGI #1 was drilled to accept treated acid gas (TAG) at equal rates from the Plant in conjunction with Zia AGI #2. DCP needs to safely inject a maximum of 15 million standard cubic feet per day (MMSCFD) of TAG for 30 years. Under normal operations the TAG will be injected into both AGI wells simultaneously. The TAG stream is composed of approximately 89% CO_2 and 11% H_2S, with trace constituents of C_1-C_6 and Nitrogen. During scheduled or unanticipated maintenance, the ratio between the wells may be modified. Geologic studies conducted for the selection of this location demonstrate that the proposed injection zone is readily capable of accepting and containing the proposed acid gas and CO_2 injection volumes. However, due to the unforeseen limited permeability encountered in the Zia AGI #1, injection rates have been lowered, and the location and injection zone for Zia AGI #2 is being reevaluated.

Phase I - AGI Feasibility Study:

Geologic studies and analyses of the reservoir characteristics conducted at this location confirmed that the injection zone is an excellent closed-system reservoir that should accommodate and contain the future volumetric needs for disposal of acid gas and CO_2 by injection of the Plant. Major elements in this feasibility study included: 1) the characterization of all wells completed in hydrocarbon-producing zones that surround and are present on the Plant site, 2) the past and current uses of the injection zone, 3) the stratigraphic and structural setting of the targeted injection zone relative to any nearby active or plugged wells, and other wells penetrating the intervals, 4) Identification and characterization of all plugged wells in the vicinity of the injection well, 5) Sources of injection fluid and compatibility with the formation fluid of the injection zone, and 6) location and identification of any fresh water bearing zones in the area; the depth and quality of the available groundwater in the vicinity, including a determination that there are no structures which could possibly act as conduits between the disposal zone and any known sources of drinking water.

Phase II – Permitting:

In 2013, Geolex submitted a C-108 application to the New Mexico Oil and Gas Conservation Division (NMOCD). Discussions with the Bureau of Land Management (BLM) and NMOCD resulted in some design modifications and changes to the surface locations in the original C-108 application to better fit the configurations and safety requirements of the Plant. Prior to the acceptance of the Zia AGI #1 C-108 application, A New Mexico Oil Conservation Commission (NMOCC) public hearing took place where Alberto A. Gutiérrez, RG provided testimony as an expert petroleum geologist and hydrogeologist. The NMOCC approved the application under Order R-13809, allowing DCP to inject TAG into the desired formation at pressures not to exceed 2,233 psig. Due to the location of the well on federally owned land, DCP was required to submit an Application for Permit to Drill (APD) to the BLM. This application covers the Nine Point Drilling Plan associated

Major Project Elements:

Phase I:
AGI Feasibility Study

Phase II:
Permitting and Expert Witness Testimony

Phase III:
Well Design, Drilling and Completion Supervision

Commissioning, Training, and Start-up Oversight

Phase IV:
Ongoing Maintenance, Support, and Compliance for existing AGI wells

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with all pre, current and post drilling activities. In conjunction with the C-108 and APD applications, Geolex prepared a comprehensive H_2S Contingency Plan (Rule 11), which encompasses the gas plant, the pipeline, the compressor facility, and the well head, which was approved by the NMOCD prior to commencement of injection operations.

Phase III - Well Design, Drilling and Completion Supervision:

The AGI facilities and wells are integrated components of the Plant's design. Due to the corrosive environment in which the Zia AGI #1 is required to operate, special consideration was given to the metals used in its construction. Corrosion resistant alloys were thoroughly evaluated and included in the well design of all potentially impacted components, which include the wellhead, valves, packer, casing and tubing. Geolex was responsible for geologic and regulatory oversight associated with all drilling and completion activities. Collaboration with the drilling engineers in interpreting geophysical logs and analyzing sidewall cores resulted in the selection of the correct perforation zones, which was confirmed through reservoir testing. Geolex supervised, instructed, and trained plant operators in start-up and in how to minimize technical problems in order to safely inject TAG.

The Zia AGI #1 began injecting TAG in August of 2015. Injection rates are currently below the design rate of 7.5 MMSCFD. Due to the limited permeability encountered in Zia AGI #1 future stimulation plans of the reservoir could provide increased injection rates.

Phase IV - Ongoing Maintenance, Support, and Compliance:

Geolex's ongoing activities include annual mechanical integrity tests, notifying DCP of any upcoming deadlines, and currently overseeing monitoring and maintenance of Linam AGI #2. Due to seasonal fluctuations, the annular pressure is constantly monitored by gas control operations at the plant so that any pressure anomalies can be addressed immediately if the need arises. Tubing injection pressure and volume are monitored and archived for input into reservoir modeling software. Any changes in injection pressures at the subsurface safety valve (SSSV) control panel are constantly monitored, and regular function rests for the SSSV are scheduled every 6 months to verify proper functioning of the sliding sleeve within the SSSV. Current state guidelines mandate a mechanical integrity test (MIT) of the annular space every year. By having the annular pressures monitored constantly by gas control, regular MIT tests can be conducted in a routine manner.